IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

REMBRANDT WIRELESS TECHNOLOGIES, LP, Plaintiff, v. APPLE INC., Defendant.	Case No. 2:19-cv-00025-JRG Hon. Rodney Gilstrap JURY TRIAL DEMANDED

OPENING EXPERT REPORT OF RICHARD T. MIHRAN, PH.D.

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I. INTRODUCTION

1. I, Richard T. Mihran, Ph.D., submit this report on behalf of the Defendant Apple Inc. ("Apple") in the above-captioned action, to provide the information required by Rule 26(a)(2)(B) of the Federal Rules of Civil Procedure. I have been retained as a technical expert in connection with the above-captioned action to study and provide my opinions on certain issues related to U.S. Patent Nos. 8,023,580 (the "'580 patent") and 8,457,228 (the "'228 patent").[1]

2. I have been asked, for purposes of this report, to provide my opinions regarding the state of the art as of the priority date of each patent. I have also been asked to provide background explanations of the relevant technologies, the '580 and '228 patents and their prosecution histories, my opinions regarding the scope and content of the prior art as of the respective priority dates, my opinions regarding the experience and education of a person of ordinary skill in the art to which each patent is directed, and the validity of the asserted claims of each patent. A summary of my opinions is set forth below, and my opinions are set forth in detail in this report and in the accompanying Exhibits.

II. BACKGROUND AND QUALIFICATIONS

3. I am a Professor Adjunct in the Department of Electrical, Computer and Energy Engineering at the University of Colorado at Boulder, where I have been on the faculty since 1990. I teach a wide variety of classes at the undergraduate and graduate level covering general electrical and computer engineering theory and practice, including circuit theory, microelectronics, communications, signal processing, and medical devices and systems. Many of these classes incorporate lecture and laboratory components that include both hardware and software design.

[1] Unless otherwise noted, all emphasis to quotes and citations herein are added by me.

4. I have performed research and development in academic and industrial settings pertaining to electronic, optical and ultrasonic devices and systems for a wide variety of applications, including both hardware and software development, for over 35 years. As part of my faculty role at the University of Colorado, I participate in the supervision of doctoral research performed by graduate students as part of obtaining their doctoral degrees.

5. Classes I have taught at the undergraduate and graduate level include those covering analog and digital signal processing; radio-frequency identification devices and wireless communications, including modulation and demodulation; miniaturized devices incorporating embedded systems; medical devices and systems; and optical electronics, including fiber optic communications. Many of these courses cover subject matter directly relevant to wired and wireless communication systems, including principles of electromagnetic, inductive, electrostatic, and optical coupling and energy transfer, carrier modulation and demodulation techniques, and methods of data encoding. These courses further include components and concepts directly relevant to electronic devices and systems and their interfaces with other devices, including communications networks, general principles of wired and wireless RF communications, and data signal modulation and encoding in a variety of applications.

6. With respect to the subject matter of the patents addressed in this Report, wired and wireless modem communications systems are generally implemented using microprocessor-based designs along with supporting control and transceiver communication circuitry. I have been involved in the design and analysis of microprocessor-based devices and systems since approximately 1979, utilizing commercial microprocessors manufactured by Intel, Motorola, Zilog and Microchip, among others. Research projects I have directed involving such microprocessor-based systems include the development of radio frequency identification (RFID) readers, transponders and networks; spread-spectrum RF data telemetry devices, embedded

system radar signal processing devices, and microprocessor-controlled medical devices and systems. Many of these projects have involved the development and/or analysis of communications transceiver devices utilized in systems for acquiring, processing, storing and retrieving data, as well as computational algorithms and analytical techniques implemented in both software and firmware on a variety of computing platforms, including embedded microprocessor systems and personal computers (PCs).

7. Since obtaining my Ph.D. in 1990, I have also actively consulted in industry in many areas of technology development and analysis, including product development and analysis of intellectual property portfolios. The fields of technology in which I have consulted include, but are not limited to, wireless smart card and Radio Frequency Identification systems, including design and analysis of RFID readers, transponders, and networking architectures of RFID devices in inventory tracking applications; wireless networking devices and systems; spread-spectrum data telemetry devices and systems for industrial and medical applications; computer storage and data systems; and wireless telecommunications and networking.

8. I have consulted in the area of wireless communications systems and RFID systems, devices and networks for over twenty five years, including those having frequencies of operation ranging from LF through VHF, UHF and microwave bands, and employing a wide range of different modulation and encoding protocols and techniques. Included among this activity is consulting and teaching of short-range wireless communication techniques used in RFID and near-field communication (NFC), including various forms of amplitude and angle modulation techniques, including ASK/OOK, FSK and PSK, and including multi-mode transceivers capable of communicating using multiple modulation and digital data encoding schemes. I have also led the development of narrow-band and spread-spectrum RF data telemetry systems used in large-scale agricultural management applications, which used a variety

of different approaches to signal modulation and encoding. This work further includes consulting and teaching of wireless communications techniques used in the medical field for communication between external transceivers and implanted medical devices used for non-invasive programming and general data exchange. These systems include those utilizing a wide range of proprietary signaling and encoding protocols, employing modulation such as ASK/OOK, FSK, and PSK.

9. I have further consulted in the telecom industry for companies such as EchoStar and Comcast, including projects directed to terrestrial cable and satellite communications systems. These systems utilize packet-based communication networks employing modulation techniques such as QPSK, 8-PSK and QAM, among others.

10. I am an inventor on three issued U.S. patents and one Canadian patent associated with some of these activities, two involving computer-based Doppler radar signal processing and data analysis to extract, digitize and process AM and FM signal components of reflected signals from moving objects to track trajectory, and two involving data telemetry utilizing narrow-band and spread spectrum wireless links and database analysis systems for agricultural management applications.

11. I have served as an expert witness in a variety of patent litigation matters in the areas of wired and wireless telecommunications, active and passive radio-frequency identification (RFID) devices and systems, computers and computer networks, data storage, medical devices, and others. I have been admitted and recognized in U.S. District Courts as a technical expert in seven separate District Court patent trials, as well as before the International Trade Commission (ITC).

12. As part of this work, I have been recognized and admitted as a technical expert and provided testimony at trial in a patent matter in the District of Delaware in the field of RF

transponders and readers operating in the UHF band used as part of vehicular tire pressure monitoring systems (TPMS). I have also been recognized and admitted in the Federal District of Colorado as a technical expert and provided testimony at trial in the field of implantable radio-frequency identification transponders and readers which operate using FSK modulation. I have further been admitted and recognized as a technical expert in wireless communications in the Northern District of California, San Jose Division where I served as a technical expert witness on behalf of several manufacturers of wireless networking equipment. The accused products in that matter included PCMCIA wireless network adapters used to provide wireless connectivity to a variety of data networks, including Ethernet and cellular networks.

13. I have also been admitted and recognized as a technical expert in the Eastern District of Virginia in which I served as a technical expert witness on behalf of several major cellular service providers and smart phone manufacturers. The accused products in that matter included USB and PCMCIA wireless network adapters used to provide wireless Internet connectivity to computers over cellular data networks, such as GSM and CDMA based networks. I have also been admitted and recognized as a technical expert in the Eastern District of Texas in which I served as a technical expert witness addressing patents directed to integrated microcontrollers and associated network adapter modules used to provide Ethernet communications.

14. I received a BS in Electrical Engineering and Applied Physics from Case Western Reserve University, Cleveland, Ohio in 1982. I further received an MS in Electrical and Computer Engineering and a Ph.D. in Electrical Engineering from the University of Colorado at Boulder in 1988 and 1990, respectively. A summary of my professional and educational background, as well as a listing of other matters on which I have provided consulting and/or

provided testimony as a technical expert, are detailed in my *curriculum vitae,* attached as Exhibit A to this Report.

15. In preparing the opinions and discussion outlined in this report, I have reviewed and considered patents, technical references, and court documents, among other documents. A list of the documents that I have received, reviewed, and/or relied upon for this report is attached as Exhibit C (and includes also those cited in the body of this report). I have also relied on years of education, teaching, research, and experience, and my understanding of the applicable legal principles. As I continue my work on the issues raised in this case, I may supplement, refine or revise my opinions and findings as a result of further review and analysis. I may also consider additional documents and information in forming any necessary opinions – including documents that may not yet have been produced and testimony that may not yet have been given.

16. This report contains a summary of my opinions and analysis to date in connection with this issue. I expect to be called as an expert witness if this case comes to trial. As I continue my work on the issues raised in this case, I may supplement, refine or revise my opinions and conclusions as a result of further review and analysis, or upon further information from the parties or the Court. I have not yet prepared any demonstrations or demonstrative charts, presentations or other exhibits to summarize or explain my opinions, but may do so.

III. SUMMARY OF OPINIONS

17. This Report provides the opinions and conclusions I have formed and the bases for each. In support of my opinions and conclusions, I expect to testify concerning my background and qualifications, and technical aspects of the asserted claims and prior art to the asserted claims.

18. It is my opinion that all of the asserted claims are invalid for at least the following reasons:

- All of the asserted claims are invalid under 35 U.S.C. § 102 or § 103, either anticipated or rendered obvious by prior art, as discussed below and in the attached claim charts;
- None of the secondary considerations identified by Rembrandt supports its claim of non-obviousness;
- All of the asserted claims are invalid under 35 U.S.C. § 112 due to a lack of written description, as discussed below;
- Each of the asserted claims recite well-understood, routine, conventional subject matter.

IV. PATENTS-IN-SUIT

A. Prosecution Overview

19. The ’580 and ’228 patents purport to claim priority, through a string of applications, to Provisional Application No. 60/067,562, filed on December 5, 1997 (“the Provisional Application”).

20. Starting from most recent events and working backward in time to the Provisional Application, the ’228 patent issued on June 4, 2013, and matured from Application No. 13/198,568, which was filed on August 4, 2011. Application No. 13/198,568 was filed as a continuation of Application No. 12/543,910, filed on August 19, 2009. Application No. 12/543,910 matured into the ’580 patent, which issued on September 20, 2011. Application No. 12/543,910 was filed as a continuation of Application No. 11/774,803, which was filed on July 9, 2007 and issued as Patent No. 7,675,965. Application No. 11/774,803 was filed as a continuation of Application No. 10/412,878, which was filed on April 14, 2003 and issued as Patent No. 7,248,626. Application No. 10/412,878 (“the CIP Application”) was filed as a continuation-in-part of Application No. 09/205,205, which was filed on December 4, 1998 and issued as Patent No. 6,614,838. Application No. 09/205,205 claims priority to the Provisional Application, which was filed on December 5, 1997 as discussed above. *See* “Related U.S. Application Data” on the

faces of the ’580 and ’228 patents. I will discuss in more detail certain aspects of these applications and patents in Section X.A below.

21. The ’580 patent issued with 79 claims, with claims 1, 23, 32, 40, 49, 54, and 58 being independent claims. Claims 1, 4-5, 10, 13, 20-22, 38, 47, 54, 57, 58, 61, 62, 66, 70, 76-79 were found to be unpatentable and cancelled by the Patent Office during IPR proceedings not involving Apple. *See* Final Written Decisions in *Samsung Elecs. Co. Ltd. v. Rembrandt Wireless Tech., LP*, IPR2014-00518 and IPR2014-00519. I understand that on December 4 and 15, 2014, Rembrandt further statutorily “disclaimed” claims 24, 26-28, 31-37, 39, 40, 42-46, and 48 under 37 C.F.R. § 1.321(a). Therefore, the claims not previously cancelled or disclaimed are claims 2-3, 6-9, 11-12, 14-19, 23, 25, 29, 30, 41, 49-53, 55-56, 59-60, 63-65, 67-69, and 71-75. I understand that Rembrandt has asserted in this case only claims 2 and 59 of the ’580 patent.

22. The ’228 patent was filed as a continuation of the ’580 patent. The ’228 patent issued with 52 claims, with claims 1, 22, and 26 being independent claims. Claims 1-3, 5, 10-20, 22, 23, 25-29, 31, 36-41, 43, and 47-52 were found to be unpatentable and cancelled by the Patent Office during IPR proceedings not involving Apple. *See* IPR2014-00518, Pap. 47 at 21 [REM_USPTO_00023613 at 22]; IPR2014-00892, Pap. 46 at 23 [RIP00103337 at 23]. Therefore, the claims not previously cancelled are claims 4, 6-9, 21, 24, 30, 32-35, 42, and 44-46. I understand that Rembrandt has asserted in this case only claim 21 of the ’228 patent.

B. Overview of the Purported Inventions

23. The “Background, Present State-of the-Art and Similar Designs” section of the Provisional Application describes that in prior art “data communications to date, a given data transmitter/receiver (modem) always successfully communicates only with a modem that is compatible at the modulation or physical layer.” Provisional Application at 2. Thus, in prior art “point-to-point communications architecture, if a modem attempts to establish a communication

session with an incompatible modem, one or both of the modems will typically attempt several times to communicate and then cease further attempts" making "[c]ommunication on the link impossible," such that the "solution demands replacing at least one of the modems so that both have a common operating modulation." *Id*.

24. Similarly, in a prior art "multipoint architecture, wherein a single 'central site' (**master**) modem communicates to two or more 'tributary' (**trib**) modems, the master communicates to all tribs with a single modulation method." *Id.* at 2 (bold font in original). "If one or more of the tribs is not compatible, the master can not [sic] communicate with that trib. Moreover, repeated attempts by the master to communicate with that incompatible trib will disturb communication to any compatible tribs due to wasted communication attempt time. It is seen that no attempt is made in the prior art to mix incompatible trib modulations in a multipoint architecture." *Id*. Thus, "[a]ccording to the prior art, all tribs must have a common modulation." *Id*. at 3.

25. The purported solution is depicted in Figure 5 of the patents-in-suit and the portions of the specification explaining it. The "Master Type A + B" device establishes communication with "Trib 1 Type A" (shown on the right) using Type A modulation. *See* '580 patent at Fig. 5, sequence 104. The bilingual master device then sends a Type A modulated training sequence to "Trib 1 Type A" informing "Trib 1 Type A" that the master is going to "change to Type B." *See id.* at sequence 106. The bilingual master then sends "Address + Data" information, in Type B modulation, to "Trib 2 Type B." *See id*. at sequence 108. When the master is finished communicating with "Trib 2 Type B" it sends sequence 114, modulated in Type A modulation, informing Trib 1 Type A that communications have reverted to Type A modulation. *See id*. at sequence 114. Figure 5 is reproduced below:

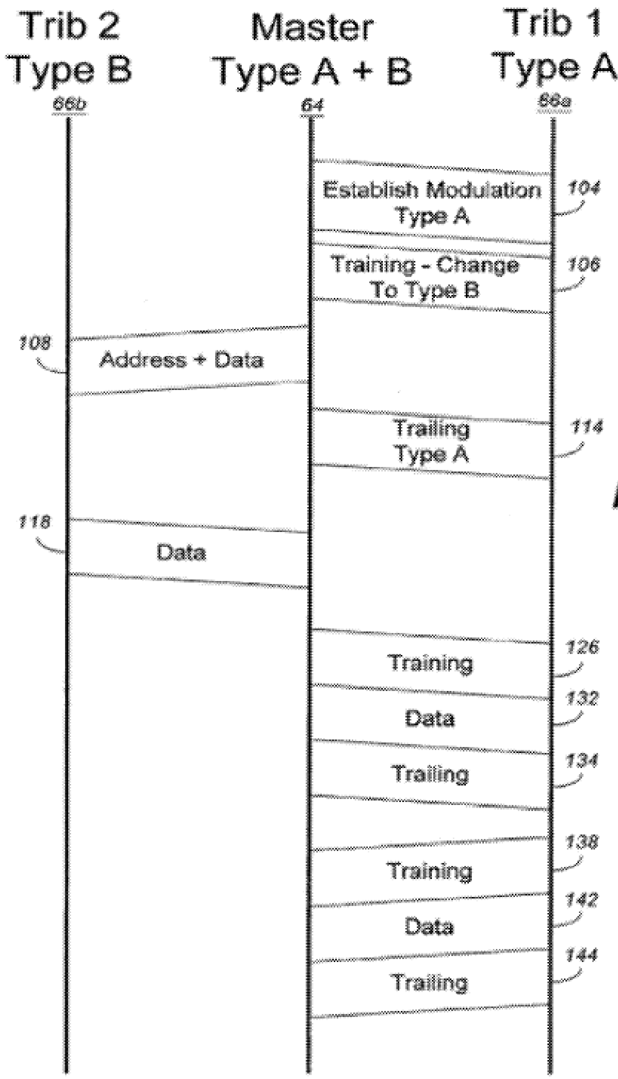

FIG. 5

V. ONE OF ORDINARY SKILL IN THE ART

26. I understand that the factors considered in determining the ordinary level of skill in the art include the level of education and experience of persons working in the field; the types of problems encountered in the field; and the sophistication of the technology.

27. In my opinion, a person of ordinary skill in the art relating to the technology of the patents-in-suit as of the priority date of the ’580 and ’228 patents would have had a minimum of a Bachelor’s degree in Electrical Engineering, Computer Science, or a related field, and approximately two years of experience in the field of communication systems. Additional graduate education could substitute for professional experience, or significant experience in the

field could substitute for formal education. I am qualified to provide opinions concerning what a person of ordinary skill in the art would have known and understood at that time, based on my education and work experience, and my analysis and conclusions herein are from the perspective of a person of ordinary skill in the art as of the claimed priority date of the December 5th, 1997.

VI. CLAIM CONSTRUCTION

28. For the purposes of this declaration, I have been asked to apply the following construction provided by the Court in performing my analysis. For all remaining claim terms, I have applied their plain and ordinary meaning as would have been understood by one of ordinary skill in the art at the time of the claimed invention:

Claim language	**Court's Construction**
"modulation method [] of a different type" / "different types of modulation methods" '580: 1, 58 '228: 1	"different families of modulation techniques, such as the FSK family of modulation methods and the QAM family of modulation methods"

See Claim Construction Memorandum and Order, 18. I understand the Court's construction of "different types of modulation methods" is based on the following statement that Rembrandt made during prosecution of the '580 patent:

> Applicant thanks Examiner Ha for the indication that claims 1–18 and 37–57 are allowed (office action, p. 7). Applicant has further amended claims 1–2, 9–15, 18, 37–38, and 45–46 with additional recitations to more precisely claim the subject matter. For example, the language of independent claim 1 has been clarified to refer to two *types* of modulation methods, *i.e.*, different families of modulation techniques, such as the FSK [(frequency shift keying)] family of modulation methods and the QAM [(quadrature amplitude modulation)] family of modulation methods.

Id. at 10 (quoting March 1, 2011 Reply Pursuant to 37 CFR § 1.111 at 20 (RIP0019073)).

29. Rembrandt's statement during prosecution provides an example of "different types of modulation methods": the FSK family of modulation methods and the QAM family of modulation methods. *Id.*

VII. STATE OF THE ART

30. By Rembrandt's claimed priority date of December 5, 1997 and alleged June 8, 1997 conception date, the elements of the asserted claims were all well-known in the art, and their combination as claimed was also well-known or at minimum obvious to a person of ordinary skill.

31. For example, as discussed below, by the claimed priority date of the patents-in-suit it was already well known that communications systems could transmit and receive information using different types of modulation methods, including those in which the different types of modulation were embedded in sequence within transmitted messages. *See* Sections IX.A.1(b) (discussing communications systems using FSK and QAM), IX.B.1(a) (same), IX.C.1(b) (discussing communications system using "different … modulation methods"), IX.C.2(a) (discussing communications systems using FSK and QAM).

32. It was further known to maintain backwards compatibility with legacy devices on the network capable of operating using only a single modulation method, and to further provide power savings. *See, e.g.*, Motorola '306, 1: 54-2:11 (describing how existing modulation techniques capable of providing "higher data rates" as compared to FM "generally are incompatible for use with existing receiver architectures, are incompatible with present day signaling protocols, and thus recognized the "need to provide a receiver architecture which *retains compatibility* within existing FM modulated paging signaling protocols, thereby taking advantage of the battery saving capabilities of these existing paging signaling protocols," and "provide[s] a receiver architecture which includes linear demodulation for voice and high speed

data capability, to provide the increased message throughput required for these ever expanding services, without compromising the battery saving performance of the existing paging signaling protocols."

33. Similarly, it was well-known as of the claimed priority date to implement communications systems utilizing a master/slave configuration. I note in this context that the patents-in-suit expressly acknowledge this, and further note that the PTAB found that such master/slave systems were already known in the prior art. *See* Section IX.C.3. It is my understanding that the named inventor confirmed in testimony at trial that he did not invent master/slave communications. *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 137:6-14. Likewise, the references discussed herein described master/slave systems as of the priority date of the patents-in-suit.

34. In addition, the named inventor admitted at trial that he did not invent many of the other elements described and claimed in the patents-in-suit:

> Q. And you had mentioned -- you were describing modems to the jury. You did not invent modems, correct?
>
> A Yes, that's correct.
>
> Q. And there were a few pieces of technology that are mentioned in your patent that you didn't invent. For example, you didn't invent master/slave communications; isn't that true?
>
> A I believe that's true.
>
> Q. And you didn't invent polling, correct?
>
> A That's true.
>
> Q. And you didn't invent multipoint communications; isn't that true?
>
> A That's true.
>
> Q. And you didn't invent any of the modulation methods that are mentioned in your patents, correct?
>
> A I --

Q. I can --

A I guess I'd have to --

Q. I can list them for you. I'll make it easier. Just to be clear, you didn't invent the QAM modulation method, Q-A-M, correct?

A That's right.

Q. And you didn't invent the FSK modulation method, correct?

A Correct.

Q. And you didn't invent DMT modulation; is that correct?

A Yes.

Q. And you didn't invent the other modulations, like PAM modulation, PSK, or PPM; isn't that true?

A Yes.

Samsung Trial Tr., 2015-02-09 PM Session [RIP00110505] at 137:3-138:8.

35. Further, many different forms of modulation for use in modem and other communications networks were well known and widely implemented across many fields of application, including all forms of modulation identified in the patents-in-suit, as confirmed by the named inventor's own testimony above. *See, e.g.*, Electronic Communications Systems – Fundamentals Through Advanced, Wayne Tomasi, Prentice-Hall, Inc., 1988 [APL-REMBR_00982464-522].

36. I will further present in detail many other aspects of what was known in the art as of the time of the alleged invention throughout this Report in describing the extensive body of prior art that anticipates and/or renders obvious all asserted claims of the patents-in-suit.

VIII. UNDERSTANDINGS OF LAW

A. Anticipation

37. I understand that a patent claim is invalid as "anticipated" if all of the limitations of the claim are present, either expressly or inherently, in a single pervious device, or described, either expressly or inherently, in a single prior art publication or patent. I understand that in the

relevant time period (pre-AIA), 35 U.S.C. § 102 stated that a person shall be entitled to a patent unless:

> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or
>
> (c) he has abandoned the invention, or
>
> (d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States, or
>
> (e) the invention was described in—(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for the purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language; or
>
> (f) he did not himself invent the subject matter sought to be patented, or
>
> (g) (1) during the course of an interference conducted under section 135 or section 291, another inventor involved therein establishes, to the extent permitted in section 104, that before such person's invention thereof the invention was made by such other inventor and not abandoned, suppressed, or concealed, or (2) before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it. In determining priority of invention under this subsection, there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

38. I also understand that a prior art reference can disclose a claimed feature because the feature is expressly described or because the feature is inherent in the disclosure. I

understand that something is inherent in a prior art reference if the missing descriptive matter must necessarily be present, not merely probably or possibly present, and it would be so recognized by a person of ordinary skill in the art as of the priority date of the patent.

39. Claim limitations that are not expressly found in a prior art reference are inherent if the prior art necessarily functions in accordance with, or includes, the claim limitations. I understand that it is acceptable to examine evidence outside of the prior art reference (*i.e.*, extrinsic evidence) in determining whether a feature, while not expressly discussed in the reference, is necessarily present in it.

B. Obviousness

40. I understand that a patent claim is invalid as "obvious" under 35 U.S.C. § 103 if the claimed subject matter would have been obvious to a person of ordinary skill in the art as of the priority date of the patent based upon one or more prior art references or embodiments. I understand that an obviousness analysis must consider (1) the scope and content of the prior art; (2) the differences between the claimed inventions and the prior art; (3) the level of ordinary skill in the pertinent art; and (4) secondary considerations, if any, of non-obviousness, such as commercial success, long-felt but unresolved needs, failure of others, etc. I further understand that the United States Supreme Court has recently reiterated the need for caution in granting a patent based on the combination of elements already present in the prior art, in part because the grant of a patent on a combination that merely assembles old elements with no change in their respective functions may deprive the public of the right to use and practice that which is already known and may limit the resources that skilled artisans and engineers can use freely. In such circumstances, when a patent claim covers a combination of previously known, prior art elements, I understand the Supreme Court has stated:

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it,

> either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. . . . [A] court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. . . . As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.
>
> *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 417-418 (2007).

41. Likewise, even if the claim involves more than the simple substitution of one known element for another, or the mere addition of known techniques to prior art embodiments to predictably address new applications, I further understand that the suggestion to combine prior art references or embodiments may exist in (a) the nature of any general need or problem known in the field of endeavor at the time of the alleged invention (not only the specific problem solved by the alleged invention); (b) the overall disclosures, teachings and suggestions of multiple references; (c) the background knowledge of a person of ordinary skill in the art (including knowledge that certain references are of special importance in a particular field); (d) the design-related demands present in the marketplace; or (e) the determination that there is something in the prior art as a whole to suggest the benefit, desirability, or obviousness of making the combination.

42. I also understand that an obviousness analysis need not be based only on specific elements of prior art designed to solve a problem, such as those evident in precise teachings in published articles or in the explicit content of issued patents directed to the specific subject matter of a claim. Indeed, in many fields there is little discussion of obvious techniques or combinations because they are so obvious that people in the field do not bother to describe to

others in the field that which is well known. Rather, the obviousness analysis may be based on common sense, inferences, and creative steps that a person of ordinary skill in the art would use to solve a general problem known in the field of the alleged invention.

43. I understand that an obviousness determination may also rest on inferences drawn from what might have been obvious to try. For example, where there is a need or pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product of ordinary skill and common sense, not innovation.

C. Written Description

44. I understand that the first paragraph of 35 U.S.C. § 112 contains two separate requirements for patentability: (1) the written description requirement; and (2) the enablement requirement. The relevant portion of 35 U.S.C. § 112 provides:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same . . . .

45. I understand that to satisfy the written description requirement, the patent specification must convey with reasonable clarity to a person of ordinary skill in the art that, as of the filing date sought, the named inventor was in possession of the claimed invention.

46. I also understand that to demonstrate possession of the invention, the specification must permit a person of ordinary skill in the art to visualize or recognize the identity of the subject matter purportedly described. Although the specification need not describe the claimed subject matter verbatim to demonstrate possession of the invention, generalized language will not suffice if it does not convey the detailed identity of the invention.

47. I understand that when a patent applicant intentionally deletes material from a patent's specification, the deleted material cannot be used to satisfy the written description, even if the deleted material had been disclosed previously in an earlier application that has been incorporated by reference into the patent at issue.

48. I further understand that to have an adequate written description, each limitation of the claimed invention must be disclosed actually or inherently in the specification. It is not sufficient that the missing claim limitation may be obvious from the specification.

IX. INVALIDITY OF THE ASSERTED CLAIMS UNDER §§ 102 AND 103

A. All Asserted Claims are Invalid under § 102 over Motorola '448 (Briancon) (incorporating Motorola '440 (Leitch)), under § 103 over Motorola '448 (incorporating Motorola '440) standing alone, and/or under § 103 over Motorola '448 in view of Motorola '440 and Motorola '568 (Ayerst)

1. Overview of Motorola '448 [Briancon] and Motorola '440 [Leitch]

49. U.S. Patent No. 5,905,448 ("Motorola '448" or "Briancon") [APL-REMBR_00962932], entitled "Multipart analog message and a response in a communication system," was filed on January 2, 1997, issued May 18, 1999, and was initially assigned to Motorola, Inc. I understand that Motorola '448 is prior art to the '580 and '228 patents.

50. Motorola '448 discloses "[a] communication system in which a multipart analog message (480) is generated by a controller (112)" and relates "in particular to transmitting a message with a synchronous protocol to a receiving device." Motorola '448, Abstract, 1:13-16.

51. Motorola '448's synchronous protocol is illustrated in Figures 3 and 4 and comprises "control frames 330 [which] are also classified as data frames 330" and "analog frames 345." Motorola '448, 6:35-37, 5:38-49. "Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame." Motorola '448, 5:46-49.

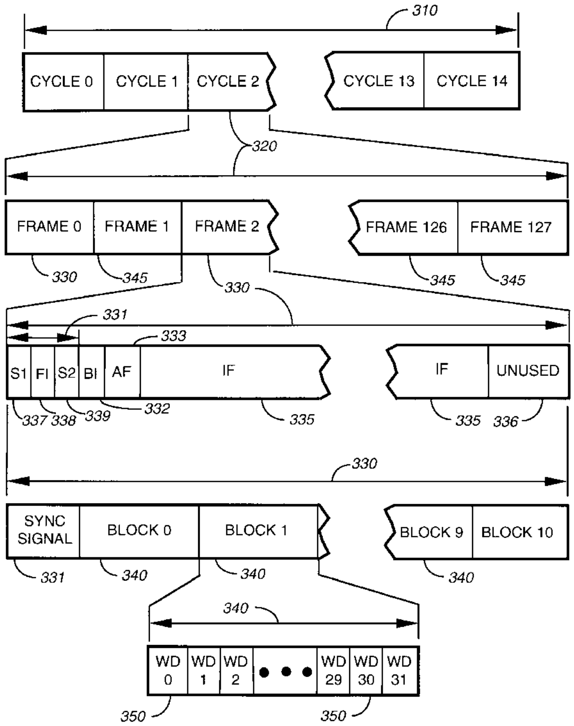

FIG. 3

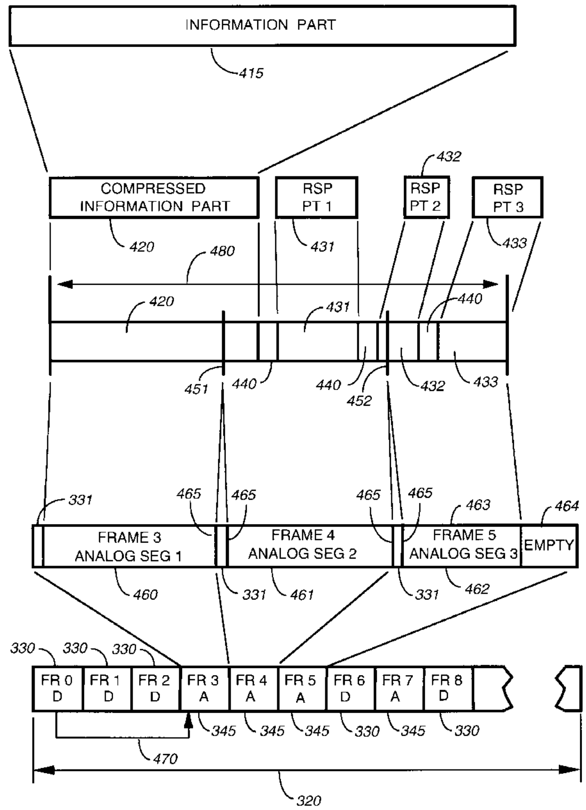

FIG. 4

As Motorola ’448 explains, “[a]ll protocol divisions are defined with reference to a synchronous period of a synchronous clock; the protocol division boundaries are coincident with edges of the synchronous clock.” Motorola ’448, 6:29-32.

52. U.S. Patent No. 5,689,440 (“Motorola ’440” or “Leitch”) [APL-REMBR_00961938], entitled “Voice compression method and apparatus in a communication system,” was filed December 11, 1996, issued November 18, 1997, and was initially assigned to Motorola, Inc. I understand that Motorola ’440 is prior art to the ’580 and ’228 patents. Motorola ’448 expressly incorporates by reference Motorola ’440:[2]

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[2] The disclosure in Motorola ’448 identifies U.S. Application No. 08/395,747 [APL-REMBR00961136] and refers to it as “Leitch ’747.” 1:33-42. I have reviewed the prosecution history of Motorola ’440 and understand that it issued as a file-wrapper continuation of Leitch ’747.

- “RELATED APPLICATIONS
  Application Ser. No. 08/395,747 filed Feb. 28, 1995 by Leitch et al., entitled "VOICE COMPRESSION METHOD AND APPARATUS IN A COMMUNICATION SYSTEM" now U.S. Pat. No. 5,689,440.” Motorola ’448, Col. 1:5-9.
- “In an analog communication system such as that described in application Ser. No. 08/395,747 filed Feb. 28, 1995 by Leitch et al., entitled "Voice Compression Method and Apparatus in a Communication System", which is hereby incorporated by reference, and referred to hereinafter as Leitch '747, voice messages are compressed by techniques described therein, and then transmitted on a radio channel or a subchannel of radio channel, using a synchronous protocol, such as the well known InFLEXion™ protocol, licensed by Motorola, Inc. of Shaumburg, Ill.” Motorola ’448, Col. 33-42.
- “A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Motorola ’448, Col. 3:61-65.
- “A voice signal can be sent as an SSB signal occupying a single voice bandwidth on the outbound channel, or equivalently on either of the one or more I or Q channels as described in more detail in Leitch '747.” Motorola ’448, Col. 10:57-60.
- “The IF signal, which now carries the SSB (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals.” Motorola ’448, Col. 12:54-60.

53. I understand that, for purposes of anticipation and obviousness, material incorporated by reference from Motorola ’440 forms a part of the disclosure of Motorola ’448. As I discuss below, Motorola ’440 discloses different types of modulation methods: FSK and QAM. *See* Section IX.A.1(b) below.

54. Like Motorola ’448, Motorola ’440 discloses transmitting digital and analog voice messages to receiver units using a synchronous communication protocol:

- "The present invention can operate as a mixed-mode (voice or digital) one or two way communications system for delivering analog voice and/or digital messages to selective call receiver units on a forward channel (outbound from the base transmitter) and for receiving acknowledgments from the same selective call receiver units which additionally have optional transmitters (on an optional reverse channel (inbound to a base receiver). The system of the present invention preferably utilizes a synchronous frame structure similar to FLEX™ (a high speed paging protocol by Motorola, Inc. and subject of U.S. Pat. No. 5,282,205, which is hereby incorporated by reference) on the forward channel for both addressing and voice messaging. Two types of frames are used: control frames and voice frames. The control frames are preferably used for addressing and delivery of digital data to selective call receivers in the form of portable voice units (PVU's). The voice frames are used for delivering analog voice messages to the PVU's. Both types of frames are identical in length to standard FLEX™ frames and both frames begin with the standard FLEX™ synchronization."

Motorola '440, Col. 5:57-6:10.

(a) <u>Motorola '448 discloses master/slave communications</u>

55. Motorola '448 discloses a communication system with a central part that comprises a master transceiver (base station (116), controller (112), transmitting antenna (120) and receiving antenna (118), collectively "base station/controller") for transmitting messages to selective call radios (122) and receiving responses from those radios:

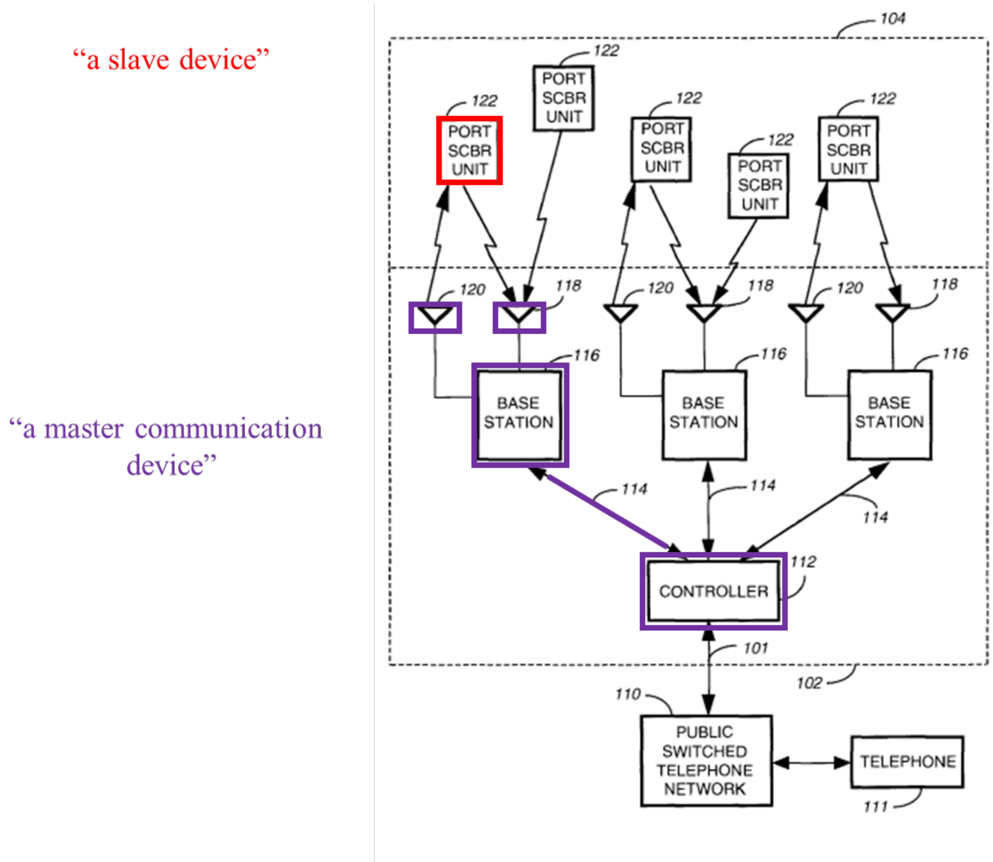


FIG. 1

Motorola ’448, FIG. 1 (annotated), 2:50-3:5.

56. Motorola ’448’s transceiver communicates according to the claimed master/slave relationship in which communication from a slave to a master occurs in response to a communication from the master to the slave. Motorola ’448 discloses communications from the master (base station/controller) to a slave (selective call radio) called “outbound messages”: “[t]he RF signals transmitted by the base stations 116 to the selective call radios 122 (outbound messages) comprise selective call addresses identifying the selective call radios 122, and data or voice messages originated by a caller.” Motorola ’448, 3:8-12. Motorola ’448 further discloses that a slave (selective call radio) responds with “inbound messages” that are responsive to the outbound message from the transceiver:

- "The RF signals transmitted by the selective call radios 122 to the base stations 116 (inbound messages) comprise *positive acknowledgments (ACKs) which indicate that the message was received reliably by the selective call radio 122, or negative acknowledgments (NAKs) which indicate that the selective call radio 122 did not receive the message reliably*." Motorola '448, Col. 3:13-18.
- "The processor section 210, while performing the message handling functions, also identifies inbound messages as being associated with one of the selective call radios in the subscriber data base 220 and identifies *response messages as being associated with one of the outbound messages* in an outbound message memory, which is a portion of the mass media 214. As one example of an operation of the system controller 112, the delivery of an outbound message stored in the mass memory 214 is completed when: the outbound message has been communicated to the intended selective call radio 122; *the outbound message is acknowledged by an inbound acknowledgment generated by the selective call radio 122*; the outbound message and some possible responses are presented either on a display or by a speaker of the selective call radio 122 in response to a user manipulation of controls; one of the possible responses is selected by the user and identified within an inbound response transmitted back to the system controller 112 from the selective call radio 122; and *the user inbound response is identified by the message handler function as having been generated by the user specifically in response to the outbound message*." Motorola '448, Col. 5:50-6:4.

57. Motorola '448 discloses that these "[i]nbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions." Motorola '448, 4:1-3. This is consistent with the use of a synchronous protocol in Motorola '448 which is controlled by the base station/controller. Motorola '448, 3:37-44, 6:19-32, 17:39-63. The synchronous protocol may include transmission of "unsolicited" data during the predetermined time slots that are allocated and controlled by the base station/controller. Motorola '448, 4:38-42.

58. Thus, Motorola '448 discloses a master/slave relationship between the base station/controller and the selective call radios. As described above, the base station/controller (master) controls the network communications with the selective call radios (slaves) at least

because: (1) the devices all communicate using a synchronous protocol where the timing for that protocol is controlled by controller 112, (2) the protocol includes slave communications from the selective call radio to the controller that are responsive to outbound messages sent from the controller to the selective call radios, and (3) the selective call radios cannot communicate directly with other selective call radios in a peer-to-peer fashion. A person of ordinary skill would have known of master/slave architectures, as I discussed above. Based on this knowledge, a person of ordinary skill would have understood Motorola '448 to be describing a master/slave relationship, or at least it would have been obvious to such a person to use a synchronous protocol as taught by Motorola '448 for communications in a master/slave relationship, in view of the characteristics of the relationship between the base/station controller and the addressed selective call radios disclosed by Motorola '448 and discussed above, which a person of ordinary skill in the art would have understood to be common in master/slave architectures.

59. To the extent Rembrandt argues that Motorola '448 does not expressly disclose master/slave communications, it would have been obvious to a person of ordinary skill in the art to implement Motorola '448's communication system using a master/slave relationship. Such implementations were conventional and well-known. For example, the PTAB already concluded and the patents-in-suit admit that master/slave systems were well-known. '580 patent, 3:40-4:50, Figs. 1-2; IPR2014-00518 Final Written Decision [REM_USPTO_00023613], 13-18; *see also* Upender et al., "Communication Protocol for Embedded Systems," Embedded Systems Programming , Vol 7 (11), November 1994 (Upender) [REM_USPTO_00006443], 50; Goodman Declaration [REM_USPTO_00006455], ¶¶102-104. Likewise, the named inventor admitted at trial that he did not invent master/slave communications. *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 137:6-14. Examples of references that show it was well known to implement master/slave configurations include the following: U.S. Patent No. 5,666,651 [APL-

REMBR_00964044] at 2:25-67 (disclosing "master/slave" schemes); U.S. Patent No. 5,644,568 [APL-REMBR_00964586] at 5:26-41 (same); U.S. Patent No. 5,517,505 (describing "synchronous system" where a "master terminal defines the clock information which is derived by slave terminals"); Upender, REM_USPTO_00006443 at 50, APL-REMBR_00937715 at 4/10("a network master broadcasts a frame sync signal before each round of messages to synchronize clocks of all the nodes.").

60. A person of ordinary skill in the art also would have understood that a master/slave configuration, as was well-known in the prior art, provides several benefits that are associated with central management of contention for network access, and is directly applicable to the system disclosed in Motorola '448. First, because the central master controller coordinates communications in both directions with its slaves, the master can efficiently schedule messages using address and vector information and improve the efficiency of the system. In addition, a master/slave configuration where the central controller (master) sets specific times for a selective call radio to receive and/or send a message saves battery life. Indeed, Motorola'448 teaches the advantages of improving battery life by suspending the supply of power to components of the selective call receiver when not needed based on the contents of the outbound messages sent by the transceiver. Motorola '448, 12: 29-54; 10: 5-42; FIG. 6. It therefore would have been an obvious and straightforward design choice for a person of ordinary skill to implement Motorola '448's paging system using a master/slave relationship, and it would have been clear that doing so would have worked and provided the expected functionality.

(b) Motorola '448 (incorporating Motorola '440) discloses two different types of modulation methods

61. Motorola '448 (incorporating Motorola '440) discloses transmitting messages from the base station/controller to a selective call radio using two different types of modulation methods, FSK and QAM. In particular, these different types of modulation methods are used for

different types of messages: "messages may have either digital information, such as a [*sic*] alphanumeric message, or analog information, such as voice." Motorola '448, 5:44-46. Digital messages are preferably transmitted using "frequency shift keyed (FSK) modulation." Motorola '448, 3:49-51. Analog information, such as voice, is transmitted using linear modulation, such as "QAM." Motorola '448, 11:10-11, 12:29-32, 13:10-51; Motorola '440, 6:14-22.

62. Motorola '440, which is incorporated by reference into Motorola '448 for its voice messaging system, explains that FSK and QAM are "preferably used" for the two types of modulation:

> "With regard to modulation, *two types of modulation are preferably used on the forward channel of the present invention: Digital FM (2-level and 4-level <u>FSK</u>) and AM (SSB or <u>QAM</u> with pilot carrier).* Digital FM modulation is used for the sync portions of both types of frames, and for the address and data fields of the control frames. AM modulation (each sideband maybe used independently or combined together in a single message) is used in the voice message field of the voice frames."

Motorola '440, 6:14-22. *See also*, Motorola '440 15:66-16:20.

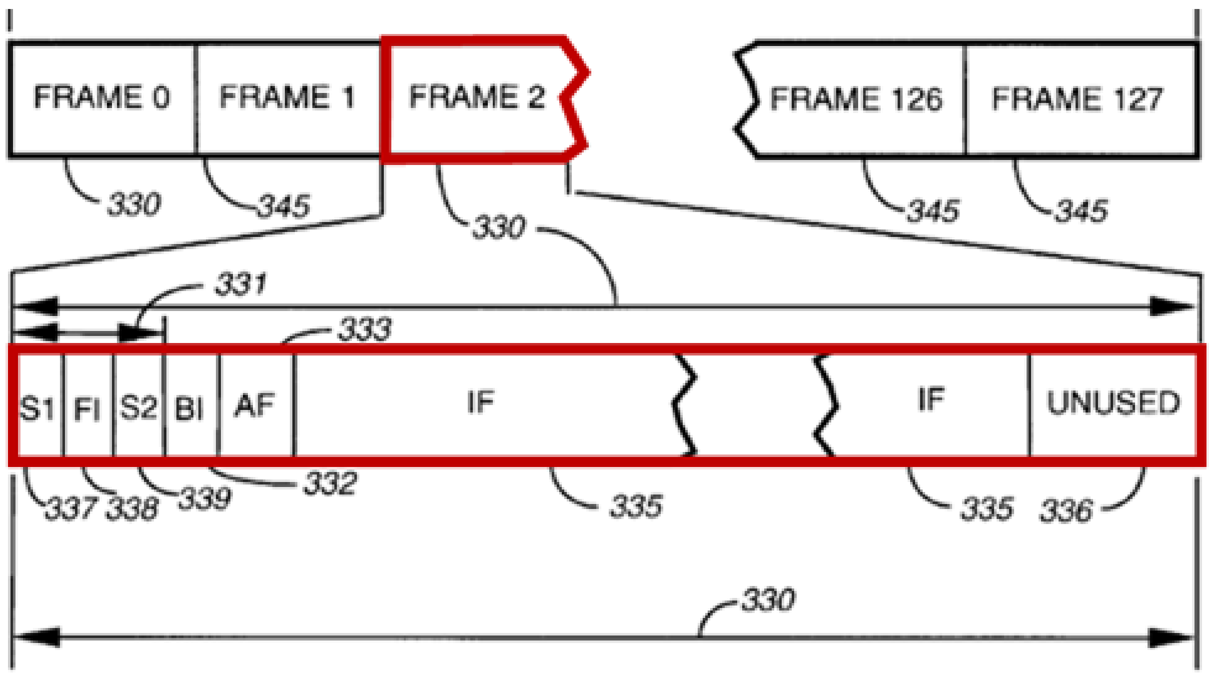
63. Thus, Motorola '448 (incorporating by reference Motorola '440) discloses the two different types of modulation methods set forth in the court's construction: FSK and QAM.

(c) <u>Motorola '448 discloses messages with a first portion and a payload portion</u>

64. Motorola '448 discloses that "outbound messages" to a receiver are structured as a group of transmission sequences having at least a first portion and a payload portion. The payload portion may include digital data, such as an "alphanumeric message" or "long message," in which case it is transmitted using the FM-modulation format (FSK). Motorola '448, 3:49-54, 4:51-55, 5:44-49, 6:55-62. In addition, the payload portion may include a voice message or "analog message" that is transmitted using a different type of modulation format such as QAM. Motorola '448, 3:31-37, 3:54-57, 5:44-49, 10:57-60, 12:13-18; Motorola '440, 6:14-30. The first

portion of each message includes information modulated using FSK that indicates whether the corresponding payload message is a digital data message (and is therefore modulated using FSK) or an analog voice message (and therefore modulated using a different type of modulation format such as QAM). *Id.* Motorola '448 discloses transmitting the various portions of these messages in "control frame[s]" (FIG3-FIG4, 330) and "analog frames" (FIG3-FIG4, 345). Motorola '448, 6:35-37, 5:38-49.

65. Motorola '448 discloses an exemplary control frame 330 (in red) in Figure 3:



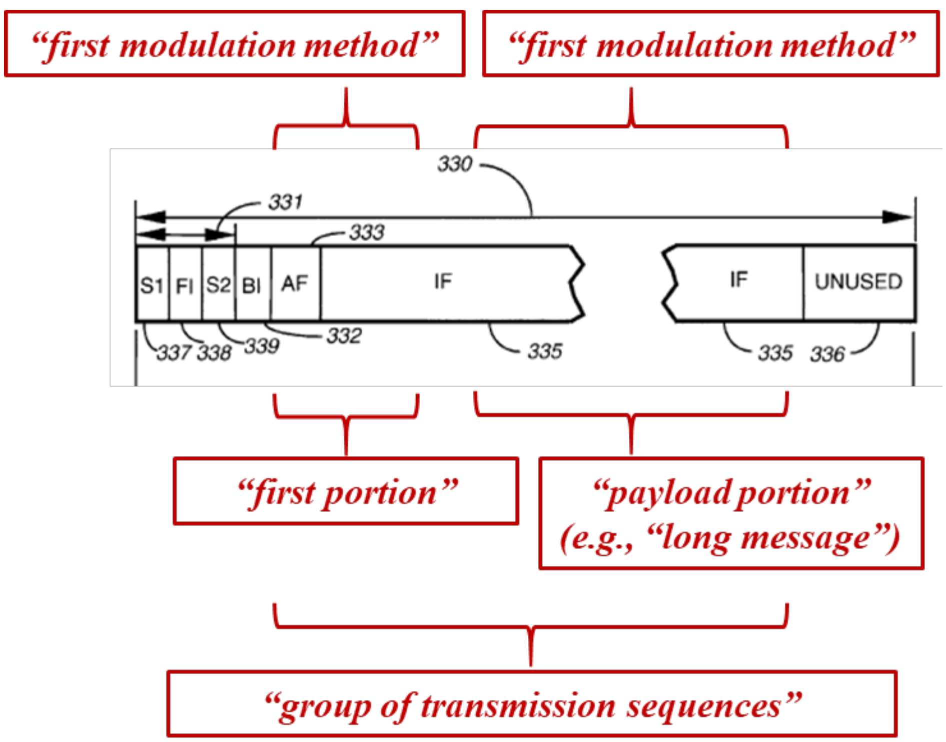
66. As described in the specification, control frame 330 includes a first portion including a "selective call address" in address field (AF) 333 and a "vector" in information field (IF) 335, as well as a "long message" payload also within information field (IF) 335:

> "Information is included in each <u>*control frame 330*</u> in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, <u>*one or more selective call addresses in an address field (AF) 333*</u>, <u>*one or more of a set of vector packets*</u>, short message packets, and <u>*long messages in the information field (IF) 335*</u>, and an unused field 336 having no useful information therein. One aspect of system information included in the frame information word 338 is the frame number and the cycle number. … <u>*Each vector packet*</u> and short message packet in the information

field 335 of a control frame 330 *corresponds to at least one of the addresses in the address field 333* of the same control frame 330. *Each long message in the information field 335 corresponds to at least one vector packet* in the information field 335 of at least one or more control frames 330."

Motorola '448, 6:55-7:6. All data within a control frame (including the long message) is modulated using the FM modulation format (FSK). *Id.*, 3:49-65, 6:25-62, 14:19-29.

67. The annotated Figure 3 below illustrates relative locations of a first portion and "long message" payload portion of a group of transmission sequences within a control frame 330. Because all information within a control frame is modulated using the FM-modulation format, both the first portion and the payload portion are transmitted using the "first modulation method" (*e.g.*, FSK):



68. Motorola '448 discloses that an outbound voice message will have an "analog message" payload, and also includes a first "digital message portion": "A voice message preferably includes a digital message portion and an analog message portion. The digital

message portion includes at least the addressing information which is used to identify the selective call radio 122, and a message vector identifying the location of the analog message." Motorola '448, 3:31-37. The digital message is transmitted in control frame 330 and the payload portion is transmitted using analog frames 345. Motorola '448 (incorporating Motorola '440 by reference) discloses that the analog frames 345 may be used to carry "modem signals," in addition to voice messages. Motorola '440, 19:14-18. Motorola '448 discloses an exemplary analog frame 345 (in red) in Figure 4:

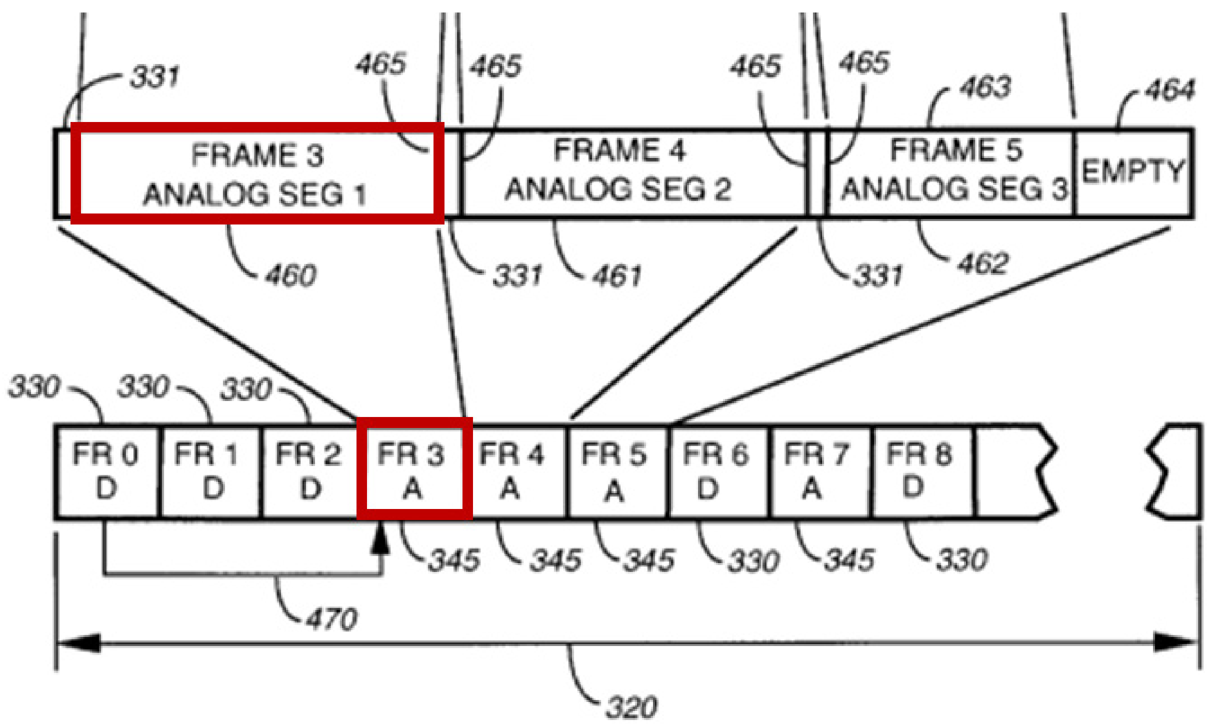


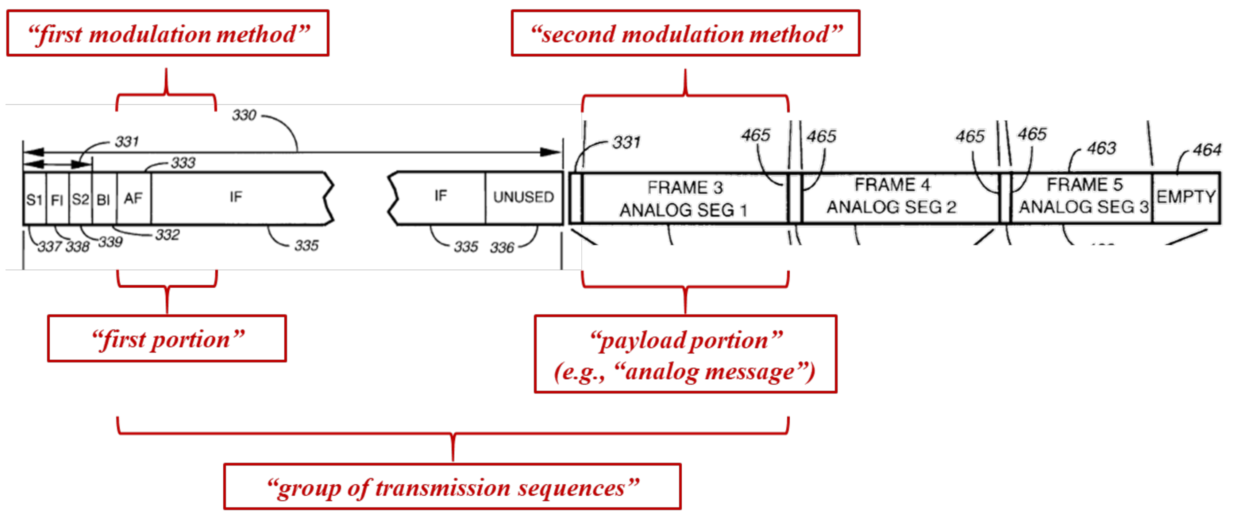
FIG. 4

Motorola '448, 5:46-49, 7:25-31, 8:30-44, 8:53-65.

69. Motorola '448 discloses that the address and vector information are used to identify a corresponding analog message in an analog frame: "[w]hen a selective call radio 122 decodes a <u>*vector*</u> packet in a control frame 330 which corresponds with its <u>*selective call address*</u>, [it] is directed to receive and decode…<u>*an analog message in…an analog frame 345*</u>." *Id*., 7:25-

31. Analog frames are modulated using a different type of modulation, such as QAM. *Id.*, 3:54-65, 12:29-60, 14:34-42; Motorola '440, 6:14-17. Under the Court's construction, this is a different type of modulation than that used for the digital message portion, i.e. FSK.

70. The annotated Figures 3 and 4 below illustrate the relative locations of a first portion of a voice message or modem signal within control frame 330 (containing address and vector information) and an "analog message" payload in analog frame 345:



(d) Motorola '448 discloses indicating an impending change in modulation

71. Motorola '448 further discloses that the address and pointer information (including a vector) indicates which modulation method is used for the associated payload: "When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded *to determine if additional information* is directed to the receiver which *is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format*." Motorola '448, 12:13-18; 7:25-31 ("*When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, [it] is directed to receive and decode a long message*

or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.").

72. As described above, Motorola '448 (incorporating Motorola '440 by reference) discloses that the "linear modulation format" is preferably QAM. The address and pointer information in control frame 330 thus indicates an impending change from the first modulation (FSK) used for long message payloads within a control frame 330, to the second modulation method (QAM) used for voice message payloads within an analog frame 345. Motorola '448, 12:29-60, 7:4-6, 14:19-42. As illustrated in Figure 4, a digital control frame 330 (FR 0) includes a vector identifying (via arrow 470, in red) an analog message in analog frame 345 (FR 3), which is modulated using a different type of modulation, such as QAM:

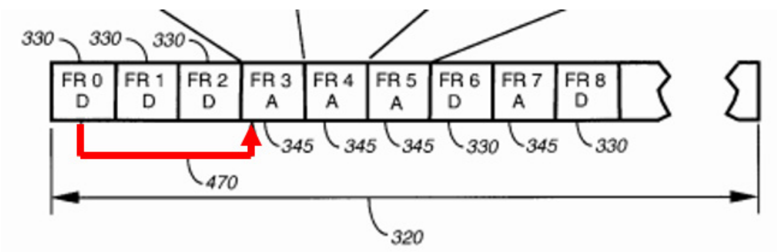
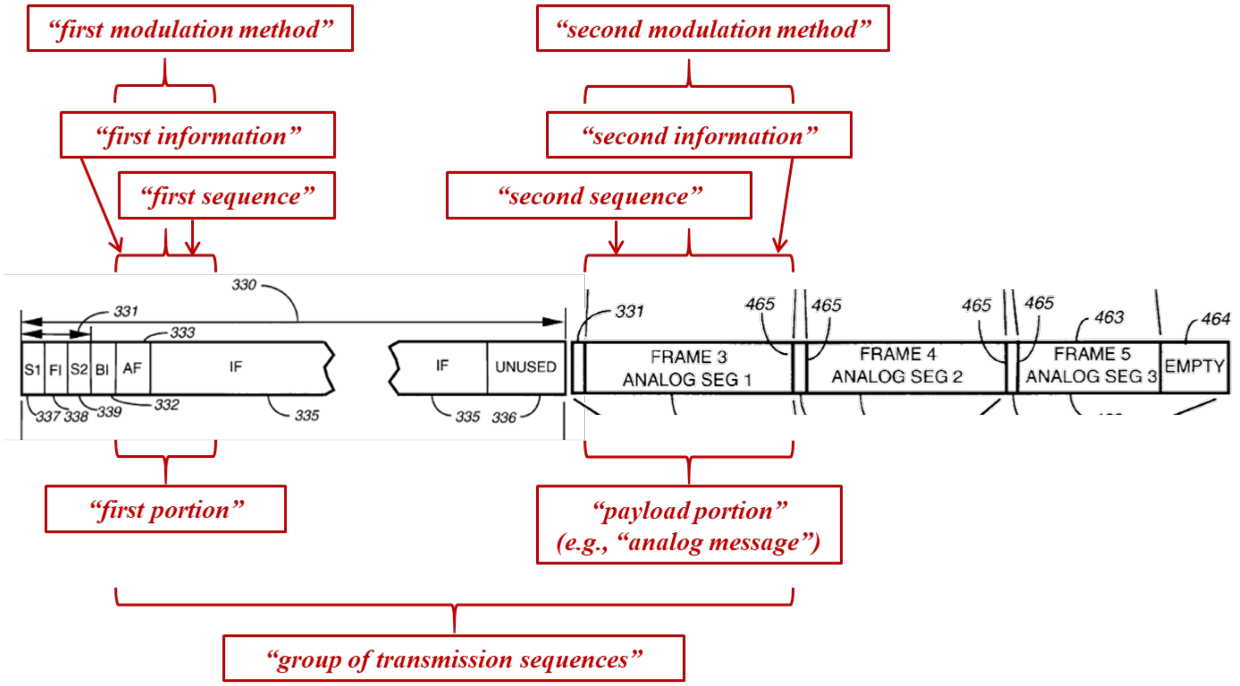


FIG. 4

Id., Figure 4, 8:62-65. Thus, as illustrated below, Motorola '448's transceiver is configured to transmit a ***first sequence*** (address, vector, pointer information within control frame 330) modulated using FSK, followed by a ***second sequence*** (analog message) modulated using QAM:



Motorola '448, Figures 3-4. The first sequence indicates an impending change from the first modulation method to the second modulation method: "The *position identifier* includes a *vector* identifying the frame number of the frame 345 in which the multipart analog message 480 starts, and further *indicates in which sidebands segments of the multipart message are located*, as well as how many frames include segments of the multipart analog message 480.…Using the *position identifier*, the processor section 606 controls power to the receiver 602 to turn off the FM demodulator 608, turn on the linear output section 624, and begin recovering the multipart analog message 480 after the synchronizing signal 331 of the frame 345 has been recovered, at step 740." Motorola '448, 14:29-42.

(e) Motorola '448 discloses reversion to the first modulation method

73. Motorola '448 discloses that the base station/controller is configured to transmit a sequence, following the transmission of an analog voice message, that indicates that communication to the selective call radio has reverted to the first modulation method (FSK) for a subsequent long message (digital) payload. For example, Figure 4 discloses the transmission of

control frames 330 (“D”) followed by analog frames 345 (“A”) followed, in turn, by additional control frames 330 and analog frames 345.

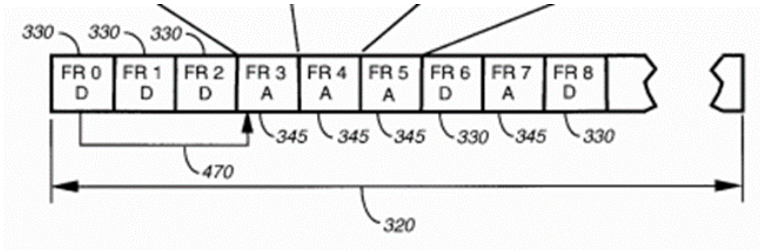
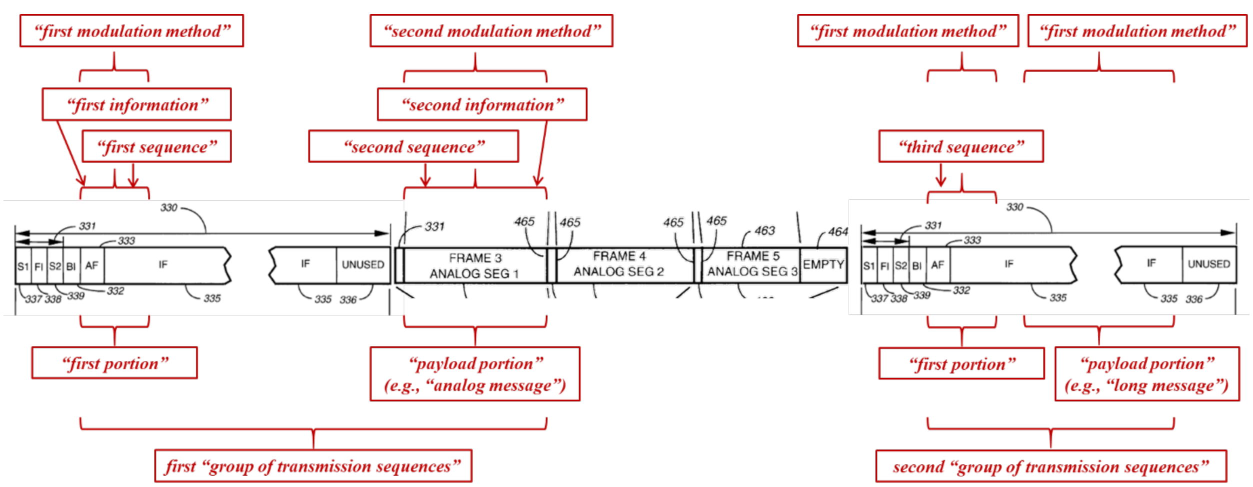


FIG. 4

Motorola ’448, 5:44-49, 6:55-7:31, 8:58-61. As discussed above, these control frames include address and pointer information (including vectors) that correspond to long message payloads, also within control frame 330, and indicate the modulation method of those payloads. *Supra*, §§IX.A.1(c)-(d). Thus, for a selective call radio addressed to receive an analog voice message in Frame 3 (FR 3), followed by a digital long message in, for example, Frame 6 (FR 6), address and vector information corresponding to that payload in FR 6 (the “third sequence”) indicates that communication to that selective call radio has reverted to the first modulation method (FSK):



Motorola ’448, 3:49-65, 6:55-7:6, 7:22-31, 11:19-27, 12:10-18.[3]

[3] I understand that Rembrandt told the Patent Office during prosecution of the ’228 patent that the terms “first” and “second” are not meant to imply an order of claim elements unless a serial limitation is included (*e.g.*, “before” or “after”) and that, even “when ‘before’ or ‘after’ is used in

(f) Motorola ’448 (incorporating Motorola ’440) discloses a second type of modulation method resulting in a higher data rate

74. Motorola ’448, incorporating Motorola ’440 by reference, discloses that messages transmitted using QAM result in higher data rates than messages transmitted using FSK. Analog messages in analog frames 345, which are transmitted using QAM as described above, are expressly characterized as “high speed data” as compared to FM-modulated data. Motorola ’448, 12:39-45. Motorola ’448 discloses that its FSK-modulated information, has “a bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps.” Motorola ’448, 6:44-46. Analog messages are sampled at “6.4 kilohertz per I and Q channel.” Motorola ’448, 12:61-67, 13:10-51. Motorola ’440 (incorporated by reference into Motorola ’448) further discloses that the analog messages require a “sampling rate of about 6.4 KHz…sampl[ed] with 8 bit precision” by the analog-to-digital converter, and that these transmissions may represent “modem signals,” in addition to voice signals. Motorola ’440, 12:59-65, 13:57-60, 15:66-16:20, 19: 14-18. “The bandwidth required for transmission is the same in the QAM and SSB cases.” Motorola ’440, 4:63-65. A person of ordinary skill in the art would have understood from Motorola ’440’s disclosures that sampling the QAM signals with “8 bit precision” and at a sampling rate of 6.4 KHz (i.e., 6,400 samples per second) would result in a data rate of at least 51,200 bps for each of the I and Q channels, which is higher than the rate disclosed for FSK.[4] Motorola ’440, 12:59-67.

2. Motorola ’568 [Ayerst] discloses master/slave communications

75. U.S. Patent No. 5,644,568 (“Motorola ’568” or “Ayerst”) [APL-REMBR_00964586], entitled “Method and apparatus for organizing and recovering information communicated in a radio communication system,” was filed on March 15, 1995, issued July 1,

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the claims to describe the relative order of two events or steps, intervening events or steps are not disclaimed.” 10/19/2012 Reply Pursuant to 37 CFR § 1.111, at 20 [RIP00102128].

[4] *See also, e.g.*, Motorola ’306, 4:32-57 (disclosing that transmitting high speed message information using a linear modulation format “enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher.”).

1997, and was initially assigned to Motorola, Inc. I understand that Motorola '568 is prior art to the '580 and '228 patents.

76. Motorola '568 discloses a transceiver (system controller 102, transmitter/receiver 103, antenna 104, collectively "controller/transceiver") for transmitting messages to selective call radios (122) and receiving responses from those radios:

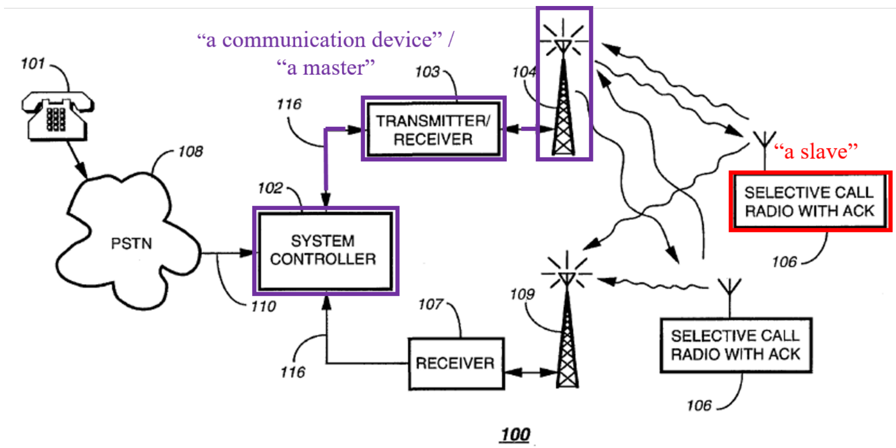


FIG. 1

Motorola '568, Fig. 1, 4:41-5:8.

77. Motorola '568 expressly states that its system is "capable of operating in a distributed transmission control environment" such as "*master/slave.*" Motorola '568, 5:26-33.

78. In addition, Motorola '568 discloses that its controller/transceiver is configured to transmit "information for communication to selective call radios such as pagers in a radio communication system" using a synchronous protocol. Motorola '568, 1:18-25. Motorola '568's "signaling protocol is similar to the FLEX™ protocol, which is a synchronous outbound signaling protocol" and includes control frames 330 and data frames 370. Motorola '568, 8:60-9:35.

79. Motorola '568 further discloses that the controller/transceiver transmits "outbound messages" to selective call radios and, in response, receives "inbound messages" from the selective call radios:

- "[I]nbound messages, including unsolicited and *response messages*, [are] received by the radio frequency transmitter/receivers 103 and the fixed system receivers 107 from the plurality of selective call radios 106." Motorola '568, 4:41-5:8.
- These response messages include "*acknowledgments and designated response messages*." *Id*.
- "*An acknowledgment is a response to an outbound message initiated at the system controller 102*." *Id.*
- "A designated response message is a message sent from a selective call radio *in response to a command included in an outbound message* from the system controller 102. An example of a designated response message is *a message initiated by the selective call radio 106, but which is not transmitted until after a response command is received from the system controller 102*. The response command, in turn, is sent by the system controller 102 after an inbound message requesting permission to transmit the designated response message is communicated from the selective call radio 106 to the system controller 102. The response messages are preferably transmitted at a time designated within the outbound message or response command, but alternatively can be transmitted using a non-scheduled protocol, such as the ALOHA or slotted ALOHA protocol, which are well known to one of ordinary skill in the art." *Id.*

80. Thus, Motorola '568 discloses a master/slave relationship between the base station/controller and the selective call radios in the same types of systems disclosed in Motorola '448 and '440. As described above, the base station/controller (master) controls the network communications with the selective call radios (slaves) at least because: (1) the devices all communicate using a synchronous protocol where the timing for that protocol is controlled by controller 102, (2) the protocol includes slave communications from the selective call radio to the controller that are responsive to outbound messages sent from the controller to the selective call radios, and (3) the selective call radios cannot communicate directly with other selective call radios in a peer-to-peer fashion. A person of ordinary skill would have known of master/slave architectures, as I discussed above. Based on this knowledge, a person of ordinary skill would have understood Motorola '448 to be describing a master/slave relationship, or at least it would

have been obvious to such a person to use a synchronous protocol as taught by Motorola ‘448 for communications in a master/slave relationship, in view of the characteristics of the relationship between the base/station controller and the addressed selective call radios disclosed by Motorola ‘448 and discussed above, which a person of ordinary skill in the art would have understood to be common in master/slave architectures.

3. Opinions Regarding Motorola ’448 in view of Motorola ’440 and/or Motorola ’568

81. In my opinion, Motorola ’448 (which incorporates by reference Motorola ’440) anticipates claims 2 and 59 of the ’580 patent and claim 21 of the ’228 patent.

82. In addition, and alternatively, in my opinion, Motorola ’448 (which incorporates by reference Motorola ’440) renders obvious claims 2 and 59 of the ’580 patent and claim 21 of the ’228 patent in view of the knowledge of a person of ordinary skill in the art.

83. In addition, and alternatively, in my opinion, Motorola ’448 (incorporating by reference Motorola ’440) in view of the teachings of Motorola ’568 renders obvious claims 2 and 59 of the ’580 patent and claim 21 of the ’228 patent.

84. A detailed description of the invalidating disclosures for these opinions on a limitation-by-limitation basis is included in Exhibits D and E to this report, which is incorporated in full as if set forth herein.

(a) Motivation to Combine Motorola ’448 and Motorola ’440

85. As set forth above, the Motorola ’440 disclosures are incorporated by reference into Motorola ’448 and, therefore, I understand that they form part of Motorola ’448’s express disclosure. However, to the extent Rembrandt argues that Motorola ’440 is an independent reference, a person of ordinary skill in the art would have been motivated and found it obvious and straightforward to apply Motorola ’440’s teachings of modulating voice messages using QAM to advantageously provide for switching between QAM and FSK modulation types in

implementing Motorola ’448’s communication system. First, Motorola ’448 and Motorola ’440 are commonly assigned and in the same field of the art, and concern synchronous communication systems for transmitting data and voice messages to selective call radios using two different types of modulation. Motorola ’448, 3:31-65, 5:44-49, 10:7-13, FIG. 6; Motorola ’440, 5:27-6:22, FIG. 9. Further, Motorola ’448 expressly suggests that a person of ordinary skill in the art should utilize the teachings of Motorola ’440 to implement the “preferred analog voice messaging system” to be used as part of the synchronous communication system that Motorola ’448 discloses. Motorola ’448, 3:63-65. In particular, Motorola ’440 explains that the signal representing a voice signal portion of the transmission sequence “can be sent as an SSB signal occupying a single voice bandwidth on the outbound channel, or equivalently on either of the one or more I or Q channels as described in more detail in Leitch '747,” i.e. utilizing QAM as the second modulation method as disclosed in Motorola ’440. Motorola ’448, 10: 57-60.

86. Motorola ’448 additionally teaches that consideration of a signal’s bandwidth usage “is an important factor in the choice of technology for use in the communication system.” Motorola ’448, 16:3-9. A person of ordinary skill in the art would have found it advantageous to apply Motorola ’440’s teachings of a “highly bandwidth efficient” voice paging system “using the basic concepts of quadrature amplitude (QAM)…modulation.” Motorola ’440, 4:44-49. Motorola ’448 further suggests that “[t]he preferred compression technique [for analog message portions] is described in Leitch ’747. Motorola ’448, 7:67-8:7.

87. It would have been obvious and straightforward for a person of ordinary skill in the art to use Motorola ’440’s teachings with the teachings of Motorola ’448 in light of the foregoing, including Motorola ’448’s express direction to apply the teachings of Motorola ’440, and further because, in combination, each element (Motorola ’448’s system for transmitting data and voice, and Motorola ’440’s disclosure of QAM for modulation used to transmit voice

messages) performs the same function as it would separately, yielding nothing more than predictable results. A person of ordinary skill in the art would have thus recognized that this combination, per the express suggestion found in Motorola ’448 yields the claimed limitation, and would have worked as expected.

(b) Motivation to Combine Motorola ’448 (incorporating Motorola ’440) with the teachings of Motorola ’568

88. A person of ordinary skill in the art would have been motivated and found it obvious and straightforward to implement Motorola ’448’s communication system (in view of Motorola ’440’s teachings) using Motorola ’568’s express teachings of a “master/slave” configuration, and Motorola ’568’s disclosure of a system that provides for “designated response messages” from the selective call radio to the base station. Both Motorola ’448 (incorporating Motorola ’440) and Motorola ’568 are in the same field of art and relate to synchronous communication systems for communicating with selective call radios. For example, Motorola ’448 “relates in general to analog communication systems, and in particular to transmitting a message within a synchronous protocol to a receiving device.” Motorola ’448, 1:13-16. Similarly, Motorola ’568 discloses “an improved technique for organizing message information in a radio communication system.” Motorola ’568, 1:52-53.

89. Motorola ’448 and Motorola ’568 both describe synchronous, two-way protocols based on the Motorola FLEX™ signaling protocol for transmissions between a system controller transceiver and a selective call radio/transceiver. Motorola ’568, 8:60-67 (“The signaling protocol is similar to the FLEX™ protocol, which is a synchronous outbound signaling protocol.”); Motorola ’448, 3:37-43 (“The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols…”); *see also* Motorola ’448, Figure 3, 6:19-54 (disclosing timing diagram for the synchronous protocol), Motorola ’568,

Figure 3, 8:60-9:31 (disclosing timing diagram for the synchronous protocol). Both Motorola ’448 and Motorola ’568 disclose acknowledgments and response messages from selective call radios to the system controller. *Compare* Motorola ’448, 13:52-57 (Motorola ’448 disclosure of “inbound messages” as including “response messages and acknowledgements”) *with* Motorola ’568, 4:51-5:3 (Motorola ’568 discussion of “response messages” as including “acknowledgements and designated response messages”). Finally, both Motorola ’448 and Motorola ’568 were developed at, and commonly assigned to Motorola Inc. *See* Motorola ’448, [73]; Motorola ’568, [73].

90. Motorola ’568 expressly explains that having the controller handle scheduling of response messages “minimize[s] contention of messages at transmitter/receivers 103 and fixed system receivers 107,” thereby improving the system. Motorola ’568, 6:43-61. Recognizing that Motorola ’448 discloses similar acknowledgments and response messages from its selective call radios to its base station controller and that there is a need to maximize the efficiency of the network (for example, by minimizing message contention), a person of ordinary skill in the art would have been motivated to implement Motorola ’448’s communication system (incorporating Motorola ’440) using Motorola ’568’s advantageous teachings. A person of ordinary skill in the art also would have understood that a master/slave configuration, as taught by Motorola ’448, provides several benefits that are associated with central management of contention for network access, and is directly applicable to the system disclosed in Motorola ’306. First, because the central master controller coordinates communications in both directions with its slaves, the master can efficiently schedule messages using address and vector information “and thereby improve the efficiency of message scheduling.” Motorola ’568, 12:1-14. This “improve[s] the efficiency of message throughput in the radio communication system 100 and to provide the improved battery life in the selective call radios 106.” Motorola ’568, 11:16-24. Second, a

master/slave configuration where the master controller "schedules outbound messages" and "also determines response schedules for response messages…minimize[s] contention of [inbound] messages" at the master controller. Motorola '568, 6:43-61. Third, a master/slave configuration where the central controller (master) sets specific times for a selective call radio to receive and/or send a message saves battery life. As Motorola '568 discloses, this protocol allows the selective call radios go into sleep mode during times when they are not scheduled to receive or send messages; this invention "has the advantage of improving the battery life of the selective call radios, because a radio which has no information in the predetermined portion of the transmission cycle can quickly revert to a low power mode as soon as it determines its address is not in the address field. Motorola '568, 1:26-30. Motorola '448 similarly teaches the advantages of improving battery life using suspending the supply of power to components of the selective call receiver when not needed based on the contents of the outbound messages sent by the transceiver. Motorola '448, 12: 29-54; 10: 5-42; FIG. 6.

91. This is consistent with the opinions set forth by Rembrandt's expert, Dr. Morrow, in his infringement report from the *Samsung* Litigation:

> There are several benefits to a master/slave network. One such benefit is the reliability and ease of implementation that comes from centralized control. In a master/slave network, the master has the global view of the master-slave subsystem formed by itself and its slaves. Consequently, the slaves in this subsystem can be efficiently coordinated: the master can decide a communication plan in advance, then make sure every slave is communicating according to that plan. For example, if a slave's data is time-dependent, such as real-time two-way voice or music streaming, the master can assign higher transmit priority to that particular slave. During network operation, the master can avoid potential conflicts, such as more than one device transmitting simultaneously, before that conflict takes place. Another benefit is efficiency. The master/slave network is very efficient because slaves need not negotiate with each other before communicating on the network; when there are multiple slaves, this additional overhead can be very time consuming. Finally, a slave in a master/slave network

> saves power because it needs to activate its receiver only during master-to-slave transmissions, and can sleep while a different slave is responding to a master.

2014-10-6 Expert Report of Dr. Robert Morrow Regarding Samsung's Infringement of U.S. Patent Nos. 8,023,580 & 8,457,228 ("Morrow *Samsung* Infringement Report") (RIP00092014), ¶40.

B. All Asserted Claims are Invalid under § 103 over Motorola '306 (Siwiak) in view of Motorola '038 (Siwiak) and/or Motorola '568 (Ayerst)

1. Overview of Motorola '306 [Siwiak '306] Patent

92. U.S. Patent No. 5,239,306 ("Motorola '306" or "Siwiak '306") [APL-REMBR_00964463], entitled "Dual mode receiver having battery saving capability," was filed October 5, 1992, issued August 24, 1993, and was initially assigned to Motorola, Inc. I understand that Motorola '306 is prior art to the '580 and '228 patents.

93. Motorola '306 discloses a communication system for pagers including "a selective call communication receiver providing high speed data and voice communication with battery saving capability." Motorola '306, 1:11-13, 4:32-57. The communication system provides this high speed data while also retaining compatibility with existing FM modulated protocols and "without compromising the battery saving performance of the existing paging signaling protocols" by providing a "dual mode communication receiver compris[ing] means for receiving information transmitted in a first and second modulation format," as I discuss further below. Motorola '306, 2:14-3:2.

(a) <u>Motorola '306 discloses two different types of modulation methods</u>

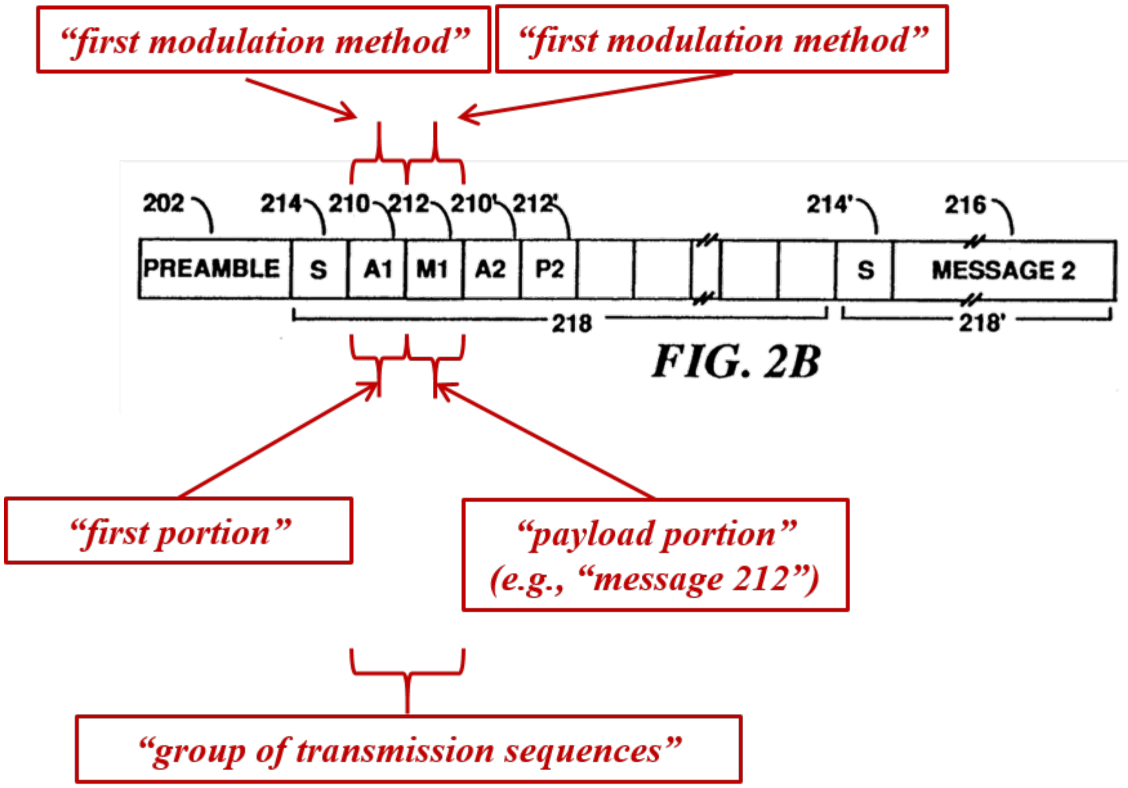
94. Motorola '306 discloses transmitting messages using FSK and QAM. Motorola '306 recognizes a need for a transmission protocol that retains compatibility with existing paging systems while providing for transmissions at high bit rates. Motorola '306, 1:61-2:12. As Motorola '306 discloses, "standard FM modulation is not suitable for data transmission at high

bit rates," so "other forms of modulation, such as linear modulation techniques are required to provide for transmission at the higher data rates." Motorola '306, 1:54-61. Thus, Motorola '306 conveys the understanding of those of ordinary skill in the art at that time that "standard FM modulation" such as FSK was known to represent a low-performance modulation method relative to known higher-performance techniques such as QAM. However, while Motorola '306 recognizes that utilizing high data-rate techniques such as QAM was advantageous in this regard, it also recognized that doing so presented issues of backward compatibility with existing receivers, as well as higher power requirements: "While linear modulation techniques are available to provide the increased message transmission speeds, such modulation techniques generally are incompatible for use with existing receiver architectures, are incompatible with present day signaling protocols, and require significantly more current drain for operation …" Motorola '306, 1:61-2:12. Motorola '306 therefore provides such high speed data while retaining compatibility with existing FM modulated protocols and "without compromising the battery saving performance of the existing paging signaling protocols" by providing a "dual mode communication receiver compris[ing] means for receiving information transmitted in a first and second modulation format." Motorola '306, 2:14-3:2. Motorola '306 discloses transmitting addresses and low speed messages in an FM modulation format (to conserve battery life), and high speed data messages in a higher performance QAM format. Motorola '306, 13:46-50. For the low speed "first modulation format," Motorola '306 discloses using "frequency shift keyed FM"—FSK. Motorola '306, 14:13-24. For the high-speed "second modulation format" (also referred to as the "linear modulation format"), Motorola '306 discloses using "QAM." Motorola '306, 4:2-5 ("Examples of linear modulation formats include, but are not limited to, quadrature amplitude modulation (QAM modulation)"); Motorola '306, 14:22-24

("The dual mode communication receiver according to claim 3, wherein the second modulation format is QAM modulation.").

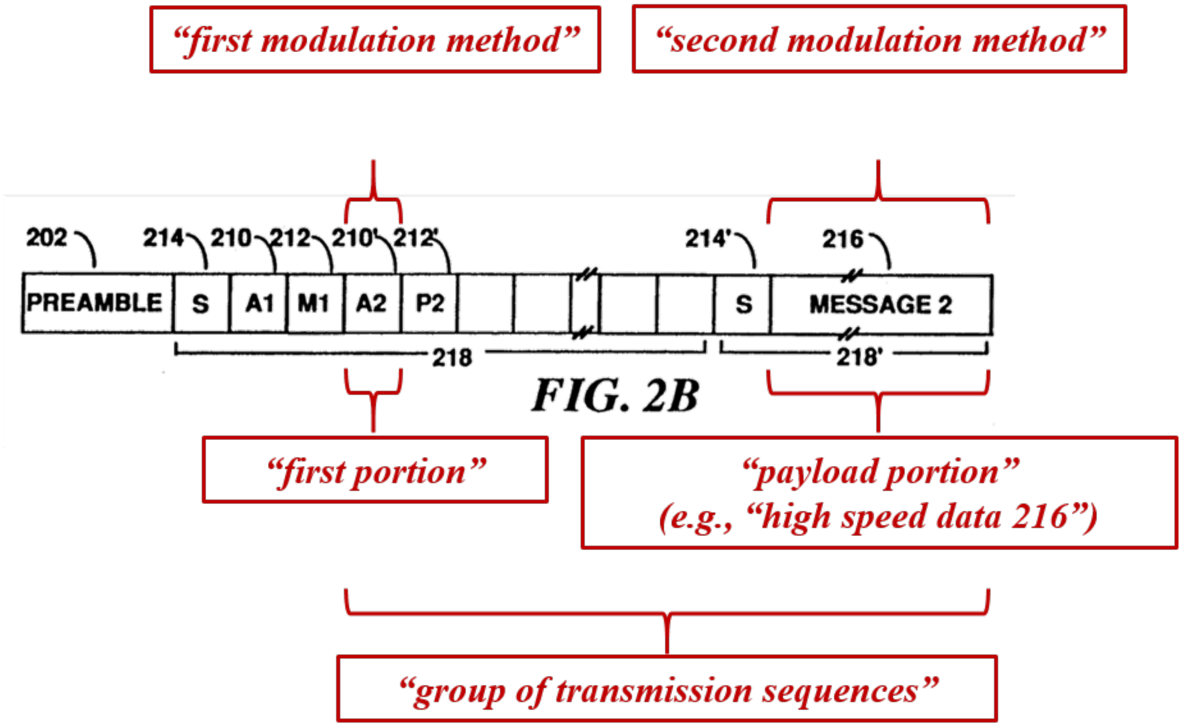
(b) Motorola '306 discloses messages with a first portion and a payload portion

95. Motorola '306 discloses transmission to a receiver is structured as a group of transmission sequences having at least a first portion and a payload portion. The first portion includes the receiver's address and is transmitted using FM (FSK). Motorola '306, 6:24-37, 14:13-15. The payload portion includes an "alphanumeric data message" transmitted using FM (the same modulation used to transmit the first portion), or a "high speed message" transmitted using a different type of modulation—QAM. Motorola '306, 6:43-44, 15:1-4. The "high speed message" payload includes voice information or other "high speed data information." *Id.*, 2:6-11, 15:51-54, 15:43-46. For example, as illustrated in Figure 2B (annotated below), Motorola '306 discloses transmitting a group of transmission sequences to a receiver that includes a first portion ("address 210") and an alphanumeric message payload portion ("message 212"), with both portions modulated using FSK, the "first modulation method":



Motorola '306, Figure 2B, 6:26-30 ("In the example shown in FIG2B, … addresses 210 and message 212 [] are also modulated in the FM modulation format."), 14:13-15, 15:1-4, 6:19-26.

96. Figure 2B of Motorola '306 also discloses a group of transmission sequences transmitted to a receiver including a first portion ("address 210"") and a pointer, both modulated using FSK, and a "high speed data 216" payload portion, modulated using QAM:



Motorola '306, Figure 2B, 6:38-45 ("[A]ssociated message 212 are transmitted, followed by the address 210' … Message 212' … is a predetermined 'batch' pointer, directing the receiver to … the next transmission batch 218'[, which] contains the high speed message information 216 which is modulated in a linear modulation format."), 14:22-24. This high speed message information may represent voice information, or other high speed digital data transmissions. Motorola '306, 10:41-66; 15:43-50.

(c) Motorola '306 discloses indicating an impending change in modulation

97. Motorola '306 discloses that address information included in the first portion, modulated using FSK, indicates the modulation that will be used for the associated payload: "When an address is detected," the receiver "evaluates the next received code word," to determine if the message information being transmitted is "low speed or high speed message information." *Id.*, 12:59-63, Figs. 5A, 5B. "When the *information received in the first modulation format indicates a high speed data message is to be received in the second*

modulation format, at step 518," the receiver "decodes the data pointer" pointing to the location of the high speed message, thereby indicating an impending change to the second modulation method:

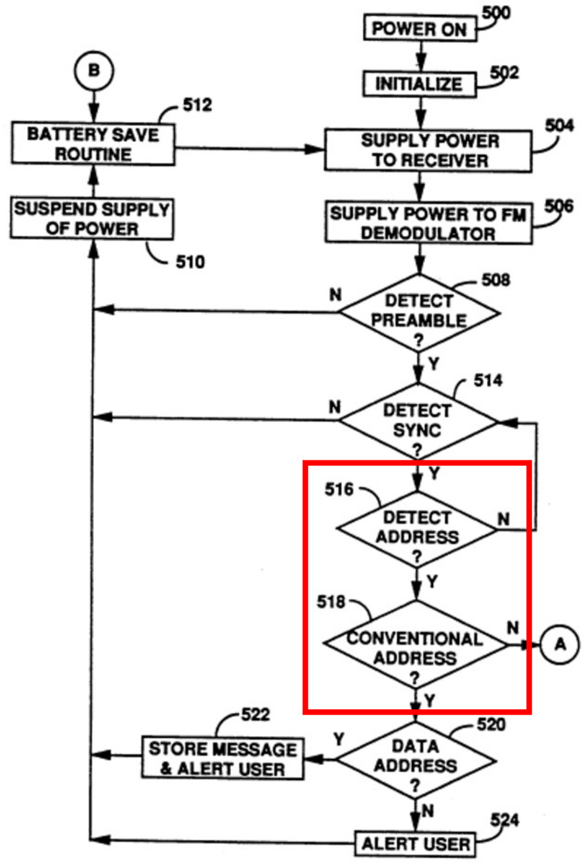


FIG. 5A

Id., 13:10-14, 6:38-43, Figures 5A-5B.

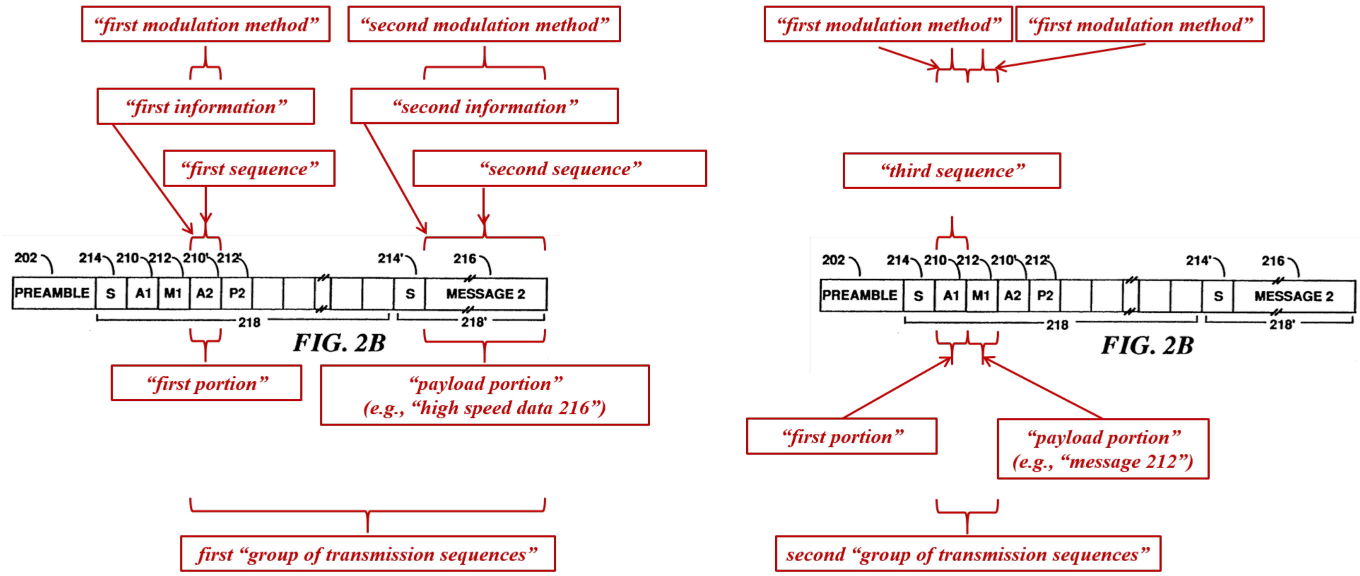
(d) Motorola '306 discloses reversion to the first modulation method

98. Motorola '306 discloses that high speed message batch '218 (modulated using QAM) in Figure 2B may be followed by conventionally modulated batches containing conventional messages: "Following the transmission of batch 218', … other conventionally modulated address and message information can be transmitted in additional batches…." Motorola '306, 6:43-55. "Conventionally modulated" information is modulated using the "FM

modulated format." Motorola '306, 4: 45-50. "[O]ne or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format." Motorola '306, 6:1-4. "FIG. 2B shows in further detail the interleaving of batches modulated in the FM modulation format with batches modulated in the linear modulation format." Motorola '306, 6:9-11.

99. Based on this disclosure, a person of ordinary skill in the art reading Motorola '306 would have understood that, after transmission of a first sequence (FSK-modulated "address 210''") indicating that a high speed message is forthcoming in a subsequent batch, and a second sequence that includes the high speed message 216 within batch 218', a third sequence is subsequently transmitted using "conventionally modulated address…information" that indicates that the modulation method for the next payload ("conventionally modulated…message information") has reverted to the first modulation method.

100. For example, the first annotated Figure 2B below illustrates a first group of transmission sequences with a "high speed data" payload (and therefore modulated using the second modulation method) and the second annotated Figure 2B below illustrates a second group of transmission sequences with a "conventionally modulated" "message 212" payload (and therefore modulated using the first modulation method):



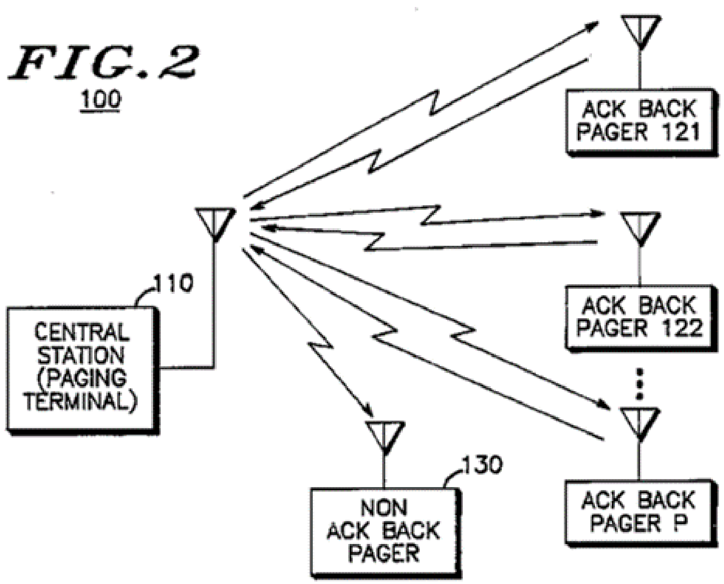
(e) Motorola '306 discloses a second modulation resulting in a higher data rate

101. Motorola '306 discloses that QAM provides higher data rates than FM modulation. For example, Motorola '306 teaches that "[o]ther signaling protocols … have typically utilized a frequency shift keying (FSK) modulation format for both the address and message transmissions. The existing signaling protocols, such as the POCSAG [Post Office Code Standardisation Advisory Group] signaling protocol at 512 and 1200 bits per second, or the Golay Sequential Code protocol at 600 bits per second …." Motorola '306, 3:45-62. In contrast, Motorola '306 's "dual mode communication receiver…enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher." Motorola '306, 4:32-39. Motorola '306 further specifies that "high speed data information is transmitted at a rate in excess of 1200 bits per second" and that "message information…in the second modulation format is voice information … [that] is digitized at a rate of at least 8 kilobits per second." Motorola '306, 15:47-57.

2. Overview of Motorola ’038 [Siwiak ’038] Patent

102. U.S. Patent. No. 4,875,038 (“Motorola ’038” or “Siwiak ’038”) [APL-REMBR_00964131] entitled “Frequency division multiplexed acknowledge back paging system,” was filed January 7, 1988, and issued October 17, 1989. I understand that Motorola ’038 is prior art to the ’580 and ’228 patents.

103. Motorola ’038 discloses two-way communications for pagers: an “acknowledge back paging system 100” including a “central station 110” that transmits “outgoing paging signals” to, and receives responses from, a “group of addressed ack-back pagers.” Motorola ’038, Abstract; Figure 2.



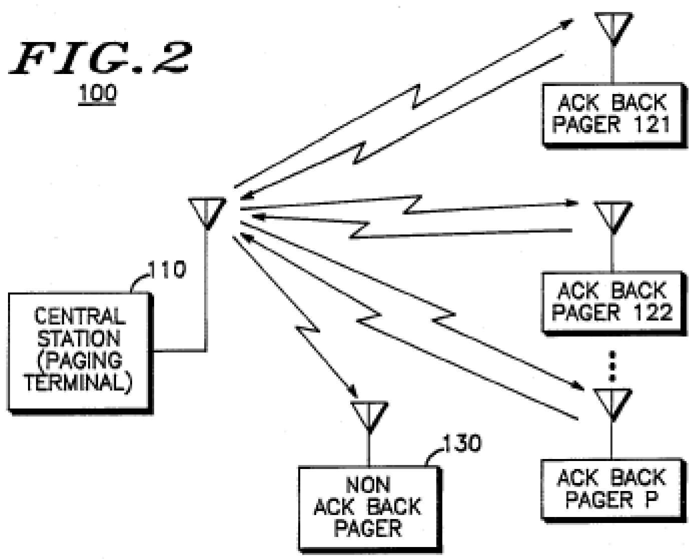
104. In particular, Motorola ’038 discloses a transceiver (*e.g.*, “central station 110”) “which is capable of both transmitting outgoing paging signals and of receiving acknowledge back (ack—back) paging signals…” using a synchronized protocol. *Id.*, 2:55-66, 4:63-5:5, 19:9-12, 20:22-26.

105. Motorola ’038 discloses communication from a pager (*e.g.*, 121) to central station (110) of a user-selected message in response to an addressed message received by the pager from

the central station. The user responds to the message during a predetermined time period. *Id.*, 7:23-55, Figure 4E. A person of ordinary skill in the art thus would have understood Motorola '038 discloses the transceiver communicates according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.

(a) Motorola '038 discloses master/slave communications

106. Motorola '038 discloses two-way communications for pagers: an "acknowledge back paging system 100" including a "central station 110" that transmits "outgoing paging signals" to, and receives responses from, a "group of addressed ack-back pagers." Motorola '038, Abstract; FIG. 2.



107. Motorola '038 discloses a paging system with a "central station 110" transceiver. Motorola '038, 2:55-58, 3:7-64. Motorola '038's transceiver "is capable of both transmitting outgoing paging signals and of receiving acknowledge back (ack—back) paging signals." Motorola '038, 2:55-66. Motorola '038 describes various alternative protocols for transmitting both addresses and messages to its pagers, and explains that "[w]hat is important here is that a

predetermined relationship exists between the order in which the paging addresses are transmitted … to the order in which the paging messages are transmitted … so as to permit acknowledge back pagers … to match a particular message … to a respective paging address." Motorola '038, 6:5-15. Motorola '038 also describes that the protocol timings are designed "to permit the ackback receivers … to synchronize to the paging signals transmitted by central station 110." Motorola '038, 4:63-5:5, 19:9-12 ("The receiver portion of pager 121 is turned on and becomes synchronized with respect to the paging signals transmitted on the paging channel by central station 110."), 20:22-26 ("The ack-back pager waits as per block 1270 for an ack-back field (time interval) before responding back to the central station 100…").

108. A person of ordinary skill in the art would have understood that Motorola '038's transceiver communicates according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave. For example, Motorola '038 teaches a synchronous protocol wherein pager (slave) communications are transmitted in response to an addressed message received by the pager from the central station (master). Specifically, Motorola '038 discloses that the central station (master) transmits messages intended for particular addressed pagers using a synchronous protocol. Motorola '038, 5:21-27 ("After transmission of the group of M addresses, … central station 110 sequentially transmits the 20 paging messages corresponding to the 20 paging addresses…"). "This enables a particular pager to determine which of the 20 paging messages in block 330 is intended for it." Motorola '038, 6:12-14. Motorola '038 discloses that "pager AB-1 is programmed to determine that message 1 is …intended for pager AB-1" and allows its user to respond to that displayed message during a predetermined time period. Motorola '038, 7:23-37, FIG. 4E. The acknowledge-back response is then transmitted "Back to central station 110" during a predetermined time period. Motorola '038, 7:37-43; FIG. 4E. Motorola '038 further

discloses an automatic response message that is sent by an ack-back pager that does not require any user input. Motorola ’038, 7:42-55, FIG. 4E.

109. Thus, Motorola ’038 discloses a master/slave relationship between the central station (master) and the ack-back pagers (slaves). As described above, the central station (master) controls the network communications with the pagers (slaves) at least because: (1) the devices all communicate using a synchronous protocol where the timing for that protocol is controlled by central station 110, (2) the protocol includes slave communications from the ack-back pager to the central station that are responsive to outbound messages sent from the central station to the pagers, and (3) the pagers cannot communicate directly with other pagers in a peer-to-peer fashion. A person of ordinary skill would have known of master/slave architectures, as I discussed above. Based on this knowledge, a person of ordinary skill would have understood Motorola ’038 to be describing a master/slave relationship, or at least it would have been obvious to such a person to use a synchronous protocol as taught by Motorola ’038 for communications in a master/slave relationship, in view of the characteristics of the relationship between the base/station controller and the addressed selective call radios disclosed by Motorola ’038and discussed above, which a person of ordinary skill in the art would have understood to be common in master/slave architectures.

3. Opinions Regarding Motorola ’306 in view of Motorola ’038 and/or Motorola ’568

110. In my opinion, Motorola ’306 in view of the teachings of Motorola ’038 renders obvious claims 2 and 59 of the ’580 patent and claim 21 of the ’228 patent.

111. In addition, and alternatively, Motorola ’306 in view of the teachings of Motorola ’038 and Motorola ’568 renders obvious claims 2 and 59 of the ’580 patent and claim 21 of the ’228 patent.

112. A detailed description of the invalidating disclosures on a limitation-by-limitation basis is included in Exhibits F and G to this report, which is incorporated in full as if set forth herein.

(a) Motivation to Combine Motorola '306 and Motorola '038

113. A person of ordinary skill in the art would have been motivated and found it obvious and straightforward to apply Motorola '038's teachings of a two-way pager under the control of a central station master transceiver in implementing Motorola '306's synchronized high speed data and voice paging system. Motorola '306 and Motorola '038 are in the same field of art and concern improvements to communication systems—specifically conventional paging systems. Motorola '306, 3:36-4:57; Motorola '038, 1:6-47.

114. A person of ordinary skill in the art would have been motivated and found it obvious to use Motorola '038's teachings of two-way pager communications in a master/slave system, in implementing Motorola '306's paging system to allow "both transmitting outgoing paging signals and [] receiving acknowledge back (ack-back) paging signals." Motorola '038, 2:55-66. A person of ordinary skill in the art would have been motivated to apply Motorola '038's advantageous teachings of a two-way pager that "is capable of responding back to the paging terminal and the caller" and providing confirmation of messages sent. *Id.*, 1:35-47. Two-way paging systems were well-known and within the skill of a person of ordinary skill in the art. Motorola '038, 2: 53-68; FIG. 2. Each of the pagers disclosed in Motorola '306 and Motorola '038 are disclosed as utilizing a microcomputer to control respective radio and other operations of the pager (Motorola '306, 9: 15-56, FIG. 3 and; Motorola '038, 12: 40-61, FIG. 6). It would have been obvious and straightforward for a person of ordinary skill in the art to use Motorola '038's teachings of the transmitter circuitry and combine this with the teachings of Motorola '306 to include the transmitter circuitry of Motorola '038 in light of the foregoing, with

straightforward extension of the microcomputer control to further control the transmitter operation. Further, in combination, each element (Motorola ’306’s receiver for receiving FSK/QAM messages from a central station and Motorola ’038’s teachings of a two-way pager including transmit circuitry under the control of the central station master transceiver) performs the same function as it would separately, yielding nothing more than predictable results. A person of ordinary skill in the art would have thus recognized that this combination (yielding the claimed limitation) would have worked as expected. *Id.*

115. To the extent Rembrandt argues that Motorola ’306 in view of the teachings of Motorola ’038 does not expressly disclose master/slave communications, it would have been obvious to a person of ordinary skill in the art to implement this communication system using a master/slave relationship. For example, the PTAB already concluded and the patents-in-suit admit that master/slave systems were well-known. ’580 patent, 3:40-4:50, Figs. 1-2; IPR2014-00518 Final Written Decision, 13-18; Upender, [REM_USPTO_00006443], 50; Goodman Declaration, ¶¶102-104. Likewise, the named inventor admitted at trial that he did not invent master/slave communications. *Samsung* Trial Tr., 2015-02-09 PM Session at 137:6-14. Examples of references that show it was well known to implement master/slave configurations include the following: U.S. Patent No. 5,666,651 at 2:25-67 (disclosing “master/slave” schemes); U.S. Patent No. 5,644,568 at 5:26-41 (same); U.S. Patent No. 5,517,505 [APL-REMBR_01161968] (describing “synchronous system” where a “master terminal defines the clock information which is derived by slave terminals”); Upender, REM_USPTO_00006443 at 50, APL-REMBR_00937715 at 4/10 (“a network master broadcasts a frame sync signal before each round of messages to synchronize clocks of all the nodes.”). A person of ordinary skill in the art also would have understood that a master/slave configuration, as was well-known in the prior art, provides several benefits, and is directly applicable to the system disclosed in Motorola

’306 in view of Motorola ’038. First, because the central master controller coordinates communications in both directions with its slaves, the master can efficiently schedule messages using address and vector information and improve the efficiency of the system. In addition, a master/slave configuration where the central controller (master) sets specific times for a selective call radio to receive and/or send a message saves battery life. Indeed, Motorola’306 teaches the advantages of improving battery life by suspending the supply of power to components of the selective call receiver when not needed based on the contents of the outbound messages sent by the transceiver. Motorola ’306, *e.g.*, 2:1-11, 5:26-34, 6:56-7:31, 13:46-62. It therefore would have been an obvious and straightforward design choice for a person of ordinary skill to implement the paging system of Motorola ’306 in view of Motorola ’038 using a master/slave relationship, and it would have been clear that doing so would have worked and provided the expected functionality.

(b) Motivation to Combine Motorola ’306 (in view of Motorola ’038) with the teachings of Motorola ’568

116. A person of ordinary skill in the art would have been motivated and found it obvious and straightforward to implement Motorola ’306’s paging system (in view of Motorola ’038’s teachings) using Motorola ’568’s express teachings of a “master/slave” configuration, and Motorola ’568’s disclosure of a system that provides for “designated response messages” from the selective call radio to the base station. As described above, Motorola ’306 Motorola ’038 and Motorola ’568 are in the same field of art and relate to synchronous communication systems for communicating with selective call radios.

117. Motorola ’038 and Motorola ’568 both describe synchronous, two-way protocols for transmissions between a system controller transceiver and a selective call radio/transceiver. Motorola ’568, 8:60-67 (“The signaling protocol is similar to the FLEX™ protocol, which is a synchronous outbound signaling protocol.”); Motorola ’038, 4:63-5:5, 19:9-12 (“The receiver

portion of pager 121 is turned on and becomes synchronized with respect to the paging signals transmitted on the paging channel by central station 110."), 20:22-26 ("The ack-back pager waits as per block 1270 for an ack-back field (time interval) before responding back to the central station 100…"). And as described above (Sections IX.A.2, IX.B.2(a)) both Motorola '038 and Motorola '568 disclose acknowledgments and response messages from selective call radios to the system controller. Finally, both Motorola '038 and Motorola '568 were developed at, and commonly assigned to Motorola Inc. *See* Motorola '038, [73]; Motorola '568, [73].

118. Motorola '568 expressly explains that having the controller handle scheduling of response messages "minimize[s] contention of messages at transmitter/receivers 103 and fixed system receivers 107," thereby improving the system. Motorola '568, 6:43-61. A person of ordinary skill in the art would have been motivated to implement Motorola '306's paging system (in view of the teachings of Motorola '038) using Motorola '568's advantageous teachings. A person of ordinary skill in the art also would have understood that a master/slave configuration, as taught by Motorola '568, provides several benefits that are associated with central management of contention for network access, and is directly applicable to the system disclosed in Motorola '306. First, because the central master controller coordinates communications in both directions with its slaves, the master can efficiently schedule messages using address and vector information "and thereby improve the efficiency of message scheduling." Motorola '568, 12:1-14. This "improve[s] the efficiency of message throughput in the radio communication system 100 and to provide the improved battery life in the selective call radios 106." Motorola '568, 11:16-24. Second, a master/slave configuration where the master controller "schedules outbound messages" and "also determines response schedules for response messages…minimize[s] contention of [inbound] messages" at the master controller.

Motorola ’568, 6:43-61. Third, a master/slave configuration where the central controller (master) sets specific times for a selective call radio to receive and/or send a message saves battery life. As Motorola ’568 discloses, this protocol allows the selective call radios go into sleep mode during times when they are not scheduled to receive or send messages; this invention “has the advantage of improving the battery life of the selective call radios, because a radio which has no information in the predetermined portion of the transmission cycle can quickly revert to a low power mode as soon as it determines its address is not in the address field. Motorola ’568, 1:26-30.

119. This is consistent with the opinions set forth by Rembrandt’s expert, Dr. Morrow, in his infringement report from the *Samsung* Litigation:

> There are several benefits to a master/slave network. One such benefit is the reliability and ease of implementation that comes from centralized control. In a master/slave network, the master has the global view of the master-slave subsystem formed by itself and its slaves. Consequently, the slaves in this subsystem can be efficiently coordinated: the master can decide a communication plan in advance, then make sure every slave is communicating according to that plan. For example, if a slave’s data is time-dependent, such as real-time two-way voice or music streaming, the master can assign higher transmit priority to that particular slave. During network operation, the master can avoid potential conflicts, such as more than one device transmitting simultaneously, before that conflict takes place. Another benefit is efficiency. The master/slave network is very efficient because slaves need not negotiate with each other before communicating on the network; when there are multiple slaves, this additional overhead can be very time consuming. Finally, a slave in a master/slave network saves power because it needs to activate its receiver only during master-to-slave transmissions, and can sleep while a different slave is responding to a master.

2014-10-6 Expert Report of Dr. Robert Morrow Regarding Samsung’s Infringement of U.S. Patent Nos. 8,023,580 & 8,457,228 (“Morrow *Samsung* Infringement Report”) (RIP00092014), ¶40.

C. All Asserted Claims are Invalid under § 103 over Broadcom '814 (Yamano) in view of Radish '922 and/or the Admitted Prior Art (APA)

1. Overview of the Broadcom '814 [Yamano] Patent

120. U.S. Patent No. 6,075,814 ("Broadcom '814" or "Yamano") [APL-REMBR_00936163], entitled "Method and apparatus for reducing signal processing requirements for transmitting packet-based data with a modem," was filed on May 9, 1997, issued June 13, 2000, and lists "Broadcom HomeNetworking, Inc." as the assignee on the face of the patent. I understand that Broadcom '814 is prior art to the '580 and '228 patents.

121. Broadcom '814 discloses that a "burst mode protocol is also provided, in which packets of digital information are modulated by a transmitter circuit of the modem, thereby converting the packets of digital information into analog signal bursts of discrete duration." Broadcom '814, Abstract. '580 Patent, Abstract, 1:13-16. For example, Broadcom '814 discloses "reducing signal processing requirements for transmitting packet-based data" in data networks of "modulator/demodulator[s] (modem[s])" "transferring packet-based data or other information that is intermittent in nature on a communication channel." Broadcom '814, 1:1-13, 1:29-2:21. Broadcom '814 further discloses transmitting messages to a receiver using different modulation methods (*e.g.*, "different modem protocols" which "may implement different data rates, modulation formats and/or protocol versions"). Broadcom '814, 5:45-58.

122. Broadcom '814 discloses a "multi-drop configuration which includes modems in a subscriber's residence and a modem in the telephone company central office," as shown in Figure 7, reproduced below. Broadcom '814, 6:46-48.

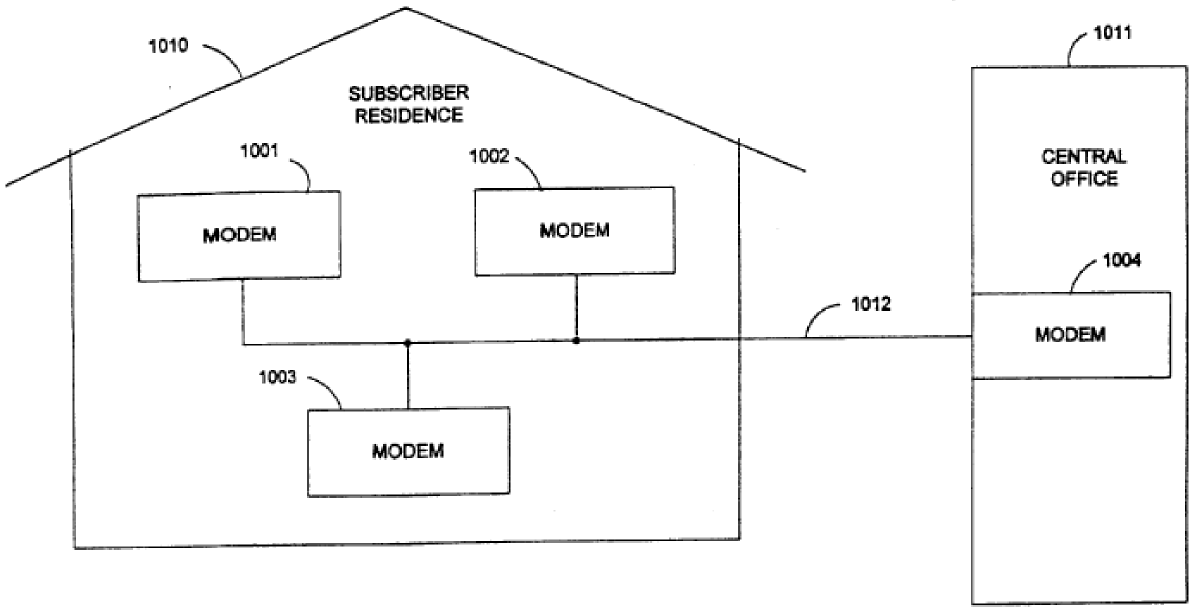


Fig. 7

Broadcom '814, Fig. 7.

(a) <u>Broadcom '814 in view of the knowledge of a person of ordinary skill in the art renders obvious master/slave communications</u>

123. Broadcom '814 explains that the disclosed multi-drop system operating on a single telephone line such as is shown in FIG. 7 may be implemented using any one of a variety of different access schemes, all of which were known to a person of ordinary skill in the art. These included various carrier-sense, reservation-based, and time-division multiple access (TDMA) schemes, among others. Broadcom '814, 19:1-53. A person of ordinary skill in the art would therefore have understood that the access scheme utilized for a particular application was a matter of design choice, would yield predictable results, and may be implemented for use in the disclosed multi-drop, system utilizing multiple, different formats of modulations. As explained further below, a person of ordinary skill in the art would have understood that Broadcom '814 disclosed a number of access schemes, (e.g., TDMA, polling) that could be implemented as master/slave and would have understood the benefits of doing so.

124. Broadcom ’814 discloses that in one embodiment for “multi-drop” operation, the modems (*e.g.*, illustrated in Fig. 7) “are connected to the same communication channel using time-division multiplexing [(‘TDMA’)]” in which “every transmitter circuit is assigned a fixed time slot during which to transmit packet information” and “[e]ach of modems 1001-1004 include[s] a transmitter circuit and a receiver circuit.” Broadcom ’814, 19:1-13, 19:43-49, 23:28-33. Broadcom ’814 expressly teaches “the advantage of this [TDMA] scheme is ease of implementation.” Broadcom ’814, 19:47-48. It would have been obvious to a person of ordinary skill in the art from Broadcom ’814’s teachings that the TDMA system described would be advantageously implemented by designating one of the modems to exercise timing control over the communication between the devices, to avoid adding more equipment. Moreover, a person of ordinary skill in the art would have had knowledge of master/slave communication architectures and master/slave relationships, and it would have been obvious that designating a modem as a master to control timing was characteristic of systems in which a master/slave relationship existed between two devices in communication. For example, it was well known to a person of ordinary skill in the art to utilize TDMA in systems involving a master/slave relationship, in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave. Examples of references that show that it was well known to implement TDMA in a master/slave configuration include the following. U.S. Patent No. 5,517,505 (“Motorola ’505”) [APL-REMBR_01161968], discloses a TDMA system in which a “master node defines the frame and packet timing for remote terminals” where each terminal “must be aligned in time relative to the start of the node frame in order to properly receive and transmit information at a predefined time slot within the-frame.” Motorola ’505, 2:3-8. U.S. Patent No. 5,684,806 (“Sony ’806) [APL-REMBR_01161997] discloses a “radio telephone system based on the TDMA system,” in which “a master station serving as a base

station and a remote station serving as a terminal device can communicate with each other through a radio transmission line." Sony '806, 1:15-19. Upender discloses that "Time division multiple access (TDMA) is … applicable to LANs as well…."; "time slices of TDMA protocols"; "a network master broadcasts a frame sync signal before each round of messages to synchronize clocks of all the nodes." Upender, REM_USPTO_00006443 at 50-52, Figure 3; APL-REMBR_00937715 at 4/10, Figure 3. Additionally, I understand that Rembrandt acknowledged and the PTAB concluded master/slave systems were well-known. '580 patent, 3:40-4:50, Figs. 1-2; IPR2014-00518 Final Written Decision [REM_USPTO_00023613], 13-18; Upender et al., "Communication Protocol for Embedded Systems," Embedded Systems Programming , Vol 7 (11), November 1994 (Upender) [REM_USPTO_00006443], 50; Goodman Declaration [REM_USPTO_00006455], ¶¶102-104. A person of ordinary skill would have been motivated to implement Broadcom '814's TDMA system in a master/slave relationship to advantageously provide for "ease of implementation" (as expressly disclosed in Broadcom '814 (19:43-48)) and efficiency in heavy traffic (as described by Upender (REM_USPTO_00006443 at 56-57, Table 1; APL-REMBR_00937715 at 8/10-9/10, Table 1)). It would have been an obvious and straightforward design choice for a person of ordinary skill to implement Broadcom '814's TDMA system (as implemented using Radish '922's teachings as discussed below) using a master/slave relationship, and it would have been clear that doing so would have worked and provided the expected functionality.

125. Broadcom '814 teaches that a modem transmitting a packet can specify timing of a "reception slot" for a subsequent packet. Broadcom '814, 20:1-7 ("preamble 701 can include … a timing value for the expected reception slot of a subsequent packet"). A person of ordinary skill in the art would have understood that, in a master/slave implementation, the transmitting master modem specifies a time slot during which a packet is expected to be sent to a

slave modem from the master modem (*e.g.*, modem 1001 in Fig. 7). *See* Broadcom ’814, 20:1-7, Fig.7. By having the master modem specify time slots for packets to be sent to the slaves, the system advantageously helps the receiver manage the durations during which it will expect a packet, which also may conserve power. The same reasons apply to a master specifying when a slave will transmit a packet. A person of ordinary skill in the art would have been motivated by the teachings of Broadcom ’814 to implement Broadcom ’814 using a master/slave relationship, where communications from the master to the slave can be specified by a transmitting device, or where communications between a master and a slave can be specified by a master device. *See e.g.*, Motorola ’505 at 2:3-8; Sony ’806 1:15-19; Upender (REM_USPTO_00006443 at 50, 52, Figures 2, 3, 56-57, Table 1; APL-REMBR_00937715 at 3/10, Figure 2, 4/10, Figure 3, 8/10-9/10, Table 1).

126. Broadcom ’814 additionally teaches that a modem transmitting a packet can request an acknowledgement. Broadcom ’814, 21:3-11, 20:64-21:11 (“the preamble can also contain error control information … [which] can be used to ‘request an acknowledgement’ from the receiver circuit….”). A person of ordinary skill in the art would have understood, based on the disclosures of Broadcom ’814, that the first modem (*e.g.*, modem 1001 in Fig. 7) transmitting a packet to a second modem (*e.g.*, modem 1002 in Fig. 7) requests an acknowledgement from the second modem that the packet has been received. *See* Broadcom ’814, 20:64-21:11. A person of ordinary skill in the art would have understood that the acknowledgements disclosed by Broadcom ’814 are communications that are sent in response to a communication from another device (e.g., a master device). *See e.g.*, Section IX.A.1.(a).

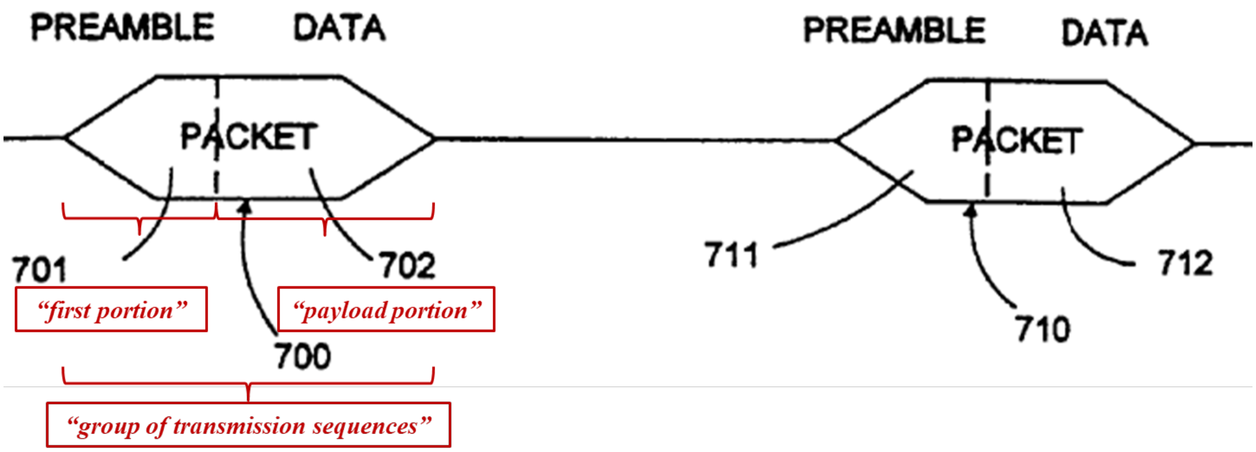
(b) Broadcom ’814 discloses two modulation formats

127. Broadcom ’814 discloses using “different modem protocols” which “may implement different data rates, modulation formats and/or protocol versions.” Broadcom ’814,

5:48-53. This “enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Broadcom ’814, 5:45-58. Broadcom ’814 further discloses that “both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) [may] be operably coupled to a single telephone line at the same time[,] [f]or example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a ‘smart toaster’ or similar appliance.” Broadcom ’814, 20:40-46, 20:27-33. I note that this very same motivation for providing a modem network capable of utilizing different types of modulation – e.g. higher performance types for internet and other data communications at a personal computer, and lower-performance types for smart appliances – was identified by the named inventor on the ’580 and ’228 Patents, Mr. Bremer, as his motivation for the Asserted Patents. *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 34:15-21 (Rembrandt Opening); 91:11-93:12 (Bremer). Broadcom ’814 recognized and addressed this need prior to even the earliest priority date of the Asserted patents. As I discuss below, a person of ordinary skill in the art would have been motivated to implement Broadcom ’814’s different modem protocols using FSK and QAM as disclosed by Radish ’922. *See* §§ IX.C.2(a), IX.C.4(a).

(c) Broadcom ’814 discloses messages with a first portion and a payload portion

128. Broadcom ’814 discloses that each packet transmitted in the network is structured with a “first portion” (e.g., “a preamble”) and a “payload portion” (e.g., “a corresponding main body”). Broadcom ’814, 5:32-38, 5:45-48. Figure 8, annotated below, provides a representation of this packet structure, in which packet 700 “includes a preamble 701 and a main body 702.” Broadcom ’814, 19:63-64:



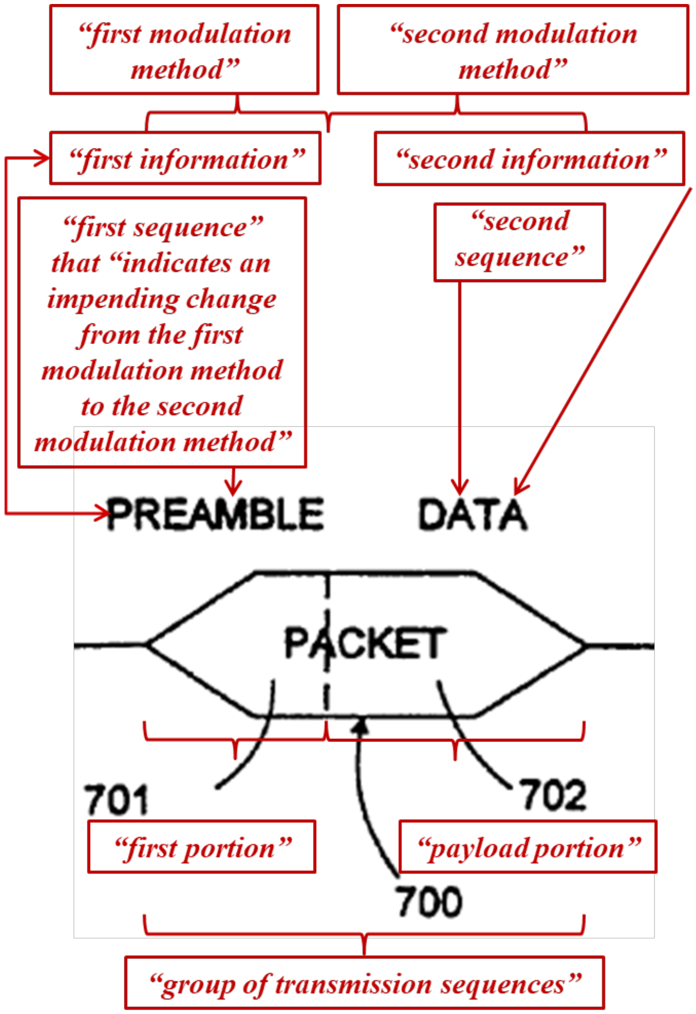
(d) <u>Broadcom '814 discloses indicating an impending change in modulation</u>

129. Broadcom '814 teaches that a respective preamble (*e.g.*, 701) and main body (*e.g.*, 702) of its packet structure may be transmitted in the same, or a different modulation. Broadcom '814, Fig. 7, 5:53-55, 19:57-20:7, 20:13-15. For example, Broadcom '814 teaches that "[e]ach preamble is transmitted in accordance with a predetermined first modem protocol." Broadcom '814, 5:45-48. This predetermined first modem protocol is associated with a first modulation format. Broadcom '814, 5:45-48. Broadcom '814 teaches that the "main bod[y] can be transmitted in accordance with different modem protocols which are different than the first modem protocol" and "the <u>different modem protocols</u> may implement different data rates, <u>modulation formats</u> and/or protocol versions." Broadcom '814, 5:48-53. Broadcom '814, discloses that the main body of the packet 700 includes "data," which a person of ordinary skill in the art would understand to comprise a payload portion. Broadcom '814, 20:13-15, Fig. 8.

130. Broadcom '814 teaches that the "preamble" of a packet contains information that indicates which modulation format is used for modulating the payload portion (*e.g.*, "data" contained therein). Broadcom '814, 5:53-55, 19:57-20:7, 20:13-15. Specifically, "[t]he modem protocol associated with each of the main bodies is identified by information included in the

corresponding preamble." Broadcom '814, 5:53-55, 19:57-20:7. For example, Broadcom '814 discloses that the information in the preamble identifies at least "packet source and destination addresses," "the line code (i.e., the modem protocol being used)," and "the data rate." Broadcom '814, 20:1-7. As I described above, "the different modem protocols may implement different data rates, modulation formats and/or protocol versions," and thus the line code in the preamble indicates an impending change in modulation to be used in the subsequent payload portion comprising data. Broadcom '814, 5:48-53; 20:1-7.

131. As Broadcom '814 explains, "preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet." Broadcom '814, 20:1-7. Thus, for example, as annotated Figure 8 below illustrates, when the main body is modulated using a different modem protocol having a different modulation format than the preamble, information in the preamble (*e.g.*, a first sequence—"line code (i.e., the modem protocol being used" in the preamble)) indicates an impending change from the first modulation method to the second modulation method for the data in the main body (*e.g.*, second sequence):



Broadcom '814, 5:45-58, 19:54-20:7, 20:23-33, Fig. 8 (annotated).

132. As Broadcom '814 explains in the context of different data rates (which may be associated with different modulation formats, for example), "[b]ecause the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712." Broadcom '814, 20:34-39. Broadcom '814 further discloses that "different modem protocols may implement different data rates, modulation formats and/or protocol versions" and that the "modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble." Broadcom '814 at 5:48-58.

(e) Broadcom ’814 discloses or renders obvious reversion to the first modulation method

133. Broadcom ’814 discloses that its modems (*e.g.* 1001-1004 in Fig. 7) are configured to transmit multiple packets, where main bodies of the packets are transmitted using different modulation formats. Broadcom ’814 discloses the transmission of multiple packets, where the main body of a first packet is transmitted using a second modulation method, and where the main body of a second packet is transmitted using a first modulation method, and a preamble (*e.g.*, line code within the preamble) of the second packet indicates that modulation has reverted from the second modulation method to the first modulation method. The indication in the preamble of the subsequent packet is an indication of reversion to the first modulation method.

134. Broadcom ’814 discloses “*modulating packets of digital information* by the modems, wherein the packets of digital information are converted into analog signal bursts of discrete duration.” Broadcom ’814, 5:35-37. Broadcom ’814 also discloses that “[e]ach preamble is transmitted in accordance with a predetermined first modem protocol.” Broadcom ’814, 5:47-48. Broadcom ’814 further discloses that “the *main bodies can be transmitted in accordance with different modem protocols* which are different than the first modem protocol” and that “[f]or example, the *different modem protocols* may implement *different* data rates, *modulation formats* and/or protocol versions.” Broadcom ’814, 5:48-53. Broadcom ’814 discloses that “[t]his variation enables devices having different operating capabilities (*e.g.*, personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Broadcom ’814, 5:47-53. As I noted above, Broadcom ’814 recognized and addressed the very same problem articulated by the named inventor of the Asserted Patents, by providing a modem network capable of utilizing different modulation methods – e.g. higher performance modulations for internet and other data communications at a

personal computer, and lower-performance modulations for smart appliances. This was identified by the named inventor on the ’580 and ’228 Patents, Mr. Bremer, as his motivation for the Asserted Patents. *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 34:15-21 (Rembrandt Opening); 91:11-93:12 (Bremer).

135. Broadcom ’814 additionally teaches that “all preambles are transmitted at a relatively low, common transmission rate” and “[f]or example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate.” Broadcom ’814, 19:54-20:29. Broadcom ’814 also teaches that “the main body 712 is transmitted at a second data rate, which is different [*e.g.*, lower] from the data rate of the main body 702 of packet 700.”). Broadcom ’814, 20:30-53.

136. Broadcom ’814 describes several scenarios of transmitting packets having different modulations between different modems within a network (*e.g.*, illustrated in Fig. 7). In the context of Figure 7, reproduced below, Broadcom ’814 discloses that “modem 1001 can be located in a personal computer, while modem 1002 can be located in a ‘smart toaster’ or similar appliance.” Broadcom ’814, 20:44-46, 5:45-58. In addition, modem 1003 can, for example, be located in a personal computer. Broadcom ’814 discloses that any of the “transmitter circuits of modems 1001-1004 can establish a session on telephone line 1012.” Broadcom ’814, 19:18-20, 19:60-64. Broadcom ’814 further discloses that “packet 700 is transmitted by the transmitter circuit of modem 1001” and that “packet 700 can be transmitted to any one or more of the other modems 1002-1004.” Broadcom ’814, 19:60-64. A person of ordinary skill in the art reading Broadcom ’814 would have understood therefore that any of Broadcom ’814’s modems 1001-1004 may act as a master and may transmit packets to any of the other modems in any order, as discussed in the examples below.

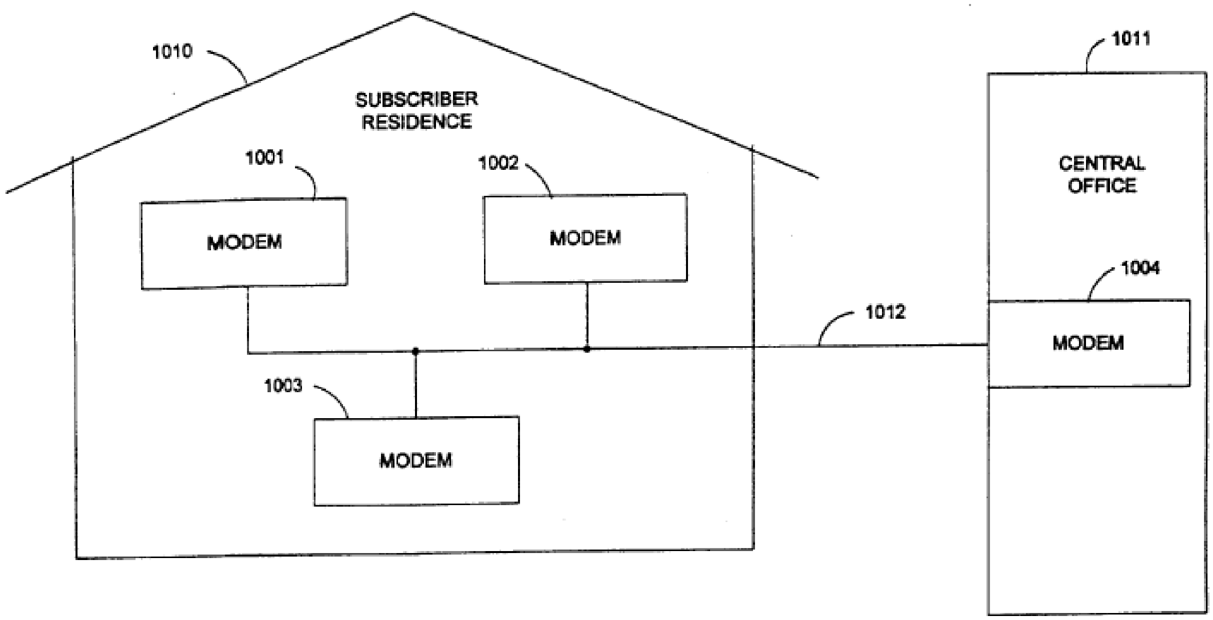
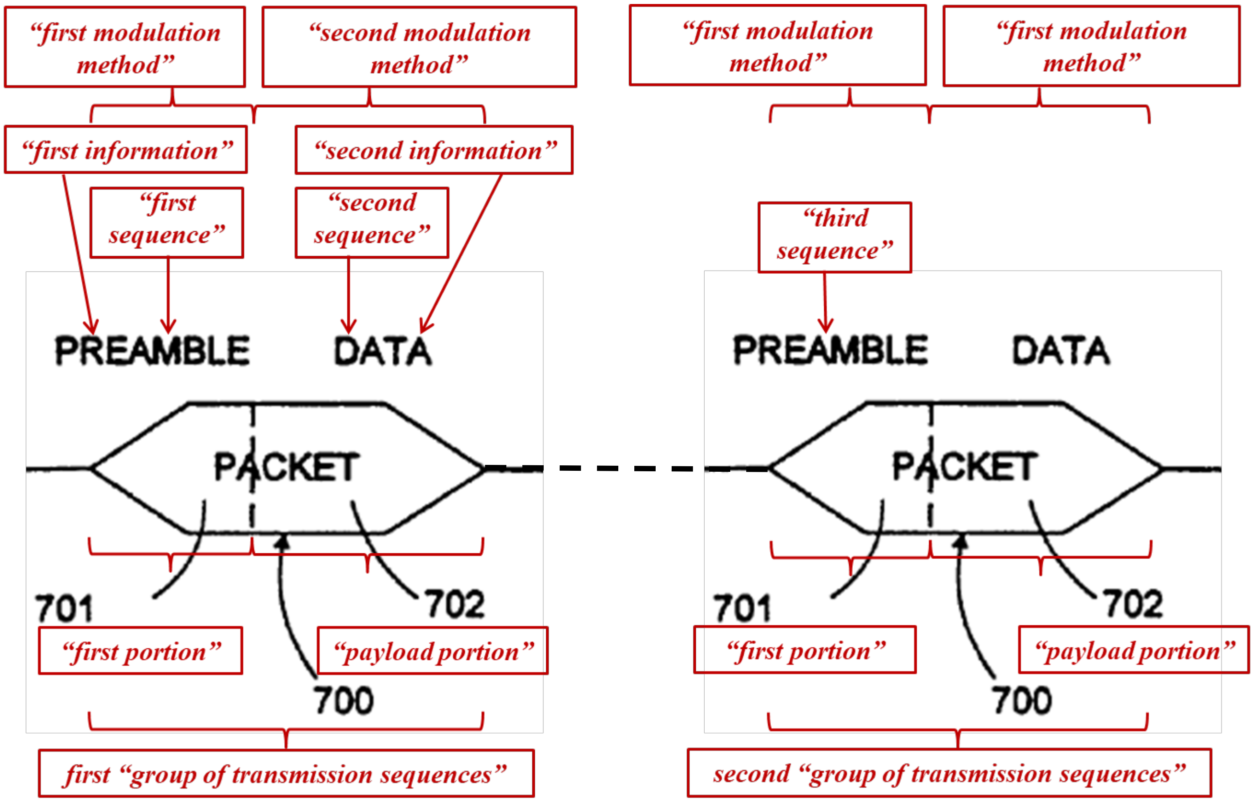


Fig. 7

Broadcom '814, Fig. 7.

137. For example, as annotated Figure 8 below illustrates, Broadcom '814's modems are configured to transmit a first packet 700 followed by a second packet 700, where "the main bodies can be transmitted in accordance with different modem protocols." Broadcom '814, 5:45-48, 5:35-38. These annotated figures illustrate Broadcom '814's modem is configured to transmit a first packet with a preamble using a first modulation method and a main body modulated using a second different modulation method; and a second packet with a preamble and main body both modulated with the first modulation method:



Broadcom '814, Figures 8 (annotated), 5:35-48.

138. This order of transmission occurs, for example, where devices having different operating capabilities are operably coupled to the same telephone line in a multi-drop configuration. For example, a modem is configured to transmit a first packet to a complex device (*e.g.*, a "personal computer"), where the preamble is transmitted in a "predetermined first modem protocol" associated with a first modulation method and a low, common transmission rate. Broadcom '814, 5:47-48 ("[e]ach preamble is transmitted in accordance with a predetermined first modem protocol"), 20:11-13 ("all preambles are transmitted at a relatively low, common transmission rate"). The main body/payload portion of the first packet is transmitted using a second modem protocol associated with a second modulation method and a relatively high transmission rate because the packet is being sent to the complex device. The modem is further configured to send a second packet to a simple device (*e.g.*, a "smart appliance" as disclosed in Broadcom '814), where the preamble is again sent using the

"predetermined first modem protocol" associated with a first modulation method and a low, common transmission rate. Broadcom '814, 5:47-48, 20:11-13. The main body/payload portion of the second packet is transmitted using the same first modem protocol associated with a first modulation method and a low, common transmission rate because the packet is being sent to the simple device. Broadcom '814, 5:32-58, 20:23-33.

139. As another example, Broadcom '814's modem is configured to transmit a first packet to a complex device (*e.g.*, a "personal computer") with a preamble modulated using the first modulation method and a main body modulated using the second modulation method, and a second packet to the same complex device with a preamble and main body modulated using the first modulation method, for example, when degraded channel conditions impede receivers from correctly receiving packets transmitted using the high rate. Broadcom '814, 5:32-58. Additionally, Broadcom '814's modem is configured to transmit, prior to transmitting the first packet to the complex device, a prior packet to the complex device with a preamble and a main body modulated using a first modulation format, for example, if there was noise on the channel or degraded channel conditions that impeded receivers from correctly receiving packets transmitted using the high data rate of the first packet. A POSITA would have understood from Broadcom '814's teachings that a reduction in noise in the channel or improvement in channel conditions prior to the sending of the first packet would facilitate sending of the first packet having a main body sent using a second modulation having a higher data rate. *See e.g.*, Broadcom '814 at 5:32-58.

(f) Broadcom '814 discloses a second modulation method resulting in a higher data rate

140. Broadcom '814 discloses that the preamble of a second packet is modulated using a first modulation method (*e.g.*, "predetermined first modem protocol"). Broadcom '814, 5:45-48 ("Each preamble is transmitted in accordance with a predetermined first modem protocol.").

The main body of the second packet is modulated using a second modulation method (*e.g.*, "different modem protocol" that implements a "different data rate[]" and "modulation format"). Broadcom '814, 5:48-53. For example, a main body is transmitted using a second modulation method that results in a higher data rate than the first modulation method where the modem is configured to transmit to a complex device (*e.g.*, a "personal computer" as disclosed in Broadcom '814). Broadcom '814, 5:47-48, 20:40-46 ("simple devices (which communicate at a relatively low speed"; "complex devices (which communicate at a relatively high speed)"). As discussed further below, Radish '922 discloses using FSK as a first modulation method associated with a first data rate (e.g., 300 bps), and a second modulation method associated with a second data rate (e.g., 9600 bps) that is higher than the first data rate. *See e.g.*, Radish '922 at 20:8-12, 21:49-54; *See also* Section IX.C.2.(d).

(g) <u>Broadcom '814 discloses an address of an intended receiver</u>

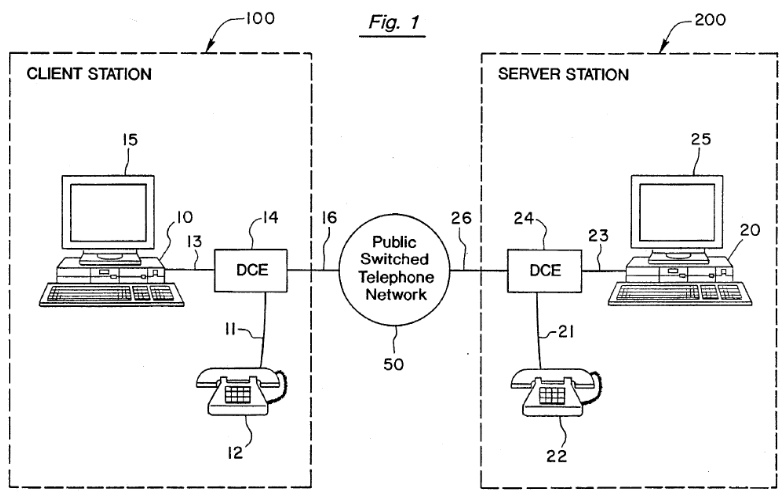
141. Broadcom '814 discloses that the preamble of a packet includes a destination address for an intended destination of the packet. Broadcom '814, 20:1-7 ("preamble 701 can include information which identifies: … packet source and destination addresses").

2. Overview of the Radish '922 Patent

142. U.S. Patent No. 5,583,922 ("Radish '922" or "Davis") [APL-REMBR_00939698], entitled "Telecommunication system for automatic switching between voice and visual data communications using forms," was filed on April 5, 1995, issued December 10, 1996, and lists Radish Communication Systems, Inc. as the assignee on the face of the patent. I understand that Radish '922 is prior art to the '580 and '228 patents.

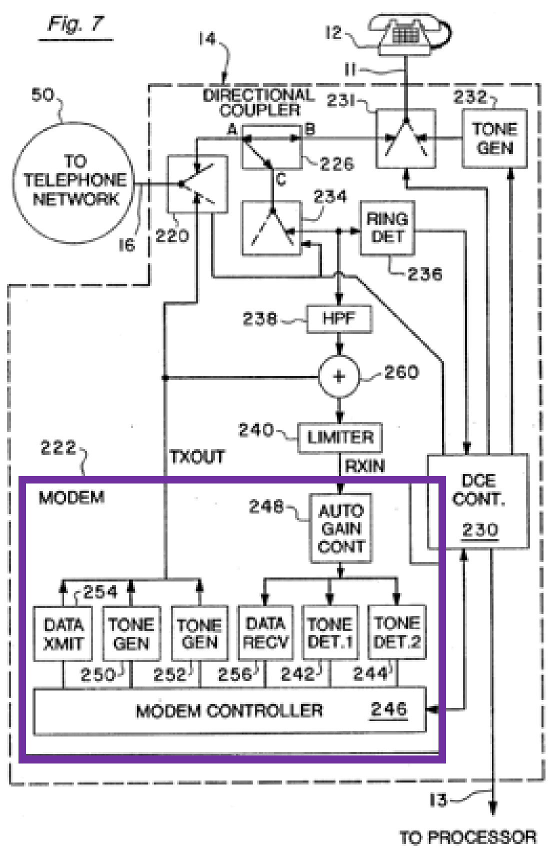
143. Radish '922 discloses a system that utilizes "data circuit-terminating equipment" ("DCEs"), which include modems that "selectively provide data communications in any of a variety of data formats, protocols, and/or transmission rates." Radish '922, 6:61-66, 16:32-37,

Figs. 1, 7. For example, Radish '922 discloses, as illustrated in Fig. 1, that DCEs are used to provide communications between a "client station" and a "server station."



Radish '922, Fig. 1.

144. Radish '922 further discloses that each DCE includes a modem, as shown in annotated Fig. 7 below.



Radish ’922, Fig. 7 (annotated in purple to identify the “modem”).

(a) Radish ’922 discloses two different types of modulation methods

145. Radish ’922 discloses sending transmissions using “three transmission rates”—“priority rate, recovery rate, and burst rate,” which each “correspond” to a specific modem data mode, data rate, and modulation scheme. Radish ’922 discloses “three transmission rates are used to convey data during *VoiceView data mode*: priority rate, recovery rate, and burst rate. *Three default modulation schemes corresponding to these rates are*: V.21 300 bps *FSK*, V.27ter 4800 bps *DPSK*, and V.29 9600 bps *QAM*.” Radish ’922, 21:49-54, 17:10-15, 17:23-34, 20:6-16. Radish ’922 further discloses that certain “tone combinations indicate the default VoiceView data mode transmission rates,” which correspond to “V.21 300 bps,” “V.27ter 4800 bps” and “V.29 9600 bps” “modulation schemes.” Radish ’922, 20:6-9.

(1) *Priority rate*: The priority rate is “[t]he highest transmission rate” and “is normally used to transmit data between DCEs.” Radish ’922, 20:10-12. The priority rate is implemented using “*V.29 9600 bps QAM*”—thus, transmissions at the priority rate are modulated using QAM. Radish ’922, 20:8-12, 21:49-54.

(2) *Recovery rate:* The recovery rate is “[t]he medium speed rate” and “is used to retransmit data that cannot be successfully transmitted at the Priority rate.” Radish ’922, 20:8-14. The recovery rate is implemented using “*V.27ter 4800* bps *DPSK*,”—thus, transmissions at the recovery rate are modulated using DPSK. Radish ’922, 20:8-14, 21:49-54.

(3) *Burst rate:* The burst rate is “[t]he slowest rate” and “is used to send small packets of data, including acknowledgments, between DCEs.” Radish ’922, 20:8-16, 21:49-54. The burst rate is implemented using “*V.21 300 bps FSK*,” thus transmissions at the burst rate are modulated using FSK. Radish ’922, 20:8-16, 21:49-54. Radish ’922 teaches that

V.21 300bps FSK is used for burst rate "because of its robustness." Radish '922, 20:19-20, 21:49-54. Radish '922 also discloses that "data blocks containing a single HDLC Supervisory or Unnumbered frame must be sent efficiently and reliably" and should be sent using "V.21 300 bps FSK." Radish '922, 22:28-31.

146. Thus, Radish '922 discloses at least two different types of modulation, e.g. FSK and QAM, as described above.

(b) Radish '922 discloses indicating an impending change in modulation

147. Radish '922 discloses that a header of its transmissions contains two bytes that indicate the data mode of the data to be transferred, which may be modulating using V.21 (FSK), V.27ter (DPSK), or V.29 (QAM). Radish '922, 20:38-55 ("Client *data blocks transmitted with V.21 modulation* begin with three HDLC flags, an address byte, [and] a control byte …. *[D]ata blocks transmitted with non-V.21 modulation* are preceded by a V.21 header containing three HDLC flags followed by two mode bytes…"), 21:49-54 ("As discussed in the previous section, *three transmission rates are used to convey data during VoiceView data mode*: priority rate, recovery rate, and burst rate. *Three default modulation schemes* corresponding to these rates are: *V.21 300 bps FSK, V.27ter 4800 bps DPSK, and V.29 9600 bps QAM*.").

(c) Radish '922 discloses reversion to the first modulation method

148. Radish '922 teaches "adaptive selection of data modulation schemes," which includes retransmitting data blocks at lower rates/modulation schemes when initial transmissions have been unsuccessful (*e.g.*, the data mode falls back from QAM to DPSK to FSK).
Radish '922, 26:10-67. For example, Radish '922 discloses that when data is transmitted in the priority rate (QAM), "if an acknowledgment is received before the timer expires, indicating that only some of the data was received correctly, the DCE initiates retransmission of the data" at the

priority data rate. Radish ’922, 26:10-24, 26:50-64. Radish ’922 discloses that the “first transmission of either a starting or subsequent data block uses the priority transmission rate (default 9600 bps)” and that the “first retransmission of some or all unacknowledged frames in the data block is transmitted at the priority transmission rate.” Radish ’922, 26:58-64.

149. Radish ’922 discloses that “[a]fter the first retransmission, if no response is encountered before the time out or only some of the frames are successfully acknowledged, the DCE retransmits the remaining unacknowledged frames in a subsequent data block one last time using the recovery transmission rate (or burst rate if recovery rate was used the first two times).” Radish ’922, 26:25-31, 26:50-67. Radish ’922 discloses that subsequent to the first transmission and first retransmission at the priority transmission rate, the “second and final retransmission of unacknowledged frames in the data block uses the recovery transmission rate (default 4800 bps).” Radish ’922, 26:65-67.

150. If the retransmission at the lower rate/modulation (*e.g.* recovery rate (DPSK)) was successful, “all remaining information data blocks during that data mode transaction” are sent using the lower rate/modulation (*e.g.*, recovery rate). Radish ’922, 26:37-45. Thus, if data blocks are initially transmitted using the priority rate (QAM) and only some of the data was received correctly, the data will be retransmitted using the same priority rate and modulation method (QAM). Radish ’922, 26:10-24, 26:50-64. If retransmission at the priority rate is unsuccessful, the data will be retransmitted using the recovery rate and associated modulation (DPSK). Radish ’922, 26:25-32, 26:50-63. If the retransmission at the recovery rate is successful, the recovery rate will be used for the duration of that data mode. Radish ’922, 26:32-45.

151. Likewise, if during transmission at the recovery rate, only some of the data is received correctly, the data will be retransmitted at the recovery rate (DPSK). Radish ’922,

26:10-67. If retransmission at the recovery rate is unsuccessful, the data will be retransmitted using the burst rate and associated modulation method (FSK). Radish ’922, 26:25-67.

152. Furthermore, as discussed below with respect to Broadcom '814 and Radish '922, the concept of reversion was well known and practiced in the prior art.

(d) Radish ’922 discloses a second modulation method resulting in a higher data rate

Radish ’922 discloses a second modulation method resulting in a higher data rate. For example, Radish ’922 discloses that the “V.29 9600 bps QAM” modulation method has a higher data rate than the “V.21 300 bps FSK” modulation method. Radish ’922 at 20:8-12, 21:49-54.

3. The Admitted Prior Art Discloses Master Slave Communication

153. I understand that the sole named inventor on the ’228 and ’580 Patents admitted in testimony provided in the *Samsung* litigation that he did not invent master/slave communications. *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 137:6-14. This is consistent with what a person of ordinary skill in the art would have understood, and is further consistent with and supported by the PTAB’s determination during an IPR proceeding that “the ’580 patent’s [disclosure of] multipoint communication systems (or master/slave systems), depicted in Figures 1 and 2 and described in column 3, line 40 through column 4, line 50, contains material that may be used as prior art against the patent under 35 U.S.C. §103(a).” IPR2014-00518 Final Written Decision at 13-21.

154. The figures and the specifications of the patents-in-suit both admit that communications systems using master/slave relationships were known in the prior art. For example, Figure 1 is expressly labeled “Prior Art” and shows a master transceiver 24 in communication with three tributary transceivers 26 over communication medium 28. In addition, the specification admits that this master/slave multipoint communication system is prior art. ’580 Patent at 3:40-44 (“With reference to FIG. 1**,** *a prior art multipoint communication system*

22 is shown to comprise a master modem or transceiver 24, which communicates with a plurality of tributary modems (tribs) or transceivers 26-26 over communication medium 28.").

155. In the master/slave system described in the Admitted Prior Art, "a master [transceiver] controls the initiation of its own transmission to the tribs and permits transmission from a trib [(*i.e.*, slave transceiver)] only when that trib has been selected." '580 Patent at 4:7-9. The master transceiver selects a trib by "transmit[ting] a training sequence 34 that includes the address of the trib that the master seeks to communicate with. In this case, the training sequence 34 includes the address of trib 26a." '580 Patent at 4:14-17. "Because master transceiver 24 selected trib 26a for communication as part of training sequence 34, trib 26a is the only modem that will return a transmission. Thus, trib 26a transmits data 44 destined for master transceiver 24." *Id.* at 4:29-33. In addition, the master can poll another trib for data as well:

> The foregoing procedure is repeated except master transceiver identifies trib 26b in training sequence 48. In this case, trib 26a ignores the training sequence 48 and the subsequent transmission of data 52 and trailing sequence 54 because it does not recognize its address in training sequence 48. Master transceiver 24 transmits data 52 to trib 26b followed by trailing sequence 54 . . . To send information back to master transceiver 24, trib 26b transmits training sequence 56 to establish a communication session. Master transceiver 24 is conditioned to expect data only from trib 26b because trib 26b was selected as part of training sequence 48. Trib 26b transmits data 58 to master transceiver 24 terminated by trailing sequence 62.

'580 Patent at 4:35-50. *See also* Provisional Application, 2-3 (describing prior art master/slave communications).

156. Accordingly, the Admitted Prior Art discloses a prior art master/slave relationship in which a slave communication (*e.g.*, 44, 58) from a slave (*e.g.*, 26a, 26b) to a master (*e.g.*, 24) occurs in response to a master communication (*e.g.*, 34, 48) from the master (*e.g.*, 24) to the slave (*e.g.*, 26a, 26b), precisely as recited in the preambles of the asserted claims.

4. Opinions Regarding Broadcom '814, Radish '922, and/or the Admitted Prior Art

157. In my opinion, Broadcom '814 in view of the teachings of Radish '922 and the knowledge of a person of ordinary skill in the art renders obvious claims 2 and 59 of the '580 patent and claim 21 of the '228 patent.

158. In addition, and alternatively, in my opinion, Broadcom '814 in view of the teachings of Radish '922 and the teachings of the Admitted Prior Art renders obvious claims 2 and 59 of the '580 patent and claim 21 of the '228 patent.

159. A detailed description of the invalidating disclosures on a limitation-by-limitation basis for these opinions is included in Exhibits H and I to this report, which is incorporated in full as if set forth herein.

(a) Motivation to Combine Broadcom '814 and Radish '922

160. A person of ordinary skill in the art would have found it obvious and straightforward and been motivated to apply Radish '922's express teaching of using FSK as a first modulation method and QAM as a second, different type of, modulation method in implementing Broadcom '814's "different modem protocols" that "may implement different data rates, modulation formats and/or protocol versions." Broadcom '814, 5:51-58.

161. Broadcom '814 and Radish '922 are in the same field of art and concern communications between modems and transmitting portions of information using different modulations. For example, Broadcom '814 is directed to modems that transfer "packet-based data or other information which is intermittent in nature on a communication channel." Broadcom '814, 1:8-13. Broadcom '814 teaches that packets or analog signal bursts include "preamble and a corresponding main body" where "[e]ach preamble is transmitted in accordance with a predetermined first modem protocol" and "main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol."

Broadcom ’814, 5:45-51. In Broadcom ’814, “different modem protocols may implement different data rates, modulation formats and/or protocol versions,” and the “modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble.” Broadcom ’814, 5:51-55. Broadcom ’814 teaches that this “variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Broadcom ’814, 5:55-58

162. Like Broadcom ’814, Radish ’922 is directed to modems that transfer data. Radish ’922 discloses using “[d]ata circuit-terminating equipment (DCE) 14, 24” “to selectively provide data communications in any of a variety of data formats, protocols, and/or transmission rates.” Radish ’922, 6:61-66. Radish ’922 discloses that each DCE communicates using a “modem 222.” Radish ’922, 16:32-37, Figs. 1, 7. Radish ’922 further teaches using three different modulation schemes and associated data rates. Radish ’922, 20:10-16. “Three default modulation schemes” are “V.21 300 bps FSK, V.27ter 4800 bps DPSK, and V.29 9600 bps QAM.” Radish ’922, 21:49-54, 17:10-15, 20:38-40, 20:46-61.

163. A person of ordinary skill in the art would have found it advantageous to transmit Broadcom ’814’s preambles using the “robust” “burst rate” (“V.21 300 bps FSK”) disclosed by Radish ’922. A person of ordinary skill in the art would have understood from the teachings of Radish ’922 that transmitting in FSK provides for a greater likelihood that receivers reliably receive and decode the control information contained in the preambles. Broadcom ’814, 5:45-58 (“Each preamble is transmitted in accordance with a predetermined first modem protocol”), 20:8-13. For example, Radish ’922 teaches that “[b]urst rate should always use V.21 300 bps because of its robustness” and that data frames that “must be sent efficiently and reliably” such as “HDLC Supervisory or Unnumbered frame” are transmitted at the “burst transmission rate

(V.21 300 bps FSK)." Radish '922, 20:19-21, 22:26-36, 21:49-54, 20:10-16 ("The highest transmission rate is referred to as the Priority rate and is normally used to transmit data between DCEs. The medium speed rate is called the Recovery rate and is used to retransmit data that cannot be successfully transmitted at the Priority rate. The slowest rate is called the Burst rate and is used to send small packets of data, including acknowledgments, between DCEs."). This is also consistent with the teachings of Broadcom '814 that "[e]ach preamble is transmitted in accordance with a predetermined first modem protocol" and that "all preambles are transmitted at a relatively low, common transmission rate." Broadcom '814, 5:45-58, 20:8-13.

164. A person of ordinary skill in the art would have understood the benefits of using Radish '922's burst rate "V.21 300 bps FSK" as the "predetermined first modem protocol" disclosed by Broadcom '814 to ensure the correct reception and decoding of information in Broadcom '814's preambles. Broadcom '814 teaches that the preamble includes "information" (*e.g.*, "line code") that identifies the "modem protocol" "associated with each of the main bodies." Broadcom '814, 5:48-58, 19:57-20:13. Broadcom '814 also teaches that the preamble includes "packet source and destination addresses" and "error control parameters." Broadcom '814, 19:57-20:7. Broadcom '814 disclosed that its receivers use the preamble's information to receive the main body of the packet. Broadcom '814, 5:49-58, 20:1-7, 20:34-39, 20:54-59.

165. Radish '922 teaches that the "[b]urst rate" is the "slowest rate" and uses "V.21 300 bps [FSK] because of its ***robustness.***" Radish '922, 20:10-16, 20:19-21, 21:49-54. Radish '922 further teaches that data frames that "must be sent efficiently and reliably" such as "HDLC Supervisory or Unnumbered frame" are transmitted at the "burst transmission rate (V.21 300 bps FSK)." Radish '922, 20:19-21, 22:26-36. A person of ordinary skill in the art, understanding the important information contained in the preambles of Broadcom '814's packets

for receiving and demodulating the main bodies of the packets, would have been motivated to implement Broadcom ’814’s preambles by applying Radish ’922’s teaching of robust FSK modulation to improve the likelihood that receivers reliably receive and decode the important control information contained in the preambles.

166. A person of ordinary skill in the art would also have found it advantageous to transmit Broadcom ’814’s packet main bodies using Radish ’922’s burst rate (“V.21 300 bps FSK”) or priority rate (“V.29 9600 bps QAM”) depending on the type of device receiving the transmissions and/or channel conditions, based on the teachings in Broadcom ’814 that “the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol” in order to communicate with simple or complex devices. Broadcom ’814, 5:45-58, 20:8-13; Radish ’922, 20:10-16, 20:19-21, 21:49-54.

167. For example, Broadcom ’814 teaches that a “main body” corresponding to each preamble “can be transmitted in accordance with different modem protocols which are different than the first modem protocol [of the preamble],” and that such “variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Broadcom ’814, 5:45-58. This is consistent with the teachings of Broadcom ’814 that “[e]ach preamble is transmitted in accordance with a predetermined first modem protocol”; “*the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol*”; and “*different modem protocols* may implement *different data rates, modulation formats and/or protocol versions*.” Broadcom ’814, 5:47-53; *see also* 20:11-17 (“all preambles are transmitted at a relatively low, common transmission rate…[f]or example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is

being transmitted at a higher data rate"), 20:31-33 ("the main body 712 is transmitted at a second data rate, which is different [*e.g.*, lower] from the data rate of the main body 702 of packet 700").

168. A person of ordinary skill in the art would have been motivated to use Radish '922's robust "V.21 300 bps FSK" as a first modulation method to transmit main bodies of packets to Broadcom '814's relatively low speed devices, such as smart appliances. *See, e.g.*, Radish '922, 20:19-21, 22:26-36. A person of ordinary skill in the art would have understood based on the teachings of Radish '922 that transmitting Broadcom '814's main bodies using Radish '922's robust "V.21 300 bps FSK" modulation scheme would improve the likelihood that the data in the main body is received correctly.

169. A person of ordinary skill in the art would also have been motivated to use Radish '922's "V.29 9600 bps QAM" modulation scheme to transmit the main bodies of packets to Broadcom '814's "relatively high speed" "complex devices" such as a personal computer. Broadcom '814, 20:40-46. Radish '922 teaches that the "priority rate" (V.29 9600 bps QAM) is the "highest transmission rate" and "is normally used to transmit data." Broadcom '814, 20:10-16, 21:49-54.

170. A person of ordinary skill in the art would have also been motivated to use Radish '922's "V.21 300 bps FSK" as a first modulation method to transmit Broadcom '814's packet main bodies when degraded channel conditions impede receivers from correctly receiving packets transmitted using the high rate "V.29 9600 bps QAM." Radish '922, 26:10-67. As discussed above, this is because the "V.21 300 bps FSK" modulation scheme is more robust than "V.29 9600 bps QAM," it increases the likelihood of successful communications in degraded channel conditions, reducing repeat transmissions, thereby increasing throughput. Radish '922, 20:19-21 ("Burst rate should always use V.21 300 bps because of its robustness"). Radish '922 teaches that data frames that "must be sent efficiently and reliably" such as "HDLC Supervisory

or Unnumbered frame" are transmitted at the "burst transmission rate (V.21 300 bps FSK)." Radish '922, 22:26-36.

171. Accordingly, in view of the purpose and similarity of the systems taught by Broadcom '814 and Radish '922 (*e.g.*, Broadcom '814, 5:45-58, 20:8-13; Radish '922, 20:10-16, 20:19-21, 20:38-61, 21:49-54), a person of ordinary skill in the art would have found it obvious and straightforward and a simple matter of design choice to implement Broadcom '814's first modem protocol to transmit preambles and main bodies of packets to simple "low speed" devices (*e.g.*, a "smart appliance" as disclosed in Broadcom '814) using Radish '922's "V.21 300 bps FSK" modulation scheme, and implement Broadcom '814's different modem protocol used to transmit main bodies of packets to complex "high speed" devices (*e.g.*, a "personal computer" as disclosed in Broadcom '814) using Radish's '922 "V.29 9600 bps QAM" modulation scheme, and would have recognized this combination (yielding the claimed limitation) would work as expected. Broadcom '814 further discloses using QAM, among other types of modulation methods. Broadcom '814 at 10:66-11:1, 12:46-61, 23:36-41. A person of ordinary skill in the art would have expected the implementation Radish '922 modulations in Broadcom '814 to work, and would have found it advantageous to do so.

172. A person of ordinary skill in the art would have also been motivated and found it obvious and straightforward to apply Radish '922's teaching of falling back from higher data rate/modulation scheme to a more robust lower data rate/modulation scheme in implementing Broadcom '814's system for transferring packet-based data.

173. For example, as discussed above, Radish '922 discloses that when data is transmitted using the priority rate, "if … only some of the data was received correctly, the DCE initiates retransmission of the data" at the priority data rate. Radish '922, 26:10-24, 26:50-64. Radish '922 discloses retransmitting using the priority rate, frames or portions of data blocks that

are initially transmitted using the priority rate (QAM) and that are not correctly received when other frames or portions of the data blocks are correctly received. Radish '922, 26:10-24, 26:50-64. If retransmission at the priority rate is unsuccessful, the data will be retransmitted using the recovery rate. Radish '922, 26:25-32, 26:50-63. If the retransmission at the recovery rate is successful, the recovery rate will be used for the duration of that data mode. Radish '922, 26:32-45. Likewise, if during transmission at the recovery rate, only some of the data is received correctly, the data will be retransmitted at the recovery rate. Radish '922, 26:10-67. If retransmission at the recovery rate is unsuccessful, the data will be retransmitted using the burst rate (FSK). Radish '922, 26:25-67.

174. As was well understood in the art at the time, and described by Radish '922, a person of ordinary skill in the art would have understood that lower data rates/modulations schemes, such as "V.21 300 bps FSK," are more robust and more likely to successfully communicate data from a source device to a destination device. Radish '922, 20:19-21. Radish '922 teaches that data frames that "must be sent efficiently and reliably" such as "HDLC Supervisory or Unnumbered frame" are transmitted at the "burst transmission rate (V.21 300 bps FSK)." Radish '922, 20:19-21, 22:26-36.

175. A person of ordinary skill in the art would have found it advantageous and obvious to use Radish '922's teaching of falling back from higher data rate/modulation scheme to a more robust lower data rate/modulation scheme in implementing Broadcom '814's system for transferring packet-based data to increase the likelihood that transmissions will be successful. A person of ordinary skill in the art would have understood that under degraded channel conditions, effective data rate decreases because, for example, noise in the channel interferes with communication of the packets and decreases throughput (*e.g.*, number of packets successfully communicated across the channel). For example, a person of ordinary skill in the

art would have understood that by falling back from a higher modulation scheme to a more robust lower modulation scheme, Broadcom '814's system is more likely to successfully transmit data packets that are lost, for example due to noise on a communication channel between the source and destination device. A person of ordinary skill in the art would have understood that by falling back, effective data rate increases as throughput increases, even at a lower per packet data rate. A person of ordinary skill in the art would have further understood in view of the teachings of Broadcom '814 and Radish '922 that under degraded conditions prior to sending of a first packet modulated using QAM, a modem would send a packet modulated using FSK to use a more robust modulation. *See e.g.*, Broadcom '814, at 5:32-58; Radish '922, 20:19-20, 21:49-54.

176. Furthermore, the concept of reversion was well-known and practiced in the prior art in communications systems that utilized different modulations and data rates. For example, Kamerman, A., Throughput Density Constraints for Wireless LANs Based on DSS, IEEE 4th International Symposium on Spread Spectrum Techniques and Applications Proceedings, Mainz Germany, Sept. 22-25, 1996, ("Kamerman") [APL-REMBR_00970129] discloses a "basic rate adaptation scheme" via which data rates fall back after a number of packets have been transmitted incorrectly. Kamerman, Section IX. Kamerman further discloses an "automatic rate selection" whereby transmissions "fall forward at reliable connections" to higher data rates and "fall back" to lower data rates at strong cochannel interference. Kamerman, Section XI. A person of ordinary skill in the art would have understood (e.g., from the teachings of Radish '922, Broadcom '814 and Kamerman) that different data rates (e.g., of Kamerman and Mahany) may be implemented using different modulations (*e.g.*, depending on characteristics of the transmissions such as robustness or bit density). A person of ordinary skill in the art would have understood that a fall back from a higher data rate to a lower data rate would correspond to a fall

back from a higher data rate modulation method to a lower data rate modulation method. *See e.g.*, Kamerman (APL-REMBR_00970139, APL-REMBR_00970140; Broadcom '814, 5:45-58; Radish '922, 20:19-20, 21:49-54, 22:28-31, 20:8-12, 21:49-54; Section IX.C.2(c).

177. Thus, a person of ordinary skill in the art would have found it obvious and straightforward to apply Radish '922's teachings of falling back from higher data rate/modulation scheme to a more robust lower data rate/modulation scheme in implementing Broadcom '814's system, and would have recognized this combination (yielding the claimed limitation) would work as expected.

(b) Motivation to Combine Broadcom '814, Radish '922, and the Admitted Prior Art

178. A person of ordinary skill in the art would have been motivated and found it obvious and straightforward to implement the combination of Broadcom '814 and Radish '922 (as described above) in view of the Admitted Prior Art disclosure of well-known master/slave communication schemes.

179. Broadcom '814, Radish '922 and the Admitted Prior Art are in the same field of art and concern modem communications systems. Additionally, both Broadcom '814 and the Admitted Prior Art disclose communications systems that use poll signals to control when transmissions occur on the network. For example, Broadcom '814 discloses that "a periodic poll or some other timing signal would be used to maintain synchronization" in a multi-drop system "between receiver circuit 400 and the remote transmitter circuit." Broadcom '814, 15:29-31, Fig. 7. Similarly, the Admitted Prior Art discloses using polled systems to control when slave devices transmit. '580 Patent at 4:35-50. For example, the Admitted Prior Art discloses that polled multipoint systems are master/slave systems. '580 Patent at 3:40-44, Fig. 1.

180. A person of ordinary skill in the art would have found it obvious and straightforward to use the Admitted Prior Art's teachings of a master/slave communication

system in implementing Broadcom ’814’s multi-drop polling system (using Radish ’922’s teachings). A person of ordinary skill in the art would have recognized that using such a master/slave relationship would advantageously provide for simplicity and determinacy (as described by Upender (REM_USPTO_00006443 at 50, 56-57, Figure 2, Table 1; APL-REMBR_00937715 at 3/10-4/10, 8/10-9/10, Figure 2, Table 1)). For example, the PTAB already concluded and the patents-in-suit admit that master/slave systems were well-known. ’580 patent, 3:40-4:50, Figs. 1-2; IPR2014-00518 Final Written Decision [REM_USPTO_00023613], 13-18; Upender et al., “Communication Protocol for Embedded Systems,” Embedded Systems Programming , Vol 7 (11), November 1994 (Upender) [REM_USPTO_00006443], 50; Goodman Declaration [REM_USPTO_00006455], ¶¶102-104. Likewise, the named inventor admitted at trial that he did not invent master/slave communications. *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 137:6-14. Thus, a person of ordinary skill in the art would have found it advantageous to implement Broadcom ’814’s multi-drop system (as implemented using Radish ’922’s teachings of “V.21 300 bps FSK” “burst rate” and “V.29 9600 bps QAM” “priority rate” modulation methods) in view of the Admitted Prior Art to implement a polling system in a master/slave configuration.

181. As a further example, Upender confirms that it was well-known to implement polling in a master/slave configuration. Upender [REM_USPTO_00006443 at 50, 56-57, Figure 2, Table 1; APL-REMBR_00937715 at 3/10-4/10, 8/10-9/10, Figure 2, Table 1]. (“Polling is one of the more popular protocols for embedded systems because of its simplicity and determinacy In this protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network.”). Additionally, PO acknowledged and the PTAB concluded master/slave systems were well-known. ’580 patent,

3:40-4:50, Figs. 1-2; IPR2014-00518 Final Written Decision, 13-18; Upender [REM_USPTO_00006443], 50; Goodman Declaration, ¶¶102-104.

182. While Broadcom ’814 explains that the disclosed multi-drop system operating on a single telephone line such as is shown in FIG. 7 may be implemented using any one of a variety of different access schemes, all of which were known to a person of ordinary skill in the art, such as carrier-sense, reservation-based, time-division multiple access, and polling schemes, among others (Broadcom ’814, 19:1-53), a person of ordinary skill in the art would have understood that it would have been a matter of design choice in selecting a particular configuration.

183. In light of the purpose and similarity of between the systems disclosed by Broadcom ’814, Radish ’922 and the Admitted Prior Art (Broadcom ’814, 19:43-48, Fig. 7; Radish ’922 20:8-12, 38-55, 21:49-54, , Figures 1, 7, Admitted Prior Art (’580 patent) at 3:40-44, 4:14-17, 29-33, 35-50, Figure 1, Provisional Application. 2-3), a person of ordinary skill in the art would have found it obvious and straightforward and a simple matter of design choice to implement Broadcom ’814’s polled multi-drop system (as implemented using Radish ’922’s teachings) using a master/slave relationship from the teachings of the Admitted Prior Art, and would have recognized this combination (yielding the claimed limitation) would work as expected.

D. All Asserted Claims are Invalid under § 103 over Lucent ’428, Kamerman, Motorola ’398, and the Admitted Prior Art

184. U.S. Patent No. 5,706,428 (“the Lucent patent” or “Lucent”) [APL-REMBR_00935603], entitled “Multirate Wireless Data Communication System” was filed on March 14, 1996 and issued on January 6, 1998 to Jan Boer et al., and assigned to Lucent Technologies Inc. I understand that Lucent is prior art to the ’580 and ’228 patents.

(a) Rembrandt is Collaterally Estopped From Disputing That Each Limitation of the Independent Claims is Within the Prior Art

185. I understand that the PTAB has already found each independent claim from which the asserted claims depend unpatentable as obvious over the Admitted Prior Art ("APA") and Lucent. *See* IPR2014-00518, Pap. 47 at 21 [REM_USPTO_00023613 at 22]; IPR2014-00892, Pap. 46 at 23 [RIP00103337 at 23]. Thus, I understand the independent claims from which the asserted claims depend have been dedicated to the public, and Rembrandt is not permitted to recapture those elements that are now in the public domain.

186. In particular, the PTAB's determination that the underlying independent claims are obvious over APA and Lucent is a recognition that each limitation of the underlying independent claims already exists within the prior art, and that a person of ordinary skill in the art would have been motivated to combine that prior art to render obvious the underlying independent claims as a whole, *i.e.* claim 1 of the '228 Patent and claims 1 and 58 of the '580 Patent.

187. I also understand Rembrandt did not appeal the PTAB's determinations in either of these proceedings. As a consequence, I understand Rembrandt cannot now challenge that each limitation of the underlying independent claims is found within APA and Lucent and that a person of ordinary skill in the art would have been motivated to combine APA and Lucent to render obvious the underlying independent claims. Thus, I have been asked to direct my invalidity analysis to the added limitations as found in dependent claim 21 of the '228 Patent and dependent claims 2 and 59 of the '580 Patent.

(b) Lucent discloses or renders obvious reversion to the first modulation method

188. Lucent discloses or renders obvious reversion to the first modulation method. *See* Rembrandt's Infringement Contentions, Exhibit B at 15. For example, Lucent discloses

"Therefore, according to the present invention, there is provided a method of operating a wireless local area network station adapted to transmit and receive messages at a plurality of data rates, wherein said messages include an initial portion and a data portion, including the steps of: transmitting the initial portion of a message to be transmitted by a station at a first predetermined one of a first plurality of data rates…" *Id.* at 1:33-40. A person of ordinary skill in the art would have understood that a subsequent transmission of Lucent's SIGNAL 206 and SERVICE 208 fields would be a "third sequence."

189. A person of ordinary skill in the art would have also understood that this third sequence indicates a reversion to the first modulation method. *See* Rembrandt's Infringement Contentions, Exhibit B at 15. For example, Lucent 428 discloses that "DATA field 214 … may be transmitted at a selected one of the four possible rates 1, 2, 5 or 8 Mbps, using the modulation and coding discussed hereinabove." *Id.* at 3:56-62.

190. Lucent also discloses that "The SIGNAL field 206 has a first predetermined value if the DATA field 214 is transmitted at the 1 Mbps rate and a second predetermined value if the DATA field 214 is transmitted at the 2, 5 or 8 Mbps rates. The SERVICE field 208 has a first predetermined value (typically all zero bits) for the 1 and 2 Mbps rates, a second predetermined value for the 5 Mbps rate and a third predetermined value for the 8 Mbps rate." *Id.* at 4:4-11.

191. Lucent also discloses that "Returning to block 508, if an ACK message is not received correctly and within the predetermined time interval, then the flowchart proceeds to block 522 where the SC count value is reset to zero and the data rate is decremented (if the minimum data rate is not already being used)…." *Id.* at 7:41-51, *see also* 8:6-9, Fig. 7.

192. A person of ordinary skill in the art would have understood that, in the situation where a packet's data rate is decremented to that achieved by the first modulation method,

SIGNAL 206 and SERVICE 208 of that packet indicates reversion to the first modulation method. *See* Rembrandt's Infringement Contentions, Exhibit B at 15.

(c) <u>Lucent renders obvious an address of an intended receiver</u>

193. Lucent renders obvious that the first information that is included in the first message comprises the first message address data. For example, Lucent discloses that a transmitted packet includes a destination address for the intended destination of the packet. Referring to Figure 1, Lucent discloses that "The LAN 10 includes an access point 12, which serves as base station, and is connected to a cable 14 which may be part of a backbone LAN (not shown), connected to other devices and/or networks with which stations in the LAN 10 may communicate. The access point 12 has antennas 16 and 17 for transmitting and receiving messages over a wireless communication channel. The network 10 includes mobile stations 18, referred to individually as mobile stations 18-1, 18-2, and having antennas 20 and 21, referred to individually as antennas 20-1, 20-2 and 21-1, 21-2. The mobile stations 18 are capable of transmitting and receiving messages selectively at a data rate of 1 Mbps (Megabit per second) or 2 Mbps, using DSSS (direct sequence spread spectrum) coding." *Id.* at 2:6-22. Lucent further discloses that "[t]he C-MST 132 determines if an incoming message is addressed to its own station, using a destination address included in the data field 214 of the message 200." Thus, Lucent expressly discloses including information in the transmission that comprises message address data. A person of ordinary skill in the art would have considered it obvious to place this address of the intended destination mobile station in the first information comprising a header of the packet, rather than the data field, for the reasons set forth further below.

2. The Kamerman Reference

194. Kamerman, A., Throughput Density Constraints for Wireless LANs Based on DSSS, IEEE 4th International Symposium on Spread Spectrum Techniques and Applications

Proceedings, Mainz, Germany, Sept. 22-25, 1996, pp. 1344-1350 vol.3 ("Kamerman") was published in September 1996. I understand that Kamerman is prior art to the '580 and '228 patents.

195. Kamerman discloses reversion to the first modulation method. For example, Kamerman discloses that it is beneficial to transmit the data of a first data packet using a second modulation method corresponding to a higher data transfer rate (e.g., QAM at a higher data rate) during lower load conditions to maximize the data transfer rate during lower load conditions when the connection is more reliable and to next transmit the data of a second data packet using a first modulation method corresponding to a lower data transfer rate (e.g., BPSK modulation at 1 mbps) (i.e., "falling back") during higher load conditions when a more robust signal is needed due to "mutilation of transmissions by interference." *See* Kamerman at Section IX (entitled "Automatic Rate Selection") ("The basic rate adaption scheme could be: after unacknowledged packet transmissions the rate falls back, and after a number (e.g., 10) of successive correctly acknowledged packet transmissions the bit rate goes up."); *id.* ("At lower load in the neighbor cells the highest bit rate can be used more often. At higher load the transmissions from the access-point to stations at the outer part of the cells, will be done at fallback rates due to mutilation of transmissions by interference. In practice the network load for LANs at nowadays client-server applications is very bursty, with sometimes transmission bursts over an individual links and low activity during the major part of the time. Therefore the higher bit rate can be used during the most of the time, and at high load in the neighbor cells … there will be switched to fall back rates in the outer part of the cell."); *id.* at Section XI (entitled "Conclusions") ("This automatic rate selection gives fall forward at reliable connections and fall back at strong co-channel interference. Therefore it gives adaptation of the bit rate to the interference as it occurs in time depending on positions as load.").

3. The Motorola '398 [Siwiak '398] Patent

196. U.S. Patent No. 5,537,398 ("Motorola '398" or "Siwiak '398") [APL-REMBR_00969736], entitled "Apparatus for Multirate Simulcast Communications" was filed on May 12, 1995 and issued on July 16, 1996 to Kazimierz Siwiak, and assigned to Motorola, Inc. I understand that Motorola '398 is prior art to the '580 and '228 patents.

197. Motorola '398 discloses user data transmitted in a second portion of a transmission that is subsequent to a preamble and synchronization fields of the transmission. Motorola '398, 4:31-39 ("As shown in FIG. 2, when a message transmission is initiated on the channel, the first transmission portion 102, modulated in the well-known FM format, is transmitted on the channel. The first transmission portion 102 includes a preamble and synchronization bits, followed by the pager address in the address block 106 and message vectors 108 which contain the information as to the modulation format of the message data 110 in the second transmission portion 104."); *see also id.* at Fig. 2 reprinted below:

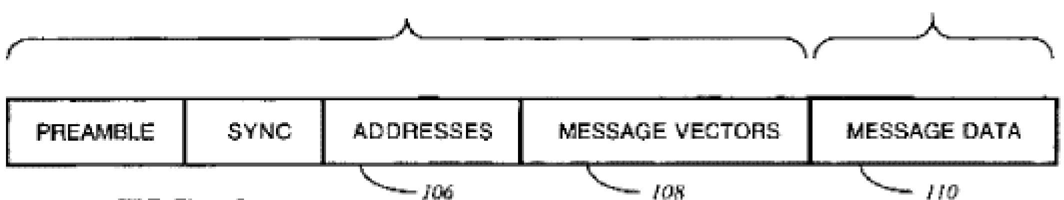


FIG. 2

198. Motorola '398 discloses placing an address of an intended receiver in the first information of a message. *See* paragraphs 196-197 above. The address is included in the first transmission portion 102, as shown in Fig. 2 and the discussion above.

199. Motorola '398 discloses that the first transmission portion 102 of Motorola '398 includes an address of an intended destination of the transmission 100. *See, e.g.*, Motorola '398, 2:24-3:4 ("The transmitters each include means for modulating, in a first modulation format, such as FM, *a first transmission portion including address and other information such as*

message characterization information . . . . *The address uniquely identifies the data communication receiver* (or a group of data communication receivers) *to which the message is directed*, and the message characterization information identifies an information service, among other things . . . . The first transmission portion allows the subscriber unit receivers to work in a lower power consumption mode which enhances battery life."); *see also id.* at 4:31-39 ("As shown in FIG. 2, when a message transmission is initiated on the channel, the first transmission portion 102, modulated in the well-known FM format, is transmitted on the channel. The *first transmission portion 102 includes a preamble and synchronization bits*, followed by the pager address in the address block 106 and message vectors 108 which contain the information as to the modulation format of the message data 110 in the second transmission portion 104.").

4. Opinions Regarding Lucent, Kamerman, Motorola '398, and the Admitted Prior Art

200. In my opinion, Lucent in view of the teachings of Kamerman, Motorola '398, the Admitted Prior Art, and/or the knowledge of a person of ordinary skill in the art renders obvious claims 2 and 59 of the '580 patent and claim 21 of the '228 patent. A detailed description of the invalidating disclosures on a limitation-by-limitation basis is included in Exhibits J and K to this report, which is incorporated in full as if set forth herein.

(a) Motivation to Combine Lucent and Kamerman

201. To the extent Rembrandt argues Lucent does not disclose a reversion to the first modulation method, it would have been obvious and straightforward to combine Kamerman's advantageous disclosure of reverting from a "second modulation method" corresponding to a higher data rate (such as QAM) to a "first modulation method" corresponding to a lower data rate (such as PSK) after unacknowledged packet transmissions in Lucent's packet transmission system.

202. Lucent discloses "if an ACK message is not received correctly and within the predetermined time interval, then the flowchart proceeds to block 522 where … the data rate is decremented…." Lucent, 7:41-51.

203. Kamerman teaches decrementing the data rate by using different modulation methods after unacknowledged packet transmissions, for instance, where there is a high load in neighbor cells causing cochannel interference: *See, e.g.*, Kamerman, 6, 11-12.

204. Kamerman expressly discloses that the different modulation methods can include QAM and forms of PSK. Kamerman, 11 ("IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: after unacknowledged packet transmissions the rate falls back, and after a number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up.").

205. It was well-known and conventional to use QAM with PSK systems for higher data rates and to revert to lower data rates after an unacknowledged message, as disclosed by Kamerman. A person of ordinary skill in the art would have been motivated to use QAM for higher bit rates.

206. In view of the foregoing, a person of ordinary skill in the art would have found it routine and straightforward to change Lucent's modulation method from the higher bit-rate, "second modulation type" of the independent claim to the lower bit-rate, "first modulation type" of the independent claim in order to ensure messages are properly received by the receiver. A person of ordinary skill in the art would have known that such a combination (yielding the claimed limitation) would work and provide the expected functionality.

(b) Motivation to Combine Lucent and Motorola ’398

207. To the extent Rembrandt argues Lucent does not disclose, or render obvious placing the address of the intended recipient in the header of the packet in view of the knowledge of one of ordinary skill in the art, it would have been obvious and straightforward to combine Lucent with the transmission format disclosed in Motorola ’398, which expressly discloses the claimed address location. *See, e.g.*, Motorola ’398, 2:42-57, 4:31-39, Fig. 2. As taught by Motorola ’398, this can provide power-savings for the device, since demodulation of the first information that is included in the first message is transmitted using a first modulation method that can use a lower power demodulator. *See, e.g.*, Motorola ’398, 3:19-31; 3:40-48. Further, if the address that is demodulated using the lower-power demodulator does not match that of the receiving device, then the device can ignore and suspend processing of the subsequent data field that may be sent at the higher data rate, thereby further saving power.

E. All Asserted Claims are Invalid under § 103 over Snell, Broadcom ’814 (Yamano), Kamerman, and/or the Admitted Prior Art

1. The Snell Patent

208. U.S. Patent No. 5,982,807 (“Snell”) [APL-REMBR_00969736], entitled “High Data Rate Spread Spectrum Transceiver and Associate Methods” was filed on March 17, 1997 and issued on November 9, 1999 to James Leroy Snell, and assigned to Harris Corporation. I understand that Snell is prior art to the ’580 and ’228 patents.

209. Snell teaches a transceiver that serves as an access point for communicating data with other transceivers connected to a wireless local area network (WLAN). Snell at 1:34-46; *see id.* at 1:47-50, 4:42-47, 5:18-21.

210. Snell’s transceiver transmits data packets intended for another transceiver, where the communication may switch on-the-fly between modulation methods. *Id.* at 2:61-63 (“The modulator may also preferably include header modulator means for modulating *data packets.”),*

1:55-57 ("The PRISM 1 chip set provides all the functions necessary for full or half duplex, direct sequence spread spectrum, *packet communications* at the 2.4 to 2.5 GHz ISM radio band."), 2:27-30 ("It is another object of the invention to provide a spread spectrum transceiver and associated method to permit operation at higher data rates and *which may switch on-the-fly between different data rates and/or formats."),* 7:10-14 ("The variable data may be modulated and demodulated in different formats than the header portion to thereby increase the data rate, and *while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly."),* 1:58-61 ("In particular, the HSP3824 baseband processor manufactured by Harris Corporation employs quadrature or bi-phase phase shift keying (QPSK or BPSK) modulation schemes."), 2:15-17 ("Moreover, a WLAN application, for example, may require a change between BPSK and QPSK during operation, that is, on-the-fly."). *See also id.* at Abstract, 1:55-61, 2:56-59, Fig. 2, Fig. 3, Fig. 5.

211. I understand that the PTAB, during *ex parte* reexaminations against the asserted claims, found the asserted claims unpatentable over the prior art. However, before the PTAB could issue a reexamination certificate cancelling the claims, the patents expired and the PTAB reinterpreted the "different types of modulation methods" term to mean "different families of modulation techniques, such as the FSK family of modulation methods and the QAM family of modulation methods." The grounds raised before the PTAB for this limitation argued the two modulation methods as being <u>BPSK</u> and <u>QPSK</u>. Because those were not found to be different families of modulation techniques, the PTAB declined to cancel the claims. As set forth in this report, it was well known in the art to use different families of modulation techniques, such as PSK and QAM as disclosed by Kamerman. Therefore, as shown below, the PTAB's only

rationale for avoiding cancelling the asserted claims in the *ex parte* reexamination was well-known in the prior art and renders the asserted claims obvious.[5]

(a) Snell discloses or renders obvious master/slave communications

212. Snell discloses or renders obvious master/slave communications. For example, Snell incorporates by reference "the entire disclosure" of Harris AN9614 [APL-REMBR_00965856]. Snell at 5:2-7 ("[A]s further described in the Harris PRISM 1 chip set literature, such as the application note No. AN9614, March 1996, the entire disclosure of which is incorporated herein by reference."). Harris AN9614 discloses that the communications between transceivers can operate according to a polled (i.e., master/slave) protocol.

213. A polled protocol is a master/slave protocol, as confirmed by the patents-in-suit and Rembrandt's representations that the master/slave language added to the claims and specification was supported by and did not add new matter to the discussion of polled multipoint communication between a master and tributary transceivers. '580 patent at 4:6-9; '580 Prosecution History at 140. *See also* IPR2014-00518, Pap. 47 at 15 ("In [a polling] protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network."); '580 Prosecution History at 404; IPR2014-00518.

214. Harris AN9614 further confirms that its reference to a polled protocol is a master/slave protocol because it discloses "[T]he controller can keep adequate time to operate either a polled or a time allocated scheme. In these modes, the radio is powered off most of the time and only awakens when communications is expected. This station would be awakened periodically to listen for a beacon transmission. The beacon serves to reset the timing and to alert

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[5] I understand Kamerman was raised in the *ex parte* reexaminations, but the petitioner did not rely on Kamerman as disclosing "different families" of modulation methods. Thus, there was no finding by the PTAB as to whether Kamerman disclosed "different families" of modulation methods.

the radio to traffic. If traffic is waiting, the radio is instructed when to listen and for how long. In a polled scheme, the remote radio can respond to the poll with its traffic if it has any. With these techniques, the average power consumption of the radio can be reduced by more than an order of magnitude while meeting all data transfer objectives." Harris AN9614 at 3. The foregoing is a description of a master/slave relationship between transceivers. To the extent that it is argued that this does not disclose a master/slave relationship between transceivers, it would have been obvious to a person of ordinary skill in the art to implement the polling scheme disclosed in Harris AN9614 such that the transceiver access control comprises a master/slave relationship. As discussed throughout this report, master/slave systems were well-known and widely utilized in the art, as acknowledged and admitted by the specifications of the patents-in-suit, and the named inventor. *See, e.g.*, Section IX.C.3.

(b) <u>Snell discloses messages with a first portion and a payload portion</u>

215. Snell discloses messages with a first portion and a payload portion. For example, Snell discloses transmitting a group of transmission sequences structured with a "first portion" including the PLCP preamble and PLCP header and a "payload portion" including the MPDU data (as depicted in annotated Figure 3 below).

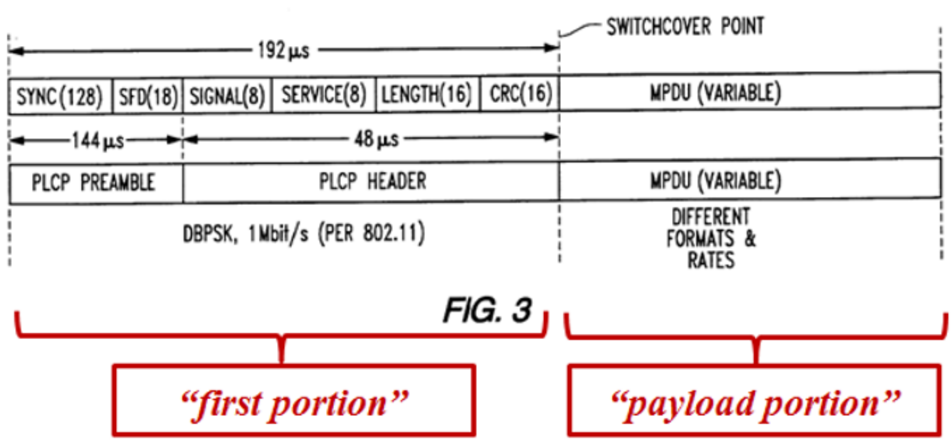


FIG. 3

(c) Snell discloses indicating an impending change in modulation

216. Snell discloses indicating an impending change in modulation. For example, Snell discloses that "The *header may always be BPSK*." *Id.* at 6:35-36. Snell also discloses that the SIGNAL field of the header indicates the modulation of the MPDU, which may be a modulation different than BPSK. For example, Snell discloses "Now relating to the *PLCP header* 91, *the SIGNAL* is:

0Ah	1 Mbit/s BPSK,
14h	2 Mbit/S QPSK,
37h	5.5 Mbit/s BPSK, and
6Eh	11 Mbit/s QPSK.

Id. at 6:52-59.

217. Snell discloses "*MPDU* is serially provided by Interface 80 and *is the variable data* scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU. *The variable data may be modulated and demodulated in different formats* than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14.

(d) Snell discloses reversion to the first modulation method

218. Snell discloses indicating that modulation has reverted to the first modulation method. For example, Snell teaches communicating multiple data packets with the ability to "switch on-the-fly between different data rates and/or formats." *See, e.g.*, Snell at 1:55-57, 2:27-30, 2:61-63, 6:35-36, 6:52-59, 6:64-66, 7:1-2, 7:5-14, Fig. 3.

219. Based on this disclosure, a person of ordinary skill in the art would have understood that Snell teaches that a series of packets may be sent that switch from using a second

modulation method to using a first modulation method for the payload portion of the data packet. For example, as shown in Figure 3 (annotated) above, a first packet in Snell comprises a "first sequence" (*e.g.*, PLCP preamble and PLCP header) that is "modulated according to the first modulation method" (*e.g.*, BPSK) where the "first sequence" (*e.g.*, "SIGNAL" field in PLCP header) "indicates" (*e.g.*, using "14h") the modulation format used for modulating the "second sequence" (*e.g.*, MPDU data).

220. For the first packet, the "SIGNAL" field in the PLCP header uses a code (*e.g.*, "14h") that "indicates" that the MPDU data is modulated "according to the second modulation method.".

221. Snell's transceiver then transmits a second packet comprising a "third sequence" (*e.g.*, PLCP preamble and PLCP header) "transmitted in the first modulation method" (*e.g.*, BPSK) where the "third sequence" (*e.g.*, "SIGNAL" field in PLCP header) "indicates" (*e.g.*, using "0Ah") the modulation type (*e.g.*, BPSK) used for modulating the MPDU data of the second packet.

222. For the second packet, the "SIGNAL" field in the PLCP header uses a code (*e.g.*, "0Ah") that "indicates" that the MPDU data is modulated using the BPSK modulation method at 1 Mbit/s. This "SIGNAL" thus "indicates that communication" from the transceiver "has reverted to the first modulation method" (*e.g.*, reverted to BPSK modulation).

2. The Broadcom '814 (Yamano) Patent

223. For an overview of the Broadcom '814 patent, *see* Section IX.C.1 above.

224. Broadcom '814 discloses placing an address of an intended receiver in the first information of a message, e.g. in the preamble of the message. *See* paragraph 141 above.

3. The Kamerman Reference

225. For an overview of Kamerman, *see* Section IX.D.2 above.

226. Kamerman discloses reversion to the first modulation method. *See id.*

227. Snell in view of Kamerman discloses using two different types of modulation methods. Snell discloses BPSK as the first modulation method. For example, Snell discloses that "[t]he header [of Snell's packets] may always be *BPSK*." Snell at 6:35-36.

228. Kamerman discloses QAM as the second modulation method to achieve higher data rates over BPSK, in addition or as an alternative to, the QPSK of Snell. For example, Kamerman discloses "IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: after unacknowledged packet transmissions the rate falls back, and after a number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up." Kamerman at 11.

229. PSK and QAM are different families of modulation methods. I note in this context that the Court's construction of the term "different types of modulation methods" is "different families of modulation techniques, such as the FSK family of modulation methods and the ***QAM family*** of modulation methods." (emphasis added). Thus, the Court's construction defines QAM as a "family" of modulation methods unto itself, and not simply an example of a member of a family.

230. It is also my opinion that, in view of the Court's construction that conveys that QAM is a *family* of modulation methods unto itself, PSK would be understood by a person of ordinary skill in the art to be a different modulation family. This understanding is supported by various prior art textbooks and other references. *See, e.g.*, Electronic Communications Systems – Fundamentals Through Advanced, Wayne Tomasi, Prentice-Hall, Inc., 1988, p. 490 ("Essentially, there are three digital modulation techniques that are commonly used in digital

radio systems: frequency shift keying (FSK), phase shift keying (PSK), and quadrature amplitude modulation (QAM).") [APL-REMBR_00982464]; Deep space telecommunications systems engineering, PN Sargeaunt - IEE Proceedings F-Communications, Radar, 1985 (referring to "the PSK family of modulation methods) [APL-REMBR_00982439]; US 5,966,055 at 3:36-45 (referring to "a method for generating the family of PSK (phase shift keyed) modulations, which include BPSK . . . and the like" by "employ[ing] direct nonlinear synthesis (an FM technique)") [APL-REMBR_00982440]; WO 2009/091,128 (referring separately to "Phase Shift Key (PSK)-family" and "Quadrature Amplitude Modulation (QAM)-family") [APL-REMBR_00982524].

231. Because the Court has construed "different types of modulation methods" to mean "different families of modulation techniques, such as the FSK family of modulation methods and the QAM family of modulation methods," and because PSK and QAM are different families of modulation methods, they are "different types of modulation methods" under the Court's construction.

4. The Admitted Prior Art

232. The Admitted Prior Art discloses master-slave communications. *See* Section IX.C.3.

5. Opinions Regarding Snell in view of Broadcom '814 (Yamano), Kamerman, and/or the Admitted Prior Art

233. In my opinion, Snell in view of Broadcom '814 (Yamano), Kamerman, and/or the Admitted Prior Art anticipates or renders obvious claims 2 and 59 of the '580 patent and claim 21 of the '228 patent. A detailed description of the invalidating disclosures on a limitation-by-limitation basis is included in Exhibits L and M to this report, which is incorporated in full as if set forth herein.

(a) Motivation to Combine Snell and Broadcom '814 (Yamano)

234. It would have been obvious and straightforward to combine Snell with the packet configuration of Broadcom '814, which expressly discloses the claimed configuration of placing address data in the first portion of the message. *See* paragraphs 141 above.

235. It was well-known in the art, as demonstrated by Broadcom '814, that packets can be advantageously addressed for an intended destination. Broadcom '814 expressly discloses that the destination address may be placed in the preamble. For example, Broadcom '814 discloses that the information in the preamble can identify at least "packet source and destination addresses," "the line code (i.e., the modem protocol being used)," and "the data rate." Broadcom '814, 20:1-7, emphasis added. A person of ordinary skill in the art would have been motivated and found it obvious and straightforward to use Broadcom '814's teaching of including a destination address in the data packet in implementing Snell's teachings of a communication system for transmitting data packets in a wireless LAN applications to advantageously specify which receiver the data is intended for and to beneficially reduce processing requirements of receiving devices by allowing the receiving device to filter out packets which it does not need to demodulate.

236. Snell and Broadcom '814 are in the same field of art, with both relating to transmitting data packets over a network (*see, e.g.,* Snell at 1:55-58, 2:61-63, 2:66-3:3, 5:18-21, 6:48-63, Fig. 3; Broadcom '814 at 1:1-29, 19:54-20:33, Fig. 8), at varying rates (*see, e.g.,* Snell at 2:15-17, 6:52-59; Broadcom '814 at 19:54-56).

237. Broadcom '814 expressly teaches that including a destination address in the preamble portion of the data packet, which precedes the data portion, will advantageously reduce processing requirements of receiving devices because the receiving device can filter out packets which it does not need to demodulate. Broadcom '814 at 20:54-59 ("When the preamble in a burst-mode packet *includes the destination address of the packet,* the receiver circuits can monitor the

destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits.").

238. In addition, Snell teaches structuring its data packet to include a preamble, header, and MPDU data portion (*see, e.g.,* Snell at 6:35-36, 6:64-66, 7:5-14, Fig. 3), and Broadcom '814 teaches structuring its data packet to also include a preamble and data portion, and specifically to place the destination address in the preamble portion (Broadcom '814 at 19:63-20:7, Fig. 8).

239. It would have been routine and straightforward for a person of ordinary skill in the art to include a destination address in the data packet, as taught by Broadcom '814, in implementing Snell's system for transmitting data packets between transceivers, as Snell teaches that its data packet already includes a preamble portion-and in combination, each element (Broadcom '814's teaching of placing a destination address in the preamble and Snell's teaching of a system for communicating data packets modulated according to different modulation methods between transceivers) performs the same function as it would separately, yielding nothing more than predictable results. *KSR Int'l Co. v. Teleflex Inc.,* 550 U.S. 398, 417 (2007).

240. A person of ordinary skill in the art would have thus recognized that this combination (yielding the claimed limitation) would have worked as expected. For these reasons, a person of ordinary skill in the art would have been motivated and found it obvious and straightforward to use Broadcom '814's advantageous teachings of including a destination address in the first portion of a data packet in implementing Snell's communication system.

(b) <u>Motivation to Combine Snell and Kamerman</u>

241. To the extent Rembrandt argues Snell does not disclose a reversion to the first modulation method, it would have been obvious and straightforward to combine Kamerman's advantageous disclosure of using QAM as the "second modulation method," corresponding to the higher data rate, and reverting from that second modulation method to a "first modulation

method" corresponding to a lower data rate (such as Snell's BPSK) after unacknowledged packet transmissions in Snell's packet transmission system.

242. Snell discloses "It is [an] object of the invention to provide a spread spectrum transceiver and associated method to permit operation at higher data rates and *which may switch on-the-fly between different data rates and/or formats*." Snell at 2:27-30.

243. Kamerman teaches decrementing the data rate by using different modulation methods after unacknowledged packet transmissions, for instance, where there is a high load in neighbor cells causing cochannel interference: *See, e.g.*, Kamerman, 6, 11-12.

244. Kamerman expressly discloses that the different modulation methods can include QAM and forms of PSK. Kamerman, 11 ("IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: after unacknowledged packet transmissions the rate falls back, and after a number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up.").

245. Indeed, it was well-known and conventional to use QAM with PSK systems for higher data rates and to revert to lower data rates—which use different modulation methods—after an unacknowledged message, as disclosed by Kamerman. A person of ordinary skill in the art would have been motivated to use QAM for higher bit rates.

246. In view of the foregoing, a person of ordinary skill in the art would have found it routine and straightforward to change Snell's modulation method from the higher bit-rate, "second modulation type" of the independent claim to the lower bit-rate, "first modulation type" of the independent claim in order to ensure messages are properly received by the receiver. A

person of ordinary skill in the art would have known that such a combination (yielding the claimed limitation) would work and provide the expected functionality.

F. All Asserted Claims are Invalid under § 102 and/or § 103 over Nokia [Reunamaki]

247. U.S. Patent No. 7,295,546 ("Nokia [Reunamaki]") issued on November 13, 2007. Nokia [Reunamaki] lists Jukka Reunamaki as the sole inventor and on its face, and was assigned to Nokia Corporation. The patent issued from Application No. 10/378,036, filed on February 26, 2003.

248. I understand that April 14, 2003 is the filing date of Rembrandt's Application No. 10/412,878 ("the CIP Application"), which was filed as a continuation-in-part application of Application No. 09/205,205. As discussed further in Section X.A.4 below, the CIP Application disclosed new subject matter that had not been disclosed previously in Rembrandt's earlier-filed purported priority documents (*e.g.*, the CIP Application disclosed subject matter that had not been disclosed in Rembrandt's provisional application filed on December 5, 1997 or in Application No. 09/205,205, filed on December 4, 1998). Thus, to the extent that the asserted claims cover the new matter first disclosed by Rembrandt on April 14, 2003, I understand that the earliest possible priority date that Rembrandt is entitled to is April 14, 2003. However, as I described below in Section X.A.5, Rembrandt subsequently deleted, from the specifications of the later-filed '580 and '228 patents, the new matter first disclosed in the CIP Application. I have been advised and it is my understanding that this deletion of subject matter means that the new matter disclosed on April 14, 2003 in the CIP Application cannot be used to support the written description requirement for the asserted claims. I have been asked, for purposes of this section of the report only, to assume that the asserted claims are entitled to a priority date no earlier than April 14, 2003, *i.e.* the filing date of the CIP Application, and thus Nokia [Reunamaki] is prior art to the '580 patent and the '228 patent under this assumption.

1. Overview of Nokia [Reunamaki]

249. As explained further below, Nokia [Reunamaki] discloses or renders obvious each of the features in the Bluetooth EDR specifications that Rembrandt accuses of infringement. For example, Nokia [Reunamaki] at Figure 3 discloses a "medium rate" packet (now known as a Bluetooth EDR packet), with the access code and header being modulated in GFSK modulation (with a data rate of 1 Mbps) and the payload being modulated in DPSK modulation (with a data rate of either 2 or 3 Mbps):

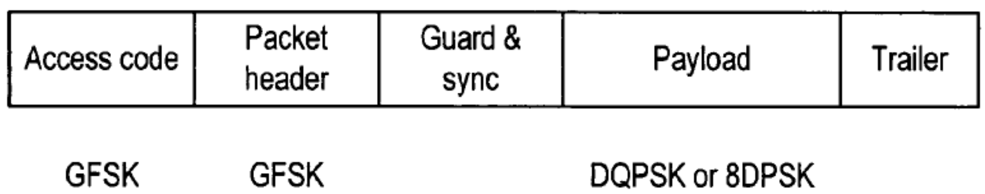


FIG. 3

250. As shown in a representative excerpt from Rembrandt's infringement contentions below, this is substantively the same packet format as that of the Bluetooth EDR standard which, when implemented in a Bluetooth-compliant device, is accused of infringing the Asserted Patents:

- "The general Enhanced Data Rate packet format is shown in Standard Enhanced Data Rate packet format. Each packet consists of 6 entities: the access code, the header, the guard period, the synchronization sequence, the Enhanced Data Rate payload and the trailer. *The access code and header use the same modulation scheme as for Basic Rate packets while the synchronization sequence, the Enhanced Data Rate payload and the trailer use the Enhanced Data Rate modulation scheme*. The guard time allows for the transition between the modulation schemes.

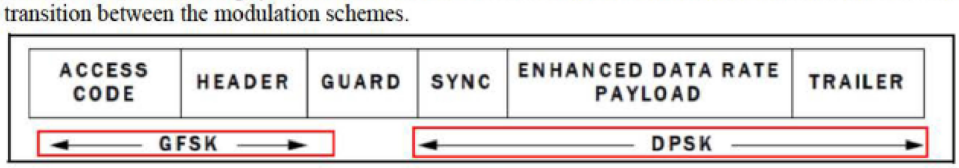


Figure 1.3: Standard Enhanced Data Rate packet format " (p. 230/1230)

Rembrandt's '580 Infringement Contentions, Ex. B, p. 4

251. Thus, to the extent that devices compliant with Bluetooth EDR specifications are alleged to infringe the Asserted Claims, then the Asserted Claims are anticipated by, or obvious in view of, Nokia [Reunamaki].

(a) Nokia [Reunamaki] discloses the same communication relationship that Rembrandt's Infringement Contentions alleges discloses master/slave communications

252. I understand that Rembrandt contends that Apple's Accused Products (which Rembrandt sometimes refers to as the accused "Apple Bluetooth EDR Products") are communication devices capable of communicating according to a "master/slave relationship" in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, wherein the accused communication devices allegedly comprise a transceiver, in the role of the "master" according to the master/slave relationship, for sending transmissions. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B at pp. 2-4. In support of its "master/slave" infringement contentions, Rembrandt cites certain pages of the Bluetooth 2.0 Specification. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose "master/slave" communications, then it is my opinion that Nokia [Reunamaki] also discloses "master/slave" communications.

253. For example, Nokia [Reunamaki] discloses:

- "A Bluetooth system provides a communication channel between two electronic devices via a short-range radio link." Col. 1:13-14.
- "It is a primary object of the present invention to improve correlation properties near ideal symbol time in Bluetooth medium rate packets." Col. 2:52-54.
- "Bluetooth network arrangements can be either point-to-point or point-to-multipoint to provide connection links among a plurality of electronic devices. Two to eight devices can be operatively connected to a piconet, wherein, at a

given period, one of the devices serves as the master while the others are the slaves." Col. 1:30-35.

- "In the time slots, master and slave devices can transmit packets. Packets transmitted by the master or the slave device may extend up to five time slots. The RF hop frequency remains fixed for the duration of packet transmission." Col. 2:2-5.

254. To the extent that Rembrandt argues that Nokia [Reunamaki] does not disclose "master/slave" communications, Nokia [Reunamaki] renders such communications obvious based on the knowledge of a person having ordinary skill in the art as of at least April 14, 2003. For example, Bluetooth devices capable of communicating in "master/slave" relationships (as that terminology is used by Rembrandt in its infringement contentions) had been made, used, and sold more than one year before April 14, 2003.

255. For example, Nokia [Reunamaki] expressly teaches at 4:48-50 that "[m]edium rate is an optional feature that can be used to complement the basic rate operation of a piconet, as specified in the Bluetooth 1.1 Specification. . ." A person of ordinary skill in the art would understand this to be the Bluetooth Core Specification Version 1.1 ("BT 1.1"), which discloses:

- "2 PHYSICAL CHANNEL 2.1 CHANNEL DEFINITION The channel is represented by a pseudo-random hopping sequence hopping through the 79 or 23 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s. All Bluetooth units participating in the piconet are time- and hop-synchronized to the channel." p. 43.

- "The channel in the piconet is characterized entirely by the master of the piconet. The Bluetooth device address (BD_ADDR) of the master determines the FH hopping sequence and the channel access code; the system clock of the master determines the phase in the hopping sequence and sets the timing. In addition, the master controls the traffic on the channel by a polling scheme. By definition, the master is represented by the Bluetooth unit that initiates the connection (to one or more slave units). . . . Note that the names 'master' and 'slave' only refer to the protocol on the channel: the Bluetooth units themselves are identical; that is, any unit can become a master of a piconet. Once a piconet has been established, master-slave roles can be exchanged." p. 92.

- "10.8.5.1 Polling in active mode The master always has full control over the piconet. Due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves." p. 119; Fig. 1.2.
- Fig. 1.2, reproduced below, depicts "master" and "slave" devices in "piconets" including (a) a single slave operation, (b) a mutli-slave operation, and (b) a scatternet operation:

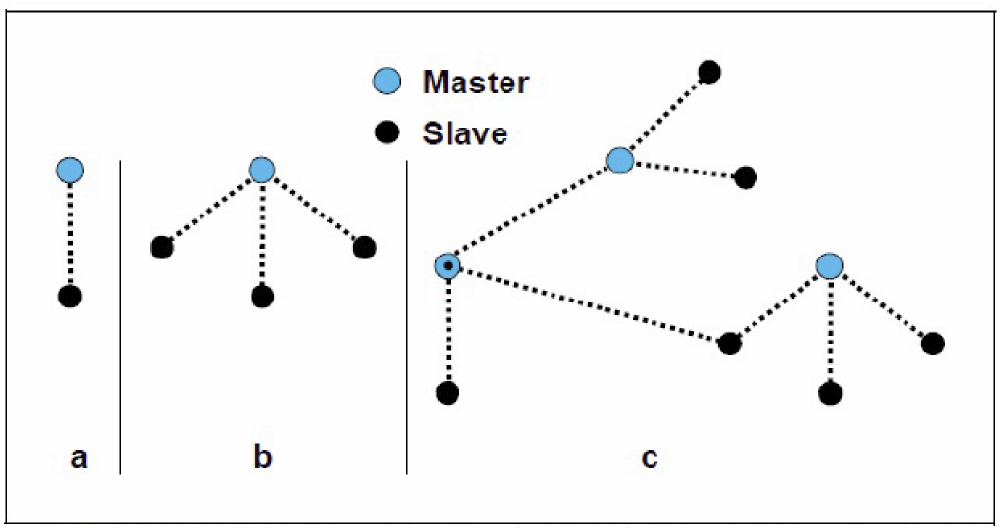


Figure 1.2: Piconets with a single slave operation (a), a multi-slave operation (b) and a scattemet operation (c).

256. Given the disclosure of Nokia [Reunamaki] and prior Bluetooth devices and/or BT 1.1, a person of ordinary skill would have been motivated to modify prior BT 1.1 devices with the medium rate packets disclosed in Nokia [Reunamaki] to make communication devices having a "master" transceiver capable of communication with slaves in a "master/slave" relationship. It would have been obvious and straightforward to use BT1.1's advantageous

disclosures of master and slave transceivers in a master/slave environment in implementing Nokia [Reunamaki]'s teaching of a communication system that uses both GFSK and PSK to beneficially include master and slave transceivers in a master/slave relationship, advantageously improving network efficiency, allowing targeted transmission, and improving network reliability over large areas. Nokia [Reunamaki] and BT 1.1 are in the same field of art, and relate to multi-device communication systems using Bluetooth. Both Nokia [Reunamaki] and BT 1.1 expressly disclose a communication system with master and slave transceivers in master/slave relationships in which a slave communication from the slave to the master occurs in response to a master communication from the master to the slave. BT 1.1 discloses that the master always has full control over the piconet and that due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves. BT 1.1 at 119; *see also* BT 1.1 Figure 1.2 (reproduced above). BT 1.1 thus teaches that using communication devices such as master and slave transceivers in master/slave relationships advantageously increases the performance and capability of the network and improves network reliability over large areas. Thus, a person of ordinary skill in the art would have found it routine and straightforward to use communication devices such as master and slave transceivers in master/slave relationships, as taught by BT 1.1, in implementing Nokia [Reunamaki]'s disclosure of a communication system.

(b) Nokia [Reunamaki] discloses the same modulations that Rembrandt's Infringement Contentions alleges are two different types of modulation methods

257. I understand that Rembrandt contends that GFSK and DPSK/DQPSK are "different types" of modulation methods as used in Apple's Accused Products. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B, p. 4-5. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement

contentions disclose "different types" of modulation methods, then it is my opinion that Nokia [Reunamaki] also discloses these "different types" of modulation methods.

258. For example, Nokia [Reunamaki] discloses:

- "A robust PSK scheme has been chosen to simplify the hardware integration of medium rate in the Bluetooth radios, addressing the low cost aspect. Narrow-band modulation, with RF channels of 1 MHz (3 dB bandwidth), has been chosen to be similar to the 1 MHz channel of the current Bluetooth 1.1 Specification. Depending on propagation conditions, π/4-DQPSK (Differential QPSK) or 8 DPSK can be applied with corresponding asymmetric ACL user data rates of up to 1.45 Mbps or 2.18 Mbps. For all of the medium rate packet types, the user data rate is effectively 2x or 3x of the basic rate equivalents. Basic rate is 1 Ms/s. Link adaptation can be applied to provide a link more resilient to errors at the expense of reduced user rate." Col. 4:28-40.
- "Regarding modulation and bit rate, medium rate has the same symbol rate as basic rate. The payload modulation is either π/4-DQPSK or 8 DPSK corresponding to the gross bit rate of 2 Mbps or 3 Mbps." Col. 4:56-59.
- "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." Col. 6:35-37.
- Figure 3 discloses a packet having an access code and packet header modulated in GFSK with a payload portion modulated in DQPSK or 8DPSK:

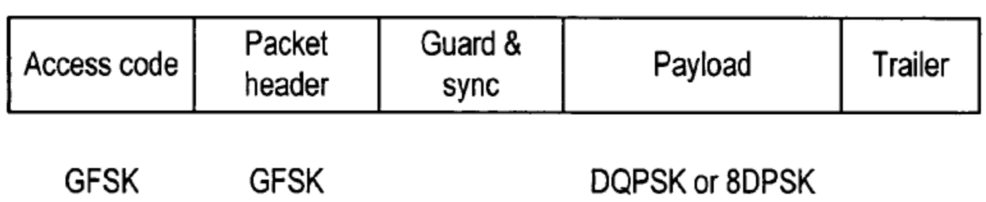


FIG. 3

(c) Nokia [Reunamaki] discloses the same information that Rembrandt's Infringement Contentions alleges indicates an impending change in modulation

259. I understand that Rembrandt contends that access code and header entities (*i.e.*, the LT_ADDR and TYPE fields) comprise information indicating an impending change in Apple's Accused Products. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B, p. 7-10, 11-12. In support of these contentions, Rembrandt cites certain pages of the Bluetooth 2.0 Specification. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions purportedly disclose information indicating an impending change in modulation methods, then it is my opinion that Nokia [Reunamaki] also discloses this same information indicating an impending change in modulation methods.

260. For example, Nokia [Reunamaki] discloses:

- A packet having an access code and packet header modulated in GFSK with a payload portion modulated in DQPSK or 8DPSK (*see* Figure 3 above).
- "In the time slots, master and slave devices can transmit packets. . . . Every packet consists of an access code, a header and a payload, as shown in FIG. 1." Col. 2:2:15.
- "The contents of the packet header for medium rate packets have two additional rules: 1. When the slave has multiple logical links based on AM_ADDRs (active member addresses) using the header extension option, the master must choose the associated AM_ADDRs such that the base AM_ADDR (along with TYPE field) uniquely defines whether the packet is in medium rate or not. 2. The meaning of the TYPE field is modified if the link is operating in medium rate." Col. 5:16-25.
- "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme). The packet types contained in Segment 1 of TABLE II (NULL, POLL, FHS and DM1) are always transmitted at 1 Mbps. Segments 2, 3 and 4 may be transmitted either at 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP (link management protocol) commands. LMP messages are always sent using the DM1 packet type in 1 Mbps mode—even when medium rate is used for the other ACL packet types." Col. 6:35-44.

- "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to. Modes for ACL and SCO are also selected independently. For ACL links, the medium rate mode is explicitly selected via LMP using the packet_type_table (PTT) parameter. For SCO links, the medium rate mode is used only with eSCO links. The medium rate mode is selected when the eSCO link is established via LMP command. The AUX1 packet will always be transmitted at 1 Mbps." Col. 7:1-10.
- "Medium rate is enabled on ACL links by the selection of a packet type table (PTT) that defines the parameters of each packet type code. There are separate PTTs for ACL links over each physical (unicast, multicast or broadcast) connection. A PTT is effectively an index or pointer to the desired column in TABLE II. The packet type options utilize combinations of the 1, 2 and 3 Mbps packet types. The SCO links medium rate is selected when the link is established." Col. 9:2-9; *see also* Table II (detailing meaning of TYPE field for each link type); Table III (showing relationship between packet type and modulation rate); and Table IV (same); and Col. 8:18-53 (describing establishing links for basic or medium rate communication).

(d) Nokia [Reunamaki] discloses the same message structure that Rembrandt's Infringement Contentions alleges discloses messages with a first portion and a payload portion

261. I understand that Rembrandt contends that access code and header in packets transmitted by Apple's Accused Products comprise a "first portion" and that the payload in packets transmitted by Apple's Accused Products comprise a "payload" portion. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B, p. 8. In support of these contentions, Rembrandt cites certain pages of the Bluetooth 2.0 Specification. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose a "first portion" and a "payload" portion, then it is my opinion that Nokia [Reunamaki] also discloses a first portion and a payload portion.

262. For example, Nokia [Reunamaki] discloses in Figure 3 a medium rate packet having an access code and packet header portion (each of which is modulated in GFSK) and a payload portion (modulated in DQPSK or 8DPSK). Figure 3 is reproduced above.

263. Nokia [Reunamaki] further discloses that the first portion contains an address for an intended destination of the payload portion. For example, Nokia [Reunamaki] discloses:

- The "access code and the packet header" in a medium rate packet "are identical in format and modulation" to those of a basic rate packet. Col. 4:60-37.
- "The contents of the packet header for medium rate packets have two additional rules: 1. When the slave has multiple logical links based on AM_ADDRs (active member addresses) using the header extension option, the master must choose the associated AM_ADDRs such that the base AM_ADDR (along with TYPE field) uniquely defines whether the packet is in medium rate or not. 2. The meaning of the TYPE field is modified if the link is operating in medium rate." Col. 5:16-25.
- "[I]t is important to monitor the link on both the master side and the slave side to avoid possible collisions when the AM_ADDR is reassigned to another slave." Col. 9:35-37.

264. To the extent that Rembrandt argues that Nokia [Reunamaki] does not disclose that the first portion contains an address for an intended destination of the payload portion, then Nokia [Reunamaki] renders this subject matter obvious based on the knowledge of a person having ordinary skill in the art as of at least April 14, 2003. For example, Bluetooth devices that were made and sold more than one year before April 14, 2003 (*i.e.*, those before the advent of Bluetooth EDR) were capable of transmitting packets having a first portion indicating an address for an intended destination of the payload portion (as this terminology is used by Rembrandt in its infringement contentions).

265. For example, Bluetooth Core Specification Version 1.1 ("BT 1.1") discloses: "The AM ADDR represents a member address and is used to distinguish between the active

members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM ADDR of this slave; that is, the AM ADDR of the slave is used in both master-to-slave packets and in the slave- to-master packets." p. 51.

266. Given the disclosure of Nokia [Reunamaki] and prior Bluetooth devices and/or BT 1.1, a person of ordinary skill would have been motivated to modify prior BT 1.1 devices with the medium rate packets disclosed in Nokia [Reunamaki] to make communication devices capable of transmitting packets having a first portion indicating an address for an intended destination of the payload portion (as this terminology is used by Rembrandt in its infringement contentions).

(e) <u>Nokia [Reunamaki] discloses the same message structure that Rembrandt's Infringement Contentions alleges discloses reversion to the first modulation method</u>

267. I understand that Rembrandt contends that access code and header in packets transmitted by Apple's Accused Products comprise information (transmitted in GFSK) that indicates that communication from the master to the slave has "reverted" to the first modulation method (GFSK). *See*, *e.g*., Rembrandt's '580 Infringement Contentions, Ex. B, p. 15. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose information (transmitted in GFSK) that indicates that communication from the master to the slave has "reverted" to the first modulation method (GFSK), then it is my opinion that Nokia [Reunamaki] also discloses information (transmitted in GFSK) that indicates that communication from the master to the slave has "reverted" to the first modulation method (GFSK).

268. For example, Nokia Reunamaki discloses:

- "In the time slots, master and slave devices can transmit packets. Packets transmitted by the master or the slave device may extend up to five time slots. The RF hop frequency remains fixed for the duration of packet transmission." Col. 2:2-5.

- "The contents of the packet header for medium rate packets have two additional rules: 1. When the slave has multiple logical links based on AM_ADDRs (active member addresses) using the header extension option, the master must choose the associated AM_ADDRs such that the base AM_ADDR (along with TYPE field) uniquely defines whether the packet is in medium rate or not. 2. The meaning of the TYPE field is modified if the link is operating in medium rate." Col. 5:16-25.

- "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme). The packet types contained in Segment 1 of TABLE II (NULL, POLL, FHS and DM1) are always transmitted at 1 Mbps. Segments 2, 3 and 4 may be transmitted either at 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP (link management protocol) commands. LMP messages are always sent using the DM1 packet type in 1 Mbps mode—even when medium rate is used for the other ACL packet types." Col. 6:35-44.

- "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to. Modes for ACL and SCO are also selected independently. For ACL links, the medium rate mode is explicitly selected via LMP using the packet_type_table (PTT) parameter. For SCO links, the medium rate mode is used only with eSCO links. The medium rate mode is selected when the eSCO link is established via LMP command. The AUX1 packet will always be transmitted at 1 Mbps." Col. 7:1-10.

- "Medium rate is enabled on ACL links by the selection of a packet type table (PTT) that defines the parameters of each packet type code. There are separate PTTs for ACL links over each physical (unicast, multicast or broadcast) connection. A PTT is effectively an index or pointer to the desired column in

TABLE II. The packet type options utilize combinations of the 1, 2 and 3 Mbps packet types. The SCO links medium rate is selected when the link is established." Col. 9:2-9; *see also* Table II (detailing meaning of TYPE field for each link type); Table III (showing relationship between packet type and modulation rate); and Table IV (same); and Col. 8:18-53 (describing establishing links for basic or medium rate communication).

- "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. . . . The access code and the packet header are identical in format and modulation [to those of a basic rate packet] so that the acquisition and packet identification are the same as basic rate." Col. 4:60-37.
- "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to." Col. 7:1-3.
- "[I]t is important to monitor the link on both the master side and the slave side to avoid possible collisions when the AM_ADDR is reassigned to another slave." Col. 9:35-37.

(f) <u>Nokia [Reunamaki] discloses the same modulation method resulting in a higher data rate that Rembrandt's Infringement Contentions alleges discloses a second modulation method resulting in a higher data rate</u>

269. I understand that Rembrandt contends that information modulated in DPSK by Apple's Accused Products is transmitted at a higher date rate than information modulated in GFSK by Apple's Accused Products. *See*, *e.g.*, Rembrandt's '228 Infringement Contentions, Ex. C, p. 13-14. Rembrandt cites to certain pages of the Bluetooth 2.0 Specification to support this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose that information modulated in DPSK by Apple's Accused Products is transmitted at a higher date rate than information modulated in GFSK by Apple's Accused Products, then it is my opinion that Nokia [Reunamaki] also discloses this same subject matter.

270. For example, Nokia [Reunamaki] at Figure 3 (reproduced above) discloses a medium rate packet wherein the access code and header are modulated in GFSK and the payload is modulated in DPSK. Nokia [Reunamaki] further discloses:

- "The medium rate mode provides a straightforward extension of the Bluetooth specification by adding additional packet types. Medium rate provides a two-fold, and optionally, a three-fold increase in the data rate during the payload portion of certain packet types." Col. 4:22-26.
- "Regarding modulation and bit rate, medium rate has the same symbol rate as basic rate. The payload modulation is either n/4- DQPSK or 8 DPSK corresponding to the gross bit rate of 2 Mbps or 3 Mbps." Col. 4:56-59.
- "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." Col. 6:35-37.

2. Opinions Regarding Nokia [Reunamaki]

271. In my opinion, Nokia [Reunamaki] anticipates or renders obvious claims 2 and 59 of the '580 patent and claim 21 of the '228 patent. A detailed description of the invalidating disclosures on a limitation-by-limitation basis is included in Exhibits N and O to this report, which is incorporated in full as if set forth herein.

G. All Asserted Claims are Invalid under § 102 and/or § 103 over Medium Rate

272. I understand that Bluetooth SIG Radio Working Group Radio 1.0 Improvements: Medium Rate Baseband Specification proposal for version 0.7, version 0.66, 2002-07-05, Arto Palin ("Medium Rate") (Apple-REMBR_00964613-631) was made available to certain people and entities prior to April 14, 2003. I also understand that the inventions disclosed in Medium Rate were made in the United States before the inventions disclosed in the CIP Application were made, and that the inventions disclosed in Medium Rate were not abandoned, suppressed, or concealed. As I described above, the inventions disclosed in Medium Rate are also disclosed in Nokia [Reunamaki], and were embodied in Bluetooth EDR compliant products that were sold

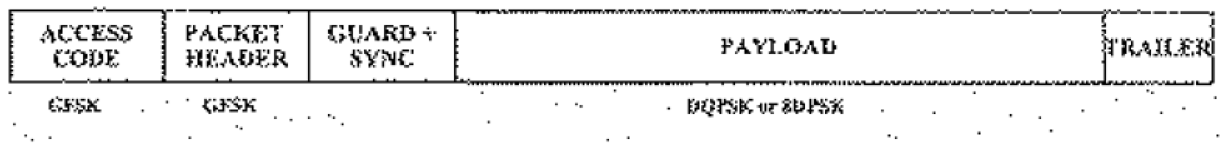
around the time that the first Bluetooth EDR specification was finalized, and have been sold ever since.

273. I have been instructed to assume, for purposes of this report, that Medium Rate (like Nokia [Reunamaki] discussed above) is prior art to the '580 patent and the '228 patent if the patents are entitled only to a priority date of April 14, 2003. April 14, 2003 is the filing date of Rembrandt's Application No. 10/412,878 ("the CIP Application"), which was filed as a continuation-in-part application of Application No. 09/205,205. As discussed further in Section X.A.4 below, the CIP Application disclosed new subject matter that had not been disclosed previously in Rembrandt's earlier-filed purported priority documents (*e.g.*, the CIP Application disclosed subject matter that had not been disclosed in Rembrandt's provisional application filed on December 5, 1997 or in Application No. 09/205,205, filed on December 4, 1998). Thus, to the extent that the asserted claims cover the new matter first disclosed by Rembrandt on April 14, 2003, I understand that the earliest possible priority date that Rembrandt is entitled to is April 14, 2003. However, as shown below in Section X.A.5, Rembrandt subsequently deleted, from the specifications of the later-filed '580 and '228 patents, the new matter first disclosed in the CIP Application. I have been advised and it is my understanding that this deletion of subject matter means that the new matter disclosed on April 14, 2003 in the CIP Application cannot be used to support the written description requirement for the asserted claims. I have been asked, for purpose of this section of the report only, to assume that the asserted claims are entitled to a priority date no earlier than April 14, 2003, the filing date of the CIP Application.

1. Overview of Medium Rate

274. Medium Rate discloses "a straightforward extension of the Bluetooth specification by adding additional packet types." Medium Rate at 7. "Medium rate provides a two-fold and optionally a three-fold increase in the data rate during the payload portion of certain

packet types." *Id*. The "general packet format of the medium rate packet is shown in Figure 1." P. 8. Figure 1 is reproduced below:



Medium Rate at 8.

275. Like Nokia [Reunamaki] discussed above, the packet structure disclosed in Medium Rate has an access code and a packet header modulated in GFSK and a payload portion modulated in DQPSK or 8DPSK. *See* Medium Rate at page 8, Figure 1.

(a) <u>Medium Rate discloses the same communication relationship that Rembrandt's Infringement Contentions alleges discloses master/slave communications</u>

276. I understand that Rembrandt contends that Apple's Accused Products (which Rembrandt sometimes refers to as the accused "Apple Bluetooth EDR Products") are communication devices capable of communicating according to a "master/slave relationship" in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, wherein the accused communication devices allegedly comprise a transceiver, in the role of the "master" according to the master/slave relationship, for sending transmissions. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B at pp. 2-4. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose "master/slave" communications as claimed, then it is my opinion that Medium Rate also discloses these same "master/slave" communications.

277. For example, Medium Rate discloses "Whether or not a device is capable of supporting Medium Rate is indicated in the *LMP_features* message. A Medium Rate capable

device may support the 2Mbps mode only or both 2Mbps and 3Mbps. The master can enable the use of Medium Rate on ACL and/or SCO links separately for each of the Medium Rate capable slaves in the piconet." p. 7. In addition, Medium Rate references "the features of the current Bluetooth 1.1 Specification." Medium Rate at 6. A person of ordinary skill in the art would understand this to be the Bluetooth Core Specification Version 1.1 ("BT 1.1"), which discloses:

- "2 PHYSICAL CHANNEL 2.1 CHANNEL DEFINITION The channel is represented by a pseudo-random hopping sequence hopping through the 79 or 23 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s. All Bluetooth units participating in the piconet are time- and hop-synchronized to the channel." p. 43.
- "The channel in the piconet is characterized entirely by the master of the piconet. The Bluetooth device address (BD_ADDR) of the master determines the FH hopping sequence and the channel access code; the system clock of the master determines the phase in the hopping sequence and sets the timing. In addition, the master controls the traffic on the channel by a polling scheme. By definition, the master is represented by the Bluetooth unit that initiates the connection (to one or more slave units). . . . Note that the names 'master' and 'slave' only refer to the protocol on the channel: the Bluetooth units themselves are identical; that is, any unit can become a master of a piconet. Once a piconet has been established, master-slave roles can be exchanged." p. 92.
- "<u>10.8.5.1 Polling in active mode</u> The master always has full control over the piconet. Due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves." p. 119; Fig. 1.2.

- Fig. 1.2, reproduced below, depicts "master" and "slave" devices in "piconets" including (a) a single slave operation, (b) a mutli-slave operation, and (b) a scatternet operation:

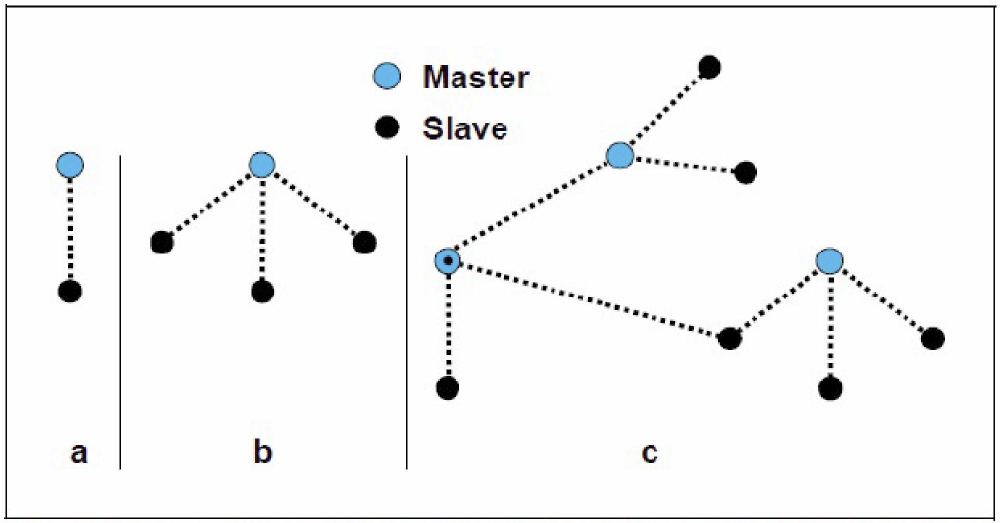


Figure 1.2: Piconets with a single slave operation (a), a multi-slave operation (b) and a scatternet operation (c).

278. To the extent that Rembrandt argues that Medium Rate does not disclose master/slave communications, master/slave communications are obvious in view of Medium Rate and BT 1.1. In particular, given the disclosure of Medium Rate and prior Bluetooth devices and/or BT 1.1, a person of ordinary skill would have been motivated to modify prior BT 1.1 devices with the medium rate packets disclosed in Medium Rate to make communication devices having a "master" transceiver capable of communication with slaves in a "master/slave" relationship. It would have been obvious and straightforward to use BT1.1's advantageous disclosures of master and slave transceivers in a master/slave environment in implementing Medium Rate's teaching of a communication system that uses both GFSK and DPSK/QDPSK to beneficially include master and slave transceivers in a master/slave relationship, advantageously improving network efficiency, allowing targeted transmission, and improving network reliability over large areas. Medium Rate and BT 1.1 are in the same field of art, and relate to multi-device communication systems using Bluetooth. BT 1.1 discloses a communication system with master

and slave transceivers in master/slave relationships in which a slave communication from the slave to the master occurs in response to a master communication from the master to the slave. BT 1.1 discloses that the master always has full control over the piconet and that due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves. BT 1.1 at 119; *see also* BT 1.1 Figure 1.2 (reproduced above). BT 1.1 thus teaches that using communication devices such as master and slave transceivers in master/slave relationships advantageously increases the performance and capability of the network and improves network reliability over large areas. Thus, a person of ordinary skill in the art would have found it routine and straightforward to use communication devices such as master and slave transceivers in master/slave relationships, as taught by BT 1.1, in implementing Medium Rate's disclosure of a communication system.

(b) Medium Rate discloses the same modulations that Rembrandt's Infringement Contentions alleges are two different types of modulation methods

279. I understand that Rembrandt contends that GFSK and DPSK/QDPSK are "different types" of modulation methods as used in Apple's Accused Products. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B, p. 4-5. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose "different types" of modulation methods, then it is my opinion that Medium Rate also discloses these "different types" of modulation methods.

280. For example, Medium Rate discloses:

- "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." p. 11; *see also* pp. 8-10, 12, Figure on page 8 (reproduced above and showing general format of the medium rate packet).

- "The payload modulation is either π/4-DQPSK or 8DPSK corresponding to the gross bit rates of 2 Mbps or 3 Mbps. … Following the guard time is a PSK-modulated synchronization sequence that is used to complete acquisition prior to demodulating the π/4-DQPSK or 8DPSK of the payload." p. 8.

(c) Medium Rate discloses the same information that Rembrandt's Infringement Contentions alleges indicates an impending change in modulation

281. I understand that Rembrandt contends that access code and header entities (*i.e.*, the LT_ADDR and TYPE fields) comprise information indicating an impending change in Apple's Accused Products. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B, p. 7-10, 11-12. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions purportedly disclose information indicating an impending change in modulation methods, then it is my opinion that Medium Rate also discloses this same information indicating an impending change in modulation methods.

282. For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11. "The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium

rate mode is selected when the SCO link is established via LMP command." *Id.*; *see also* Fig. 1 (reproduced above). Medium Rate Table 4-1 (*see* p. 11) is reproduced below:

Segment	TYPE code $b_3b_2b_1b_0$	Slots	SCO link (1 Mbps)	SCO link (2/3 Mbps)	ACL link (1 Mbps) [ptt=0]	ACL link (2/3 Mbps) [ptt =1]
1	0000	1	NULL	NULL	NULL	NULL
	0001	1	POLL	POLL	POLL	POLL
	0010	1	FHS	FHS	FHS	FHS
	0011	1	DM1	DM1	DM1	DM1
2	0100	1	Undefined	Undefined	DH1	2-DH1
	0101	1	HV1	Reserved	Undefined	Undefined
	0110	1	HV2	2-HV3	Undefined	Undefined
	0111	1	HV3	3-HV3	Undefined	Undefined
	1000	1	DV	Undefined	Undefined	3-DH1
	1001	1	Undefined	Undefined	AUX1	AUX1
3	1010	3	Undefined	Undefined	DM3	2-DH3
	1011	3	Undefined	Undefined	DH3	3-DH3
	1100	3	HV4	2-HV5	Undefined	Undefined
	1101	3	HV5	3-HV5	Undefined	Undefined
4	1110	5	Undefined	Undefined	DM5	2-DH5
	1111	5	Undefined	Undefined	DH5	3-DH5

Table 4-1 — Replacement for Table 4.2

(d) Medium Rate discloses the same message structure that Rembrandt's Infringement Contentions alleges discloses messages with a first portion and a payload portion

283. I understand that Rembrandt contends that the access code and header in packets transmitted by Apple's Accused Products comprise a "first portion" and that the payload in packets transmitted by Apple's Accused Products comprise a "payload" portion. *See*, *e.g.*, Rembrandt's '580 Infringement Contentions, Ex. B, p. 8. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement

contentions disclose a "first portion" and a "payload" portion, then it is my opinion that Medium Rate also discloses a first portion and a payload portion.

284. For example, Medium Rate at Figure 1 (pages 8 -9) discloses a medium rate packet comprising a first portion (*i.e.*, an access code and a packet header (both of which are always modulated with GFSK modulation)) and a "payload" modulated in DQPSK or 8DPSK.

(e) Medium Rate discloses the same message information that Rembrandt's Infringement Contentions alleges reversion to the first modulation method

285. I understand that Rembrandt contends that the access code and header in packets transmitted by Apple's Accused Products comprise information (transmitted in GFSK) that indicates that communication from the master to the slave has "reverted" to the first modulation method (GFSK). *See*, *e.g*., Rembrandt's '580 Infringement Contentions, Ex. B, p. 15. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose information (transmitted in GFSK) that indicates that communication from the master to the slave has "reverted" to the first modulation method (GFSK), then it is my opinion that Medium Rate also discloses information (transmitted in GFSK) that indicates that communication from the master to the slave has "reverted" to the first modulation method (GFSK).

286. For example, Medium Rate discloses:

- "The general format of the Medium Rate packet is shown in Figure 1. These are very similar to the basic rate packets. The maximum modulo- lengths (modulo the 625 µsec slot grid) are no greater than the longest basic rate packet (DM3)1). The access code and packet header are identical in format and modulation so that the acquisition and packet identification is the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header." pp. 8-14; *see also* Fig. 1, reproduced above.

- "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11. "The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium rate mode is selected when the SCO link is established via LMP command." *Id*.; *see also* Fig. 1 (reproduced above); Table 4-1 (reproduced above).

(f) <u>Medium Rate discloses the same modulation and higher data rate that Rembrandt's Infringement Contentions alleges discloses a second modulation method resulting in a higher data rate</u>

287. I understand that Rembrandt contends that information modulated in DPSK/QDPSK by Apple's Accused Products is transmitted at a higher date rate than information modulated in GFSK by Apple's Accused Products. *See*, *e.g.*, Rembrandt's '228 Infringement Contentions, Ex. C, p. 13-14. Rembrandt cites certain pages of the Bluetooth 2.0 Specification as purportedly supporting this contention. *See id*. To the extent that the portions of the Bluetooth 2.0 Specification cited by Rembrandt in its infringement contentions disclose information modulated in DPSK/QDPSK by Apple's Accused Products is transmitted at a higher date rate than information modulated in GFSK by Apple's Accused Products, then it is my opinion that Medium Rate also discloses this same subject matter.

288. For example, Medium Rate discloses:

- "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." p. 11; *see also* pp. 8-10, 12, Figure on page 8 (reproduced above and showing general format of the medium rate packet).
- "The payload modulation is either π/4-DQPSK or 8DPSK corresponding to the gross bit rates of 2 Mbps or 3 Mbps. … Following the guard time is a PSK-modulated synchronization sequence that is used to complete acquisition prior to demodulating the π/4-DQPSK or 8DPSK of the payload." p. 8.

2. Opinions Regarding Medium Rate

289. In my opinion, Medium Rate anticipates or renders obvious claims 2 and 59 of the '580 patent and claim 21 of the '228 patent. A detailed description of the invalidating disclosures on a limitation-by-limitation basis is included in Exhibits P and Q to this report, which is incorporated in full as if set forth herein.

X. INVALIDITY OF THE ASSERTED CLAIMS UNDER § 112

A. Factual Background

1. Rembrandt's Priority Claim

290. The '580 and '228 patents purport to claim priority, through a string of applications, to Provisional Application No. 60/067,562, filed on December 5, 1997 ("the Provisional Application").

291. Starting from most recent events and working backward in time to the Provisional Application, the '228 patent issued on June 4, 2013, and matured from Application No. 13/198,568, which was filed on August 4, 2011. Application No. 13/198,568 was filed as a continuation of Application No. 12/543,910, filed on August 19, 2009. Application No. 12/543,910 matured into the '580 patent, which issued on September 20, 2011. Application No. 12/543,910 was filed as a continuation of Application No. 11/774,803, which was filed on July 9, 2007 and issued as Patent No. 7,675,965. Application No. 11/774,803 was filed as a

continuation of Application No. 10/412,878, which was filed on April 14, 2003 and issued as Patent No. 7,248,626. Application No. 10/412,878 ("the CIP Application") was filed as a continuation-in-part of Application No. 09/205,205, which was filed on December 4, 1998 and issued as Patent No. 6,614,838. Application No. 09/205,205 claims priority to the Provisional Application, which was filed on December 5, 1997 as discussed above. *See* Related U.S. Application Data" on the faces of the '580 and '228 patents.

292. I will discuss in more detail certain aspects of some of these applications and patents below, starting with the Provisional Application and ending with the '228 patent.

2. The Provisional Application (Filed December 5, 1997)

293. The Provisional Application contains five pages of narrative description plus a sixth page having Figures 1, 2, 3, 4a, and 4b. The Abstract of the Provisional Application describes a "new method … that permits concurrent use of different types of modems … with drastically different levels of complexity and cost (10:1) … in a simultaneous multiple access communication system[.]" It states further that "[w]ith this method, two or more premise modem types … each with its own price/performance point … can communicate with a single central telco point" and that such "capability is important to achieve the ability to offer both moderately-priced equipment/service such as Internet access and extremely low-cost equipment/service such as electrical power monitoring/control." The Abstract states further that "[e]mbedded modulation permits a secondary modulation to replace the usual primary modulation used data segment normally located after the primary training sequence and the primary trailing sequence … in such a way that a master multipoint modem can seamlessly communicate with both primary and secondary type tributary modems without data session disruption." Provisional Application at 1.

294. A person of ordinary skill in the art as of the filing date of the Provisional Application would understand the Abstract to be disclosing a system where a "single central

telco point" (*e.g.*, a "master" modem) could communicate with at least two different types of "tributary modems," wherein one type of tributary modem uses a primary or first type of modulation and the other, different type of tributary modem uses a secondary or second type of modulation (with the primary and secondary types of modulation being different from each other). A person of ordinary skill in the art as of the filing date of the Provisional Application would understand further that while the master device can communicate using both types of modulation, there was no disclosure suggesting that either type of tributary modem is capable of using both of the primary and secondary types of modulation. To the contrary, a person of ordinary skill in the art would have understood this disclosure to convey that each tributary modem was only capable of utilizing one type of modulation, and that this was in fact the problem that was being addressed by the purported invention set forth in the Provisional Application. This understanding is bolstered by the remaining descriptions in the Provisional Application, as discussed further below.

295. The "Background, Present State-of the-Art and Similar Designs" section of the Provisional Application describes that in prior art "data communications to date, a given data transmitter/receiver (modem) always successfully communicates only with a modem that is compatible at the modulation or physical layer." Provisional Application at 2. Thus, in prior art "point-to-point communications architecture, if a modem attempts to establish a communication session with an incompatible modem, one or both of the modems will typically attempt several times to communicate and then cease further attempts" making "[c]ommunication on the link impossible," such that the "solution demands replacing at least one of the modems so that both have a common operating modulation." *Id*.

296. Similarly, in a prior art "multipoint architecture, wherein a single 'central site' (**master**) modem communicates to two or more 'tributary' (**trib**) modems, the master

communicates to all tribs with a single modulation method." Provisional Application at 2 (bold font in original). "If one or more of the tribs is not compatible, the master can not [sic] communicate with that trib. Moreover, repeated attempts by the master to communicate with that incompatible trib will disturb communication to any compatible tribs due to wasted communication attempt time. It is seen that no attempt is made in the prior art to mix incompatible trib modulations in a multipoint architecture." *Id.* Thus, "[a]ccording to the prior art, all tribs must have a common modulation." *Id.* at 3. This is illustrated in Figure 1, which states explicitly that there is a "single modulation type for master and tribs":

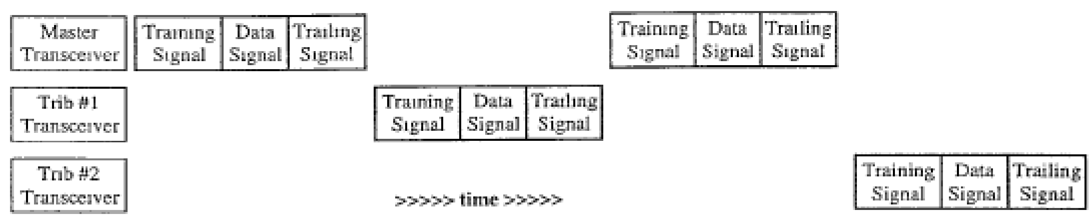


FIGURE 1: Prior Art Multipoint Signals (single modulation type for master and tribs)

297. The Provisional Application states that "there is a desire for one (moderately-priced) trib to be able to communicate at the highest reliable data rate for some applications such as Internet access while another (lowest-cost) trib is communicating at a lower data rate for other applications such as power monitoring/control" and that such "communications must occur nearly concurrently without disruption to one another." Provisional Application at 3. "That is, an attempt to control power must be successful at all times, whether or not the internet is being accessed" and "such an attempt must not significantly degrade or disrupt the Internet access." *Id.* "These needs can not [sic] be properly met by a single modulation." *Id.* "A high performance modulation, such as QAM, CAP or DMT, that is initially optimized for high performance and will continue to be improved, will demand state-of-the art implementation devices that are relatively costly" while a "low performance modulation, such as FSK, PAM or

DSB may be implemented in much, much less expensive devices." *Id*.

298. The description of Figure 2 in the Provisional Application makes clear that in a prior art multipoint architecture, all tribs must use the same type of modulation. "As can be seen with reference to Figure 2, if two tribs have different transmit and receive modulations the multipoint data session can not [sic] reliably operate. Assume the master and trib #1 have modulation type A and trib #2 has modulation type B. As the master transmits, this immediately causes disruptive reception in trib #2," which "is unaware of any communication attempt by the master and certainly cannot receive any information." Provisional Application at 3. "This usually causes disruption in the overall communication due to the master waiting excessively for a response from Trib #2." *Id*. Figure 2 is copied below and shows that a trib modem can be of "Type A" or of "Type B" but that no trib modem utilizes both Type A and Type B:

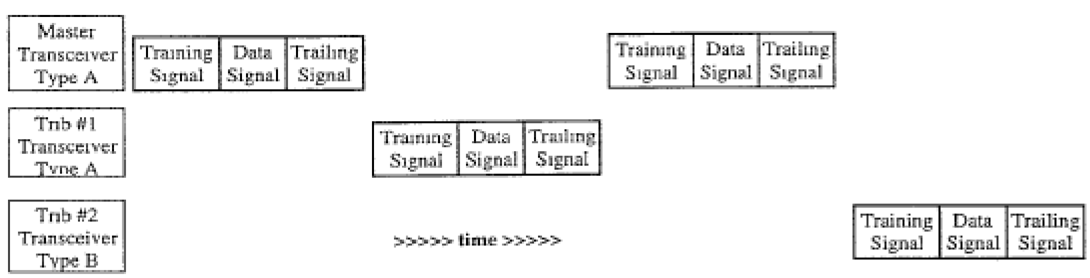


FIGURE 2: Prior Art Multipoint Signals (different modulation types)

299. In contrast to the description of the prior art—wherein all tribs must use the same type of modulation, *see supra*—the "Summary Description" section of the Provisional Application describes an "embedded modulation" system where "the Type A and Type B <u>master</u> modem conveys information to Type A & Type B tribs. Reference Figure 3" Provisional Application at 4 (underlining in original). Similarly, Figure 3 shows a "bilingual" (*i.e.*, capable of both Type A and B communication) master transceiver denoted "Master Transceiver Type A + B" and "monolingual" (*i.e.*, capable of *either* Type A or B communication, but not both) trib transceivers which are either of "Type A" or "Type B" but not of "Type A + B":

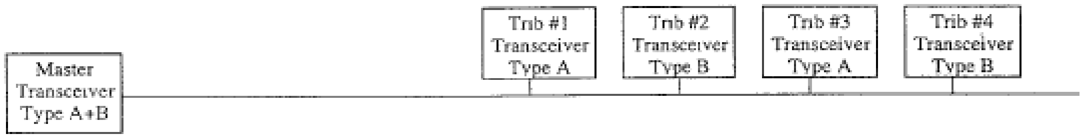
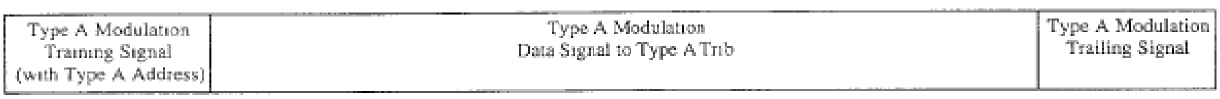


FIGURE 3: Embedded Modulation Multipoint Network

300. Further, the Provisional Application explains that when the bilingual master transceiver communicates "with Type A tribs," the "Type B tribs (conditioned to ignore Type A signals) ignore Type A communications" (Provisional Application at 4) as depicted in Figure 4a:



301. Figure 4a (reproduced above) shows that when "Type A Modulation" is used for the "Training Signal," the signal is directed only to a "Type A Address." Similarly, when the data is modulated with "Type A Modulation" then the "Data Signal" is directed only to a "Type A Trib." A person of ordinary skill in the art would understand that this is the case because a Type B Trib cannot understand a "Training Signal" or a "Data Signal" modulated with "Type A Modulation," due to incompatibility of the modulation types, and this is why the Type B tribs are "conditioned to ignore Type A communications" as disclosed on page 4 of the Provisional Application.

302. Further, the Provisional Application explains that when the bilingual "master" transceiver communicates with Type B Tribs, the master "notifies, via the training sequence, tribs Type A of an impending change to Type B (perhaps for a stipulated amount of time)" and then "changes to modulation Type B and conveys user information (perhaps a stipulated amount and likely a trib address." Provisional Application at 4. The Type A tribs "ignore the above communication to Type B without disruption or passing incorrect user data." When the master is finished communicating with Type B tribs, it "reverts to Type A" modulation again. This is

shown in Figure 4b:

Type A Modulation Training Signal (with notification of change to Type B)	Type B Modulation Data Signal to Type B Trib with Type B address	Type A Modulation Trailing Signal

303. In Figure 4b (reproduced above), the "Training Signal" is directed only to a Type A trib (because Type B tribs cannot understand Type A modulation) and informs the Type A tribs (using a Type A Modulation Training Signal) that communication is changing to Type B (so that the Type A tribs can "ignore" the following transmission). The subsequent "Data Signal" is directed only to "Type B Trib with Type B address" because it is modulated using "Type B Modulation." In other words, the "Training Signal" and "Data Signal" in Figure 4b are intended for and directed to two different tribs.

304. For the reasons set forth above, a person of ordinary skill in the art would understand that the invention described in the Provisional Application describes a bilingual "master" transceiver (that can communicate using "Type A + B" modulation) that can switch between Type A or Type B modulation to communicate respectively with different types of monolingual tribs (*i.e.*, "Type A" tribs or "Type B" tribs).

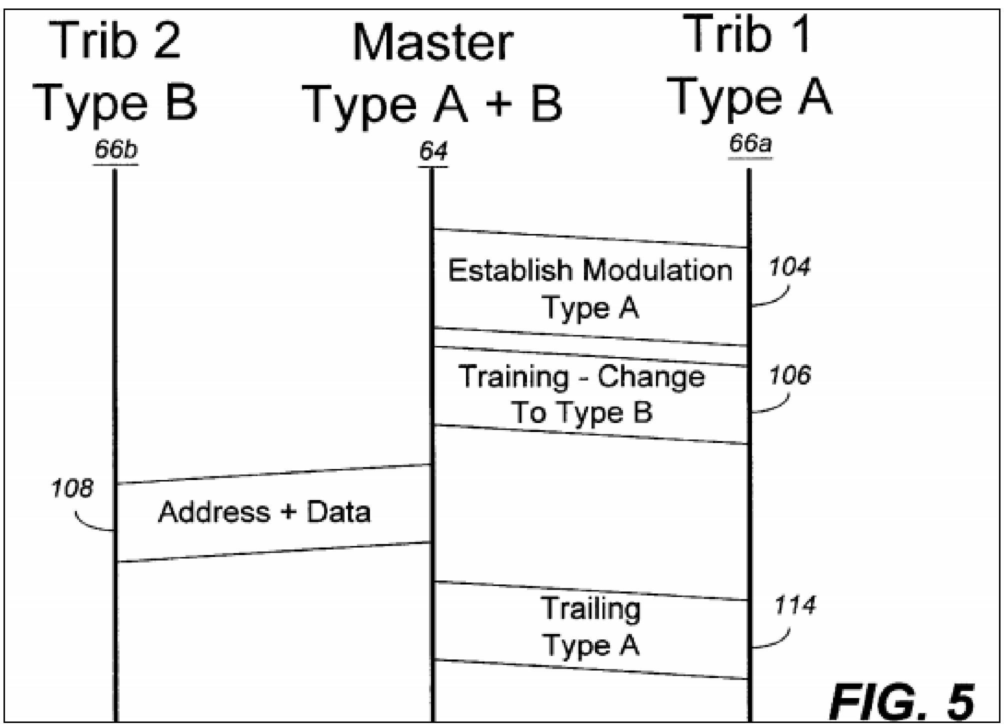
3. The First-Filed Non-Provisional Application (Filed December 4, 1998)

305. On December 4, 1998, the prior owner of the patents-in-suit filed Application No. 09/205,205, which claims priority to the Provisional Application. Application No. 09/205,205 later issued as U.S. Patent No. 6,614,838 ("'838 Patent").

306. Like the Provisional Application discussed above, the '838 Patent describes a multipoint system where bilingual "Master Transceiver Type A + B" communicates with "Tributary Transceiver Type A" tribs using only Type A modulation and with "Tributary Transceiver Type B" tribs using only Type B modulation. *See e.g.*, Figures 4 and 5.

307. Figure 5 and the portions of the specification explaining it depict and describe

relevant aspects of the claimed invention. As depicted in FIG. 5, the "Master Type A + B" device establishes communication with "Trib 1 Type A" (shown on the right) using Type A modulation (sequence 104). The bilingual master device then sends a Type A modulated training sequence to "Trib 1 Type A" informing "Trib 1 Type A" that the master is going to "change to Type B." *See* Figure 5, sequence 106. The bilingual master then sends "Address + Data" information, in Type B modulation, to "Trib 2 Type B." *See id*. at sequence 108. When the master is finished communicating with "Trib 2 Type B" it sends sequence 114, modulated in Type A modulation, informing Trib 1 Type A that communications have reverted to Type A modulation. Figure 5 is reproduced in part below:



308. As clearly indicated in Figure 5 above, neither of the tribs in Figure 5 are bilingual. To the contrary, and as further supported by Figures 6 and 7, respectively, Type B tribs "Ignore Type A Transmission" while Type A tribs "Ignore Type B Transmission," consistent with the fact that each trib is monolingual. Figures 6 and 7 are respectively

reproduced below:

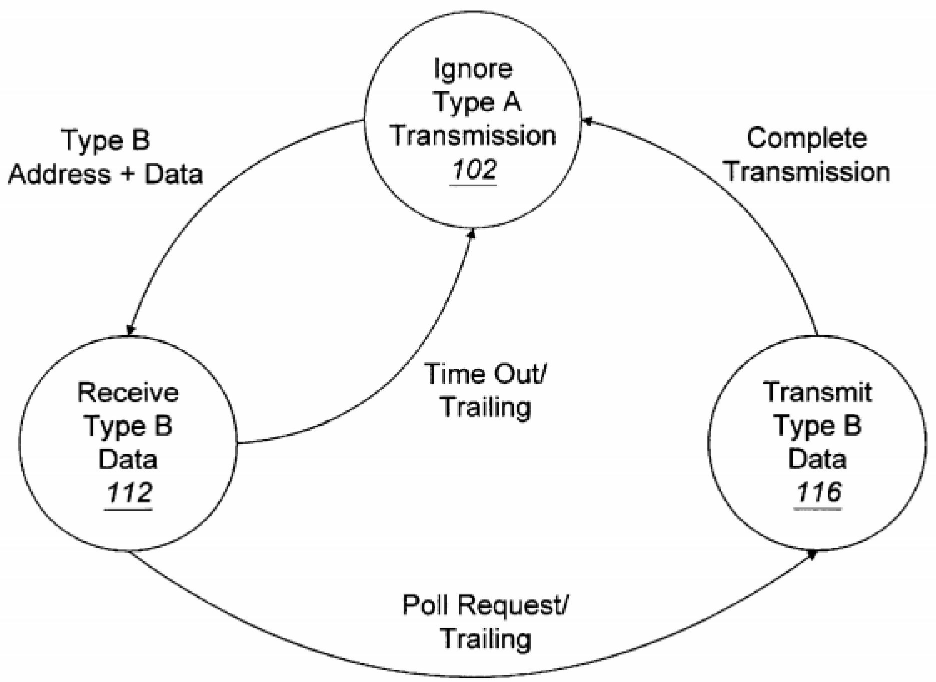


FIG. 6

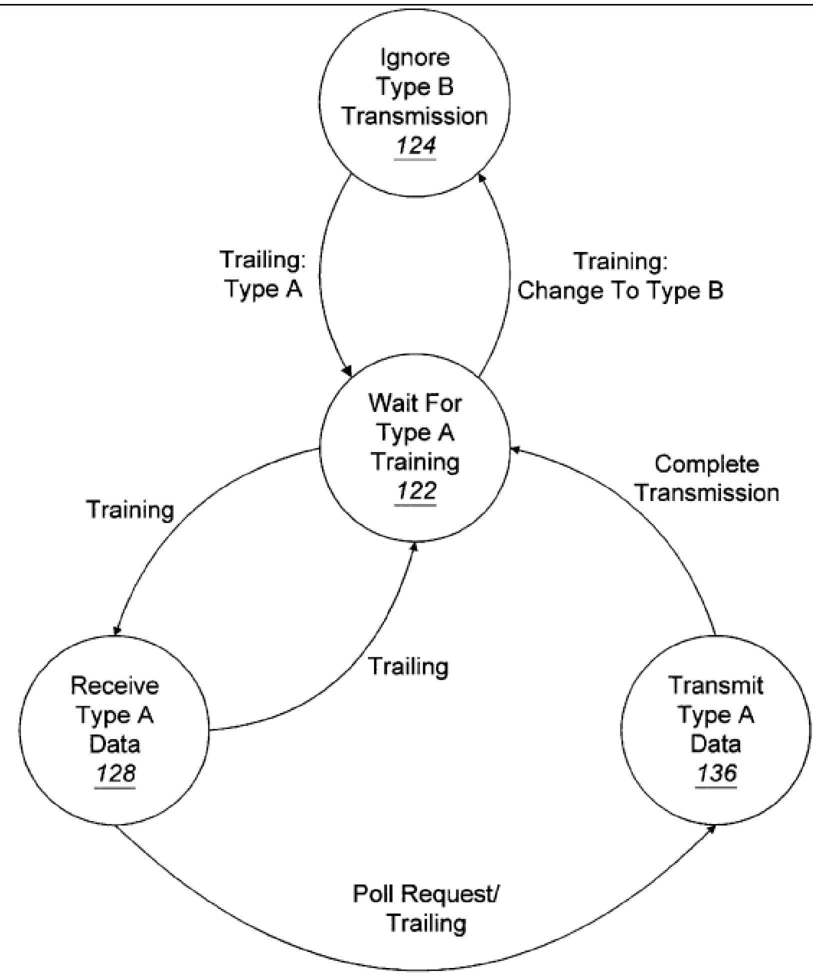


FIG. 7

309. In addition, the block diagram of Figure 3 shows explicitly that the control program of the trib devices only provide for monolingual operation: while the "Master Transceiver" (on the top of Figure 3) can communicate using both "Type A + B" modulation, the "Trib Modem" (shown on the bottom) can communicate using only "Type X." *See* '838 Patent at Figure 3 and col. 5:29-53 ("Control program 92 includes logic for implementing a particular modulation method, which, for purposes of illustration is called type X. Inasmuch as master transceiver 64 is capable of running either a type A or a type B modulation method, type X refers to one of those two modulation methods.") (emphasis added). Figure 3 of the '838 Patent is

reproduced below:

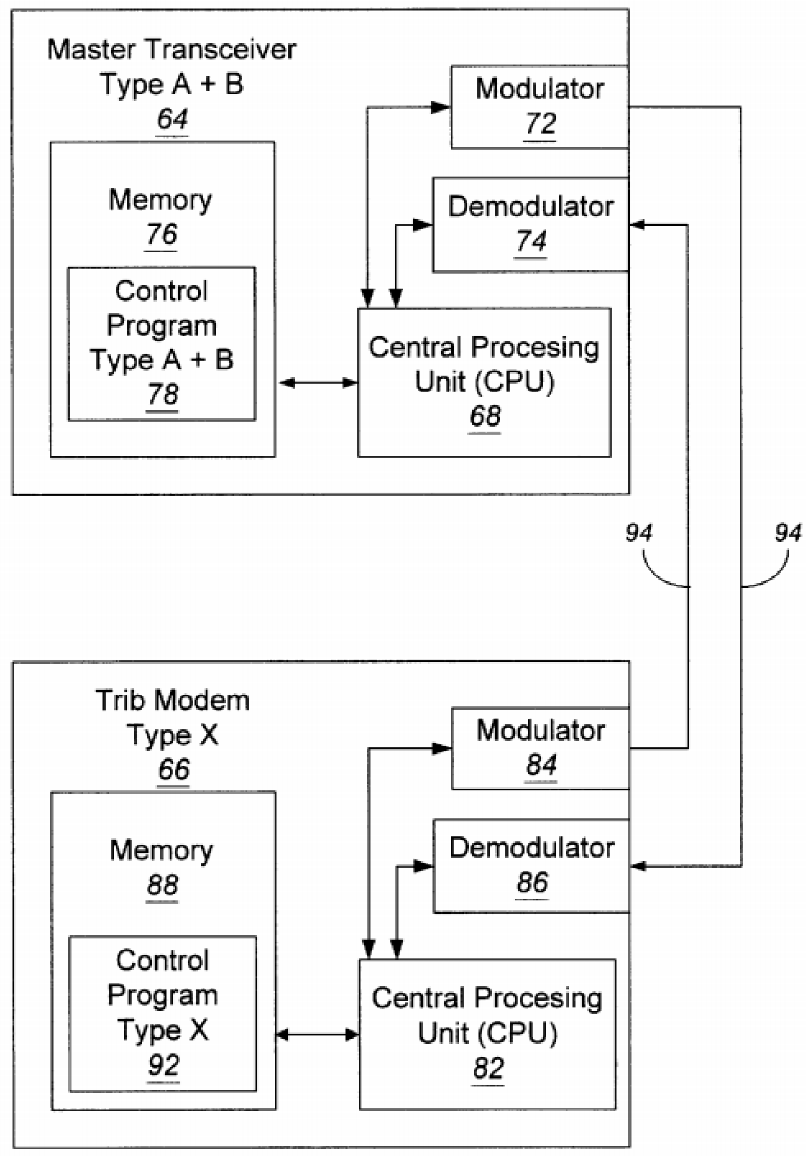


FIG. 3

310. The ‘838 Patent distinguishes its purported invention—a bilingual master transceiver switching between two different types of modulation methods to communicate respectively with two different types of monolingual tributary transceivers—by asserting that in the prior art, all of the transceivers on a communications network purportedly had to use the same type of modulation, or else communications on the network would be disrupted or

effectively impossible. *See* '838 Patent at Figure 1 and 2, and at col. 1:23-2:22 and col. 3:47-5:28. As discussed above, the Provisional Application identified this same problem of the prior art and arrived at the same solution—conditioning the monolingual tributary transceivers to "ignore" modulation types that they were not compatible with, while directing information only to tribs that can understand the current transmission from the bilingual master.

311. I understand that Rembrandt argues that original claims 23 and 27 of the application leading to the '838 Patent constitute written description for the asserted claims. I disagree with this for the reasons explained below.

312. Original claim 23 recited "[a] multipoint communication system, comprising: a first transceiver capable of transmitting and receiving a plurality of modulation methods; and at least one additional transceiver capable of transmitting and receiving at least one of said plurality of modulation methods" and original claim 27 recited "[a] remote transceiver for use in a multi-point communication system, comprising: logic configured to enable the remote transceiver to communicate over the multi-point communication system using a plurality of modulation methods." During prosecution, the then-owner of the patent estate made clear that bilingual tribs are outside the scope of these claims.

313. Neither of original claims 23 or 27 are sufficient to describe the asserted claims. For example, neither of these original claims describe a "transceiver, in the role of the master according to the master/slave relationship" configured to send transmissions modulated using at least two "different types" of modulation, as recited in the asserted claims. In contrast to the asserted claims, original claim 23 merely recites a "first transceiver" and "at least one additional transceiver," but it does not require either of these to be a "master transceiver" communicating "according to the master/slave relationship." And it does not require either of the mentioned transceivers to be a "slave" transceiver. Similarly, original claim 27 merely recites a "remote

transceiver" but it does not require a "master" transceiver communicating "according to the master/slave relationship," nor does it expressly recite a "slave" transceiver. Further, neither claim describes at least two "different types" of modulation (*e.g.*, incompatible types), much less a communication device comprising a master transceiver that can communicate with slave receivers by switching between the two different types of modulation in the same communication session.

314. The asserted patents make clear that "what is not believed to be provided by the prior art" is "a system and method of communication in which multiple modulation methods are used to facilitate communication among a plurality of modems in a network, which have heretofore been incompatible." *Id*. at col. 2:16-20; *see also id*. at *e.g*., Figure 5. The patent refers to this concept as "embedded modulation." *See e.g*., *id*. at col. 5:47-56 ("In this example, two tribs 66a-66a run a type A modulation method while one trib 66b runs a type B modulation method. The present invention permits a secondary or embedded modulation method (e.g., type A) after an initial training sequence. This allows the master transceiver 64 to communicate seamlessly with tribs of varying types."). Indeed, as described further below, the patent applicant itself made clear that original claims 23 and 27 do not describe the "embedded modulations" invention.

315. On June 28, 2001 patent examiner Phuong Phu issued an office action rejecting application claims 23-28 as being anticipated by U.S. Patent No. 5,999,563 to Polley:

4. Claims 23-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Polley et al (5,999,563).

As per claim 23, see figures 2a and 5a, and col. 9, line 16 to col. 10, line 52. Polley et al discloses a system as claimed wherein the system comprises: a first transceiver (210) (see figure 2a) capable of transmitting and receiving a plurality of modulation methods (see col. 10, lines 40-51); and a second transceiver (220) (see figure 2a) capable of transmitting and receiving said plurality of modulation methods.

As per claim 24, Polley et al further discloses that said plurality of modulation methods is selected from a group consisting (QAM, CAP, DMT, FSK and PAM) (see col. 10, lines 40-51).

As per claim 25, see figures 2a and 5a, and col. 9, line 16 to col. 10, line 52. Polley et al discloses a master system (220) (see figure 2a), as claimed, wherein the system comprises a logic (530, 150) (see figure 5a) configured to enable the system to communicate over the multi-point communication system using a plurality of modulation methods (see col. 10, lines 40-51).

As per claim 27, see figures 2a and 5a, and col. 9, line 16 to col. 10, line 52. Polley et al discloses a remote system (210) (see figure 2a), as claimed, wherein the system comprises a logic (530, 150) (see figure 5a) configured to enable the system to communicate over the multi-point communication system using a plurality of modulation methods (see col. 10, lines 40-51).

Claims 26 and 28 are rejected with the same reason set forth for claim 24.

316. The then-owner of the application (Paradyne) filed a response on October 1, 2001. In the response, the patent applicant cancelled claim 27 and amended claim 23 as follows:

> 23. (Once Amended) A multi-point communication system, comprising:
>
> a first transceiver capable of transmitting and receiving a plurality of modulation methods; and
>
> at least [one] two additional [transceiver] transceivers, each being capable of transmitting and receiving at least one of said plurality of modulation methods[.] to the exclusion of at least one of the modulation methods transmitted and received by the other one of said two transceivers.

317. The applicant explained that while the system of Polley "shows a system wherein a multi-mode transceiver connects to a second transceiver capable of receiving and transmitting the plurality of modulation methods transmitted and received by the first transceiver," Polley "does not describe a multipoint system (as in the present invention) nor in any way describes 'embedded modulations' as used in the present invention and as claimed, although not in those words." Response at page 4. The applicant stated further that "Polley describes a point-to-point-only two modem system in which each modem may host two transceivers (or a single transceiver capable of communicating via one of two modulations) and a rate negotiating means to select which modulation is used, such negotiation occurring at the beginning of a communication session." The applicant stated that "[t]his is completely different from 'embedded modulations, which provides for true multipoint communication (a master on two or more tributaries) in which communication with all tributaries occurs during a communication session using two or more modulations." Response at pages 4-5. The applicant stated further that "[i]n essence, such an arrangement is shown by Polley *et al.* is discussed in some detail in the Background of the Invention portion of the present application, see, for example, page 1, lines 19 through 30 and page 2, lines 1 through 8. See also, page 5, lines 8 through 30 and page 6, lines 1 through 26."

Response at page 5. "Thus, the Polley *et a*l. disclosure is prior art and is acknowledged as such, although not specifically, and does not disclose a multipoint system as claimed by applicant." Id.

318. In addition, the patent applicant stated that "[t]he present invention is directed to the use of differing transceivers responsive to different modulation methods to the exclusion of other modulation methods, which clearly is not shown in Polley *et al."* Response at page 4. "Accordingly, claim 23 has been amended to call for two additional transceivers, instead of one, each being capable of receiving and transmitting at least one of the modulation methods of a first transceiver to the exclusion of the modulation method transmitted and received by another one of the transceivers." *Id*. "Clearly, Polley *et al.* does not disclose such an arrangement and claim 23, as amended, is, therefore, believed to be allowable." *Id*.[6]

319. For the above additional reasons, a person of ordinary skill in the art would understand that the disclosure of the application leading to the '838 patent (including its original claims 23 and 27) does not include written description of a single trib that is capable of communicating in a master/slave relationship with a master transceiver, wherein such single trib is compatible with both of the two types of "different modulation" methods transmitted by a master transceiver. Thus, for example, if a master transceiver can transmit in both of "Type A" and "Type B" modulation, and if those modulation methods are of "different types" as claimed, then the invention requires at least <u>two</u> tribs (*i.e*., a"Type A" trib and a "Type B" trib); it does not include a "Type A + B" trib. Again, as the applicant itself told the Patent Office, the "present invention is directed to the use of differing transceivers responsive to different modulation methods to the exclusion of other modulation methods." Response at page 4.

4. The CIP Application (Filed April 14, 2003)

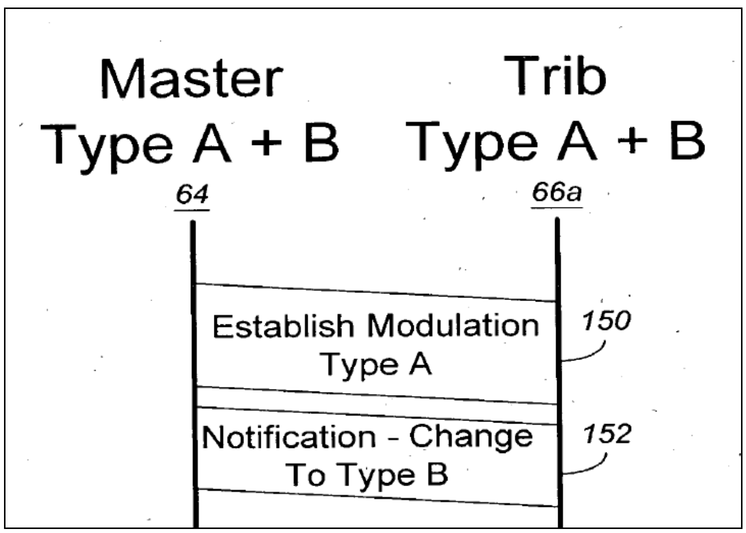
320. On April 14, 2003, the prior owner of the patents-in-suit filed the CIP Application

[6] The '843 patent issued with only 19 claims, and application claim 23 (in original or amended form), was not issued.

as a continuation-in-part of the first-filed non-provisional application discussed above. I understand that a "continuation-in-part" application is one that discloses subject matter that was not previously disclosed in the application(s) to which it claims priority.

321. As compared to the Provisional Application and the first-filed non-provisional application discussed respectively in Sections X.A.2 and X.A.3 above, the CIP Application added new matter not previously disclosed: that of a system having a bilingual trib and a bilingual master.

322. The description and depiction of this new, purported invention appeared for the first time in Figure 8 of the CIP Application, and is reproduced in part below:



323. The specification of the CIP Application describes Figure 8 as "an alternative embodiment of the multipoint communication system of Figure 4." CIP Application at page 5. Figure 4 of the CIP Application is identical to Figure 4 of the first-filed non-provisional application discussed above and it shows a bilingual master transceiver communicating with monolingual tribs (which are either "Type A" or "Type B" tribs). Thus, rather than representing an "alternative embodiment of the multipoint communication system of Figure 4" as asserted by the Applicant, newly-added Figure 8 actually represented new written description provided

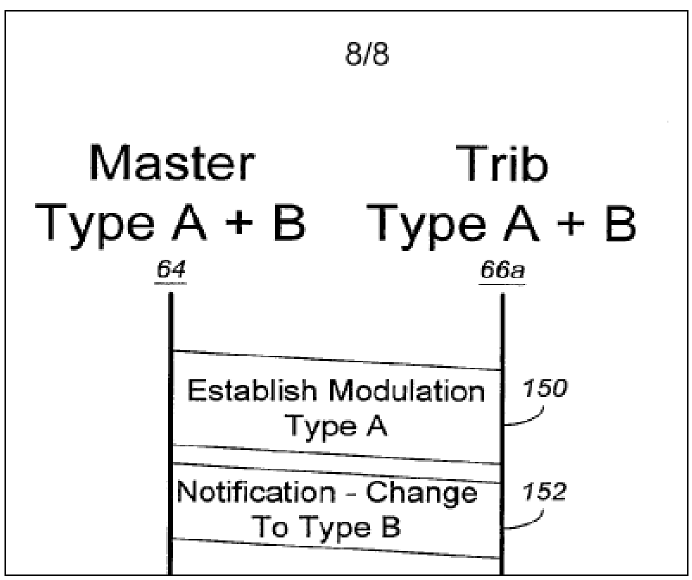
which broadened the scope of the claimed invention. In this regard, the CIP Application states that in the newly-described subject matter of Figure 8, "both a master transceiver 64 and a tributary transceiver 66a would have the ability to transmit using at least two modulation methods, type A and type B." *Id*. at 10 (emphasis added).

5. The '580 Patent (Filed Aug. 9, 2009)

324. The '580 patent matured from Application No. 12/543,910, which was filed on August 9, 2009 as a continuation of Application No. 11/774,80, the latter of which was a continuation of the CIP Application discussed above.

(a) <u>The As-Filed '580 Specification</u>

325. The as-filed specification of Application No. 12/543,910 included the same eight figures as the CIP Application, including Figure 8 which shows a bilingual "Master Type A + B" device communicating with a bilingual "Trib Type A + B":



326. The as-filed specification also included paragraphs [0042] – [0045] which describe "an alternative embodiment" wherein "both a master transceiver 64 and a tributary transceiver 661 would have the ability to transmit using at least two modulation methods, type A and type B." As discussed above, the prior owner of the patents-in-suit included this Figure 8

and the paragraphs describing it in the CIP Application, and this subject matter had not been described previously in the Provisional Application or the first-filed non-provisional application.

(b) Rembrandt Amended the ’580 Claims and Specification During Prosecution

327. On March 1, 2011, during prosecution of the ’580 patent, Rembrandt made several amendments to the description of the ’580 patent’s application.

328. First, Rembrandt amended claim 1, even though the patent examiner had previously indicated that claim 1 was allowable. The amendment to claim 1 is shown below:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A communication ~~system~~ device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, the device comprising:

a transceiver, in the role of the master according to the master/slave relationship, for sending at least ~~transmitter capable of transmitting~~ transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method, ~~and~~ wherein the ~~first transceiver is configured to transmit~~ transmissions comprise groups of transmission sequences, each group of said groups of transmission sequences structured with a first portion and a payload portion wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion, wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion, and wherein for the at least one group of transmission sequences:

the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence ~~that~~ indicates an impending change from the first modulation method to the second modulation method, and

the second information for said at least one group of transmission sequences comprises a second sequence, ~~in~~ modulated according to the second modulation method, wherein the second sequence is transmitted after the first ~~data~~ sequence.

329. Among other amendments, amended claim 1 recites a "device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave …." Rembrandt thanked the examiner "for the indication that claims 1-19, and 37-57 are allowed" and stated that the above amendment added "additional recitations to more precisely claim the subject-matter. For example, the language of independent claim 1 has been clarified to refer to two *types* of modulation methods, *i.e.*, different families of modulation techniques, such as the

FSK family of modulation methods and the QAM family of modulation methods." March 1, 2011 Reply to Office Action at page 20, emphasis in original:

Allowable Subject Matter

Applicant thanks Examiner Ha for the indication that claims 1-18, and 37-57 are allowed (office action, p. 7). Applicant has further amended claims 1-2, 9-15, 18, 37-38, and 45-46 with additional recitations to more precisely claim the subject-matter. For example, the language of independent claim 1 has been clarified to refer to two *types* of modulation methods, *i.e.*, different families of modulation techniques, such as the FSK family of modulation methods and the QAM family of modulation methods. Support for the clarifying amendments can be found throughout the specification, for example [0024], [0025] and [0031] – [0036].

330. Second, Rembrandt amended the specification by, among other things, deleting paragraph [0008] of the as-filed specification and replacing it with a new paragraph [0008] which is reproduced below:

[0008] The present invention disclosed herein includes communication systems, devices, and methods. For example, a device may be capable of communicating according to a master/slave relationship in which a communication from a slave to a master occurs in response to a communication from the master to the slave. The device may include a transceiver in the role of the master for sending transmissions modulated using at least two types of modulation methods, for example a first modulation method and a second modulation method. The first modulation method may be of a different type than the second modulation method. The transmissions may be groups of transmission sequences. A group may be structured with a first portion and a payload portion. First information in the first portion may indicate which of the first modulation method or the second modulation method is used for modulating second information in the payload portion. The transmissions may be addressed for an intended destination of the payload portion. First information in a transmission that includes an address for an intended destination may include a first sequence in the first portion that is modulated according to the first modulation method and that indicates an impending change from the first modulation method to the second modulation method. Second information in a transmission that includes an address for an intended destination may include a second sequence in the payload portion that is modulated according to the second modulation method. The second sequence may be transmitted after the first sequence.

331. Among other amendments, amended paragraph [0008] states that "a device may be capable of communicating according to a master/slave relationship in which a communication from a slave to a master occurs in response to a communication from the master to the slave."

332. Rembrandt also amended the Abstract in similar ways, as shown below:

Please amend the Abstract as shown below. A clean version of the Abstract submitted on a separate sheet is also submitted herewith.

A device may be capable of communicating using at least two type types of modulation methods. ~~single subscriber line multi-point communication system is disclosed. In general, the multi-point communication system can~~ The device may include a ~~first~~ transceiver ~~coupled to a subscriber line~~ capable of acting as a master according to a master/slave relationship in which communication from a slave to a master occurs in response to communication from the master to the slave. ~~transmitting and receiving at least two modulation methods, either of said modulation methods being operable to transmit a test signal, and a second transceiver coupled to said subscriber line capable of transmitting and receiving said at least two modulation methods, the second transceiver being operable to receive the test signal and determine at least one channel parameter from the test signal. A~~ The master transceiver may send transmissions structured with a first portion and a payload portion. ~~that can be used in various embodiments of a single subscriber line multi-point communication system, and a tributary transceiver are further disclosed~~ Information in the first portion may be modulated according to a first modulation method and indicate an impending change to a second modulation method, which is used for transmitting the payload portion. The transmissions may be addressed for an intended destination of the payload portion.

333. Rembrandt amended the specification in various other ways as well. For example, it deleted paragraph [0012] and amended paragraph [0022] as follows:

[0022] FIG. 8 ~~is a ladder diagram illustrating the operation of an alternative embodiment of the multipoint communication system of FIG. 4~~ is a signal diagram for an exemplary transmission according to an embodiment.

334. As discussed above, as-filed Figure 8 showed a system having a bilingual master and a bilingual trib, which system was disclosed for the first time in the CIP Application. Simultaneously with the amendment to paragraph [0022] describing Figure 8 shown above, Rembrandt deleted as-filed Figure 8 and submitted a replacement figure 8. *See* March 1, 2011 Response at page 19:

> **Amendments to the Drawings**
>
> The attached sheets of drawings include replacement FIG. 8. The sheets, which include new FIG. 8, replace the original sheets.
>
> Attachment: Replacement Sheets 1-8

335. Replacement Figure 8 is reproduced below:

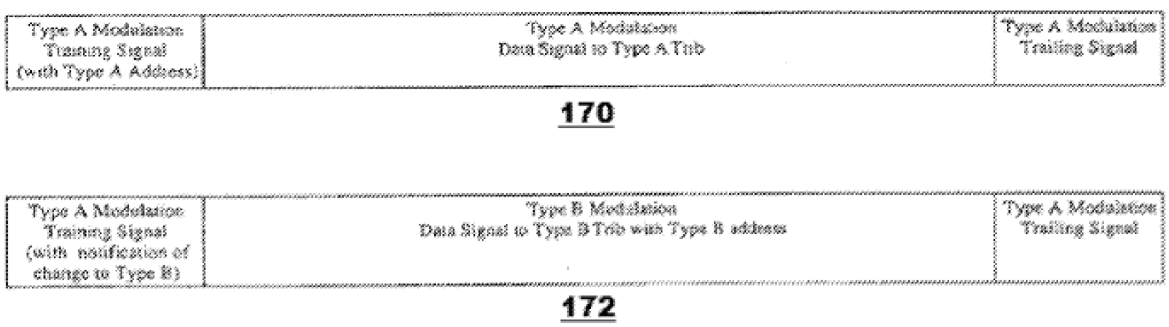


FIG. 8

336. Rembrandt told the Patent Office that replacement "FIG. 8 corresponds to FIG. 4A & 4B" of the Provisional Application. March 1, 2011 Response at page 21. As discussed above in Section X.A.2, Fig. 4a and 4b of the Provisional Application depict transmissions from a bilingual master transceiver to two different types of monolingual tribs; the master device can transmit in either of "Type A" or "Type B" modulation while a "Type A Trib" can communicate only using Type A modulation and a "Type B Trip with Type B address" can communicate only using Type B modulation. Replacement Figure 8 thus depicts the same scenario.

337. In sequence 170, master transceiver transmits a Type A "Training Signal" to a "Type A address" trib, and then transmits a "Data Signal" to a Type A trib using Type A modulation. And in sequence 172, the master transceiver transmits a "Type A Modulation Training Signal" to a Type A trib, notifying the Type A trib that the master is about to "change to

Type B" modulation, and then the master sends a "Type B Modulation Data Signal" to a different trib: a "Type B trib with Type B address." *See* Replacement Figure 8.

338. At the same time, Rembrandt amended paragraphs [0025] and [0027] of the specification to refer to the subject matter of Replacement Figure 8:

> Please amend paragraph [0025] of the specification as follows:
>
> **[0025]** Referring now to FIG. 2, an exemplary multipoint communication session is illustrated through use of a ladder diagram. This system uses polled multipoint communication protocol. That is, a master controls the initiation of its own transmission to the tribs and permits transmission from a trib only when that trib has been selected. At the beginning of the session, the master transceiver 24 establishes a common modulation as indicated by sequence 32 that is used by both the master 24 and the tribs 26a, 26b for communication. Once the modulation scheme is established among the modems in the multipoint system, The master transceiver 24 transmits a training sequence 34 that includes the address of the trib that the master seeks to communicate with. In this case, the training sequence 34 includes the address of trib 26a. As a result, trib 26b ignores training sequence 34. After completion of the training sequence 34, master transceiver 24 transmits data 36 to trib 26a followed by trailing sequence 38, which signifies the end of the communication session. Similarly, with reference to FIG. 8, the sequence 170 illustrates a Type A modulation training signal, followed by a Type A modulation data signal. Note that trib 26b ignores data 36 and trailing sequence 38 as it was not requested for communication during training sequence 34.

> Please amend paragraph [0027] of the specification as follows:
>
> **[0027]** The foregoing procedure is repeated except master transceiver identifies trib 26b in training sequence 48. In this case, trib 26a ignores the training sequence 48 and the subsequent transmission of data 52 and trailing sequence 54 because it does not recognize its address in training sequence 48. Master transceiver 24 transmits data 52 to trib 26b followed by trailing sequence 54 to terminate the communication session. Similarly, with reference to FIG. 8, sequence 172 illustrates a Type A modulation signal, with notification of a changes to Type B, followed by a Type B modulation data signal. To send information back to master transceiver 24, trib 26b transmits training sequence 56 to establish a communication session.

339. Moreover, Rembrandt entirely deleted paragraphs [0042] through [0046] of the as-filed specification, including the disclosure (originally from the CIP Application) describing

as-filed Figure 8 as “alternative embodiment of the present invention” where “both a master transceiver … and a tributary transceiver … would have the ability to transmit using at least two modulation methods, type A and type B.”:

> Please delete paragraphs [0042] – [0046]
>
> ~~[0042] In an alternative embodiment of the present invention, embedded modulations can be used as a way to measure transmission line characteristics between a master transceiver and tributary transceiver, as shown in FIG. 8. In this embodiment, both a master transceiver 64 and a tributary transceiver 66a would have the ability to transmit using at least two modulation methods, type A and type B. In the present example, the primary transmission type is type A. Thus, as shown in FIG. 8, the master transceiver 64 establishes type A as the primary modulation in sequence 150.~~

340. Rembrandt told the Patent Office that it had amended the specification to “restrict” the written description in the patent “so as to be in harmony with the claims.” Such restrictive amendments include, among other things, the deletion of as-filed Figure 8 (showing a bilingual trib) and the paragraphs describing as-filed Figure 8 (*i.e.*, as-filed paragraphs [0042] – [0046]) as well as the submission of “new” Figure 8 showing transmissions to monolingual tribs. *See* March 1, 2011 Reply at page 22, reproduced below:

Amendments to the specification

Applicant has made certain amendments to the specification. Applicant submits that the amendments contain no new matter.

Applicant has included a replacement summary section and a replacement abstract. The MPEP suggests that the applicant modify the brief summary of the invention and restrict the descriptive subject matter "so as to be in harmony with the claims." *MPEP 1302.01,* General Review of Disclosure. Accordingly, Applicant has deleted paragraphs [0042] – [0046]. Applicant has amended [0022], [0025] and [0027] to describe a new FIG. 8, which was included in the replacement sheets discussed above. Support for the amended paragraphs can be found throughout the specification and the Provisional Application. For example, support for the amendments may be found in the Summary Description section on page 4 of the Provisional Application and paragraphs [0025] – [0027] of the present application.

341. Rembrandt stated that "support for the amendments may be found in the Summary Description section on page 4 of the Provisional Application and paragraphs [0025] – [0027] of the present application." *See supra*. However, neither page 4 nor paragraphs [0015] – [0027] of the as-filed application (*i.e.*, the "support for the amendments" to the specification) disclose a bilingual trib as constituting the invention.

342. First, as discussed in Section X.A.2 above, page 4 of the Provisional Application describes a bilingual master transceiver communicating with two types of monolingual trib devices. Second, paragraphs [0025] – [0027] of the as-filed specification are directed to the prior art, not to the alleged invention. *See* as-filed specification at paragraph [0025] ("Referring now to FIG. 2 …"); *id*. at paragraph [0015] ("FIG. 1 is a block diagram of a prior art multipoint communication system …") (emphasis added); *id*. at paragraph [0016] ("FIG. 2 is a ladder diagram illustrating the operation of the multipoint communication system of FIG. 1.") (emphasis added).[7]

[7] During prosecution of the application leading to Patent No. 6,614,838, the applicant amended

343. Given that the written description, as restricted by Rembrandt, was meant "to be in harmony with the claims" (*see* March 1, 2011 Reply at page 22), a person of ordinary skill in the art would understand that the disclosure is limited to a system having a bilingual master transceiver communicating with at least two different types of modulation methods with at least two different types of monolingual trib / slave devices. I have been informed and asked to assume for the purposes of this report that subject matter intentionally deleted is removed from the written description, despite an earlier incorporation by reference to a prior application. Thus, in view of my understanding of the legal implications of deleting figures and text from a specification, there is a lack of written description support for the asserted claims.

(c) <u>The Written Description of the As-Issued '580 Patent</u>

344. Due to the deletion of as-filed Figure 8 and the text describing it in the as-filed specification, the as-issued specification of the '580 patent discloses monolingual trib devices but does not disclose or otherwise teach bilingual trib devices.

345. First, this is consistent with how the '580 patent describes the problem that the inventor was trying to solve. In particular, in prior art "existing data communication systems, a transmitter and a receiver pair can successfully communicate only when the modems are compatible at the physical layer." Col. 1:27-29. Thus "communication between modems is generally unsuccessful unless a common modulation method is used", and "if a modem attempts to establish a communication session with an incompatible modem, one or both of the modems will make several attempts to establish the communication link until giving up after a timeout period has expired or the maximum number of retry attempts has been reached"; essentially "communication on the link is impossible without replacing one of the modems such that the

Figure 2 to have the legend "Prior Art." *See* Application No. 09/205,205 Response of October 1, 2001 at page 5 and marked-up Figure 2. Figures 1 and 2 in issued Patent No. 6,614,838 are both labelled "Prior Art."

resulting modem pair uses a common modulation method." Col. 1:45-55 (emphasis added); *see also id*. at col. 1:56-65 ("If one or more of the trib modems are not compatible with the modulation method used by the master, those tribs will be unable to receive communications from the master."); col. 1:66-2:15 ("Thus, communication systems comprised of both high performance and low or moderate performance applications can be very cost inefficient to construct. For example, some applications (e.g., internet access) require high performance modulation, such as quadrature amplitude modulation (QAM), carrier amplitude and phase (CAP) modulation, or discrete multitone (DMT) modulation, while other applications (e.g., power monitoring and control) require only modest data rates and therefore a low performance modulation method. All users in the system will generally have to be equipped with a high performance modem to ensure modulation compatibility. These state of the art modems are then run at their lowest data rates for those applications that require relatively low data throughput performance. The replacement of inexpensive modems due to modulation compatibility imposes a substantial cost that is unnecessary in terms of the service and performance to be delivered to the end user.").

346. The inventor expressly characterized the problem in the context of device incompatibility in this way: "what is sought, and what is not believed to be provided by the prior art, is a system and method of communication in which multiple modulation methods are used to facilitate communication among a plurality of modems in a network, which have heretofore been incompatible." Col. 2:16-20.

347. Second, the remaining description in the '580 patent is directed to a bilingual master transceiver that can communicate with multiple types of incompatible, monolingual trib / slave devices. For example, Figure 3 shows that the "Master Transceiver Type A + B" (Figure 3, 64) has a memory (76) programmed to make the master bilingual via "Control Program Type A

+ B" (78). In contrast, Figure 3 shows that "Trib Modem Type X) (66) has a memory (88) programmed to make the trib monolingual via "Control Program Type X" (92):

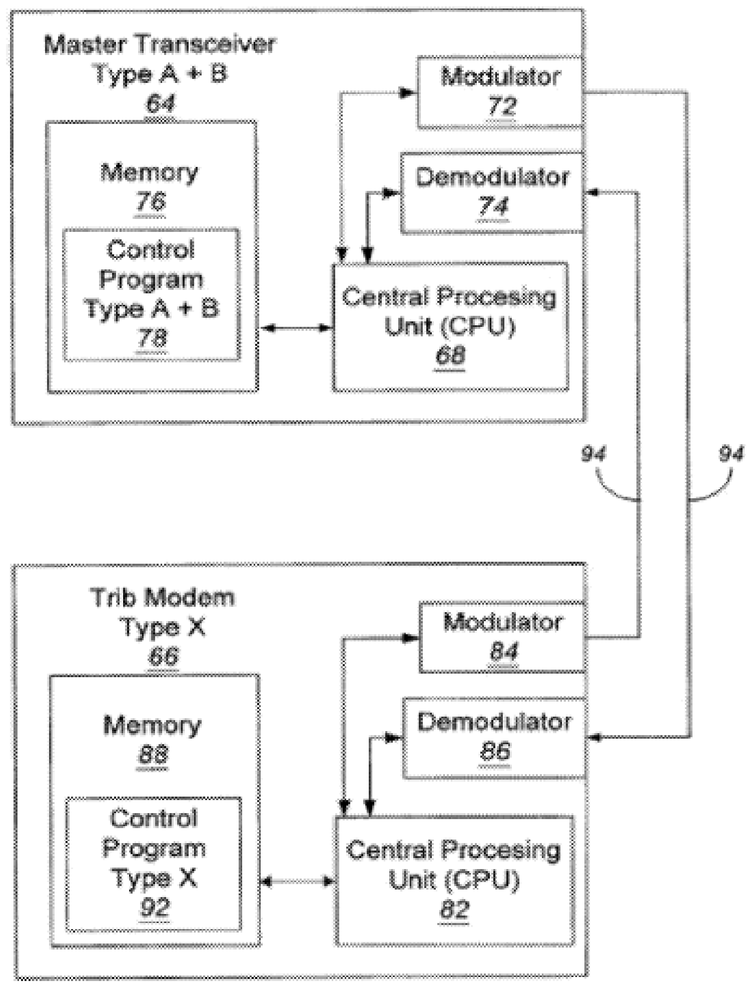


FIG. 3

348. The specification makes clear that the master of Figure 3 is programmed to be bilingual while the trib / slave is programmed to be monolingual, and that this is "in accordance with the principles of the present invention." '580 patent at col. 5:23-46 ("A block diagram of a master transceiver 64 in communication with a trib 66 in accordance with the principles invention is shown in Figure 3. Master transceiver 64 comprises a central processing unit (CPU) 68 in communication with modulator 72, demodulator 74, and memory 76. Memory 76 holds software control program 78 and any data necessary for the operation of master transceiver 64.

Control program 78 includes logic for implementing a plurality of modulation methods. For purposes of illustration, control program 78 can implement both a type A and a type B modulation through modulator 72 and demodulator 74."); *id*. ("Trib 66 comprises CPU 82 in communication with modulator 84, demodulator 86, and memory 88. Memory 88, likewise holds software control program 92 and any data necessary for the operation of trib 66. Control programs 78 and 92, are executed by CPUs 68 and 82 and provide the control logical for the processors to be discussed herein. Control program 92 includes logic for implementing a particular modulation method, which, for purposes of illustration, is called type X. Inasmuch as master transceiver 64 is capable of running either a type A or a type B modulation method, type X refers to one of those two modulation methods.").

349. Figure 4 is "a block diagram of a multipoint communication system including the master transceiver and a plurality of tributary transceivers of the type illustrated in FIG. 3." Col. 3:15-17. As discussed above, the tributary transceivers of Figure 3 have control programs only supporting monolingual operation. Figure 4 shows that the "Master Transceiver type A + B" (64) is bilingual, while the two monolingual "Tributary Transceiver Type A" (66a) can communicate only using type A modulation and the monolingual "Tributary Transceiver Type B" (66b) can communicate only using type B modulation. *See* Col. 5:47-56 ("Referring now to FIG. 4, a multipoint communication system 100 is shown comprising a master transceiver 64 along with a plurality of tribs 66-66. In this example, two tribs 66a-66a run a type A modulation method while one trib 66b runs a type B modulation method. The present invention permits a secondary or embedded modulation method (e.g., type A) after an initial training sequence. This allows the master to communicate seamlessly with tribs of varying types."). Figure 4 is reproduced below:

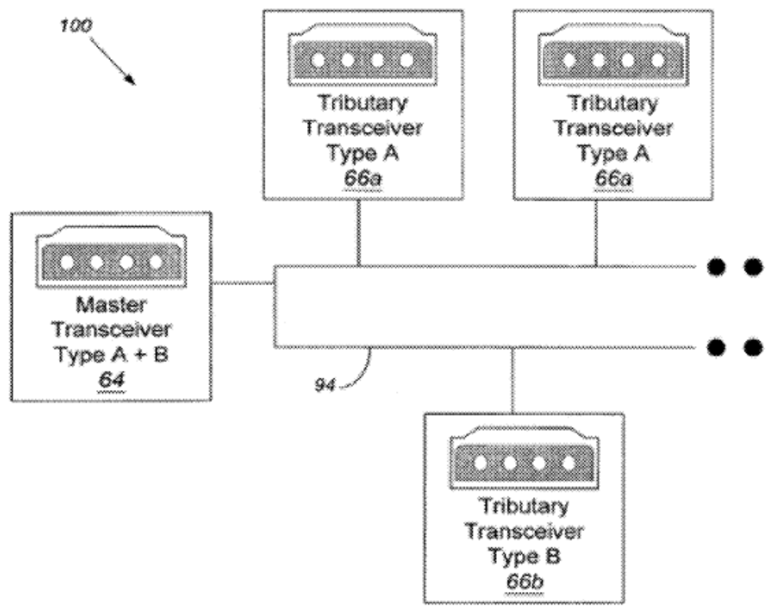


FIG. 4

350. Figures 5-7, and the text in the specification describing them, also show a bilingual master transceiver communicating with two different types of monolingual trib / slave transceivers. Figure 5 is reproduced below:

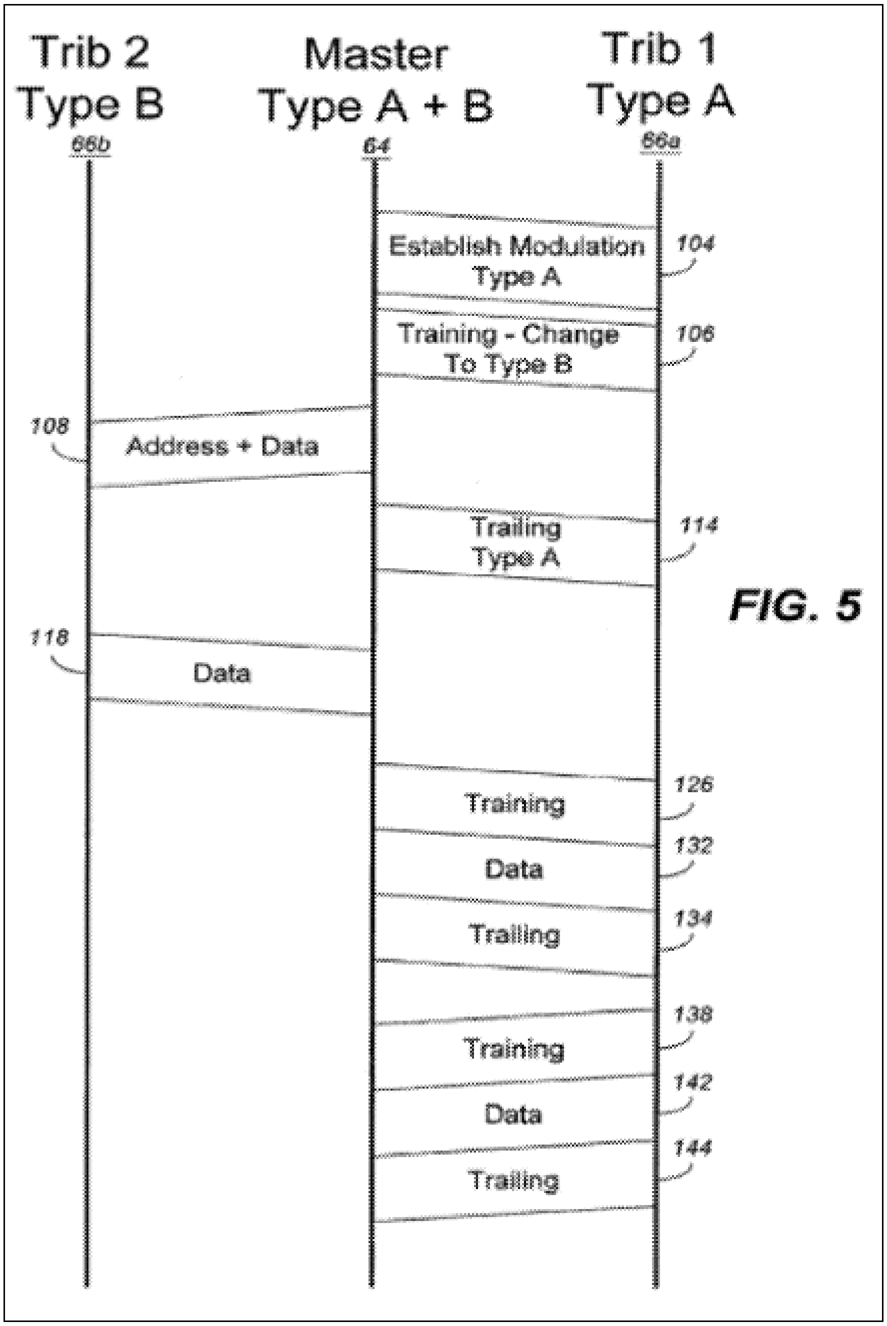


FIG. 5

351. Figure 5 shows a bilingual "Master Type A + B" transceiver communicating with monolingual "Trib 1 Type A" and monolingual "Trib 2 Type B." The specification makes clear that the master is bilingual while the tribs are monolingual. *See* Col. 5:57-6:2 ("The operation of multipoint communication system 100 will be described hereafter with reference to the ladder diagram of FIG. 5 and the state diagrams of FIGS. 6 and 7. A communication session between the master transceiver 64 and a type B trib 66b will be discussed first. A state diagram for a type

B trib 66b is shown in FIG. 6. Type B trib 66b is initialized in state 102 in which type A modulation transmissions are ignored. In the present example, the primary modulation method is type A, thus, as shown in FIG. 5, master transceiver 64 establishes type A as the primary modulation in sequence 104. Note that because trib 66b responds only to type B modulation transmissions, only the type A tribs 66a-66a are receptive to transmission sequence 104."); *id*. at col. 6:3-15 ("To switch from type A modulation to type B modulation, master transceiver 64 transmits a training sequence 106 to type A tribs 66a in which these tribs are notified of an impending change to type B modulation. The switch to type B modulation could be limited according to a specific time interval or for the communication of a particular quantity of data. After notifying the type A tribs 66a of the change to type B modulation, master transceiver 64, using type B modulation, transmits data along with an address in sequence 108, which is destined for a particular type B trib 66b. The type B trib 66b targeted by the master transceiver 64 will transition to state 112 as shown in FIG. 6 upon detecting its own address where it processes the data transmitted in sequence 108."); *id*. at col. 6:17-29 ("After completing transmission sequence 108, master transceiver 64 transmits a trailing sequence 114 using type A modulation thus notifying all type A tribs 66a that type B modulation transmission is complete. If master transceiver 64 has not transmitted a poll request to the type B trib 66b in sequence 108, then the type B trib 66b that was in communication with the master transceiver 64 will return to state 102 after timing out based on the particular time interval defined for the type B modulation transmission or transfer of the particular quantity of data. Note that <u>the trailing sequence 114 is ineffective in establishing the termination of a communication session between master transceiver 64 and a type B trib 66b because the trailing sequence is transmitted using type A modulation</u>.") (emphasis added); *id*. at col. 6:30-35 ("If, however, master transceiver 64 transmitted a poll request in sequence 108, then the type B trib 66b transitions to state 116 where it will transmit data, using type B modulation, to master transceiver 64 in sequence 118. After completion of this transmission, the type B trib 66b returns to state 102 where type A transmissions are ignored."); *id*. at col. 6:36-48 ("With reference to FIG. 5 and FIG. 7, a communication session between the master transceiver 64 and a type A trib 66a will now be discussed. A state diagram for a type A trib 66a is shown in FIG. 7. A type A trib 66a is initialized in state 122 in which it awaits a type A modulation training sequence. If, however, master transceiver transmits a training sequence in which the type A tribs 66a-66a are notified of a change to type B modulation as indicated by sequence 106, then a transition is made to state 124 where all type B transmissions are ignored until a type A modulation trailing sequence (e.g., sequence 114) is detected. Upon detecting the type A trailing sequence, a type A trib 66a returns to state 122 where it awaits a training sequence."); *id*. at col. 6:49-54 ("To initiate a communication session with a type A trib 66a, master transceiver 64 transmits a training sequence 126 in which an address of a particular type A trib 66a is identified. The identified type A trib 66a recognizes its own address and transitions to state 128 to receive data from master transceiver 64 as part of sequence 132."); *id*. at col. 6:55-62 ("After completing transmission sequence 132, master transceiver 64 transmits a trailing sequence 134 using type A modulation signifying the end of the current communication session. If master transceiver 64 has not transmitted a poll request to the type A trib 66a in sequence 132, then the type A trib 66a that was in communication with the master transceiver 64 will return to state 122 after receiving trailing sequence 134."); *id*. at col. 6:63-7:3 ("If, however, master transceiver 64 transmitted a poll request in sequence 132, then the type A trib 66a transitions to state 136 after receiving trailing sequence 134 where it will transmit training sequence 138, followed by data sequence 142, and terminated by trailing sequence 144 all using type A modulation. After completion of these transmissions, the type A trib 66a returns to state 122 to await the next type A modulation training sequence by master transceiver 64.").

352. Figures 6 and 7 show respectively that (1) monolingual Type B tribs "Ignore Type A Transmission" (Figure 6, 102) and "Receive Type B Data" only (112) while (2) monolingual Type A tribs "Ignore Type B Transmission" (Figure 7, 124) and "Receive Type A Data" only (128). Figures 6 and 7 also show respectively that (1) monolingual Type B tribs transmit "Type B Data" only (Figure 6, 116) while (2) monolingual Type A tribs transmit "Type A Data" only (Figure 7, 136). Figures 6 and 7 are reproduced below:

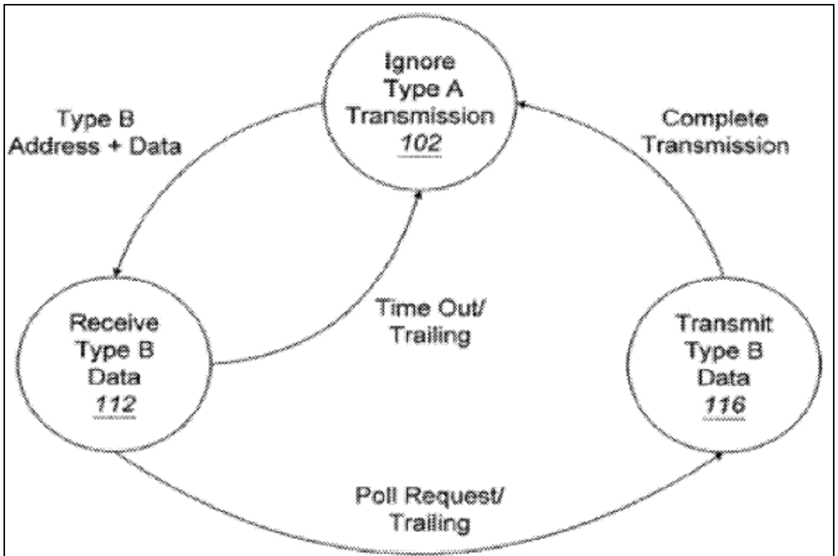


FIG. 6

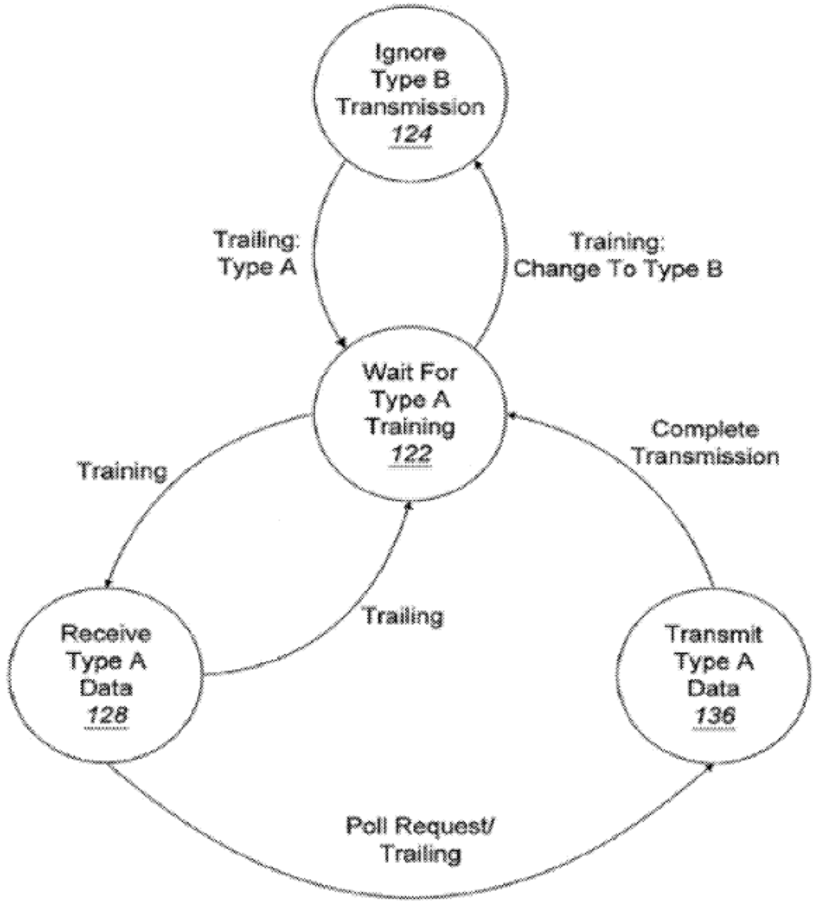


FIG. 7

353. As discussed above, Rembrandt deleted as-filed Figure 8 during prosecution and replaced it with a new Figure 8 adapted from the Provisional Application. While deleted as-filed Figure 8 had shown a bilingual trib device communicating with a bilingual master device (*see supra*), replacement Figure 8, which is in the ’580 patent as it issued, describes only transmissions from a bilingual master transceiver to two different types of monolingual slaves. In sequence 170, bilingual master transceiver transmits a Type A “Training Signal” to a “Type A address” trib, and then transmits a “Data Signal” to a Type A trib using Type A modulation. In sequence 172, the master transceiver transmits a “Type A Modulation Training Signal” to a Type A trib, notifying the Type A trib that the master is about to “change to Type B” modulation, and

then the master sends a "Type B Modulation Data Signal" to a different trib, in particular, a "Type B trib with Type B address." Figure 8 is reproduced below:

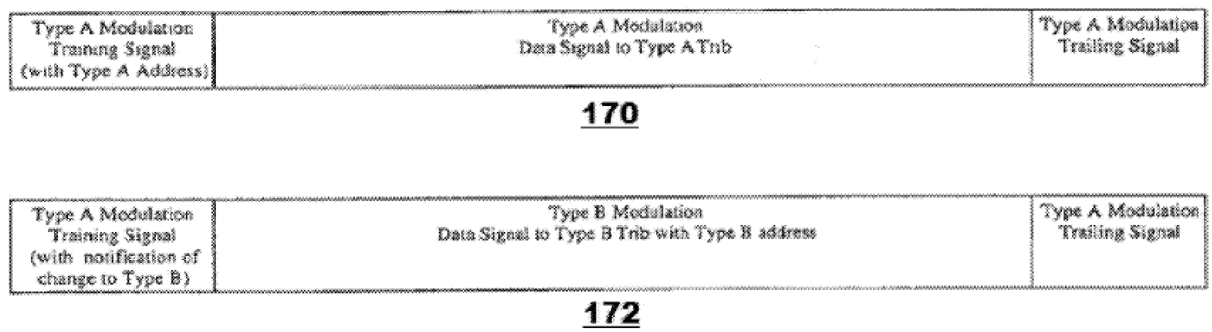


FIG. 8

354. Figure 8 is adapted from Figure 4 of the Provisional Application, which similarly discloses monolingual trib devices. *See* Section X.A.2 above.

6. The '228 Patent (Filed August 4, 2011)

355. Rembrandt filed the '228 patent application on August 4, 2011 as a continuation of the '580 patent. The patent issued on June 4, 2013.

356. The as-filed specification of the application did not contain any description for bilingual trib devices (*i.e.*, it did not contain the description of bilingual trib devices that Rembrandt deleted from the specification during prosecution of the '580 patent).

357. The issued '228 patent discloses only monolingual tribs, and includes the same Figures and text that discloses monolingual tribs as does the '580 patent discussed in Section X.A.5 above. I have been informed and asked to assume, for the purposes of this report, that the subject matter Rembrandt intentionally deleted from the '580 patent (e.g., Figure 8 as-filed) is not contained in the written description of the '228 patent even though the patents claim priority to and incorporate by reference the CIP Application. Accordingly, a person of ordinary skill in the art would understand that the '228 patent, like its parent '580 patent, lacks written description

for the asserted claims.

B. The Claims Lack Written Description Support for Bilingual Slaves.

358. As described above, there is no written description in either asserted patent for a bilingual slave device that can demodulate information transmitted from a bilingual master transceiver when such information is modulated in both of the master transceiver's two types of modulation methods. *See* Section X.A above. Thus, to the extent it is argued or determined that the scope of the asserted claims of the '580 or '228 patents are broad enough to cover bilingual slaves that can communicate with a bilingual master transceiver in both of the master's two types of "different" modulation methods, it is my opinion that the claims are invalid for lack of written description.

359. While there is no written description for bilingual tribs in either of the '580 or '228 patents, as I describe above, the earliest possible date for such a disclosure in the relevant patent family would be the filing date of the CIP Application, *i.e.* April 14, 2003. However, as I described in Section X.A.5 above, Rembrandt removed the disclosure of bilingual tribs from the '580 patent on March 1, 2011, by (among other things) deleting the as-filed Figure 8 and the text describing it. Accordingly, it is my understanding that the CIP Application does not provide written description for bilingual tribs.

360. Thus, as to independent claim 1 the '580 patent, to the extent it is argued or determined that a "communication device capable of communicating according to a master/slave relationship" comprising "a transceiver, in the role of the master according to the master/slave relationship, for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is different than the first modulation method" cover a device having a master transceiver configured to

communicate with a bilingual slave wherein the bilingual slave can communicate in both of the "first modulation method" and the "second modulation method," then claim 1 and any claim depending directly or indirectly from it are invalid for lack of written description.

361. Similarly, as to independent claim 58 the '580 patent, to the extent it is argued or determined that a "communication device capable of communicating according to a master/slave relationship" comprising "a transceiver, in the role of the master according to the master/slave relationship, capable of transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method" cover a device having a master transceiver configured to communicate with a bilingual slave wherein the bilingual slave can communicate in both of the "first modulation method" and the "second modulation method," then claim 58 and any claim depending directly or indirectly from it are invalid for lack of written description.

362. Similarly, as to independent claim 1 of the '228 patent, to the extent it is argued or determined that a "master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship" comprising "a master transceiver configured to transmit a second message" comprising "third information modulated according to the first modulation method" and "fourth information being modulated according to the second modulation method" cover a device having a master transceiver configured to communicate with a bilingual slave wherein the bilingual slave can communicate in both of the "first modulation method" and the "second modulation method," then claim 1 and any claim depending directly or indirectly from it are invalid for lack of written description.

C. The Claims Lack Written Description for all Recited Information Being "Addressed" to the Same Slave.

363. For similar reasons, it is my opinion that to the extent it is argued or determined

that the claims cover a scenario where information from the master, modulated with two different types of modulation, is addressed to a single slave transceiver, then the claims are invalid for lack of written description. As discussed above in Section X.A, the asserted patents teach and disclose, for example, that a bilingual master transceiver communicates with "Type A" slaves using Type A modulation only, and communicates with incompatible "Type B" slaves using Type B modulation only.

364. While there is no written description for a single, bilingual trib being the intended destination of information modulated with both of two different types of modulation, transmitted by a bilingual master transceiver, in either of the '580 or '228 patents, the earliest possible date for such a disclosure in the relevant patent family was the filing date of the CIP Application, April 14, 2003. But as described in Section X.A.5 above, Rembrandt removed the disclosure of bilingual tribs from the '580 patent on March 1, 2011, by (among other things) deleting the as-filed Figure 8 and the text describing it. I have been informed and asked to assume for the purposes of this report that subject matter intentionally deleted is removed from the written description, despite an earlier incorporation by reference to a prior application. Accordingly, it is my understanding that the CIP Application does not suffice to provide written description for a single, bilingual trib being the intended destination of information modulated with both of two different types of modulation, transmitted by a bilingual master transceiver.

365. Thus, as to independent claim 1 of the '580 patent, to the extent it is argued or determined that the phrase "at least one group of transmission sequences is addressed for an intended destination of the payload portion" covers the scenario where the intended destination is a bilingual slave that can demodulate both the "first modulation method" and the "second modulation method," then claim 1 and any claim depending directly or indirectly from it are invalid for lack of written description.

366. Similarly, as to independent claim 58 the ’580 patent, to the extent it is argued or determined that the phrase “at least one message is addressed for an intended destination of the sequence” covers the scenario where the intended destination is a bilingual slave that can demodulate both the “first modulation method” and the “second modulation method,” then claim 58 and any claim depending directly or indirectly from it are invalid for lack of written description.

367. Similarly, as to independent claim 1 of the ’228 patent, to the extent it is argued or determined that the “first message address information that is indicative of the one or more slave transceivers being an intended destination of the second information” and the “second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information” cover the scenario where the first and second message address information indicate that a bilingual slave is the intended destination for both of the “second information” (which is “modulated according to the first modulation method”) and the “fourth information” (which is “modulated according to the second modulation method”), then claim 1 and any claim depending directly or indirectly from it are invalid for lack of written description. Thus, if the recited “single slave transceiver” (*i.e.*, the target of the “fourth information”) can be the same slave transceiver that is the intended recipient of the “second information,” then the claim is invalid for lack of written description because the patents only describe a “single slave transceiver” that can communicate in only one of the claimed “first” and “second” modulation methods.

D. The Asserted Claims Recite Well-Understood, Routine, Conventional Subject Matter.

368. I have been asked to provide my opinion as to whether the Asserted Claims of the ’580 and the ’228 patents claim well-understood, routine, conventional subject matter. In my opinion, the elements of the Asserted Claims contain well-understood, routine, and conventional

concepts, and each of the Asserted Claims, considered as a whole, recite well-understood, routine, and conventional subject matter.

369. For example, the only structure claimed is a "transceiver in the role of a master" (or "master transceiver"). Transceivers (which simply refers to "transmitter" / "receiver") are well-known in the art and are conventional and generic. Moreover, a transceiver in the role of a master is not novel or unique. As discussed above, Rembrandt has already admitted repeatedly that Mr. Bremer did not invent master/slave communications. *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 137:6-14. Likewise, Mr. Bremer admitted previously during the *Samsung* trial that he did not invent any of the modulations listed in the patent. Using known hardware (transceivers) to send messages using known modulation schemes in a known network configuration (master/slave) is not inventive. Each of these elements is well-known, conventional, and generic and is being used in its conventional and generic manner (*e.g.*., the purpose of a transceiver is to transmit and receive data).

370. Further, the claimed messages are also conventional and generic. The claims recite a master transceiver configured to send conventional messages comprising (1) "first information," *e.g.* a conventional training portion and/or header, and (2) "second information," *e.g.* a data or "payload" portion. '580 patent at col. 7:66-8:1; '228 patent at col. 8:29-31, 43-48. The first training portion can be used for establishing the communication protocol and may include "address information" and information about "the modulation method" to be used for the "second information." '580 patent at col. 8:1-7, 12-14; '228 patent at col. 8:36-38, 43-47, 56-58, 10:28-30. The second "payload" portion may simply provide the "data intended for one of the one or more slave transceivers." '228 patent at col. 8:31-34, 48-55; *see also* '580 patent at col. 8:1-7. All of this was well-known and conventional before the filing date of the Provisional

Application, as evidenced, for example, by the multiple prior art references described in this report that did exactly this.

371. The specification itself characterizes this claimed message structure as generic. Specifically, the specification describes how conventional prior art transceiver messages begin with "training signals" that include "the address of the trib [*i.e.*, slave transceiver] with which the master is establishing communication." '228 Patent at col. 4:19-22; '580 Patent at col. 3:62-65. Such "training signals" also can be used to communicate that the desired "modulation module is available," "exchange parameters for optimizing performance and/or to select optional features," and otherwise confirm "agreement" on a communication protocol "prior to entering into data communication mode between the users." '228 Patent at 4:10-22; '580 Patent at 3:53-4:3. Conventional messages follow the "training signals" with a "data session," wherein the modulated data is sent from the master to the identified slave transceiver. *See* '228 Patent at 4:22; '580 Patent at 3:65; *see also* Provisional Application at 2-3 (describing conventional "data communications to date"); *id*. at 2 ("In the prior art, modems attempting to negotiate communication eventually seek to find a common modulation method … If a common modulation method is found, the modems will then exchange sequences of signals … commonly referred to as 'training signals' … [which may] also include the address of the communicating trib. Furthermore, at the end of a data session the modems may exchange other signals ('trailing signals')[.]"). In addition, I note that Rembrandt's expert in the *Samsung* litigation admitted that training signals—including training signals that included an address—and trailing signals were well-known in the art prior to the claimed priority date. RIP00087706 (Akl Depo Tr.), 29:19-30:3.

372. Further, as discussed above in Section IX.D, the Patent Office has previously determined that the independent claims from which the Asserted Claims depend are not

patentable in view of certain prior art, and has therefore cancelled those claims. *See* IPR2014-00518, Pap. 47 at 21 [REM_USPTO_00023613 at 22]; IPR2014-00892, Pap. 46 at 23 [RIP00103337 at 23]. The Asserted Claims similarly recite subject matter that was well-understood, routine, conventional, as evidenced by additional prior art as discussed above in Section IX of my report. For example, it was well-understood, routine, and conventional to have a master transceiver configured to send information using two different modulation methods, wherein the master transceiver was configured to transmit information indicating which modulation method would be used. *See id*.

XI. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

373. I understand that certain objective factors, sometimes known as "secondary considerations," may be taken into account in determining whether a claimed invention would have been obvious. *See* Section VIII.B (providing relevant legal principles).

374. I understand that Apple served an interrogatory asking Rembrandt to "describe in detail [Rembrandt's] contentions, if any, that secondary considerations (including commercial success, long-felt need, failed attempts of others to solve a problem, initial skepticism, industry recognition and praise for alleged invention, and copying and imitation by others) support the alleged non-obviousness of [the asserted claims]." Apple's Third Set of Interrogatories to Plaintiff (Dec. 9, 2019) at 10. I understand that Rembrandt's expert witness has the burden of proving such secondary considerations, and I therefore reserve the right to rebut any testimony that Rembrandt's witness may provide in his expert report or at trial.

375. I understand Rembrandt responded, in conclusory fashion, that each of these factors supports that the asserted claims would not have been obvious, but explained its position only with respect to the factors of (1) commercial success, (2) copying and imitation by others,

(3) industry recognition and praise for alleged invention, and (4) long-felt need. *See* Rembrandt's Response to Apple's Third Set of Interrogatories (Jan. 8, 2020) at 16-18.

376. In my opinion, Rembrandt has not established that any secondary consideration supports the validity of any asserted claim.

A. No Nexus

377. As a preliminary matter, I understand Rembrandt claims that there is a presumption of nexus between its alleged objective evidence of non-obviousness and the merits of the claimed invention because "[such] evidence is tied to a specific product and that product is the invention disclosed and claimed in the patent." Rembrandt's Response to Apple's Third Set of Interrogatories (Jan. 8, 2020) at 15 (citing *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016)). However, Rembrandt did not tie any of its alleged evidence to any specific product, let alone explain how any specific product is the invention disclosed and claimed in the patent. It is my understanding that both of these elements are necessary for the presumption to apply.

378. Moreover, I understand that the presumption of "nexus" requires the patent owner to show that the asserted objective evidence is tied to a specific product and that product embodies the claimed features, and is coextensive with them. I further understand that this requires the patent owner to demonstrate that the product is essentially the claimed invention. It is my understanding that where the patented invention is only a component of the product to which the asserted objective considerations are tied, there is no presumption of nexus. In this case, Rembrandt alleges that the asserted claims cover a very limited aspect of Bluetooth EDR, specifically (1) functionality for transitioning from transmitting a Bluetooth BR packet to transmitting a Bluetooth EDR packet ('228 Patent), and (2) functionality for reverting from transmitting a Bluetooth EDR packet to transmitting a Bluetooth BR packet ('580 Patent). *See*

generally Rembrandt's Infringement Contentions (Apr. 26, 2019) at Exs. B and C. This functionality represents a very small portion of the functionality described in the Bluetooth specifications implemented by the accused products. In this regard I note that Rembrandt's Infringement Contentions cite only a handful of pages among the more than 1,200 pages of the Bluetooth 2.0 + EDR Specification. *See generally* Rembrandt's Infringement Contentions (Apr. 26, 2019) at Exs. B and C; RIP00005169 (Bluetooth 2.0 + EDR Specification); *see also* APL-REMBR01122709 (Bluetooth 2.1 + EDR); APL-REMBR01074533 (Bluetooth 3.0 + HS); APL-REMBR01124129 (Bluetooth 4.0); APL-REMBR01131887 (Bluetooth 5.0); APL-REMBR_01161278-APL-REMBR_01161926 (Bluetooth Profiles A2DP, AVTCP, AVDTP, AVRCP, DID, GAVDP, HFP, SPP and RFCOMM).

379. Additionally, the accused products including computers, smartphones, tablets, etc., are immensely complex, powerful and feature-rich, such that their Bluetooth functionality, similarly, represents only a very small portion of the products' total functionality. Accordingly, there is no nexus between Rembrandt's alleged objective evidence of non-obviousness and the merits of the claimed invention.

380. Finally, Rembrandt's allegations as to commercial success, copying and imitation by others, and industry praise and acceptance fail to take into consideration the fact that the underlying independent claims have already been found unpatentable as obvious by the PTAB. *See* IPR2014-00518, Pap. 47 at 21 [REM_USPTO_00023613 at 22]; IPR2014-00892, Pap. 46 at 23 [RIP00103337 at 23]. These independent claims include the "embedded modulation" limitations of using two different methods of modulation, which I understand Rembrandt asserted at trial in the *Samsung* litigation was "Mr. Bremer's invention . . . [w]hat he invented was actually embedded modulations." *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 36-37. I understand that Rembrandt did not appeal those IPR decisions.

B. No Commercial Success

381. I understand Rembrandt alleges that "products with Bluetooth EDR functionality, including Apple's accused products, have enjoyed significant sales due to its [sic] use of the inventions in Plaintiff's asserted claims[,]" and that this commercial success supports the non-obviousness of the asserted claims. *See* Rembrandt's Response to Apple's Third Set of Interrogatories (Jan. 8, 2020) at 16. Even assuming the asserted claims cover Bluetooth EDR functionality (they do not), Rembrandt has not shown any nexus between such commercial success and the accused Bluetooth EDR functionality. Bluetooth EDR functionality does not drive consumer demand for Apple's products. *See, e.g.*, APLREMBR_01037667 through APL-REMBR_01037974, APL-REMBR_01050110 through APLREMBR_01050562, APL-REMBR_01141736 through APL-REMBR_01144684, and APLREMBR_01138157 through APL-REMBR_01141735 (marketing materials and consumer surveys regarding the accused Apple products, none of which mentions Bluetooth EDR functionality).

382. Moreover, as discussed above, the claims of the '228 and '580 patents are directed to "a transceiver" with certain claimed functionality. The accused products have numerous components and functionality that are unrelated to and independent of any Bluetooth transceiver function. Any analysis that points merely to, for example, the success of the accused products in general, or unclaimed features, does not inform a person of ordinary skill in the art whether the claimed subject matter of the '228 and '580 patents would enjoy similar success.

383. The accused products contain numerous unclaimed features. For example, Apple's marketing documents for AirPods identify numerous unclaimed features, including without limitation: instantly turn on and connect to your iPhone; automatically on; automatically connected; one-tap setup for all your Apple devices; small form factor; quick access to Siri with a double-tap; rich, high-quality audio and voice; seamless switching between devices; wireless;

dual beam-forming microphones; dual optical sensors; motion-detecting accelerometer; speech-detecting accelerometer; charges quickly in the case; and Lightning to USB Cable. *See e.g.*, APL-REMBR_00987428; APL-REMBR00000252. Likewise, Apple's witnesses testified that the AirPods include many key innovations—which aren't related to EDR—include a small form factor, ultralow power, and very high fidelity. *See, e.g.*, 1/13/2020 Berny Tr., 12:25-14:6. Apple's marketing documents for the Watch Series 3 identify numerous unclaimed features, including without limitation: GPS; cellular; faster dual-core processor; barometric altimeter; heart rate sensor; accelerometer; gyroscope; ambient light sensor; Siri speaks; Capacity 16GB; Ion-X glass; Wi-Fi; Water resistant 50 meters; LTE and UMTS; 2x brighter. *See e.g.*, APL-REMBR_00000457-460. Apple's marketing documents for the Beats Solo3 Wireless Headphones identify numerous unclaimed features, including without limitation: award-winning sound and design you've come to love from Beats; premium playback, fine-tuned acoustics; instantly set up; simultaneously connect; wireless; with Fast Fuel, 5 minutes of charging gives you 3 hours of playback when battery is low; integrated on-ear controls coupled with dual beam-forming mics; adjustable fit with comfort-cushioned cups; sleek, streamlined design that's durable and foldable to go everywhere you do; and take calls, control your music and activate Siri with the multifunction on-ear controls. *See e.g.*, APL-REMBR00000754-758. Apple's marketing documents for the MacBook Pro 13-inch model identify numerous unclaimed features, including without limitation: Quad-core Intel processor with Turbo Boost, 16GB memory; storage; retina display; wide color; True Tone technology; Touch Bar with integrated Touch ID sensor; Force Touch trackpad; Intel Iris Plus Graphics 655; Four Thunderbolt 3 (USB-C) ports; Thunderbolt; Wi-Fi; camera; video support; voice control; voice over; zoom; increase contrast; reduce motion; Siri and dictation; switch control; text to speech; and built-in Apps. *See e.g.*, APL-REMBR_00006920-6924; APL-REMBR00000754-758; APL-REMBR00007568-

7655. Apple's marketing documents for the iMac identify numerous unclaimed features, including without limitation: LED-backlit display; dual-core Intel Core i5 (Turbo Boost up to 3.6GHz); Intel Iris Plus Graphics 640; Wi-Fi; Force Touch trackpad; Multi-Touch gestures; FaceTime HD camera; Thunderbolt 3 digital video output; Stereo speakers; voice over; zoom; increase contrast; reduce motion; Siri and dictation; switch control; closed caption; text to speech; and built-in Apps. *See e.g.*, APL-REMBR00000821-824. Apple's marketing documents for the iPhone identify numerous unclaimed features, including without limitation: Wi-Fi; cellular; retina HD display; Multi-Touch display with IPS technology; True Tone display; Wide color display; 3D Touch; Display zoom; Splash, Water, and Dust Resistant; camera; video recording; FaceTime HD camera; Touch ID; Apple Pay; video calling; audio calling; audio playback, video playback; Siri; Home/Touch ID sensor; voiceover; zoom; magnifier; RTT and TTY support; Siri and dictation; Type to Siri; switch control; closed captions; assistive touch; speak screen; built-in Apps; and language support. *See e.g.*, APL-REMBR_00002282-2288; APL-REMBR00003498-4007; APL-REMBR00002312-2313. Apple's marketing documents for the iPad identify numerous unclaimed features, including without limitation: Wi-Fi; cellular; Smart Connector; Lightning connector; retina display; LED backlit Multi-Touch display; ProMotion technology; Wide color display; True Tone display; camera; video recording; FaceTime HD camera; video calling; dual microphones; Touch ID; three-axis gyro; accelerometer; barometer; ambient light sensor; Siri; Apple Pay; voiceover; zoom; magnifier; Siri and dictation; switch control; closed captions; assistive touch; speak screen; built-in Apps; and language support. *See e.g.*, APL-REMBR_00001244-1250; APL-REMBR00002074-2213. Apple's marketing documents for the iPod identify numerous unclaimed features including without limitation: Wi-Fi; 4-inch (diagonal) widescreen display with Multi-Touch IPS technology; retina display; Camera, Photos, and Video; HD video recording; FaceTime HD

Camera; face detection; Audio Playback; TV and Video; Three-axis gyro; and Accelerometer. *See e.g.*, APL-REMBR00004020-4024.

384. I understand Rembrandt also alleges that commercial success supports the non-obviousness of the asserted claims because, "[s]tarting with Bluetooth Version 2.0 + EDR, the Bluetooth SIG standard has included two different types of modulation, as claimed by the patents-in-suit." *See* Rembrandt's Response to Apple's Third Set of Interrogatories (Jan. 8, 2020) at 16. However, whether two different types of modulation methods are included in certain Bluetooth standards has no bearing on the "commercial success" factor for non-obviousness, which instead must focus on the commercial success of products allegedly covered by the asserted claims. In any event, the asserted claims do not cover merely utilizing two different types of modulation methods. Utilizing two different types of modulation methods is part of the prior art, and as such, just one among numerous limitations of the asserted claims, and was included in the independent claims that the PTAB found unpatentable. *See* IPR2014-00518, Pap. 47 at 21 [REM_USPTO_00023613 at 22]; IPR2014-00892, Pap. 46 at 23 [RIP00103337 at 23].

385. Finally, I understand Rembrandt alleges that commercial success supports the non-obviousness of the asserted claims because BlackBerry and Samsung have licensed the patents-in-suit. It is my understanding that the "commercial success" factor for non-obviousness, focuses on the commercial success of products allegedly covered by the asserted claims. My understanding is that the fact that BlackBerry and Samsung took licenses to the patents-in-suit is not relevant to the "commercial success" calculus, because these licenses were for resolution of litigation. As such, it is my understanding that these licenses do not inform with respect to commercial success of the products accused in Rembrandt's case against BlackBerry and Samsung.

C. No Copying and Imitation by Others

386. I understand Rembrandt alleges that copying and imitation by others supports the non-obviousness of the asserted claims because, "[s]tarting with Bluetooth Version 2.0 + EDR, the Bluetooth SIG standard has included two different types of modulation," and "the SIG standard was developed to promote widespread use of Bluetooth technology." *See* Rembrandt's Response to Apple's Third Set of Interrogatories (Jan. 8, 2020) at 16. Rembrandt also alleges this factor supports the non-obviousness of the asserted claims because "[t]he SIG standard requires backwards compatibility," which "ensures that Bluetooth users cannot design around the Rembrandt patents." *Id.* However, I am not aware of any evidence presented by Rembrandt of any instance of any copying of the technology claimed in the patents-in-suit. While products may be designed to utilize different modulations, as Rembrandt asserts is specified by the Bluetooth 2.0 + EDR standard (or higher), this is not evidence of copying of the technology claimed in the patents-in-suit. As I noted above, the asserted claims do not claim merely utilizing two different types of modulation methods. Further, utilizing two different types of modulation methods is part of the prior art, and as such, just one among numerous limitations of the asserted claims.

D. No Industry Praise/Acceptance

387. I understand Rembrandt alleges that industry recognition and praise for Bluetooth EDR supports the non-obviousness of the asserted claims. Specifically, Rembrandt cites to various commentaries that Bluetooth EDR functionality results in a higher data rate and reduced power consumption. *See* Rembrandt's Response to Apple's Third Set of Interrogatories (Jan. 8, 2020) at 17-18. However, Rembrandt did not invent any type of modulation that achieves a higher data rate or reduces power consumption. Its claims recite, among other things, transmitting various information according to either a first or second type of modulation method.

The asserted claims do not specify any particular first or second type of modulation method, which only when selected and employed, may impact the data rate and power consumption. The documents cited by Rembrandt relate to unclaimed features, as well as features that were already present in the art. For example, Gordon Bremer, the alleged inventor of the patents-in-suit, admitted that he "did not invent master/slave communications," he "didn't invent polling," he "didn't invent multipoint communications," and he "didn't invent any of the modulation methods" in his patents or other modulations (QAM, FSK, DMT, PAM, PSK or PPM). *Samsung* Trial Tr., 2015-02-09 PM Session [RIP00110505] at 137. Indeed, Mr. Bremer admitted that he did not participate in any meetings of the Bluetooth standards body group and he didn't make any contribution to the standards body—including the EDR portion of the standard—that the Bluetooth SIG was developing and that is the subject of the "industry praise" documents Rembrandt cites in its interrogatory response. *Id.*, 117-118; *See* Rembrandt's Response to Interrogatory 15 at 17-18. Moreover, that others praised EDR generally has no nexus to praise for the alleged invention as claimed in the only asserted dependent claims—namely, an indication that communication has reverted to a first modulation method (as claimed in '580 claims 2 and 59) or inclusion of "first message address data" within the first information (as claimed in '228 claim 21). I note, again, that the underlying independent claims have already been found unpatentable as obvious and Rembrandt did not appeal those findings, so it is my understanding that praise for EDR generally does not suffice to show a nexus without tying it specifically to the purportedly novel aspects of the asserted claims.

Dated: January 27, 2020 Respectfully Submitted,

Richard T. Mihran, Ph.D.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing document was served upon counsel of record for Plaintiff Rembrandt Wireless Technologies, LP via email on January 27, 2020.

/s/ Andrew N. Saul
Andrew N. Saul

EXHIBIT A

RICHARD T. MIHRAN, PH.D.

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University of Colorado
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Education

Ph.D. Electrical Engineering, 1990
University of Colorado, Boulder, CO
M. S. Electrical and Computer Engineering, 1988
University of Colorado, Boulder, CO
B. S. Electrical Engineering and Applied Physics, 1982
Case Western Reserve University, Cleveland, OH

Professional Academic Experience

UNIVERSITY OF COLORADO, Department of Electrical, Computer and Energy Engineering, Boulder, Colorado.
Professor Adjunct, Assistant Research Professor and Lecturer, June 1990 to present
Teaching and research in electrical and biomedical engineering in the electrical and aerospace engineering departments in the areas of electronic, optical, and ultrasonic systems and devices.

Representative Courses Taught (University of Colorado, Department of Electrical and Computer Engineering, 1990-present)

Design of Implantable Medical Devices (ECEN 4021/5021): Senior/Graduate - level course covering engineering applications in medicine emphasizing design of implantable devices, including cochlear implants, spinal cord stimulators, injectable microstimulators, retinal and visual-cortex implants, and the artificial β-cell; biomaterials and tissue/material interface processes, electrochemical and optical sensors, and engineering analysis applied to physiological systems.
Engineering Applications in Medicine and Biology (ECEN 4011/5011): Senior/Graduate - level courses covering engineering applications in medicine, emphasizing implantable devices for the cardiovascular system, such as pacemakers, implantable cardioverter-defibrillators, total artificial hearts, left-ventricular assist devices, and laser angioplasty devices.
Microelectronic Devices (ECEN 3250): Lecture and laboratory course covering active CMOS, BJT and GaAs semiconductor devices and circuits, including device physics, software-based modeling and simulation, analog and digital discrete and integrated circuit applications, semiconductor lasers, LEDs, photodiodes/transistors.
Introduction to Signal Processing (ECEN 2260): Lecture and laboratory covering signal processing circuits, systems, and software algorithms, including frequency domain analysis and second-order system response in the time and frequency domains.
Circuits and Electronics I (ECEN 2250): Lecture and laboratory covering fundamental principles of AC and DC electronic circuits, systems, and devices, software-based modeling and simulation.
Introduction to Optical Electronics (ECEN 4645/5645): Lecture course covering gas and solid state laser theory, Gaussian optics, single/multimode wave propagation in optical fibers, optoelectronic modulators, nonlinear optics, electrooptical sensors and detectors, and related optical devices and systems.
Introduction to Digital and Analog Electronics (ECEN 1400): Lecture and laboratory covering analog and digital circuit analysis and design.
Neural Signals (ECEN 4811/5811): Lecture course covering biophysical bases of electrical signal generation and propagation in nerve cells and other excitable tissues. Topics include membrane electrochemical equilibrium, generation of transmembrane potentials, control of ionic conductance, sensory transduction, synaptic transmission, and active transport processes.

Doctoral Dissertation Research Supervision/Committees:

Characterization and Design of Low-power Wireless Power Delivery Systems; E. Falkenstein, doctoral dissertation, 2011. RF front ends and multi-band antenna/rectenna elements for harvesting broadband (2.4-24 GHz) power/telecom applications.
Broadband Components for RF Front Ends; E. Cullens, doctoral dissertation, 2009-10. Microwave front ends and multi-band antenna elements for broadband (2.4-24 GHz) telecommunications/radar applications.
Telementoring using Haptic Communication; G. Gruener, doctoral dissertation, 1998. Design of haptic interfaces for providing touch/tactile feedback for virtual environments/telementoring.
Nonlinear Analytical Model of the Autonomic Basis of Heart Rate Variability (HRV); D. Becker, Ph.D., 2000. Time-dependent spectral analysis and signal processing techniques.
Prediction and Verification of Internal Electric Current Distribution in Muscle from Surface Application; W. Waugaman, Ph.D., 1999. Application of Finite Element Method (FEM) to modeling of current densities in tissue.
Automated tissue classification and feature extraction from digital images using artificial fuzzy neural networks; Mehdi Sedighi, Ph.D., 1998. Optical image processing and feature extraction.
Fast Electromagnetic Simulations using Wavelets; David L. Gines, Ph.D., 1997. Wavelet methods for computationally intensive electromagnetic simulations for GHz waveguide designs.
Super-Resolution Methods for Single Trial Neuromagnetometry; John W. Hobbs, Ph.D., 1997. Signal processing/filtering and feature extraction from neuromagnetometry data.
The Effects of DC and ELF AC Magnetic Fields on the Division Rate of Mastocytoma Cells; Cynthia Leigh Bingham, Ph.D., 1996. Electromagnetic field interaction with biological systems.

UNIVERSITY HOSPITAL, Department of Experimental Surgery, Groningen, The Netherlands
Visiting Scientist, 1982 - 1984. Development of glucose sensor and wearable insulin infusion system.

UNIVERSITY OF COLORADO, Department of Electrical and Computer Engineering, Boulder, Colorado.
Research Assistant, 1985 to 1990. Development of laser-based devices and systems; high-power ultrasound modulation of nerve and cardiac tissue.

CLEVELAND CLINIC FOUNDATION, Department of Artificial Organs, Cleveland, OH
Research Associate, 1979-1982. Fabrication/mechanical design of insulin-infusion devices.

Professional and Technical Consulting:

Technical Consultant, St. Jude Medical Inc., 2014-2016
- Technical consulting directed to far-field RF communication protocols with implanted medical devices.
- Technical consulting directed to pulse generators used in Spinal Cord Stimulation (SCS)
- Technical consulting directed to MRI-compatible leads

Technical Consultant, Greatbatch-QIG Group (now Nuvectra) Broomfield CO, 2010
- Technical consulting directed to pulse generators used in Spinal Cord Stimulation (SCS), and general neuromodulation applications.

Technical Consultant, Echostar Communications (Dish Network), Englewood CO, 2009 – 2012
- Technology analysis and intellectual property assessment for DVR technology and transmitted packet processing used in Direct Broadcast Satellite (DBS) digital television networks.

Technical Consultant, VUE Technology, Lake Forest CA, 2005 – 2008 (Acquisition by Tyco International, Oct 2008)
- Technology analysis and development and intellectual property assessment for radio-frequency (RF) network system designs, networked antenna systems and data networks for radio frequency identification systems.

Technical Consultant, HID Corp./Assa Abloy Corp, 1995 – 2015

- Contactless Smart Card systems and networks, radio frequency identification systems, access networks and systems. Technology development and analysis, intellectual property assessment, reverse engineering of RFID transponders and readers.
- Evaluation of intellectual property portfolios associated with due diligence in corporate acquisitions.

Technical Consultant, Intrado, Inc., Longmont, CO, 2008

- Consulting addressing cellular telecommunication network technologies for emergency response systems.

Technical Consultant, Boston Scientific Corp, 2004 – 2005

- Technology analysis and intellectual property portfolio assessment associated with due diligence activities during/following acquisition of Advanced Bionics, Corp. in the areas of Spinal Cord Simulation (SCS), cochlear implant, and BION microstimulator technologies.

Technical Consultant, Synthes, Inc., West Chester, PA, 2007-2012

- Development of measurement and analysis system for 2-dimensional mapping of pressure v. position profiles over compliant, contoured surfaces.
- Technical consulting addressing mechanical characterization, stress analysis of cervical and lumbar spinal implant devices.

Technical Consultant, Terraspark Geosciences, Inc., Denver, CO, 2007 – 2009

- Technology analysis of feature extraction/pattern recognition algorithms and related software technology applied to the analysis of 3D seismic data for gas and oil exploration.

Technical Consultant, FreeWave Technologies, Inc., Boulder, CO, 2006

- Comprehensive analysis of 900 MHz spread-spectrum radio data transceivers and technology used in point-to-point and point-to-multipoint data telemetry networks.
- Analysis of emerging and competitive broadband wireless data technologies and platforms.

Technical Consultant, Maxtor Corporation, 1997 – 2006

Product analysis and intellectual property assessment for computer disk drive and data storage systems.

- Technical analysis in support of licensing/ cross-licensing negotiations with major competitors
- Reviewed and assessed entire Maxtor/Quantum US Patent portfolio as part of acquisition of Quantum Corporation (approx. 850 patents).
- Reverse engineering of data storage products.
- Analysis of emerging data storage technologies/ manufacturing data.
- Technical presentations to Board of Directors

Technical Consultant, Sokymat, SA, Granges Switzerland, 2005

- Analysis and reverse engineering of radio-frequency identification (RFID) transponders and RF reader systems.

Technical Consultant, Sonic Innovations, Inc. Salt Lake City, UT, 2004-2007

- Analysis of digital signal processing algorithms for auditory prostheses.

Technical Consultant, Synthes, Inc., West Chester, PA, 2007-2012

- Development of measurement and analysis system for 2-dimensional mapping of pressure v. position profiles over compliant, contoured surfaces.
- Technical consulting addressing mechanical characterization, stress analysis of cervical and lumbar spinal implant devices.

Technical Consultant, Destron Fearing Corp, Inc., St. Paul, MN, 2000-2002

- Development and analysis of far-field RF communication technologies for syringe-implantable micro-transponders/transmitters.
- Integration of temperature sensing and data transmission in syringe-implantable RFID devices.

Technical Consultant, PixSys, Inc./ SNT, Boulder CO, 1994-6

- Development of diffractive lens system and associated electro-optical systems for CCD camera arrays utilized for real-time three-dimensional tracking of surgical instruments with mapping to CT/MRI data sets.

Technical Consultant, Interim Director of Research and Development, DDX, Inc., 1992 – 1993

- Development of laser-based optical biosensor technology and RF wireless data telemetry systems for agricultural management systems.
- Principle investigator on successful phase I and II SBIR proposals for development of semiconductor laser optical sensor/assay system based on patterned bioactive sensors formed on silicon substrates.

Doppler Radar Signal Processing Algorithm/Software Development

- Development of Doppler radar hardware and signal processing algorithms and software implementations in Delphi Pascal and C++ for monitoring flight parameters of small projectiles. Two patents issued and licensed: "Spin Determination for a Rotating Object" (US 6,244,971 B1) and "Launch and Aim Angle Determination for an Object" (US 6,547,671).

Legal and Litigation Consulting, Trial and Deposition Testimony:

- **Testimony in seven District Court Trials and Two International Trade Commission (ITC) Hearings** in the areas of wireless technologies, medical devices/systems, telecommunications/networking, RF networks, RFID devices and systems, computing, signal processing, and related fields.
- **IAM 1000 "Recommended" Technical Expert Witness (2015):** One of only 27 technical expert witnesses named as "recommended," and identified as one of the "leading testifying experts" in the United States.

Summary of Trial Testimony Experience:

- ***District Court Trials:***

Bridgestone Americas v. Schrader-Bridgeport International, et al., U.S. District Court for the District of Delaware, Case No. 13-763-GMS.
Subject: Expert witness testimony at jury trial for non-infringement of two patents directed to power management and wireless transmission capabilities of RFID/TPMS devices on behalf of Defendant Schrader International. Prepared and submitted expert report addressing non-infringement of both patents; testimony at trial and in deposition, 2014-2015.
Result: Both patents found not infringed by DE District Court Jury at trial, June 2015.

USEI v. Texas Instruments No. 6:11-cv-491-LED (E.D. Tex.); USEI v. Ricoh, et al. No. 6:12-cv-235
Subject: Expert witness on behalf of Defendants, testifying at trial on three patents addressing network interface controllers and network adapter technology, Ethernet MACs. June 2013 – June 2014
Result: Two of three patents dropped after invalidity trial, third patent ruled invalid in post-trial ruling.

DNT, LLC v. Sprint-Nextel Corp., et al., U.S. Dist. Court for the Eastern Dist. of VA, Richmond Division, Case No. 3:09-cv-0021(JRS),
Subject: Expert testimony at trial and deposition on behalf of Defendants. Patent asserted against cellular providers and wireless network adapters providing Internet connectivity over cellular broadband networks.
Result: Patent found invalid and not infringed in jury trial, December 2009

Fujitsu Limited v. Belkin Intl., Inc., D-Link Corp., NetGear, Inc., Zyxel Comm. Corp
Subject: Expert witness on behalf of Defendants. Twice-reexamined patent asserted against defendants' wireless network adapters and routers/access points providing connectivity in wireless local area networks (LANs). Trial testimony as invalidity expert on behalf of defendants, Nov-Dec. 2012.
Result: Patent found invalid by jury at trial, San Jose, CA, Dec. 2012.

KBA-Giori SA. v. Muhlbauer, Inc. U.S. Dist. Court for the Eastern Dist. of VA, Norfolk Division, Civil Action No 08-CV-34-HCM-FBS
Subject: Expert testimony at trial and deposition on behalf of plaintiff KBA-Giori, SA. Asserted patent addresses high-speed digital image processing algorithms and systems. 2008 - 2009
Result: Patent found to be valid and infringed in jury trial, October 2009

Cardiac Pacemakers, Inc., Guidant Corporation and Eli Lilly and Co., Plaintiffs, v. St. Jude Medical, Inc., PaceSetter, Inc., and Ventritex, Inc., Cause No. IP96-1718-C H/G: 2000-2001; 2004-2007(Remand following appeal).
Subject: Expert witness testimony at jury trial on behalf of St. Jude rebutting assertions of patent infringement and testifying on invalidity of patent covering cardiac electrical signal processing algorithms and therapies for implantable cardioverter devices (ICDs). Patent non-infringement/invalidity analyses with accompanying expert reports submitted to District Court, trial and deposition testimony on behalf of St. Jude (Defendant).
Result: Patent found non-infringed by jury, patent ruled invalid by Judge in post-trial motion (2001), remanded for new trial on appeal (2004). Patent again ruled by Judge in post-trial motion (2001), remanded for new trial on appeal (2004). Patent again ruled invalid (anticipation) on Summary Judgment (2007).

Destron/IDI, Inc. v. Infopet Identification Systems, Inc., United States District Court, District of Colorado, Civil Action No. 93-Z-2348; Electronic Identification Systems et al. V. Destron/IDI Inc., v. Trovan, Ltd. (Third Party Defendant), Civil Act 94-Z-819: 1993-94
Subject: Expert witness testimony at jury trial for Destron/IDI of infringement of patent claiming syringe-implantable implantable radio-frequency identification technology. Patent infringement/validity analysis with accompanying expert reports submitted to District Court, trial testimony to jury on behalf of Destron/IDI.
Result: Jury upheld validity of Destron patent, found willful infringement, court issued Permanent Injunction of infringing products.

- **Hearing/Trial Testimony at the International Trade Commission**

Immersion Corp. (complainant) v. Apple, Inc. and AT&T Mobility, LLC (respondents), United States International Trade Commission: Certain Mobile and Portable Electronic Devices Incorporating Haptics (Including Smartphones and Laptops) and Components thereof, and; Certain Mobile Electronic Devices Incorporating Haptics (Including Smartphones and Smartwatches) and Components thereof, Investigation Nos. 337-TA-1004/990.
Subject: Expert witness for Apple and AT&T for invalidity and Apple for non-infringement of patent directed to mobile devices having touchscreen HCIs incorporating haptic feedback. Prepared expert reports and gave trial and deposition testimony addressing invalidity and non-infringement.
Result: Trial concluded May 2017, settled 2018.

HTC Corp. v. Apple Inc., United States International Trade Commission: Certain Portable Electronic Devices and Related Software, Investigation No. 337-TA-721
Subject: Expert witness providing technology tutorial before the International Trade Commission, and expert testimony at ITC trial defending validity of two of Complainant HTC's patents. Asserted patents address power management and data preservation methods for smart phones and portable electronic devices. 2010 – 2012.
Result: Both patents found to be valid by ALJ.

General Litigation Support Experience as Technical Expert Witness - Previous 5 years and additional matters:

Wireless/Cellular Technology, Smartphones/Mobile Devices:

Technical Expert Witness for Google, LLC.
Subject: SEVEN Networks v. Google. Expert witness in IPR filing challenging patent addressing data synchronization in networks for use with mobile devices.
Status: Settled, 2019.
Counsel: Paul Hastings, LLP, Washington, DC.

Technical Expert Witness for Apple, Inc.
Subject: Expert witness in two IPR filings challenging patents addressing user interfaces/feedback in portable devices.
Status: Settled, 2019
Counsel: O'Melveny and Myers, LLP, San Francisco, CA.

Technical Expert Witness for Respondent Apple, Inc.: *Immersion Corp. (complainant) v. Apple, Inc. and AT&T Mobility, LLC (respondents), United States International Trade Commission: Certain Mobile and Portable Electronic Devices Incorporating Haptics (Including Smartphones and Laptops) and Components thereof, and; Certain Mobile Electronic Devices Incorporating Haptics (Including Smartphones and Smartwatches) and Components thereof, Investigation Nos. 337-TA-1004/990.*
Subject: Expert witness for Apple and AT&T for invalidity and Apple for non-infringement of patent directed to mobile devices having touchscreen HCIs incorporating haptic feedback. Prepared expert reports and gave trial and deposition testimony addressing invalidity and non-infringement.
Status: Trial concluded 2017, settled prior to ruling, 2018.
Counsel: DLA Piper, Palo Alto, CA

Technical Expert Witness for all Defendants: *In Re: TransData, Inc. Smart Meters Patent Litigation, U.S. District Court, Western District of Oklahoma, CA No. 12-ML-2309-C.*
Subject: Expert witness on behalf of multiple defendants. Prepared and submitted expert reports addressing invalidity and non-infringement of three patents directed to wireless transmission capabilities integrated with digital electric meters used in RF mesh networks. Expert Reports and deposition testimony, 2013-2016.
Status: Settled, 2016.
Counsel: Perkins Coie, LLP, Seattle, WA; Ballard Spahr, Atlanta, GA; Yetter Coleman, Houston, TX.

Technical Expert Witness for Verizon Wireless and AT&T Mobility: *Solocron Media, LLC v. Verizon Communications, Inc., et al., United States District Court, E.D. Texas, Marshall Division, Case No. 2:13-CV-1059-JRG-RSP.*
Subject: Expert witness on behalf of Defendants Verizon and AT&T before the Patent Trial and Appeals Board. Prepared and submitted three expert declarations for IPR Petitions addressing invalidity of patents directed portable electronic devices, including cellular telephones, which may be programmed with audio files selected by the user.
Status: Settled, 2015
Counsel: Wiley Rein LLC, Washington DC; McKool Smith, PC, Dallas TX

Technical Expert Witness for Defendants Sprint-Nextel Corp., Verizon Wireless, T-Mobile USA, US Cellular, Kyocera Wireless, Novatel Wireless, and Sierra Wireless: *DNT, LLC v. Sprint-Nextel Corp., et al., U.S. Dist. Court for the Eastern Dist. of VA, Richmond Division, Case No. 3:09-cv-0021(JRS),.*
Subject: Expert testimony at trial and deposition on behalf of Defendants. Patent asserted against cellular providers and wireless network adapters providing Internet connectivity over cellular broadband networks.
Status: Patent found invalid and not infringed in jury trial, December 2009

Counsel: Nixon Peabody, LLP (Sprint-Nextel; Sierra Wireless), Wiley Rein, LLP (Verizon Wireless), Perkins Coie, LLP (T-Mobile), Procopio, Cory, Hargreaves & Savitch (US Cellular), Troutman Sanders, LLP (Kyocera Wireless), K&L Gates, LLP (Novatel Wireless)

Technical Expert Witness for Complainant HTC, Corp.: *HTC Corp. v. Apple Inc., United States International Trade Commission: Certain Portable Electronic Devices and Related Software, Investigation No. 337-TA-721*
Subject: Technology tutorial before the International Trade Commission, and expert testimony at ITC trial on validity of two of Complainant HTC's patents. Asserted patents address power management and data preservation methods for smart phones and portable electronic devices. 2010 – 2012.
Status: Both patents found to be valid at trial; HTC-Apple Global Settlement, 2012.
Counsel: Finnegan, Henderson, Farabow, Garrett & Dunner, LLP; Washington, D.C.

Technical Expert Witness for Defendant Verizon Wireless, Inc.: *Fenner Investments, Ltd. v. Verizon Wireless, U.S. District Court for the Eastern District of TX, Tyler Div., Case No. 6-11-cv-348*
Subject: Expert witness on behalf of defendant Verizon Wireless, Inc. for non-infringement. Asserted patent addresses management of access to wireless networks. 2013.
Status: Stipulation of non-infringement following dispositive claim construction ruling, 2013.
Counsel: Wiley Rein, LLP.

Technical Expert Witness for Defendants Pantech Wireless, Inc. and Sanyo North America Corp.: *Minerva Industries v. Motorola Inc., et al., Case No. 2-07-cv-229*
Subject: Expert witness on behalf of defendant Pantech Wireless, Inc. and Sanyo North America Corp. Asserted patent addresses Internet-enabled smart phone technology. 2010
Status: Settled 2010
Counsel: HC Park & Assoc., Vienna VA (Pantech); Katten Muchin, Chicago (Sanyo)

Technical Consulting Expert for Motorola, Palm, Inc, Sony-Ericsson Inc., Nokia, Inc., et al.
Subject: Technical consulting and IP analysis addressing Internet-enabled smart phone technology, 2008.

Technical Expert for Samsung Telecommunications, Palm, Inc. Motorola Inc., Nokia, Inc, Sony-Ericsson, Siemens, LG Electronics, Research in Motion: *Morris Reese v. Samsung Telecommunications, et al, C.A. No. 2:05-cv-415 DF, Eastern District of Texas, Marshall Division.*
Subject: Served as technical expert on behalf of defendants. Asserted patent addresses method and device for displaying and storing third-party caller identification data in a call-waiting context during an active cellular telephone connection.
Status: Settled, 2006.
Counsel: Greenberg Traurig, Palo Alto; Wilmer Hale, Palo Alto; Jones Day, Chicago; Baker Botts, Dallas; Kirkland and Ellis, NY; King and Spalding, NY.

Medical Devices and Systems:

Technical Expert Witness for Boston Scientific and Boston Scientific Neuromodulation Corp., *Nevro Corp. v. Boston Scientific Corp. and Boston Scientific Neuromodulation Corp., Case No. 3:16-cv-06830-VC, 2017 – 2018.*
Subject: Technical expert witness for Boston Scientific defending assertions of patent infringement and opining on invalidity of seven patents covering high pulse-rate neuromodulation therapies for implantable spinal cord stimulation systems. Patent infringement/validity analyses with accompanying expert reports submitted to Federal Court, deposition testimony on behalf of Boston Scientific (Defendant).
Status: Majority of asserted claims across seven patents ruled invalid. Remaining claims ruled non-infringed, 2018.
Counsel: Arnold Porter, Palo Alto, CA

Technical Expert Witness for LivaNova Neuromodulation, Inc.
Subject: Expert witness in IPR filings challenging patent directed to implantable neurostimulators for vagal nerve stimulation applications, 2018 - present. Expert declarations and deposition testimony on invalidity.
Status: IPR instituted 2019, in process.
Counsel: Haynes and Boone, LLP, Dallas, TX.

Technical Expert Witness at the International Trade Commission for Dexcom *Dexcom Corp. v. AgaMatrix, In the Matter of CERTAIN ELECTROCHEMICAL GLUCOSE MONITORING SYSTEMS AND COMPONENTS THEREOF, 2017 – present.*
Subject: Technical expert witness for Dexcom supporting assertions of patent infringement and validity of two patents covering glucose sensor and monitoring systems. Patent infringement/validity analyses with accompanying expert reports submitted to the International Trade Commission
Status: In process.
Counsel: Dentons, Washington, D.C.

Technical Expert Witness for St. Jude Medical, Pacesetter, Inc, *Pacesetter, Inc. v. Cardiac Pacemakers, Inc., Civil File No. 02-01908 (C.D. Cal.): 2002-2006*
Subject: Technical expert witness for St. Jude/Pacesetter supporting assertions of infringement of four patents covering cardiac electrical signal processing algorithms and therapies for implantable pacemaker and cardioverter devices. Prepared/submitted multiple expert reports, testimony at deposition.
Status: Settled, 2006.
Counsel: Sidley Austin Brown and Wood, Los Angeles, CA; Gibson Dunn, Palo Alto, CA

Technical Expert Witness for St. Jude Medical, *Cardiac Pacemakers, Inc., Guidant Corporation and Eli Lilly and Co., Plaintiffs, v. St. Jude Medical, Inc., PaceSetter, Inc., and Ventritex, Inc., Cause No. IP96-1718-C H/G: 2000-2001; 2004-2007(Remand following appeal).*
Subject: Testimony at trial on behalf of St. Jude defending assertions of patent infringement and arguing invalidity of patent covering cardiac electrical signal processing algorithms and therapies for implantable cardioverter devices (ICDs). Patent infringement/validity analyses with accompanying expert reports submitted to Federal Court, trial and deposition testimony on behalf of St. Jude (Defendant).
Status: Patent found non-infringed by jury, patent ruled invalid by Judge in post-trial motion (2001), remanded for new trial on appeal (2004). Patent again ruled invalid (anticipation) on Summary Judgment (2007). Final settlement of these and other matters, 2010.
Counsel: Sidley, Austin, Brown & Wood, Los Angeles, CA; Gibson Dunn, Palo Alto, CA

Technical Expert Witness for Defendants Advanced Bionics and Boston Scientific, *Advanced Neuromodulation Systems, Inc. v. Advanced Bionics Corp., Civil Action No. 4:04cv131 (E.D. Tex).*
Subject: Technical Expert consulting on behalf of Advanced Bionics and Boston Scientific against assertions of infringement of patent addressing spinal cord stimulation (SCS) devices. Identification and analysis of key prior art leading to settlement, 2004-2006.
Status: Settled, 2006.
Counsel: Sidley, Austin, Brown & Wood, Los Angeles, CA.

Technical Expert Witness for Defendants Boston Scientific Corp and Radio Therapeutics, Corp., *RITA Medical Systems, Inc. v. Radio Therapeutics Corporation Civil Action No C-01-3267.*
Subject: Expert testimony on behalf of Boston Scientific and RTC against assertions of infringement of multiple patents addressing devices and methods for radio frequency ablation. Affidavit covering patent claim construction analysis submitted to San Francisco Federal Court for Markman hearing, deposition testimony on claim construction.
Status: Settled, April 2003.
Counsel: Sidley, Austin, Brown & Wood, Los Angeles, CA.

Technical Expert Witness for Plaintiff Intermedics*, Intermedics, Inc. v. Cardiac Pacemakers, Inc., United States District Court, District of Minnesota Civil Action No. 4-95-716:*
Subject: Assertion by plaintiff of infringement of multiple patents claiming various aspects of microprocessor-controlled cardiac pacemakers. Patent infringement/validity analyses with accompanying expert reports and affidavits submitted to Federal Court, Deposition testimony on behalf of Intermedics (plaintiff). 1997- 1999.
Status: Settled before trial.
Counsel: Lyon and Lyon, Los Angeles, CA

Technical Expert Witness for Plaintiff Destron, *Destron/IDI, Inc. v. Infopet Identification Systems, Inc., United States District Court, District of Colorado, Civil Action No. 93-Z-2348; Electronic Identification Systems et al. V. Destron/IDI Inc., v. Trovan, Ltd. (Third Party Defendant), Civil Act 94-Z-819: 1993-94*
Subject: Assertion by Destron/IDI of infringement of patent claiming implantable radio-frequency identification technology. Patent infringement/validity analysis with accompanying expert reports submitted to Federal Court, trial testimony to jury on behalf of Destron/IDI.
Status: Jury upheld validity of Destron patent, found willful infringement, court issued Permanent Injunction of infringing products.
Counsel: Sheridan Ross, Denver, Co; Stroock & Stroock & Lavan, New York, NY

Technical Expert Witness for Plaintiff Digital Angel Corp., *Digital Angel Corp. v. Datamars, SA., United States District Court, District of Minnesota, Civil Action No. 04-4544: Oct. 2005 – 2007*
Subject: Assertion by Digital Angel Corp. of infringement of a patent claiming syringe-implantable radio-frequency identification technology.
Status: Settled.
Counsel: Stroock & Stroock & Lavan, New York, NY

Technical Expert Witness for Plaintiff Fischer Imaging Corp., *Fischer Imaging Corporation v. Lorad Corporation/Trex Medical Corporation; Civil Action No. 98-N-772(consolidated with Civil Action No. 98-N-772)*
Subject: Assertion by Fischer Imaging of infringement of patent directed to stereoscopic, image-guided biopsy system. Patent infringement/validity analysis with accompanying expert reports submitted to Federal Court.
Status: Settled, 2001.
Counsel: Sheridan Ross, Denver,

Technical Expert for Sonic Innovations, Inc. *Sonic Innovations, Inc. v. Starkey Laboratories, Inc. and MicroEar Technology, Inc., Case No. 2:03CV00670 DAK*.
Subject: Technical consulting on behalf of Sonic Innovations defending against assertions (in countersuit) of infringement of a patent directed to digital hearing prostheses systems and devices, including invalidity analysis. Presentation of technical analysis at mediation conference. 2004-2005.
Status: Settled, 2005.
Counsel: Thelen Reid and Priest LLP, San Jose, CA

Technical Expert for Sonic Innovations, Inc. *ETG, Inc. v. Sonic Innovations, Inc., U.S. District Court of Delaware, Case No. 1:05-CV-00422-GMS*.
Subject: Technical expert witness on behalf of Sonic Innovations defending against assertions of infringement of two patents involving digital signal processing technology and programming of digital prostheses systems and devices. 2004-2007.
Status: Settled, 2007.
Counsel: Holland and Hart, Salt Lake City, UT

Technical Expert Witness for Plaintiff, *AMD v. Erchonia Medical, Inc.: Civil Action No. 1:05-cv- 02325-WYD-MJW*
Subject: Assertion by AMD of infringement of patent claiming hand-held semiconductor laser apparatus.
Status: Settled, 2007.
Counsel: Sheridan Ross, Denver, CO.

RFID Technology and Devices:

Technical Expert Witness for Defendant Schrader International: *Bridgestone Americas v. Schrader-Bridgeport International, et al., U.S. District Court for the District of Delaware, Case No. 13-763-GMS.*
Subject: Expert witness at jury trial for non-infringement of two patents directed to power management and wireless transmission capabilities of RFID/TPMS devices on behalf of Defendant Schrader International. Prepared and submitted expert report addressing non-infringement of both patents; testimony at trial and in deposition, 2014-2015.
Status: Both patents found not infringed by DE District Court Jury at trial, June 2015.
Counsel: Holland and Hart LLP, Denver/Boulder, CO

Technical Expert Witness for Plaintiff, *HID Global Corp. et al. v. Farpointe Data, Inc., United States District Court, Central District of California, Southern Div., Case No. SACV 10-01954 JVS (RNBx), 2011-2012*
Subject: Assertion by Plaintiff of infringement of two patents claiming programmable multi-technology radio frequency identification (RFID) reader technology. Testimony on behalf of plaintiff addressing infringement and validity of both patents.
Status: Both patents found valid and infringed in Summary Judgment Ruling.
Counsel: Rutan & Tucker, LLC, Costa Mesa CA.

Technical Expert Witness for NXP Semiconductors.
Subject: Expert witness in five IPR filings addressing patents directed to Near Field Communication (NFC) readers and systems for use in mobile devices.
Status: All five IPRs instituted by PTAB, all challenged claims of '770 NFC patent found unpatentable, 2017
Counsel: Ropes and Gray, San Francisco, CA.

Technical Expert Witness for Assa Abloy, AB
Subject: Expert witness in support of IPR petition addressing patent directed to wireless access control systems incorporating proximity detection and other sensors.
Status: IPR instituted by PTAB, all challenged claims invalidated/cancelled, March 2017.
Counsel: Fish and Richardson, Austin, TX, Minneapolis, MN.

Technical Expert Witness for Axcess International, Inc.: *Axcess International v. Savi Technology, Inc., . U.S. Dist. Court for the Northern Dist. of TX, Dallas Division, No 3:10-cv-01033-F*
Subject: Asserted patent directed to a high-sensitivity demodulator for active radio frequency identification (RFID) transponders. 2011 - present
Status: Stayed pending reexamination of patent.
Counsel: Strook, Strook & Lavan, NY, NY

Telecommunications/Telephone Networks:

Technical Expert Witness for Defendant AT&T Mobility, LLC : *Intellectual Ventures II, LLC v. AT&T Mobility, LLC, et al., U.S. District Court for the District of Delaware, Case No. 13-cv-1631-LPS.*
Subject: Expert witness for non-infringement of patent directed to directory assistance/call completion services for cellular wireless networks. Expert report on non-infringement and deposition testimony.
Status: Settled, 2013-2017.
Counsel: Baker Botts, Palo Alto, CA

Technical Expert Witness for Lucent Corp, Nortel Networks Inc., and Qwest Communications, Inc.: *Morris Reese v. Lucent Corp., Nortel Networks and US West, Civil Action No 99-WM-773.*
Subject: Expert testimony on behalf of Lucent, NTI and US West (now Qwest Communications) defending against assertions of infringement of a patent addressing telecommunication switching systems and communication networks which provide Caller ID on Call Waiting, multi-party conferencing, and related features. Patent non-infringement/invalidity analysis with accompanying expert reports submitted to NY

Federal Court in support of motions for summary judgment. Preparation of technology tutorials and demonstratives for trial. 2000 – 2002.
Status: Dismissed on Summary Judgment following fact and expert discovery.
Counsel: Fish and Neave, New York, NY; Cobrin and Gittes, New York, NY; Jones Day, New York, NY.

Technical Expert Witness for Sonic Trading Management, LLC: *Lava Trading Inc. v. Sonic Trading Management LLC,,and RoyalBlue Financial Corp, Civil Action No 03Civ.0842 (TPG)*
Subject: Expert testimony on behalf of Sonic Trading Management against assertions of infringement of a patent covering integration of financial systems data networks and data feeds for securities and commodities trading. Expert report addressing patent claim construction analysis submitted to Southern District of NY Federal Court for Markman hearing, deposition testimony on claim construction issues.
Status: Dismissed on summary judgment (2003-4).
Counsel: Sheridan Ross, Denver CO; Quinn Emanuel, Los Angeles CA (counsel for co-defendant)

Technical Expert Witness for Evercom Systems, Inc.: *Condes, et al. v. Evercom Systems, Inc; SBC Communications, Inc.; Pacific Bell Telephone Co. Case No 2002054255*
Subject: Technical Expert for Evercom Systems analyzing operation of specialized telecommunication calling platforms and associated stored-program-controlled switching equipment.
Status: Dismissed, 2006
Counsel: Andrews Kurth, LLP, Dallas, TX

Technical Consulting Expert for Microsoft Corporation: *Phonetel v. Microsoft et al, Case No 4:00-CV-1750-R)*
Subject: Retained as consulting technical expert on behalf of Microsoft against assertions of infringement of multiple patents covering digital telephony and related storage and display features (RE31,789; 4,821,311; RE33,507; 4,903,289; 4,263,481; 4,737,979; 4,821,308.
Status: Settled (2001)
Counsel: Klarquist Sparkman Campbell Leigh & Whinston, LLP, Portland, OR

Computers, Microelectronic Devices:

Technical Expert Witness for Vizio Corp:
Subject: Prepared and submitted expert declaration in an IPR addressing invalidity of a patent directed to computer display controllers and algorithms, 2019.
Status: Pending Institution decision, 2020
Counsel: Maschoff Brennan, Los Angeles CA, Salt Lake City, UT.

Technical Expert Witness for Defendant Intel Corp: *e.Digital Corporation v. Intel Corporation, et al., U.S. District Court, Southern District of California, Case No. 3:13-cv-2905-H-BGS.*
Subject: Expert witness on behalf of Defendant Intel. Prepared and submitted expert declarations in an IPR addressing invalidity of a patent directed to file management systems used in conjunction with nonvolatile flash memory, 2014.
Status: Settled, 2014
Counsel: Kirkland & Ellis LLP, New York, NY

Technical Expert Witness for Defendants Texas Instruments, ST Microelectronics, Samsung Electronics, Freescale Semiconductor, Xerox Corp, Epson America, Ricoh Americas, Oki Data Americas: *USEI v. Texas Instruments No. 6:11-cv-491-LED (E.D. Tex.); USEI v. Ricoh, et al. No. 6:12-cv-235*
Subject: Expert witness on behalf of Defendants, testifying at trial on three patents addressing network interface controllers and network adapter technology, Ethernet MACs. June 2013 – June 2014
Status: Two of three patents dropped after invalidity trial, third patent ruled invalid in post-trial ruling.
Counsel: Covington & Burling, LLP – San Francisco, CA (Texas Instruments), K&L Gates – Dallas, TX (ST Micro), Akin Gump Strauss Hauer & Feld LLP – Washington, DC (Samsung), Amster Rothstein &

Ebenstein LLP – New York, NY (Ricoh), Bracewell Guiliani LLP – Austin, TX (Freescale Semi), Locke Lord LLP – Dallas, TX (Xerox), Nagashima & Hashimoto – Reston, VA (Oki Data)

Technical Expert Witness for Defendants Canon USA, Inc. and Canon, Inc.; Coby Electronics Corporation, DXG Technology Corporation; Hoya Corp., Hoya Corp. USA, and Pentax of America, Inc.; HTC America, Inc. and HTC Corporation; Imation Corp.; Kyocera Communications, Inc., Kyocera International, Inc., Kyocera Corp. and Kyocera Wireless Corp.; Leica Camera, Inc., Panasonic Corporation of North America and Panasonic Corporation; Marantz America, Inc., D&M Holdings US Inc. and D&M Holdings, Inc.; Nokia Corporation and Nokia, Inc.; Samson Technologies Corp.; Summit Technology Group, LLC; Teac America, Inc. and VTech Electronics North America, LLC: *e.Digital Corporation v. Pentax of America Inc., et al., U.S. District of Colorado, Civil Action No. 09-cv-02578-MSK-MJW.*
Subject: Expert report and testimony at deposition on behalf of Defendants addressing issues of claim construction. Patent addressing digital audio data storage on removable flash memory asserted against smart phone and digital camera manufacturers.
Status: Settled favorably for defendants after dispositive claim construction ruling, October 2011.
Counsel: King and Spalding / Davis Graham & Stubbs (Nokia), Finnegan Henderson (DXG Technology), Patterson & Sheridan (HTC Corporation/HTC America), Greenberg Traurig (Canon, Inc., VTech Electronics NA), Katten Muchin (Kyocera, TEAC, Samson), Morrison and Foerster (Marantz America), Howrey (Coby Electronics), Winston & Strawn (Pentax), Amster Rothstein (Panasonic and Leica Camera), Hole Roberts & Owen (Summit Technology), Chan Law Grp (Imation Corp)

Technical Expert Witness for Visio, Inc.
Subject: Expert witness in IPR filings challenging patent directed to display controllers, 2019 - present. Expert declaration on invalidity.
Status: IPR pending institution, in process.
Counsel: Maschoff Brennan, Los Angeles, CA.

Technical Expert Witness for Trigem Computer, Inc. and TriGem America Corp. *Toshiba Corp. v. Trigem Computer, Inc. and TriGem America Corp, Case No. CV-03-4558-GHK.*
Subject: Expert testimony on behalf of TriGem defending against assertions of infringement of multiple patents addressing computer security and thermal management devices and systems. Non-infringement/invalidity analysis with accompanying expert report submitted to CA Federal Court.
Status: Stayed, 2004.
Counsel: Thelen Reid and Priest LLP, New York and San Jose; Cohen and Gresser, NY, NY.

Networking Technology and Devices:

Technical Expert Witness for Defendants Belkin Intl., Inc., D-Link Corp., NetGear, Inc., Zyxel Comm. Corp.: *Fujitsu Limited v. Belkin Intl., Inc., D-Link Corp., NetGear, Inc., Zyxel Comm. Corp*
Subject: Expert witness on behalf of Defendants. Twice-reexamined patent asserted against defendants' wireless network adapters and routers/access points providing connectivity in wireless local area networks (LANs). Trial testimony as invalidity expert on behalf of defendants, Nov-Dec. 2012.
Status: Patent found invalid by jury at trial, San Jose, CA, Dec. 2012.
Counsel: Reed Smith (NetGear, Inc.), Winston Strawn (Belkin), Law Off. S.J.C Yang, LLP (D-Link and Zyxel)

Technical Expert Witness for Defendant Itron, Inc., *Eon Corp. IP Holdings, LLC, Plaintiff v. Landis+GYR Inc., et al (incl. Itron) U.S. Dist. Court for the Eastern Dist. of TX, Tyler Division, Civil Action No. 6:11-cv-00317-LED-JDL, 2013*
Subject: Expert Witness on behalf of defendant Itron addressing non-infringement of patents directed to Smart Meter Radio Frequency networks and associated technologies.
Status: Settled, 2013
Counsel: Andrews Kurth, LLP, Dallas, TX.

Technical Expert Witness for HTC America: *Levine v. Samsung Telecommunications, Sprint Solutions, AT&T Mobility, HTC America, LG Electronics, Motorola, Inc., Nortex Communications, Palm, Inc., T-Mobile, Verizon Wireless*
Subject: Expert witness on behalf of HTC America. Patents asserted against cellular providers and handsets providing map and navigation services over cellular broadband networks. 2012 - 2013
Status: Settled, 2013
Counsel: Patterson &Sheridan, LLC, Houston, TX

Digital Signal Processing:

Technical Expert Witness for KBA-Giori, SA.: *KBA-Giori SA. v. Muhlbauer, Inc. U.S. Dist. Court for the Eastern Dist. of VA, Norfolk Division, Civil Action No 08-CV-34-HCM-FBS*
Subject: Expert testimony at trial and deposition on behalf of plaintiff KBA-Giori, SA. Asserted patent addresses high-speed digital image processing algorithms and systems. 2008 - 2009
Status: Patent found to be valid and infringed in jury trial, October 2009.
Counsel: Sidley, Austin, Brown & Wood, Los Angeles, CA
Technical Expert Witness for KBA-Giori, SA.: *KBA-Giori SA. v. Muhlbauer, Inc., U.S. Dist. Court for the Eastern Dist. of VA, Norfolk Division, Civil Action No 09-CV-216-HCM-FBS*
Subject: Expert testimony on behalf of plaintiff KBA-Giori, SA. Asserted patent addresses high-speed digital image deformation and processing algorithms and systems. 2009 - 2010
Status: Settled 2010
Counsel: Sidley, Austin, Brown & Wood, Los Angeles, CA

Satellite/Cable Networks, Video-on-Demand Technology

Technical Expert for Defendant EchoStar, *Forgent Networks (VTel) v. EchoStar Technologies Corp., United States District Court, Eastern District of Texas, Tyler Division; Case 6:06-cv-208-LED*
Subject: Assertion by Forgent of infringement by Echostar of U.S. Patent No. 6,285,746 addressing video download and storage technologies delivered over satellite networks. Acted as consulting expert identifying and analyzing prior art for invalidity; 2005.
Status: Patent found invalid by jury at trial, May 2007
Counsel: Sheridan Ross, Denver, CO; Morrison and Foerster, Palo Alto, CA
Technical Expert Witness for Plaintiff EchoStar, *EchoStar Technologies Corp. v. TiVo, inc., and Humax USA, Inc., United States District Court, Eastern District of Texas,Texarkana Div., No. 05:05CV81-DF-CMC*
Subject: Testimony on behalf of EchoStar on infringement of patents addressing multimedia direct access storage devices and systems used in Satellite/Cable/Broadcast digital TV systems, digital video recording (DVR) / set top box technology - US Pat. Nos. 6,529,685; 6,208,804. Dec. 2005 – present
Status: Settled, 2011
Counsel: Morrison and Foerster, Palo Alto and Los Angeles, CA

Technical Expert Witness for MovieLink, LLC: *USA Video Technology Corp. v. MovieLink LLC, Case No 03-368-KAJ*
Subject: Expert testimony on behalf of MovieLink LLC (a joint venture of Metro-Goldwyn-Mayer Studios, Paramount Pictures, Sony Pictures Entertainment, Universal Studios and Warner Bros. Studios) defending against assertions of infringement by MovieLink's internet video delivery technology of a patent addressing retrieval of compressed video files over the public telephone network. 2004-2005
Status: Summary judgment of non-infringement granted, 2005; upheld on appeal, 2006.
Counsel: Sidley, Austin, Brown & Wood, Los Angeles, CA

Technical Expert Witness for Defendants Time-Warner Cable, Comcast, and Charter Communications: *USA Video Technology Corp. v. Time-Warner et al., C.A. No. 2:06cv239 RHC, Eastern District of Texas, Marshall Division.*
Subject: Expert testimony on behalf of TWC, Comcast and Charter on claim construction defending against assertions of infringement by Defendants' cable network video-on-demand technology of a patent addressing retrieval of compressed video files over the public telephone network. 2006-2007
Status: Summary judgment of non-infringement granted, December 2007.
Counsel: Sidley, Austin, Brown & Wood, Los Angeles, CA; Davis Polk & Wardwell, Menlo Park, CA; Thompson Coburn, St. Louis

Technical Consulting Expert for Defendants Time-Warner Cable, Comcast, and Charter Communications:
Subject: Cable network video-on-demand technology and cable network video distribution technology. Dec 2007-2011.
Status: Summary judgment of non-infringement, 2011.
Counsel: Vinson & Elkins, Austin, TX

Technical Expert Witness for Plaintiff, *HID CORPORATION v. SYTRON, INC. et al., United States District Court, District of Colorado Civil Action No. 98-WM-60: 1998*
Subject: Assertion by Plaintiff of infringement of patent claiming radio-frequency identification technology. Patent infringement/validity analysis with accompanying expert reports submitted to Federal Court.
Status: Settled, 1998.
Counsel: Sheridan Ross, Denver, Co.

Patents:

U.S. Patent No. 6,244,971; Spin determination for a rotating object
U.S. Patent No. 6,547,671; Launch and aim angle determination for an object
U.S. Patent No. 5,542,431; CA Patent 2 179 501; Heat detection system

Publications/Conference Proceedings:

"A Nonlinear Analytical Model of the Autonomic Basis of Heart Rate Variability (HRV)", with D. Becker, *Proc. 37th Ann. RMBS Symp.*, April, 2000

"Effects of Pulsed Acoustic and Mechanical Stimuli on the Excitability of Isolated Neuronal and Cardiac Cells", R. T. Mihran et al., *Appl. Occup. Environ. Hyg.*, 11(4), 1-4, 1996

"Rapid Food-borne Pathogen Immunoassay Using Magnetic Bacteria", R.T. Mihran et al., abstracted in *Proc. Tenth Annual Colorado Biotechnology Symposium*, Fort Collins, CO., 1996.

"Assessing Sympathetic Alterations of Cardiac Function in Terrestrial and Reduced-Gravity Environments", with L. Stodiek et al., abstracted in *Proc. Eighth Annual Colorado Biotechnology Symposium*, Boulder, 1995.

"Development of a Rapid-Screen Optical Immunoassay for Penicillin Residue Detection in Milk", Abstracted in *Proc. Sixth Annual Colorado Biotechnology Symposium*, Boulder, 1993.

"Modification of Sciatic Nerve Electrical Excitability by Single, Low-Level Ultrasound Pulses," R.T. Mihran, F. S. Barnes and H. Wachtel, in Bioelectromagnetics Society (BEMS) Eleventh Annual Meeting Abstracts, June 1989.

"A Radially Focusing Fiber Optic Probe for Laser Angioplasty", R.T. Mihran , H.D. Wu, and F.S Barnes, *Progress in Biomedical Optics,* vol. 1642, 153-157, 1992

"Interaction of Laser Radiation with Structures of the Eye," R. T. Mihran, *IEEE Transactions on Education*, Special Issue on Laser Safety, **34** , no. 3, 1991.

"Radiotelemetered measures of Mounting Activity for Detection of Estrus in Lactating Dairy Cows", abstract with R.L. Nebel et al, Proceedings of the National Dairy Science Conference, 291, 1992

"Temporally -Specific Modification of Myelinated Axon Excitability *in vitro* Following a Single Ultrasound Pulse," R. T. Mihran, F. S. Barnes and H. Wachtel, *Ultrasound in Medicine and Biology* **16**, 297-309 (1990).

"Charge and Impedance Analysis of 4000-plus hours of Electrical Stimulation of Sacral Roots with a Foramen Electrode Implant", N. Kaula et al., abstracted in Proceedings of the 18th Annual Conference of the IEEE Engineering in Medicine and Biology Society, 1996

"Comparison of the Neural Excitability Effects of Ultrasonic Fields with those of Electromagnetic Fields," H. Wachtel, R.T. Mihran, F.S. Barnes, abstracted in Proceedings of the Office of Naval Research (ONR) Program on Membrane Electrochemistry, San Francisco, CA, 1991.

"Transient Modification of Nerve Excitability *in vitro* by Single Ultrasound Pulses," R.T. Mihran, F. S. Barnes and H. Wachtel, *Biomedical Sciences Instrumentation* ***26***, 235-246 (1990).

"Transient Modification of Membrane Potential and Conductance by Single Ultrasound Bursts Modulates Neuronal Excitability," R.T. Mihran, F. S. Barnes and H. Wachtel, Proceedings of the 12th Annual Conference of the IEEE Engineering in Medicine and Biology Society, vol. 1., 447-448, 1990

"Modification of Nerve Excitability *in vitro* Following a Single Ultrasound Burst," R.T. Mihran, F. S. Barnes and H. Wachtel, *Innovation et Technologie en Biologie et Medecine,* **12**, No 1, 52-64, (1991) This paper was also abstracted in Proceedings of the 5th Young Researchers Forum, an international conference co-sponsored by the French National Institute for Medical Research (INSERM), the IEEE/EMBS, and the European Society for Innovation and Technology in Biology and Medicine (ITBM), Paris, France, May 1990

"Comparison of Electrical and Mechanical Forces on Membranes," F. S. Barnes , H. Wachtel, and R.T Mihran, Proceedings of the 9th Annual Conference of the IEEE Engineering in Medicine and Biology Society, 1987.

"Development of an Implantable Closed-loop Artificial Endocrine Pancreas," R. T. Mihran, Annual Report of the Department of Experimental Surgery, University Hospital, Groningen, The Netherlands, 35, 1982.

EXHIBIT B

Reserved

EXHIBIT C

EXHIBIT C

LIST OF MATERIALS CONSIDERED		
Beginning Bates Range (if applicable)	**Ending Bates Range (if applicable)**	**Description**
		US 8,023,580
		US 8,457,228
		’580 Patent Prosecution File History (Application No. 12/543,910)
		’228 Patent Prosecution File History (Application No. 13/198,568)
		US 7,675,965 and Prosecution File History (Application No. 11/774,803)
		US 7,248,626 and Prosecution File History (Application No. 10/412,878)
		US 6,614,838 and Prosecution File History (Application No. 09/205,205)
		Provisional (Application No. 60/067,562)
		Rembrandt Infringement Contentions with Exhibits
		TXED-2-13-cv-00213-114 *Rembrandt v. Samsung* Claim Construction Order
		TXED-2-19-cv-00025-111 *Rembrandt v. Apple* Claim Construction Order
		IPR2014-00518
		IPR2014-00519
		IPR2014-00892
		IPR2014-00893

List of Materials Considered		
Beginning Bates Range (if applicable)	**Ending Bates Range (if applicable)**	**Description**
		IPR2014-00895
		IPR2020-00033
		IPR2020-00034
		IPR2020-00036
		IPR2020-00037
		Ex Parte Reexamination No. 90/013,808 (for the ’580 Patent)
		Ex Parte Reexamination No. 90/013,809 (for the ’228 Patent)
		2015-02-09 Rembrandt v Samsung PM session
		2014-10-6 Expert Report of Dr. Robert Morrow Regarding Samsung’s Infringement of U.S. Patent Nos. 8,023,580 & 8,457,228 [Redacted]
		2020-01-13 Deposition Transcript of Axel Berny
		US 5,905,448 (Motorola ’448 / Briancon)
		US 5,689,440 (Motorola ’440 / Leitch) and Prosecution File History (Application No. 08/395,747) (Leitch ’747)
		US 5,239,306 (Motorola ’306 / Siwiak)
		US 6,075,814 (Broadcom ’814 / Yamano)
		US 5,644,568 (Motorola ’568 / Ayerst)
		US 4,875,038 (Motorola ’038 / Siwiak)
		US 5,070,536 (Mahany)
		US 5,583,922 (Radish ’922 / Davis)
		US 5,706,428 (Lucent / Boer)

LIST OF MATERIALS CONSIDERED		
Beginning Bates Range (if applicable)	**Ending Bates Range (if applicable)**	**Description**
		US 5,537,398 (Motorola ’398 / Siwiak)
		US 7,295,546 (Reunamaki)
		US 5,999,563 (Polley)
		US 5,966,055 (Knoedl)
		US 5,666,651 (Wang)
		US 5,982,807 (Snell)
		US 5,684,806 (Akiyama)
		US 5,517,505 (Buchholz)
		WO 2009/091128 (Kim)
REM_USPTO_00006443, APL-REMBR_01106742		Upender et al., “Communication Protocol for Embedded Systems,” Embedded Systems Programming , Vol 7 (11), November 1994
REM_USPTO_00006455		IPR2014-00518 Goodman Declaration
		Kamerman, A., "Throughput Density Constraints for Wireless LANs Based on DSSS," IEEE 4th International Symposium on Spread Spectrum Techniques and Applications Proceedings, Mainz, Germany, Sept. 22-25, 1996, pp. 1344-1350 vo1.3
		Palin, A., Bluetooth SIG Radio Working Group Radio 1.0 Improvements: Medium Rate Baseband Specification proposal for version 0.7, version 0.66, 2002-07-05
		Sargeaunt, P.N., Deep space telecommunications systems engineering, J.H. Yuen (Ed.), Plenum Press, 1983, p. 603
		Tomasi, W., Electronic Communications Systems – Fundamentals Through Advanced, Prentice-Hall, Inc., 1988, p. 490

LIST OF MATERIALS CONSIDERED		
Beginning Bates Range (if applicable)	**Ending Bates Range (if applicable)**	**Description**
		AN9614 Using the PRISM Chip Set for Low Data Rate Applications - Harris Semiconductor App Note
APL-REMBR_00004020	APL-REMBR_00004024	iPad touch 5th generation – Technical Specifications
APL-REMBR_01121479	APL-REMBR_01121708	Core v2.0 + EDR
APL-REMBR_01122709	APL-REMBR_01124128	Core v.2.1 + EDR
APL-REMBR_01074533	APL-REMBR_01076244	Core v.3.0 + HS
APL-REMBR_01124129	APL-REMBR_01126430	Core v.4.0
APL-REMBR_01131887	APL-REMBR_01134708	Core v.5.0
APL-REMBR_01126431	APL-REMBR_01129114	Core v4.1
APL-REMBR_01129115	APL-REMBR_01131886	Core v4.2
APL-REMBR_01037667	APL-REMBR_01037974	Bluetooth EDR / Apple Products
APL-REMBR_01050110	APL-REMBR_01050562	Bluetooth EDR / Apple Products
APL-REMBR_01141736	APL-REMBR_01144684	Bluetooth EDR / Apple Products
APL-REMBR_01138157	APL-REMBR_01141735	Bluetooth EDR / Apple Products
APL-REMBR_00987428	APL-REMBR_00987430	AirPods – Technical Specifications
APL-REMBR_00000252	APL-REMBR_00000252	AirPods Wireless Charging Case – Technical Specifications
APL-REMBR_00000457	APL-REMBR_00000460	Apple Watch Series 3 – Technical Specifications
APL-REMBR_00000754	APL-REMBR_00000758	Beats Solo3 Wireless On-Ear Headphones
APL-REMBR_00006920	APL-REMBR_00006924	MacBook Pro – Technical Specifications
APL-REMBR_00007568	APL-REMBR_00007655	Welcome to Your MacBook Pro
APL-REMBR_00000821	APL-REMBR_00000824	iMac – Technical Specifications

List of Materials Considered		
Beginning Bates Range (if applicable)	**Ending Bates Range (if applicable)**	**Description**
APL-REMBR_00002282	APL-REMBR_00002288	iPhone 8 – Technical Specifications
APL-REMBR_00003498	APL-REMBR_00004007	Say hello to iPhone
APL-REMBR_00002312	APL-REMBR_00002313	Welcome to Your New iPhone
APL-REMBR_00001244	APL-REMBR_00001250	iPad Pro – Technical Specifications
APL-REMBR_01161278	APL-REMBR_01161926	BT Profiles
APL-REMBR_00002074	APL-REMBR_00002213	iPad User Guide iOS 7.1 Software
RIP00005169	RIP00006398	Specification of the Bluetooth System
RIP00013500	RIP00013501	CSR's BlueCore4 first to qualify for full Bluetooth EDR specification
RIP00013497	RIP00013499	Broadcom Announces Widespread Adoption of Its Enhanced Data Rate (EDR) Bluetooth® Solutions
RIP00011576	RIP00011599	*Bluetooth*® Enhanced Data Rate (EDR): The Wireless Evolution - Application Note
RIP00009505	RIP00009506	NXP Bluetooth® 2.0 + EDR solution BGB210S
RIP00027033	RIP00027498	1997 802.11 Draft Standard
RIP00004310	RIP00004338	Broadcom Tech Note 137 & Patent Disclosure Form
		Rembrandt's Response to Apple's Third Set of Interrogatories (Jan. 8, 2020)

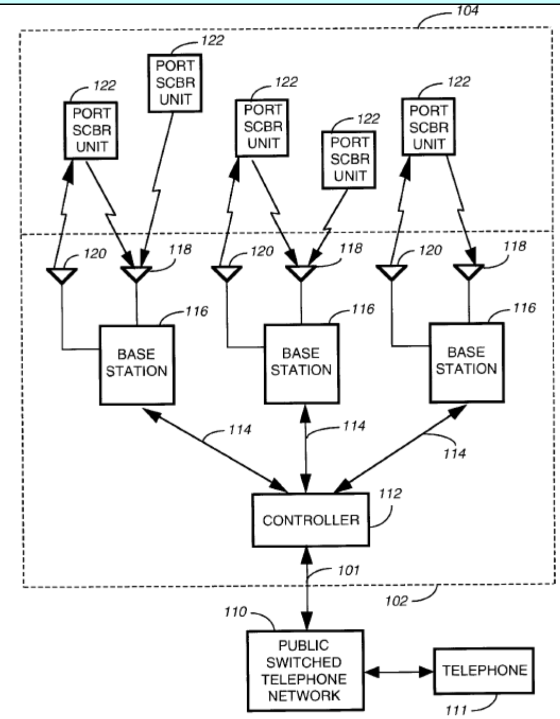
EXHIBIT D

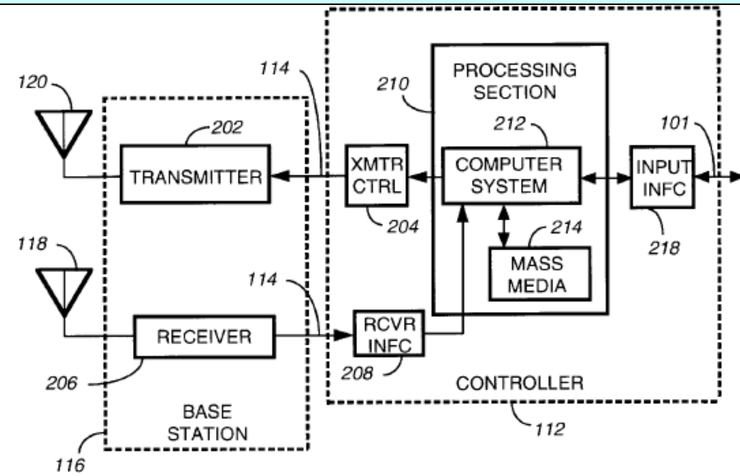
EXHIBIT D

Comparison of the Asserted Claims of the ’580 Patent to U.S. Patent No. 5,905,448 (“the Motorola ’448 patent” or “Motorola ’448”)

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,023,580 (“the ’580 patent”) are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by U.S. Patent No. 5,905,448 (“Motorola ’448”) (which incorporates by reference U.S. Patent No. 5,689,440 (“Motorola ’440”)) and (b) under 35 U.S.C. § 103(a) as obvious over Motorola ’448 (incorporating by reference Motorola ’440) standing alone and as set forth herein, and/or in view of the teachings of U.S. Patent No. 5,644,568 (“Motorola ’568). One of ordinary skill in the art, as of the priority date of the ’580 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	**The Motorola ’448 patent**
1[pre]	A communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, the device comprising:	**Motorola ’448 discloses a communication device capable of communicating according to a master slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, Motorola ’448 discloses a communication device (e.g., “base station[] 116,” “controller 112,” antennas 118/120) acting as a master in master/slave relationship capable of transmitting communications to and receiving communications from a slave (e.g., “selective call radio 122”). The controller/base station communicates with the selective call radios using a synchronous protocol controlled by the controller/base station.** “FIG. 1 is an electrical block diagram of a radio communication system, in accordance with the preferred embodiment of the present invention.” Col. 2:22-24. “FIG. 2 is an electrical block diagram of a system controller used in the radio communication system, in accordance with the preferred and alternative embodiments of the present invention. Col. 2:22-28. Fig. 1, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 FIG. 1 Fig. 2, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 ***FIG. 2*** “Referring to FIG. 1, an electrical block diagram of a communication system in accordance with the preferred embodiment of the present invention comprises a fixed portion 102 and a portable portion 104. The fixed portion 102 includes a plurality of base stations 116, for communicating with the portable portion 104, utilizing conventional radio frequency (RF) techniques well known in the art, and coupled by communication links 114 to a system controller 112 which controls the base stations 116. The hardware of the system controller 112 is preferably a combination of the 60 Wireless Messaging Gateway (WMG™) Administrator! paging terminal, and the RF-Conductor!™ message distributor manufactured by Motorola, Inc. The hardware of the base stations 116 is preferably a combination of the Nucleus® Orchestra! transmitter and RF-Audience!™ receivers manufactured by Motorola, Inc. It will be appreciated that other similar hardware can be utilized for the system controller 112 and the base stations 116.” Col. 2:50-67. “Each of the base stations 116 transmits RF signals to the portable portion 104 comprising a plurality of selective call radios 122 via a transmitting antenna 120. The base stations 116 each receive RF signals from the plurality of selective call radios 122 via a receiving antenna 118.” Col. 3:1-5. “The hardware of the system controller 112 is preferably a combination of the Wireless Messaging Gateway (WMG™) Administrator! paging terminal, and the RF-Conductor!™ message distributor manufactured by Motorola, Inc. The hardware of the base stations 116 is preferably a combination of the Nucleus® Orchestra! transmitter and RF-Audience!™ receivers manufactured by Motorola, Inc. It will be appreciated that other similar hardware can be utilized for the system controller 112 and the base stations 116.” Col. 2:58-67.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		"The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols as described more fully in U.S. Pat. No. 5,168,493 issued Dec. 1, 1992 to Nelson et al., which is hereby incorporated herein by reference, and hereinafter referred to as Nelson '493." Col. 3:37-44. "Inbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions. The outbound and inbound channels preferably operate on separate carrier frequencies utilizing frequency division multiplex (FDM) techniques well known in the art. A detailed description of FDM techniques is more fully described in U.S. Pat. No. Siwiak '038. It will be appreciated that, alternatively, the outbound and inbound channels can operate on a single carrier frequency using time division duplex (TDD) techniques as described more fully in Nelson '493. It will be further appreciated that, alternatively, other synchronous signaling protocols can be used to transmit the digital and analog portions of the message…" Col. 4:1-14. "Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention. Control frames 330 are also classified as data frames 330. The outbound signaling protocol is subdivided into protocol divisions, which are an hour 310, a cycle 320, a frame 330, 345, a block 340, a word 350, and bits (not shown in FIG. 3). All protocol divisions are defined with reference to a synchronous period of a synchronous clock; the protocol division boundaries are coincident with edges of the synchronous clock. Up to fifteen 4 minute uniquely identified cycles are transmitted in each hour 310. Normally, all fifteen cycles 320 are transmitted each hour. Up to one hundred twenty eight 1.875 second uniquely identified frames including control frames 330 and analog frames 345 are transmitted in each of the cycles 320. Normally, all one hundred twenty eight frames are transmitted. One synchronization signal 331 lasting one hundred fifteen milliseconds and 11 one hundred sixty millisecond uniquely identified blocks 340 are transmitted in each of the control frames 330. The synchronization signal 331 includes a first sync portion 337, a frame information word 338, and a second sync portion 339. A bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps is usable during the blocks 340 of each control frame 330. The bit rate of the blocks 340 of each control frame 330 is communicated to the selective call radios 122 during the synchronization signal 331." Col. 6:19-48. "The receiver 206 demodulates four-level FSK and is preferably collocated with the base stations 116, as implied in FIG. 2, but can be positioned remotely from the base stations 116 to avoid interference from the transmitter 202. The receiver 206 is for receiving one or more acknowledgments (ACKs or NAKs) from the selective call radios 122." Col. 4:63-5:2. "The IF signal, which now carries the SSE (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals." Col. 12:13-60. **Motorola '448 further discloses a "slave communication" (e.g., "inbound message") from a slave to a master occurs**

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		“in response to a master communication from the master to the slave” (e.g., “response message” and/or “acknowledgements” made in response to an “outbound message” from the controller/base station to a selective call radio). “The RF signals transmitted by the selective call radios 122 to the base stations 116 (inbound messages) comprise positive acknowledgments (ACKs) which indicate that the message was received reliably by the selective call radio 122, or negative acknowledgments (NAKs) which indicate that the selective call radio 122 did not receive the message reliably. A detailed description of inbound acknowledge-back messaging is more fully described in Siwiak '038, which is hereby incorporated by reference. It will be appreciated that a portion of the selective call radios 122 are utilized for RF reception only (i.e., one-way receivers).” Col. 3:13-21.[1] “Inbound messages (response messages and acknowledgments) are generated in conventional digital form by a inbound message function of the processor section 606, in response to user manipulation of the user controls 651 or an event detected by the processor section 606, such as receipt of an outbound message or occurrence of a predetermined time of day. A digital inbound message is encoded using a conventional FM protocol and coupled by the first 1/0 port 627 to the transmitter 603, in a manner well known to one of ordinary skill in the art. The conventional transmitter 603 generates an FM radio signal, which is radiated by the antenna 601.” Col. 13:52-63. “As one example of an operation of the system controller 112, the delivery of an outbound message stored in the mass memory 214 is completed when: the outbound message has been communicated to the intended selective call radio 122; the outbound message is acknowledged by an inbound acknowledgment generated by the selective call radio 122; the outbound message and some possible responses are presented either on a display or by a speaker of the selective call radio 122 in response to a user manipulation of controls; one of the possible responses is selected by the user and identified within an inbound response transmitted back to the system controller 112 from the selective call radio 122; and the user inbound response is identified by the message handler function as having been generated by the user specifically in response to the outbound message.” Col. 5:56-6:4. “Referring to FIG. 2, an electrical block diagram of elements of the fixed portion 102 in accordance with the preferred embodiment of the present invention comprises portions of the System controller 112 and the base stations 116. The system controller 112 comprises a processor section 210 for directing operation of the system controller 112. The system controller 112 Schedules and queues data and stored voice messages for transmission to the selective call radios 122, connects telephone calls from the PSTN 110, and receives acknowledgments, demand responses, unsolicited data and stored audio messages, and telephone calls from the selective call radios 122. The processor section 210 preferably is coupled through a conventional transmitter controller 204 to a transmitter 202 via the communication links 114. The communication links 114 use conventional means well known in the art, such as a direct wire line (telephone) link, a data communication link, or any number of radio frequency links, such as a radio frequency (RF) transceiver link, a microwave transceiver link, or a satellite

[1] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		link, just to mention a few.” Col. 4:32-51. “In two way communication systems such as those described in U.S. Pat. No. 4,875,038 filed Jan. 7, 1988 by Siwiak et al., entitled “Frequency Division Multiplexed Acknowledge Hack Paging System,” hereinafter referred to as Siwiak '038, it is desirable to provide a pager radio user with several possible responses from which one response is selected to be transmitted back to the paging fixed network, where it is sent lo the caller who initiated the call. One method of providing such responses in a pager is described in U.S. Pat. No. 5,153,582 filed Aug. 7, 1989 by Davis, entitled "Method and Apparatus for Acknowledging and Answering a Paging Signal," hereinafter referred to as Davis '582.” Col. 1:19-32. “In a system using such an analog protocol for signals sent from the paging fixed network to the pager, as described in Leitch '747, and having acknowledge capability, as described in Siwiak '038 and Davis '582, it is also desirable to be able to include, in a message that has an information part, a plurality of probable analog responses pertaining thereto, thus avoiding the problem of having either no responses available, or only a rigidly defined set of responses which have been predetermined for use by each pager user, and which may not turn out to pertain to an information part of a particular message. When such probable responses are included within the message received by the pager, they can then be stored in the pager. The user can review the responses, select one, and transmit the response, or an identifier corresponding to that response back to the paging fixed network for delivery to the caller.” Col. 1:43-58. “Another issue which arises in a pager having voice response capabilities is how to provide for user selection of one of the voice responses. Io an alphanumeric pager such as described in Davis ' 582, the problem is solved by dedicating several keys for response selection. When there are at least a moderate (say, 8 to 12) number of keys, dedicating several for response selection works well. However, in simple analog pagers, in which there may be only a very few keys (i.e., less than 8, and perhaps as few as 2), a problem arises as to how a selection o[a voice response is conveniently made.” Col. 2:4-14. “Inbound channel transmissions from the selective call radios 122 to the base stations 116 preferably utilize four-level FSK modulation at a rate of eight hundred bits per second (bps). Inbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions. The outbound and inbound channels preferably operate on separate carrier frequencies utilizing frequency division multiplex (FDM) techniques well known in the art. A detailed description of FDM techniques is more fully described in U.S. Pat. No. Siwiak '038. It will be appreciated that, alternatively, the outbound and inbound channels can operate on a single carrier frequency using time division duplex (TDD) techniques as described more fully in Nelson '493.” Col. 3:65-4:11. “Referring to FIG. 6, an electrical block diagram of the selective call radio 122 is shown, in accordance with the preferred embodiment of the present invention. Selective call radio 122 is essentially equivalent to the selective call receiver 900 described with reference to FIG. 9 of Leitch 747, but additionally comprises a conventional transmitter 603 for transmitting response messages and acknowledgments, and further comprises functions for generating the response messages and acknowledgments. The selective call radio 122 comprises an antenna 601, which is different than the antenna included in the selective call receiver 900 of Leich ‘747 in that it is suitable for both intercepting and radiating radio signals.” Col. 10:5-17. “The processor section 210, while performing the message handling functions, also identifies inbound messages as being associated with one of the selective call radios in the subscriber data base 220 and identifies response messages as being

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		associated with one of the outbound messages in an outbound message memory, which is a portion of the mass media 214.” Col. 5:50-56. “The transmitter 202 transmits two and four-level FSK data messages to the selective call radios 122 during a digital message portion, and at least one LSE, USE and a pilot during the analog message portion for voice messages. The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202. The processor section 210 is also coupled to at least one receiver 206 through a conventional receiver interface 208 via the communication links 114.” Col. 4:51-63. “The processor section 210 is also coupled to an input interface 218 for communicating with the PSTN 110 through the telephone links 101 for receiving selective call originations from a message originator. In order to perform the functions (to be described below) necessary in controlling the elements of the system controller 112, as well as the elements of the base stations 116, the processor section 210 preferably includes a conventional computer system 212, and conventional mass storage media 214. The conventional mass storage media 214 includes the subscriber data base which has subscriber user information such as, for example, selective call radio 122 addressing, programming options, etc. The conventional computer system 212 is programmed by way of program instructions included in the conventional mass storage media 214. The conventional computer system 212 preferably comprises a plurality of processors such as VME Spare processors manufactured by Sun Microsystems, Inc., and is alternatively described as the computer 212. The plurality of processors include memory such as dynamic random access memory (DRAM), which serves as a temporary memory storage device for scratch pad processing such as, for example, storing analog and digital messages originated by callers using the PSTN 110, processing acknowledgments received from the selective call radios 122, and for protocol processing of analog and digital messages destined for the selective call radios 122, just to mention a few. The conventional mass storage media 214 is preferably a conventional hard disk mass storage device, which can also serve as a message memory for digitally encoded analog signals.” Col. 5:3-32. “It will be appreciated that other types of conventional computer systems 212 can be utilized, and that additional computer systems 212 and mass storage media 214 of the same or alternative type can be added as required to handle the processing requirements of the processor section 210.” Col. 5:33-37. “The processor section 210 provides message handling functions which schedule outbound messages having selective call addresses associated therewith, for transmission within a transmission cycle of the synchronous protocol. This is accomplished by scheduling, as necessary, portions of messages within different frames of a transmission cycle. As described above, messages may have either digital “information, such as a alphanumeric message, or analog information, such as voice.” Col. 5:3-46. “The processor section 210, while performing the message handling functions, also identifies inbound messages as being associated with one of the selective call radios in the subscriber data base 220 and identifies response messages as being associated with one of the outbound messages in an outbound message memory, which is a portion of the mass media 214.” Col. 5:50-56.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		"Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention. Control frames 330 are also classified as data frames 330. The outbound signaling protocol is subdivided into protocol divisions, which are an hour 310, a cycle 320, a frame 330, 345, a block 340, a word 350, and bits (not shown in FIG. 3). All protocol divisions are defined with reference to a synchronous period of a synchronous clock; the protocol division boundaries are coincident with edges of the synchronous clock. Up to fifteen 4 minute uniquely identified cycles are transmitted in each hour 310. Normally, all fifteen cycles 320 are transmitted each hour. Up to one hundred twenty eight 1.875 second uniquely identified frames including control frames 330 and analog frames 345 are transmitted in each of the cycles 320. Normally, all one hundred twenty eight frames are transmitted. One synchronization signal 331 lasting one hundred fifteen milliseconds and 11 one hundred sixty millisecond uniquely identified blocks 340 are transmitted in each of the control frames 330. The synchronization signal 331 includes a first sync portion 337, a frame information word 338, and a second sync portion 339. A bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps is usable during the blocks 340 of each control frame 330. The bit rate of the blocks 340 of each control frame 330 is communicated to the selective call radios 122 during the synchronization signal 331. Depending on the bit rate used, 8 to 32 thirty two bit uniquely identified words 350 are transmitted in each block 340. The bits and words 350 in each block 340 are transmitted in an interleaved fashion using techniques well known to one of ordinary skill in the art to improve the burst error correction capability of the protocol." Col. 6:19-54. "When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the decoded message information is received and stored in the microcomputer RAM 638, or in the analog conversion and message storage section 668, as will be explained further below, and an alerting signal is generated by alert generator function 642. The alerting signal is coupled to the audio processing circuit 614 which drives transducer 616, delivering an audible alert. Other forms of sensible alerting, such as tactile or vibrating alert, can also be provided to alert the user." Col. 12:13-28. "When analog information is to be transmitted in the linear modulation format (such as SSE or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information. The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section 606, through 1/0 port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		and message storage section 668, thus starting a process of recovering an analog signal, as will be described below.” Col. 12:29-53.

Fig. 6, reproduced below.

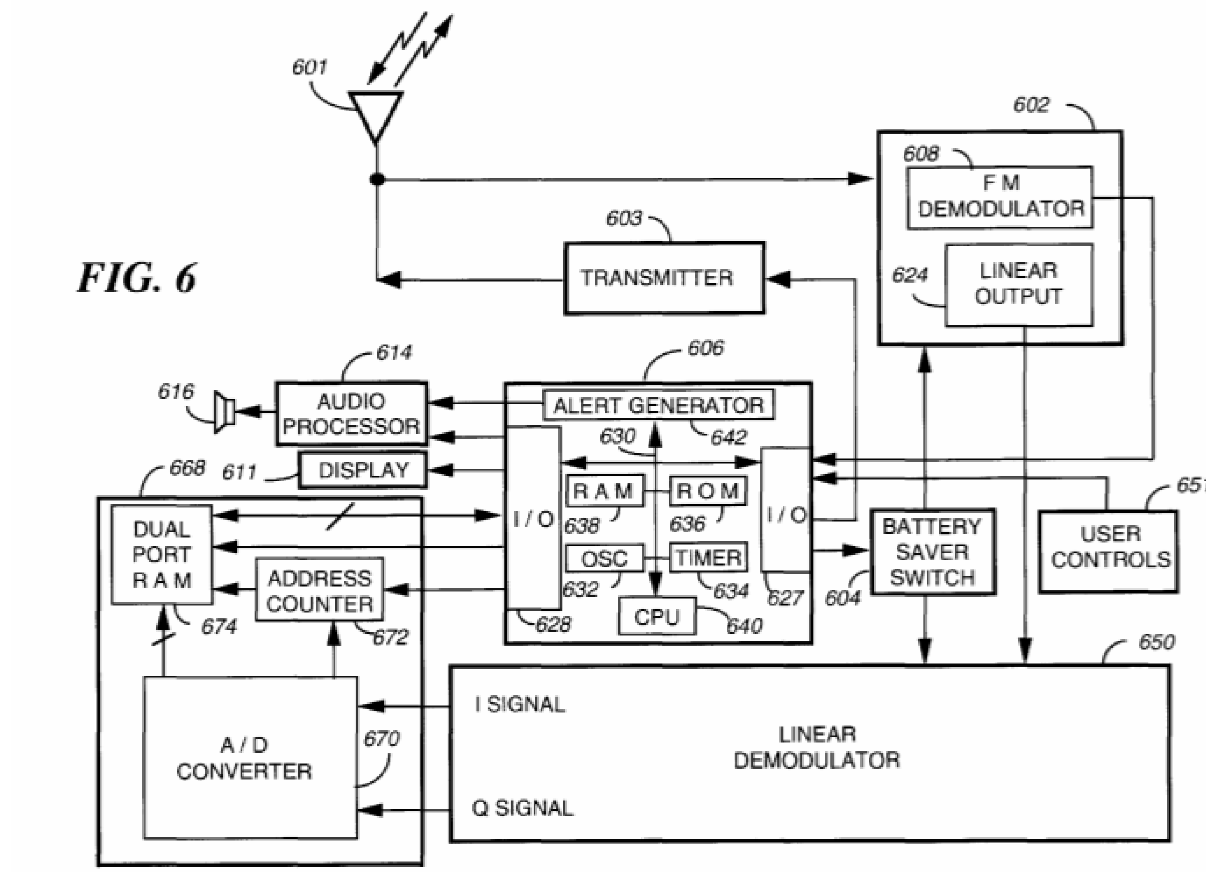
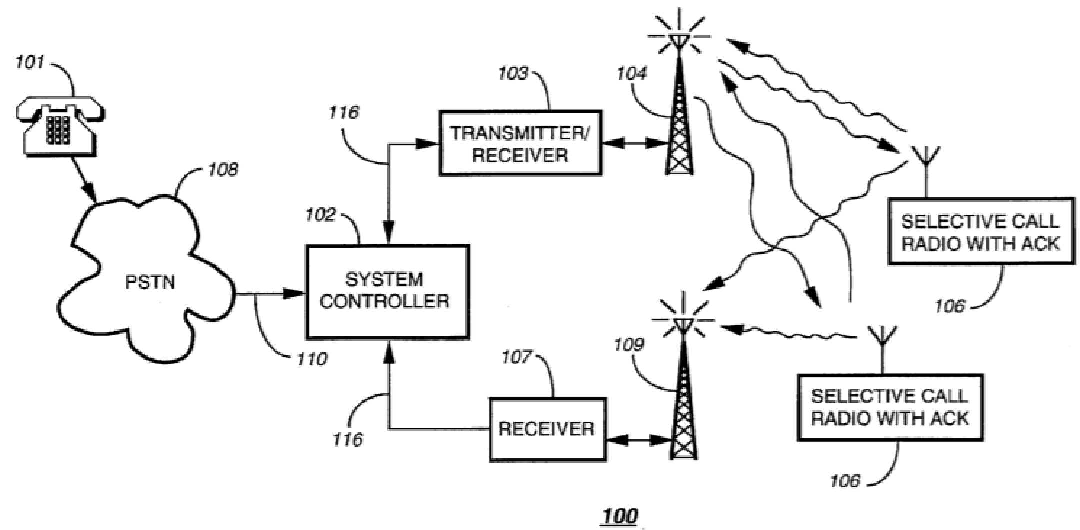


FIG. 6

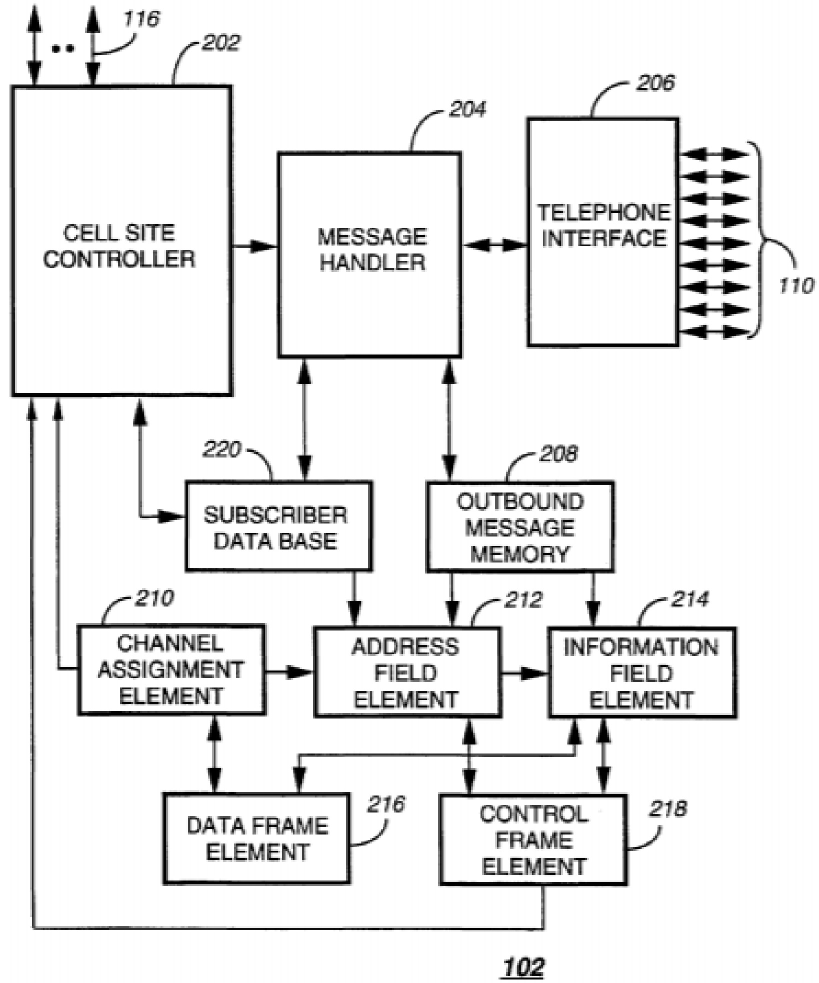
To the extent it is argued that Motorola ’448 does not expressly disclose a master/slave relationship, a POSITA would have understood that Motorola ’448 renders obvious a master/slave relationship based on the disclosures above. In particular, (1) the controller/base station communicates with the selective call radios in a synchronous protocol; (2) the inbound messages from the selective call radio to the controller/base station are made in response to outbound

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		messages from the controller/base station to the selective call radio; and (3) the selective call radios do not communicate directly with each other. A POSITA would understand such a system to disclose and/or render obvious a master/slave relationship. **Alternatively, Motorola '448 in view of the teachings of Motorola '568 discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, as discussed above, Motorola '448 discloses a communication device. Motorola '568 further discloses a master/slave relationship and slave communications from a slave to a master (e.g., "response messages") in response to a master communication from a master to a slave (e.g., "outbound message"):** "The system controller 102 also functions to digitally encode and schedule outbound messages, which can include such information as digitized audio messages, alphanumeric messages, and response commands, for transmission by the radio frequency transmitter/receivers 103 to a plurality of selective call radios 106. The system controller 102 further functions to decode inbound messages, including unsolicited and response messages, received by the radio frequency transmitter/receivers 103 and the fixed system receivers 107 from the plurality of selective call radios 106. Examples of response messages are acknowledgments and designated response messages. Designated response messages are communicated in the inbound channel in portions named data units. An acknowledgment is a response to an outbound message initiated at the system controller 102. An example of an outbound alphanumeric message intended for a selective call radio 106 is a page message entered from the telephone 101. The acknowledgment indicates successful reception of the outbound message. A designated response message is a message sent from a selective call radio in response to a command included in an outbound message from the system controller 102. An example of a designated response message is a message initiated by the selective call radio 106, but which is not transmitted until after a response command is received from the system controller 102. The response command, in turn, is sent by the system controller 102 after an inbound. message requesting permission to transmit the designated response message is communicated from the selective call radio 106 to the system controller 102. The response messages are preferably transmitted at a time designated within the outbound message or response command, but alternatively can be transmitted using a non-scheduled protocol, such as the ALOHA or slotted ALOHA protocol, which are well known to one of ordinary skill in the art." Cols. 4:41-5:8. "It should be noted that the system controller 102 is capable of operating in a distributed transmission control environment that allows mixing conventional cellular, simulcast, master/slave, or other coverage schemes involving a plurality of radio frequency transmitter/receivers 103, conventional antennas 104, 109, and fixed system receivers 107, for providing reliable radio signals within a geographic area as large as a nationwide network. Moreover, as one of ordinary skill in the art would recognize, the telephonic and selective call radio communication system functions may reside in separate system controllers 102 which operate either independently or in a networked fashion. It should also be noted that the radio frequency transmitter/receiver 103 may comprise the fixed system receiver 107 collocated with a conventional radio frequency transmitter." Col. 5:26-41. "The message handler 204 schedules outbound messages and the selective call addresses associated therewith within a

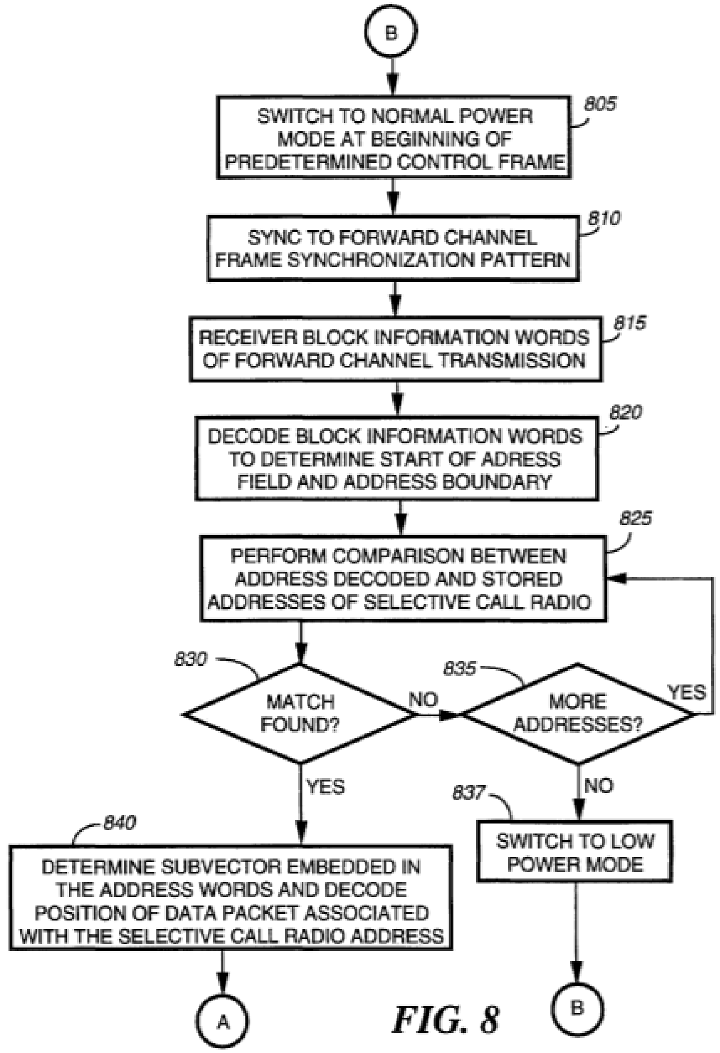
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		transmission cycle. The message handler 204 also determines response schedules for response messages which minimize contention of messages at transmitter/receivers 103 and fixed system receivers 107, and includes response timing information in outbound messages so that selective call radios 106 will respond according to the response schedule.” Col. 6:43-51. “Examples of response messages are acknowledgments and designated response messages. Designated response messages are communicated in the inbound channel in portions named data units. An acknowledgment is a response to an outbound message initiated at the system controller 102. An example of an outbound alphanumeric message intended for a selective call radio 106 is a page message entered from the telephone 101. The acknowledgment indicates successful reception of the outbound message. A designated response message is a message sent from a selective call radio in response to a command included in an outbound message from the system controller 102. An example of a designated response message is a message initiated by the selective call radio 106, but which is not transmitted until after a response command is received from the system controller 102. The response command, in turn, is sent by the system controller 102 after an inbound message requesting permission to transmit the designated response message is communicated from the selective call radio 106 to the system controller 102. The response messages are preferably transmitted at a time designated within the outbound message or response command, but alternatively can be transmitted using a non-scheduled protocol, such as the ALOHA or slotted ALOHA protocol, which are well known to one of ordinary skill in the art.” Cols. 4:51-5:8. “System controller 102 is preferably a model MPS20006) paging terminal manufactured by Motorola, Inc., of Schaumburg Ill., modified with unique firmware elements in accordance with the preferred embodiment of the present invention, as described herein. The cell site controller 202, the message handler 204, the outbound message memory 208, the subscriber data base 220, the telephone interface 206, the channel assignment element 210, the address field element 212, the information field element 214, the data frame element 216, and the control frame element 218 are preferably implemented within portions of the model MPS2000(8) paging terminal which include, but are not limited to those portions providing program memory, a central processing unit, input/output peripherals, and a random access memory. The system controller alternatively could be implemented using a model E09PED0552. Page Bridge(8) paging terminal manufactured by Motorola, Incorporated of Schaumburg, Ill. The subscriber data base 220 and the outbound message memory 208 can alternatively be implemented as magnetic or optical disk memory, which can alternatively be external to the system controller 102.” Col. 8:39-59. “For example, a selective call radio 106 can be vectored from a synchronous control frame 360 as described above to a radio channel that contains only Post Office Committee Standardization Advisory Group (POCSAG) formatted one way asynchronous paging signaling.” Col. 15:35-39. Fig. 1, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 FIG. 1 “Accordingly, in a third aspect of the present invention, a method is used in a system controller for generating a radio signal transmitted on a first radio channel. The radio signal has short and long messages included in a plurality of control frames and data frames. Each of the short and long messages has an address signal and related message information. The method includes the steps of generating each address field; generating an information field; assembling each control frame; assembling each data frame; and transferring the control frames and data frames to a transmitter for radio transmission. In the step of generating each address field, each address field of a control frame is generated having a set of address signals. Each of the set of address signals includes an address and a subvector indicating, respectively, a selective call radio for which one of the short and long messages is intended, and a starting position of a data packet within the control frame. In the step of generating an information field, an information field following the address field and having a set of data packets is generated. Each data packet in the set of data packets has the starting position of the data packet indicated by at least one subvector within the control frame. Each data packet in the set of data packets is one of a vector packet and a short message packet. Vector packets indicate starting positions of long messages within the plurality of control frames and data frames. In the step of assembling each control frame, each control frame is assembled including an address field and an information field. In the step of assembling each data frame, each data frame is assembled including a set of long messages. Each long message in the set of long messages has a starting position indicated by at least one vector packet in a control frame.

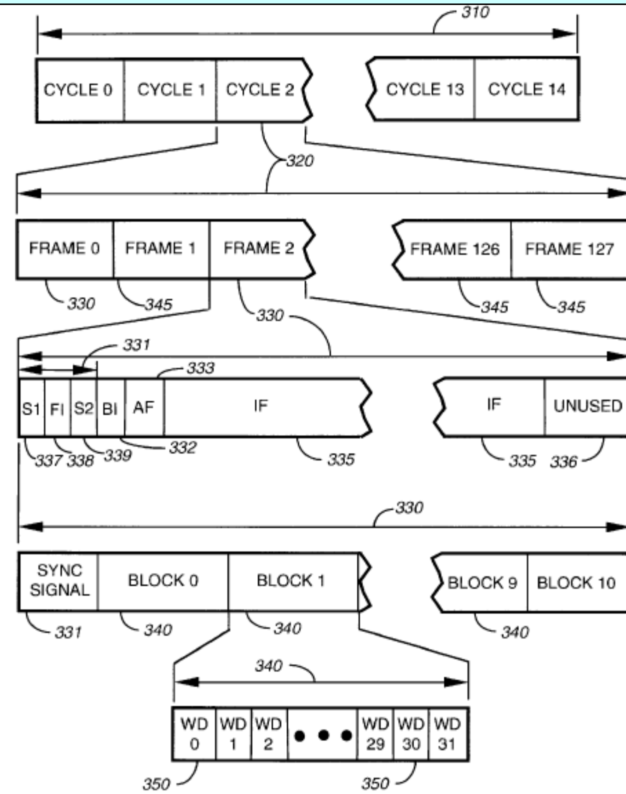
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		Accordingly, in a fourth aspect of the present invention, a system controller is used for generating a radio signal transmitted on a first radio channel. The radio signal has short and long messages included in a plurality of control frames and data frames. Each of the short and long messages has an address signal and related message information. The system controller includes a control frame element, an address field element, an information field element, a data frame element, and a cell site controller. The control frame element assembles each control frame including an address field and an information field. The address field element, which is coupled to an outbound message memory which stores the short and long messages, and which is also coupled to the control frame element, generates an address field of a control frame having a set of address signals." Col. 2:66-3:49. "Referring to FIG. 2, an electrical block diagram of the system controller 102 is shown, in accordance with the preferred embodiment of the present invention. The system controller 102 comprises a cell site controller 202, a message handler 204, an outbound message memory 208, a subscriber data base 220, a telephone interface 206, a channel assignment element 210, an address field element 212, an information field element 214, a data frame element 216, and a control frame element 218. The cell site controller 202 is coupled to the radio frequency transmitter/receivers 103 (FIG. 1) and fixed system receivers 107 (FIG. 1) by the links 116. The cell site controller 202 couples outbound messages including selective call addresses to the transmitter/receivers 103 and controls the transmitter/receivers 103 to transmit transmission cycles which include the outbound messages. The cell site controller 202 also processes inbound messages from the selective call radios 106. The inbound messages are received by the transmitter/receivers 103 and fixed system receivers 107, and are coupled to the cell site controller 202. The message handler 204, which routes and processes messages, is coupled to the telephone interface 206, the subscriber data base 220, and the outbound message memory 208. The telephone interface 206 handles the switched telephone network 108 (PSTN) (FIG. 1) physical connection, connecting and disconnecting telephone calls at the telephone links 110, and routing the audio signals between the telephone links 110 and the message handler 204." Col. 6:1-28. Fig. 2, reproduced below.

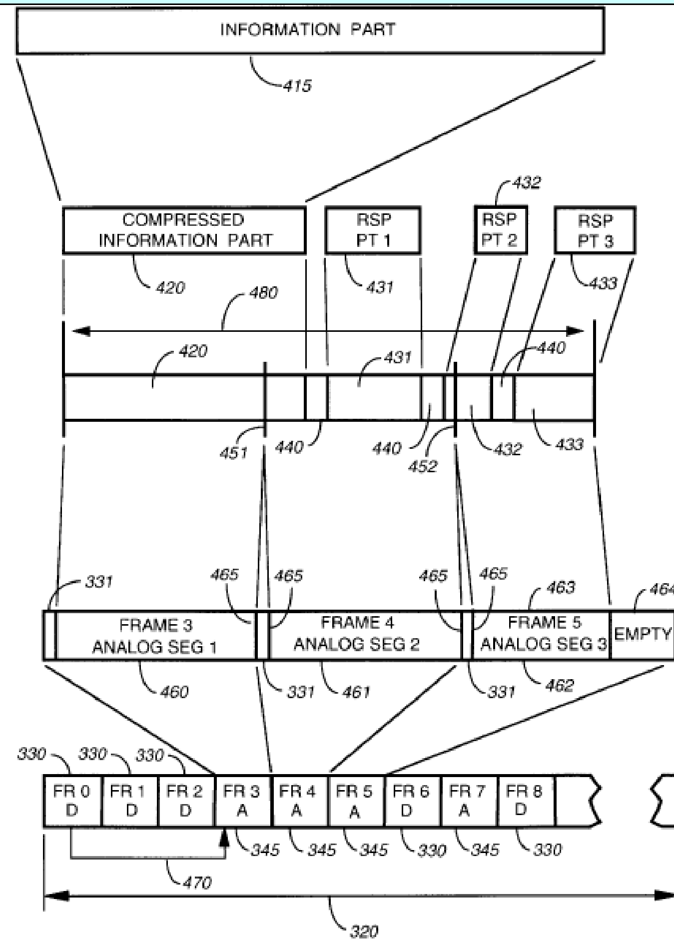
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 *FIG. 2* "All vector packets and short messages intended for a particular selective call radio 106 are preferably scheduled for transmission in a predetermined one or more of the frames 330 of each cycle 320, so as to allow the particular selective call radio 106 to go into a low power mode during other frames when short messages and vectors are not included for the

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		particular selective call radio 106." Col. 9:60-67. "At step 740, the next predetermined control frame 360 which will be decoded by the selective call radio is determined by the system controller 102. The control frame determination is based on the selective call radio's address and system management information. The input message type is determined at step 750. When the input message is a short message, it is assembled in the information field of the next control frame 360, at step 780. The address of the selective call radio 106 is included in the same control frame 360 as the one containing the short message. The starting position of the short message packet is stored in the system controller 102. When the input message is a long message, it is generated in the information field of control or data frames which will be transmitted in one of the radio channels present in the radio communication system 100, at step 760. The starting position of the long message is stored. At step 770, a vector packet is assembled in the information field of the control frame in which the selective call radio is addressed. The starting position of the long message and the channel assigned for transmission of the long message, are included in the vector packet. The starting position of the vector packet is stored. At step 790, the selective call radio address is generated in the address field of the control frame. The position of the data packet (short message packet or vector packet), is included as a subvector in the selective call radio's address. At step 795, the formatted control and data frames containing addresses and messages for selective call radios are transferred to the cell site controller 202 for transmission by the radio transmitter/receiver 103." Col. 17:36-43. "It will be further appreciated that for improved battery life in the selective call radios 106, selective call addresses for messages intended for a particular selective call radio 106 are included in a control frame which is at a predetermined position of a transmission cycle, so that the selective call radio 106 need only go into a normal power mode at the beginning of the predetermined control frame." Col. 8:32-38. "At step 805, the selective call radio 106 switches from a low power mode to a normal power mode operation. The switching is done at the beginning of predetermined control frames 360 that the selective call radio 106 receives and decodes." Col. 17:51-54. "When no more addresses are present in the address field 333 of the control frame 360, at step 835, the selective call radio 106 switches to the low power mode at the address boundary 334, at step 837, and waits for the next predetermined control frame that it has to decode." Col. 18:6-9. "When the data packet, at step 860, is a vector packet, the selective call radio decodes a starting position and length of a long message, at step 865. At step 870, the selective call radio 106 switches to the low power mode at the end of the vector packet to conserve battery life. The selective call radio 106 switches to the normal power mode before the beginning of the long message, at step 875. The long message is processed in the control frame 360 or data frame 370 identified by the vector packet in a cycle 320 transmitted on any one of the radio channels operating in the radio communication system 100. At step 885, the selective call radio 106 switches to low power mode at the end of the long message to conserve battery life, and waits for the next predetermined control frame 360 that it has to decode." Col. 18:31-44. *See also*, Claims 1, 3. Fig. 8, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 ***FIG. 8***
1[a]	a transceiver, in the role of the master according to the master/slave relationship,	**Motorola ’448 discloses a transceiver, in the role of the master according to the master/slave relationship.** *See* 1[pre] discussion of base station 116, controller 112, antennas 118/120 which comprise a transceiver in the role of a

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		master according to the master/slave relationship.
1[b]	for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,	**Motorola ’448 (incorporating by reference Motorola ’440) discloses for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** **For example, Motorola ’448 (incorporating by reference Motorola ’440) discloses sending transmissions modulated using a “first modulation method” (e.g., “FSK”) and a “second modulation method” (e.g., “QAM”) of a different “type” than the “first modulation method.”** Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 *FIG. 3* Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 ***FIG. 4*** Fig. 6, reproduced below.

<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,023,580
(“the ’580 patent”)</th><th>The Motorola ’448 patent</th></tr>
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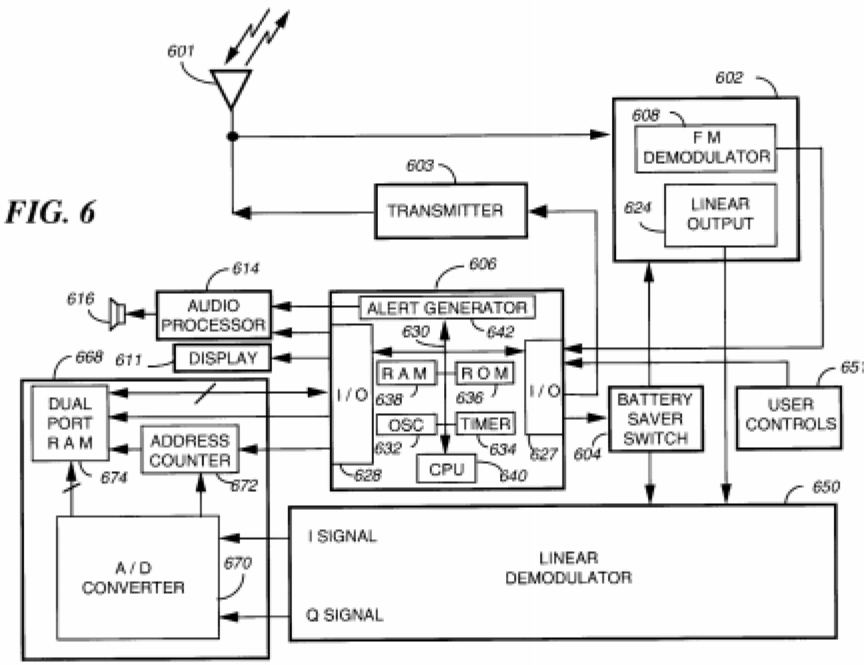
FIG. 6



“Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Outbound channel transmissions of the analog message portion transmitted by the base stations 116 preferably utilize single side band (SSB) transmission. A voice message portion preferably comprises at least an upper side band (USB), a lower side band (LSB) and a pilot carrier. It will be appreciated that, alternatively, a voice message portion can comprise the pilot carrier and a single one of the sidebands. A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Col. 3:49-65.[2]

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</table>

[2] U.S. Patent No. 5,689,440 (Motorola ’440) is a continuation of U.S. Patent Application No. 08/395,747 (“Leitch ’747”) and the respective disclosures of each are incorporated by reference herein as if the disclosures were fully set forth.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		“The transmitter 202 transmits two and four-level FSK data messages to the selective call radios 122 during a digital message portion, and at least one LSE, USE and a pilot during the analog message portion for voice messages. The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202. The processor section 210 is also coupled to at least one receiver 206 through a conventional receiver interface 208 via the communication links 114.” Col. 4:51-63. “When the message information or control data is digital, it is transmitted in the FM modulation format, and the IF signal is coupled to the FM demodulator 608.” Col. 11:19-21. “When analog information is to be transmitted in the linear modulation format (such as SSB or ‘I and Q’), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located.” Col. 12:29-37. “As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49. “Voice messages transmitted by the base stations 116 utilize mixed signaling techniques. A voice message preferably includes a digital message portion and an analog message portion. The digital message portion includes at least the addressing information which is used to identify the selective call radio 122, and a message vector identifying the location of the analog message. The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols as described more fully in U.S. Pat. No. 5,168,493 issued Dec. 1, 1992 to Nelson et al., which is hereby incorporated herein by reference, and hereinafter referred to as Nelson '493. This synchronous protocol utilizes well-known error detection and error correction techniques and is therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous in any one code word.” Col. 3:31-48. “The receiver 602 is preferably a modified FM receiver including the addition of a DAFC (digital automatic frequency control) as described in U.S. Pat. No. 5,239,306 issued to Siwiak et al. (which is assigned to the assignee of the present invention and which is hereby incorporated by reference herein,” Col. 10:33-38.[3] “A voice signal can be sent as an SSB signal occupying a single voice bandwidth on the outbound channel, or equivalently on either of the one or more I or Q channels as described in more detail in Leitch '747.” Col. 10:57-60.

[3] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		“Recovered voice is played back through the audio processor 614 and transducer 616, while alphanumeric data can be displayed on display 611, which is a limited display (~16 characters) in accordance with the preferred embodiment of the present invention. An information signal, modulated in the FM modulation format, or in a linear modulation format (such as SSB), is intercepted by the antenna 601, which couples the information signal to the receiver 602.” Col. 11:5-13. “In accordance with the preferred embodiment of the present invention, analog message segments predeterminedly begin immediately after the end of the synchronizing signal 331. Also, an analog frame 345 is defined to include a segment of only one analog message, and multiple segments are included in order, within sequential frames. Thus, the position is conveyed only by the position of the first frame (its hour, cycle, and frame number) and the number of frames. It will be appreciated that there are other ways to transmit the segments and convey the position of the multipart analog message 480, which work equally well. For example, in some systems the segments 460, 461, 462 may be included within one frame. Such an arrangement is useful in a radio communication system in which there are several analog subbands within an outbound channel resource, and several analog segments can be transmitted simultaneously. In such a case, to include the position of the multipart analog message 480 within the protocol, the order and subband number of the analog segments must either by conveyed in a message, or predetermined. In another example, segments of a multipart message which are transmitted in order and in consecutive frames can have their position identified by a continuation indication within the synchronizing portion of each frame.” Col. 8:65-9:21. “As described in Leitch '747, the selective call radio 122 further comprises a means for detecting and decoding the FM modulated control signals and the SSE analog signals which are included in the synchronous protocol, which is similar to the well known InFLEXion™ protocol, licensed by Motorola, Inc. The selective call radio 122 further comprises a receiver 602, a processor section 606, a battery saver switch 604, user controls 651, a linear demodulator 650, an analog conversion and message storage section 668, a display 611, an audio processor 614, and a speaker 616. The receiver 602, which is coupled to the antenna, comprises an FM demodulator 608 and a linear output section 624.” Col. 10:16-28. “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format.” Col. 12:13-28. “Vectors, as described above with reference to FIG. 3, form a part of the pointer information. The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section 606, through 1/0 port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion and message storage section 668, thus starting a process of recovering an analog signal, as will be described below. The IF signal, which now carries the SSE (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to

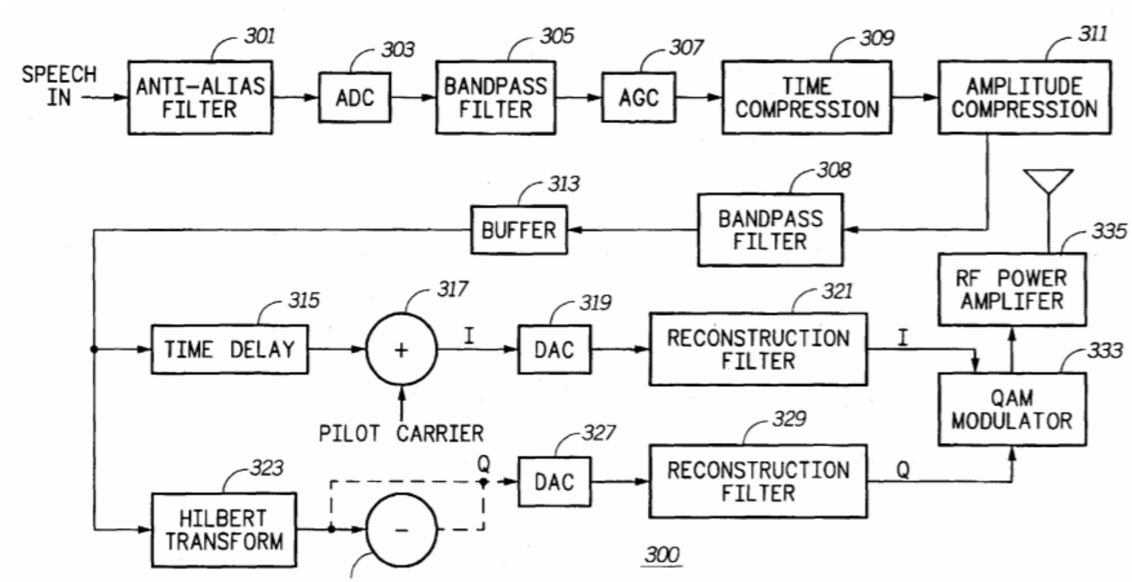
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals." Col. 12:37-60. "When analog data is received in an analog portion of a message, the A/D converter 670 is enabled to allow sampling of the information symbol pairs. The A/D converter 670 generates high speed sample clock signals which are used to clock the address counter 672 which in turn sequentially generates addresses for loading the sampled voice signals into a dual port random access memory 674 through data lines going from the converter 670 to the RAM 674. The analog signals which are loaded at high speed into the dual port RAM 674 in real time, are processed by the microcomputer 606 after all analog signals in a message have been received. The microcomputer 606 accesses the data stored in RAM 674 through data lines and address lines, and in the preferred embodiment of the present invention, generates either character encoded information in the case of alphanumeric message data having been received, or digitized sampled data of the information symbol pairs in the case voice was transmitted. The digitized voice samples can alternatively stored in formats such as CVSD (Continuous Variable Slope Delta modulation), or LPC (Linear Predicitive Coding) based formats. In the case of time compressed voice signals, the stored ADC samples are processed by CPU 640 by bringing them in from the dual port RAM 674 and second I/O 628 to (1) amplitude expand the audio signal and (2) time-expand the signal as described in Leitch '747, and store the now decompressed analog (typically, voice) signal in RAM 674, in digitally sampled form. The alphanumeric or voice data is stored in the dual portRAM 674 until the information is requested for presentation by manipulation of the user controls 651. When a stored alphanumeric encoded message is to be read, the user actuates a display message read switch (a portion of the user controls 651) which enables processor section 606 to recover the data, and to present the recovered data to a display 611, such as a liquid crystal display. When a voice message is to be presented audibly, the user actuates an audio message read switch which enables the processor section 606 to recover the data from the dual port RAM 674, and to present the recovered digitally sampled data to the audio processor 614 which converts the digitally sampled data into an analog voice signal which is coupled to a speaker 616 for presentation of the voice message to the user." Col. 13:10-51. **Motorola '448 incorporates by reference U.S. Patent No. 5,689,440 ("Motorola '440") which discloses transmissions modulated using a "first modulation method" (e.g., "FSK") and a "second modulation method" (e.g., "QAM") of a different "type" than the "first modulation method."** "With regard to modulation, wo types of modulation are preferably used on the forward channel of the present invention: Digital FM (2-level and 4-level FSK) and AM (SSB or QAM with pilot carrier). Digital FM modulation is used for the sync portions of both types of frames, and for the address and data fields of the control frames. AM modulation (each sideband may be used independently or combined together in a single message) is used in the voice message field of the voice frames." Col. 6:14-22. "Please keep in mind that this compressed voice paging system is highly bandwidth efficient and intended to support typically 6 to 30 voice messages per 25 kHz channel using the basic concepts of quadrature amplitude (QAM) or single-side band (SSB) modulation and time scaling of speech signals." Col. 4:44-49. "Alternatively, the quadrature amplitude modulation may be used where the two independent signals are transmitted directly

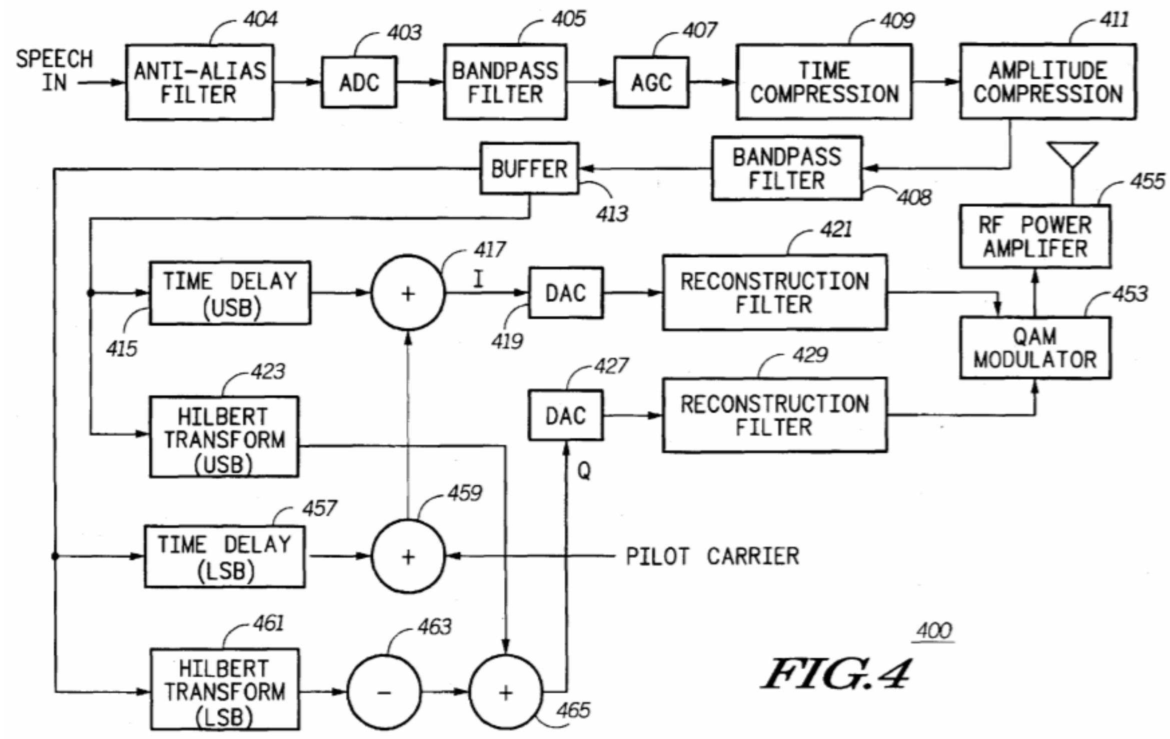
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		via I and Q components of the signal to form each sub-channel signal." Col. 4:60-63. "The present invention can operate as a mixed-mode (voice or digital) one or two way communications system for delivering analog voice and/or digital messages to selective call receiver units on a forward channel (outbound from the base transmitter) and for receiving acknowledgments from the same selective call receiver units which additionally have optional transmitters (on an optional reverse channel (inbound to a base receiver). The system of the present invention preferably utilizes a synchronous frame structure similar to FLEX.TM. (a high speed paging protocol by Motorola, Inc. and subject of U.S. Pat. No. 5,282,205, which is hereby incorporated by reference) on the forward channel for both addressing and voice messaging. Two types of frames are used: control frames and voice frames. The control frames are preferably used for addressing and delivery of digital data to selective call receivers in the form of portable voice units (PVU's). The voice frames are used for delivering analog voice messages to the PVU's. Both types of frames are identical in length to standard FLEX.TM. frames and both frames begin with the standard FLEX.TM. synchronization. These two types of frames are time multiplexed on a single forward channel. The frame structure for the present invention will be discuss in greater detail later on with regard to FIGS. 10, 11 and 12. With regard to modulation, two types of modulation are preferably used on the forward channel of the present invention: Digital FM (2-level and 4-level FSK) and AM (SSB or QAM with pilot carrier). Digital FM modulation is used for the sync portions of both types of frames, and for the address and data fields of the control frames. AM modulation (each sideband maybe used independently or combined together in a single message) is used in the voice message field of the voice frames. The digital FM portions of the transmission support 6400 BPS (3200 Baud symbols) signaling. The AM portions of the transmissions support band limited voice (2800 Hz) and require 6.25 KHz for a pair of voice signals. The protocol, as will be shown later, takes advantage of the reduced AM bandwidth by subdividing a full channel into 6.25 KHz subchannels, and by using each subchannel and the AM sidebands for independent messages." Col. 5:57-6:30.[4] "If the speech processing, encoding and modulation portion of the present invention were to be implemented into hardware, the implementation of FIG. 5 could be used. For instance, transmitter 500 of FIG. 5 would include a series of pairs of single-sideband exciters (571-576) set to the frequencies of their respective pilot carriers (581-583). Exciters 571-576 and pilot carriers 581-583 correspond to the separate voice processing paths. All these signals, including a signal from an FM signal exciter 577 (for the digital FM modulation used for the synchronization, address and data fields previously described) would be fed into a summing amplifier 570 which in turn is amplified by a linear amplifier 580 and subsequently transmitted. The low level output of FM exciter 577 is also linearly combined in summing amplifier 570. The composite output signal of summing amplifier 570 is amplified to the desired power level, usually 50 watts or more, by linear RF power amplifier 580. The output of linear RF power amplifier 580 is then coupled to the transmitting antenna." Col. 11:62-12:13. "The maintenance of receiver tuning is especially important for the proper reception of QAM (that is, I and Q components) and/or SSB information which is transmitted in the linear modulation format." Col. 13:57-60.

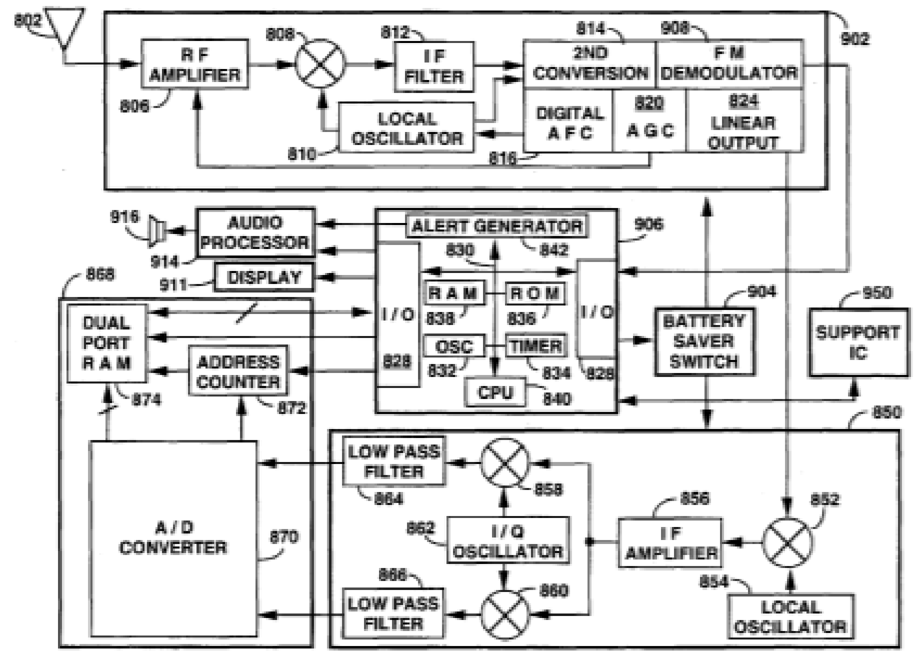
[4] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

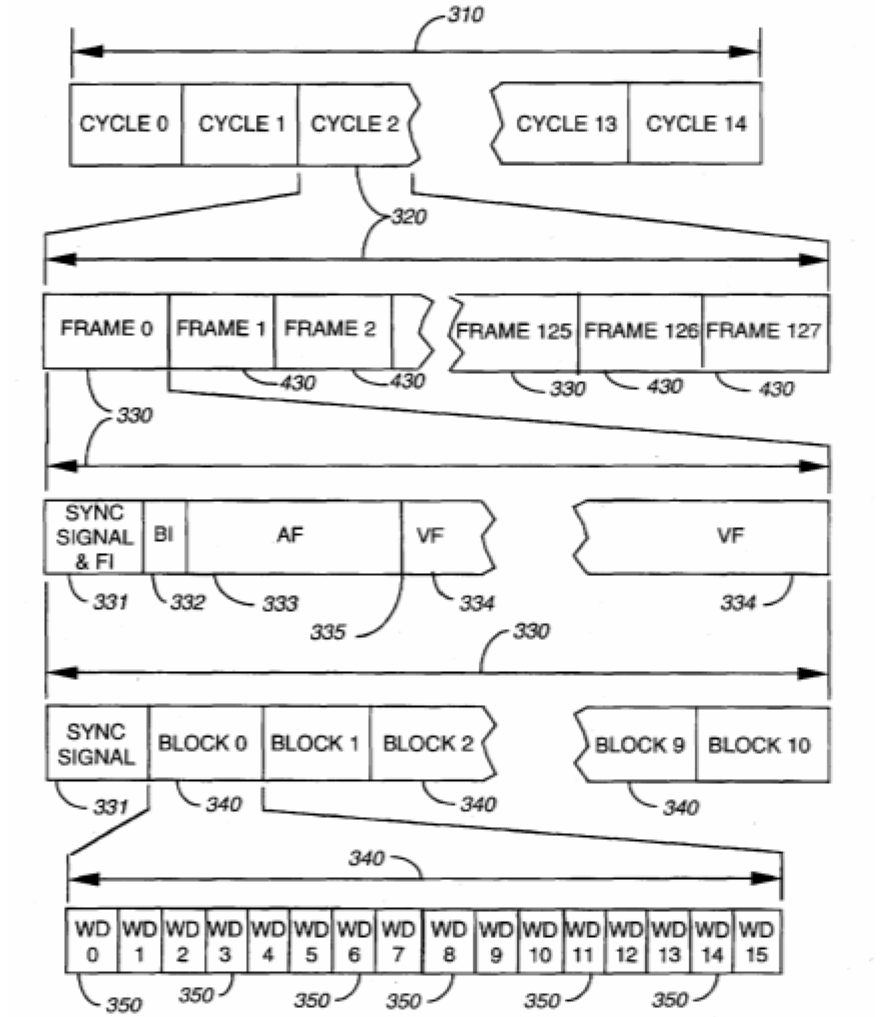
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		“The transmitter base station comprises an input device for receiving an audio signal, a processing device for compressing the audio signal using a time-scale compression technique and a single side band modulation technique to provide a processed signal and a quadrature amplitude modulator for the subsequent transmission of the processed signal.” Cols. 2:2-8. “In yet another aspect of the present invention, a paging base station for transmitting selective call signals on a communication resource having a predetermined bandwidth, comprises, an input device for receiving a plurality of audio signals, a device for subchannelizing the communication resource into a predetermined number of subchannels, an amplitude compression and filtering module for each subchannel for compressing the amplitude of the respective audio signal and filtering the respective audio signal, a time compression module for compression of the time of the respective audio signal for each subchannel, and a quadrature amplitude modulator for the subsequent transmission of the processed signal.” Cols. 2:24-36. “The selective call is then input to the selective call transmitter 102 where it is applied as modulation to a radio frequency signal which is sent over the air through an antenna 103. Preferably, the transmitter is a quadrature amplitude modulation transmitter for transmitting the processed signal” Cols. 3:39-44. “Preferably, in a first embodiment and also referring to FIG. 6, the compressed voice channel or voice communication resource consists of 3 sub-channels that are separated by 6250 Hz. Each sub-channel consists of two side-bands and a pilot carrier. Each of these two side-bands may have the same message in a first method or separate speech messages on each sideband or a single message split between the upper and lower sidebands in a second method. The single sub-channel has a bandwidth of substantially 6250 Hz with each side-band occupying a bandwidth of substantially 3125 Hz. The actual speech bandwidth is substantially 300-2800 Hz.” Cols. 4:49-60. “This signal is Hilbert transformed to obtain a single-sideband signal. Alternatively, the signal is quadrature modulated to obtain a QAM signal. A pilot carrier is then added to the signal and the final signal is interpolated, preferably, to a 16 kHz sampling rate and converted to analog. This is then modulated and transmitted.” Cols. 5:50-56. “FIG. 3 illustrates a block diagram of a first embodiment of a transmitter 300 in accordance with the present invention. An analog speech signal is input to an anti-aliasing low pass filter 301 which strongly attenuates all frequencies above one-half the sampling rate of an analog-to-digital converter (ADC) 303 which is further coupled to the filter 301. The ADC 303 preferably converts the analog speech signal to a digital signal so that further signal processing can be done using digital processing techniques. Digital processing is the preferred method, but the same functions could also be performed with analog techniques or a combination of analog and digital techniques. A band pass filter 305 coupled to the ADC 303 strongly attenuates frequencies below and above its cutoff frequencies. The lower cutoff frequency is preferably 300 Hz which allows the significant speech frequencies to pass, but attenuates lower frequencies which would interfere with a pilot carrier. The upper cutoff frequency is preferably 2800 Hz which allows the significant speech frequencies to pass but attenuates higher frequencies which would interfere with adjacent transmission channels. An automatic gain control (AGC) block 307 preferably coupled to the filter 305 equalizes the volume level of different voices.

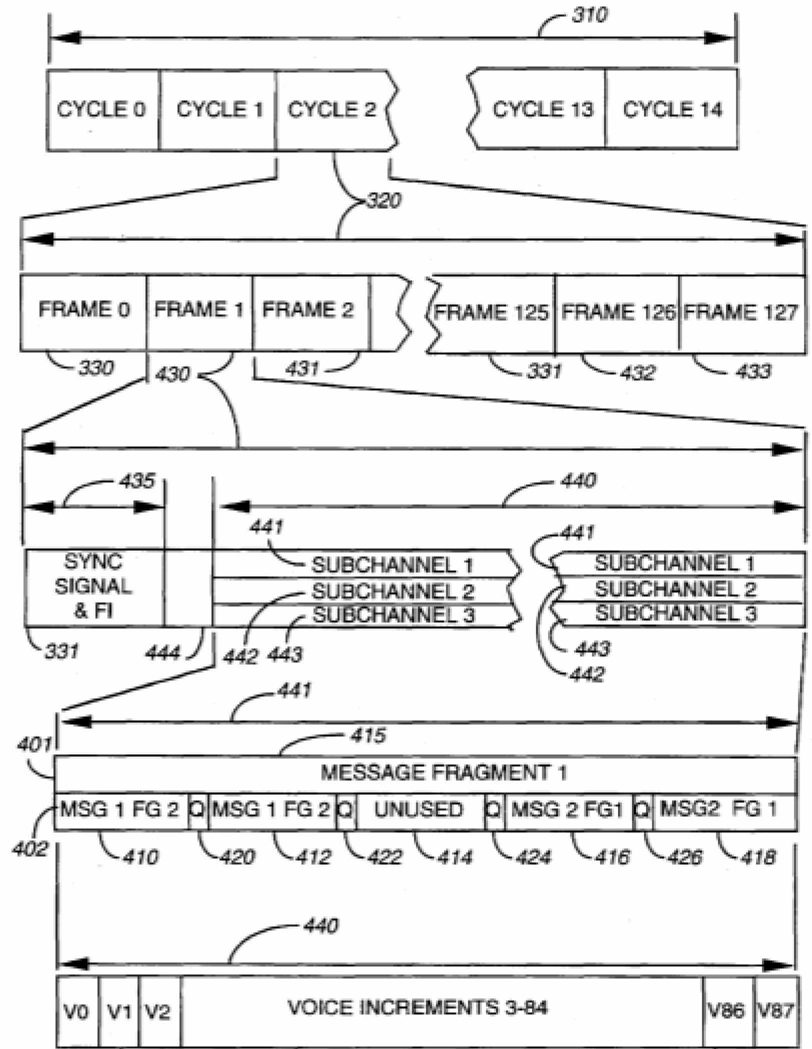
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		A time compression block 309 preferably coupled to the AGC block 307 shortens the time required for transmission of the speech signal while maintaining essentially the same signal spectrum as at the output of the bandpass filter 305. The time compression method is preferably WSOLA-SD (as will be explained later on), but other methods could be used. An amplitude compression block 311, and the corresponding amplitude expansion block 720 in a receiver 700 (FIG. 7), form a companding device which is well known to increase the apparent signal-to-noise ratio of the received speech. The companding ratio is preferably 2 to 1 in decibels, but other ratios could be used in accordance with the present invention. In the particular instance of a communication system such as a paging system, the devices 301-309 may be included in a paging terminal (113 of FIG. 1) and the remaining components in FIG. 3 could constitute a paging transmitter (102 of FIG. 1). In such a case, there would typically be a digital link between the paging terminal and paging transmitter. For instance, the signal after block 309 could be encoded using a pulse code modulation (PCM) technique and then subsequently decoded using PCM to reduce the number of bits transferred between the paging terminal and paging transmitter.” Cols. 7:26-8:4. “A quadrature amplitude modulation (QAM) modulator 333 modulates the I and Q signals onto a radio frequency (RF) carrier at low power level. Other modulation methods, e.g. direct digital synthesis of the modulated signal would accomplish the same purpose as the DACs (319 and 327), reconstruction filters (321 and 329), and QAM modulator 333.” Cols. 9:5-11. *See also*, 9:20-10:19. “During the batch when the high speed data is transmitted, the microprocessor 906 provides a count enabling signal which is coupled to the address counter 872. the A/D converter 870 is also enable to allow sampling of the information symbol pairs. The A/D converter 870 generates high speed sample clock signals which are used to clock the address counter 872 which in turn sequentially generates addresses for loading the sampled voice signals into a dual port random access memory 874 through data lines going from the converter 870 to the RAM 874. The voice signals which have been loaded at high speed into the dual port RAM 874 in real time, are processed by the microcomputer 906 after all voice signals have been received, thereby producing a significant reduction in the energy consumed by not requiring the microcomputer 906 to process the information in real time. The microcomputer 906 accesses the stored signals through data lines and address lines, and in the preferred embodiment of the present invention, processes the information symbol pairs to generate either ASCII encoded information in the case of alphanumeric data having been transmitted, or digitized sampled data in the case voice was transmitted.” Col. 15:66-16:20. “A transition portion 444 exists between the header portion 435 and analog portion 440. In accordance with the preferred embodiment of the present invention, the transition portion includes amplitude modulated pilot subcarriers for up to three subchannels 441, 442, 443. The analog portion 440 illustrates the three subchannels 441, so 442, 443 which are transmitted simultaneously, and each subchannel includes an upper sideband signal 401 and a lower sideband signal 402 (or alternatively, an in-phase and a quadrature signal).” Cols. 17:45-54. “1. A method for compressing a plurality of voice signals within a voice communication resource having a given bandwidth within a voice communication system, comprising the steps of: (a) subchanneling the voice communication resource into a plurality of subchannels and simultaneously placing a pair of the

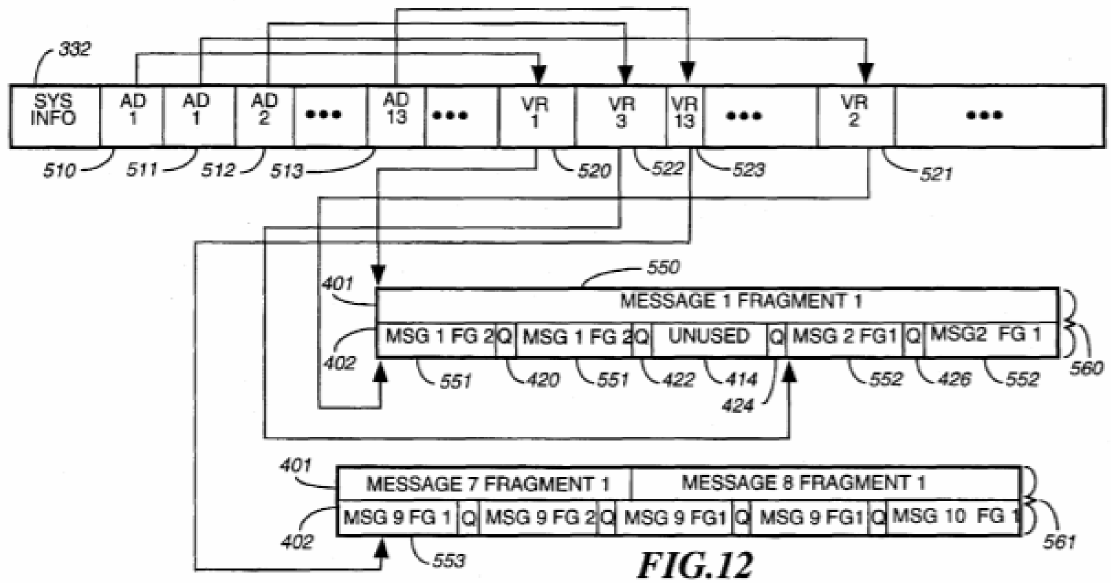
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		plurality of voice signals on a subchannel; (b) modulating the pair of the plurality of voice signals about a pilot signal within the subchannel within the voice communication resource using single sideband modulation; and (c) compressing the time of each of the voice signals within the plurality of subchannels, wherein the result of steps (a), (b), and (c) provides a compressed voice signal. 2. The method of claim 1, wherein the step of subchanneling further comprises the step of using quadrature amplitude modulation.” Claims 1-2. *See also*, Claims 10-14, 20. Fig. 3, reproduced below.  FIG.3 Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 Fig. 9, reproduced below.

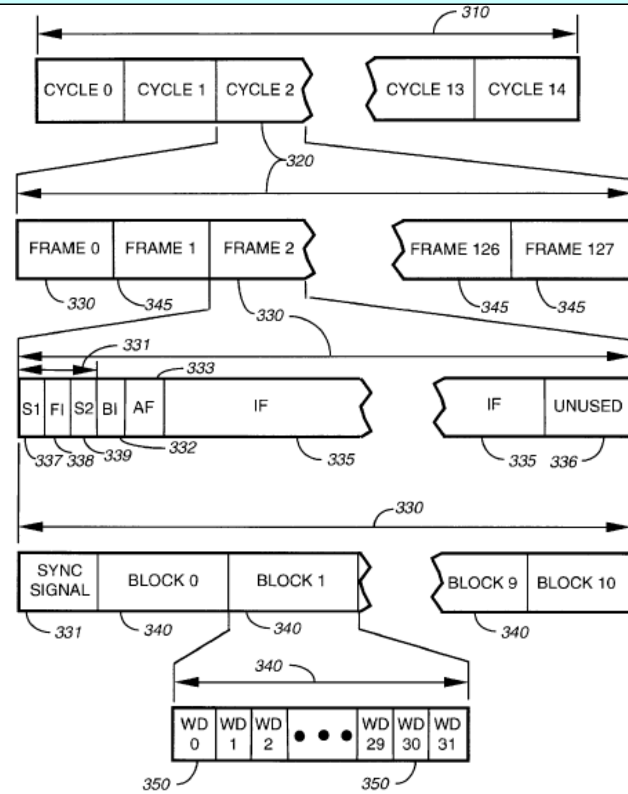
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 FIG. 9 900 Fig. 10, reproduced below.

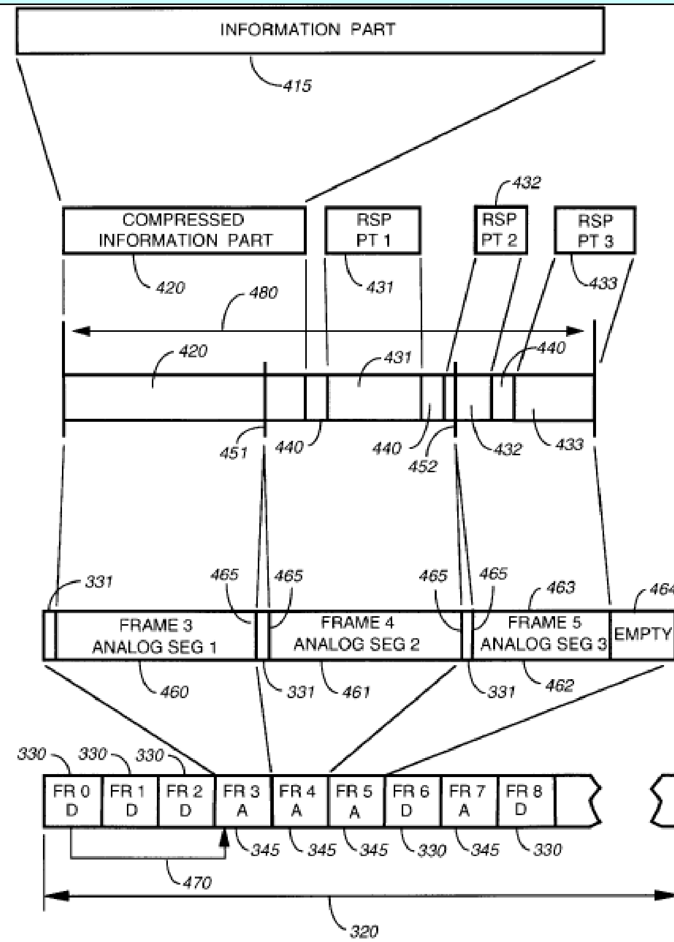
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 *FIG.10* Fig. 11, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 *FIG. 11*

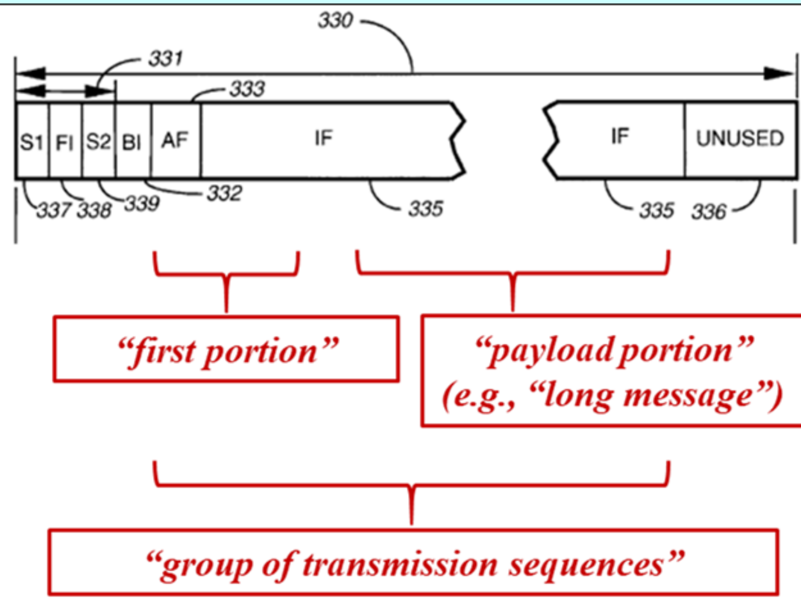
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		Fig. 12, reproduced below.  FIG.12
1[c]	wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion	**Motorola ’448 discloses wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion** **For example, Motorola ’448 discloses transmitting a “first portion” (e.g., “address,” “vector,” “pointer information”) within “control frame 330.”** “Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention. Control frames 330 are also classified as data frames 330. The outbound signaling protocol is subdivided into protocol divisions, which are an hour 310, a cycle 320, a frame 330, 345, a block 340, a word 350, and bits (not shown in FIG. 3). All protocol divisions are defined with reference to a synchronous period of a synchronous clock; the protocol division boundaries are coincident with edges of the synchronous clock. Up to fifteen 4 minute uniquely identified cycles are transmitted in each hour 310. Normally, all fifteen cycles 320 are transmitted each hour. Up to one hundred twenty eight 1.875 second uniquely identified frames including control frames 330 and analog frames 345 are transmitted in each of the

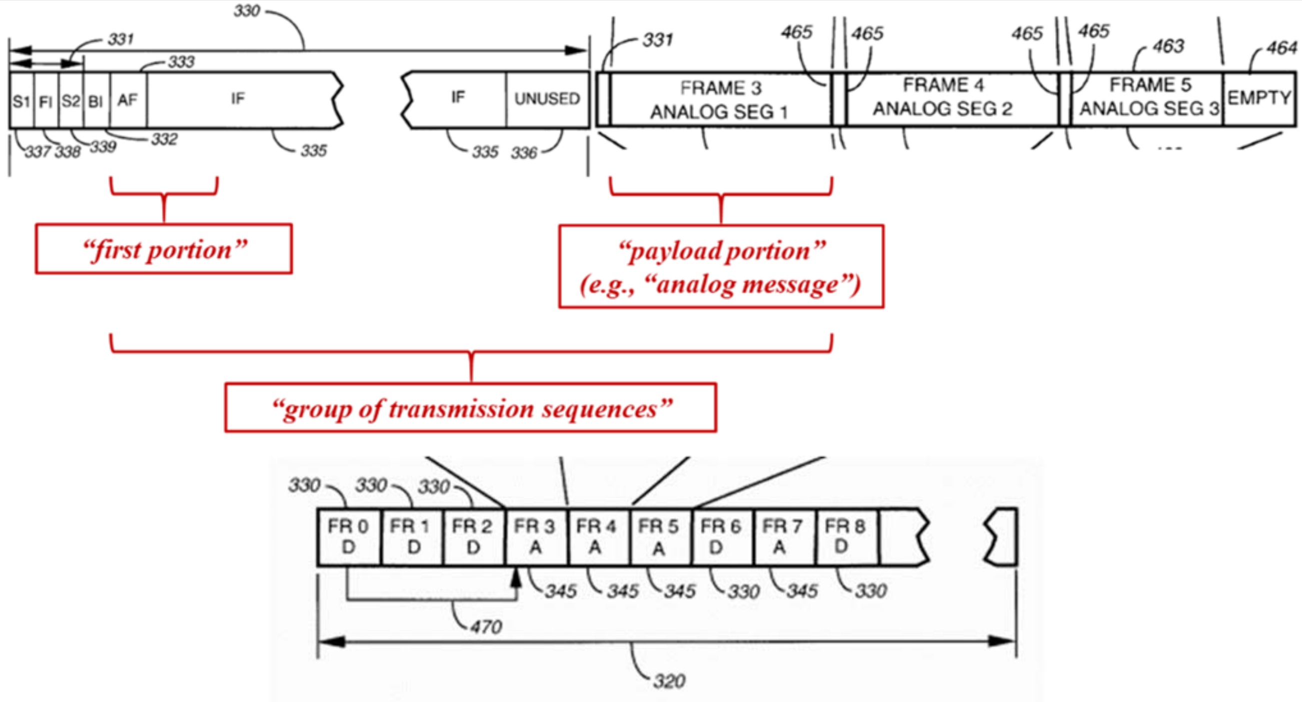
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		cycles 320.” Col. 6:19-37. “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein” Col. 6:55-62. “When analog information is to be transmitted in the linear modulation format (such as SSE or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information.” Col. 12:29-39. “Voice messages transmitted by the base stations 116 utilize mixed signaling techniques. A voice message preferably includes a digital message portion and an analog message portion. The digital message portion includes at least the addressing information which is used to identify the selective call radio 122, and a message vector identifying the location of the analog message. The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols as described more fully in U.S. Pat. No. 5,168,493 issued Dec. 1, 1992 to Nelson et al., which is hereby incorporated herein by reference, and hereinafter referred to as Nelson '493. This synchronous protocol utilizes well-known error detection and error correction techniques and is therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous in any one code word. Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Outbound channel transmissions of the analog message portion transmitted by the base stations 116 preferably utilize single side band (SSE) transmission. A voice message portion preferably comprises at least an upper side band (USE), a lower side band (LSE) and a pilot carrier. It will be appreciated that, alternatively, a voice message portion can comprise the pilot carrier and a single one of the sidebands. A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Col. 3:31-65; “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format” Col. 12:13-18. **In addition, Motorola ’448 discloses transmitting a “payload portion” (e.g., “long message,” “analog message”) — within frame 330 and frame 345.** Fig. 3, reproduced below.

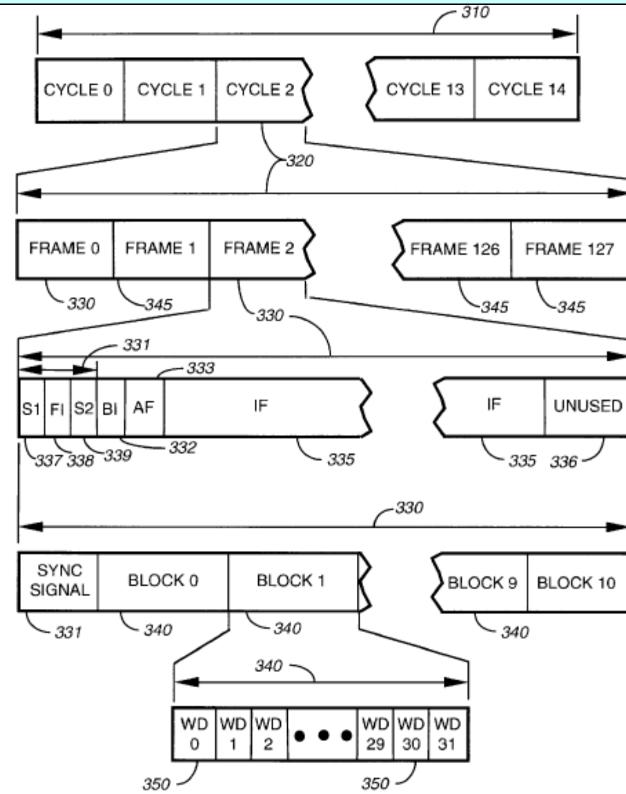
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 ***FIG. 3*** Fig. 4, reproduced below.

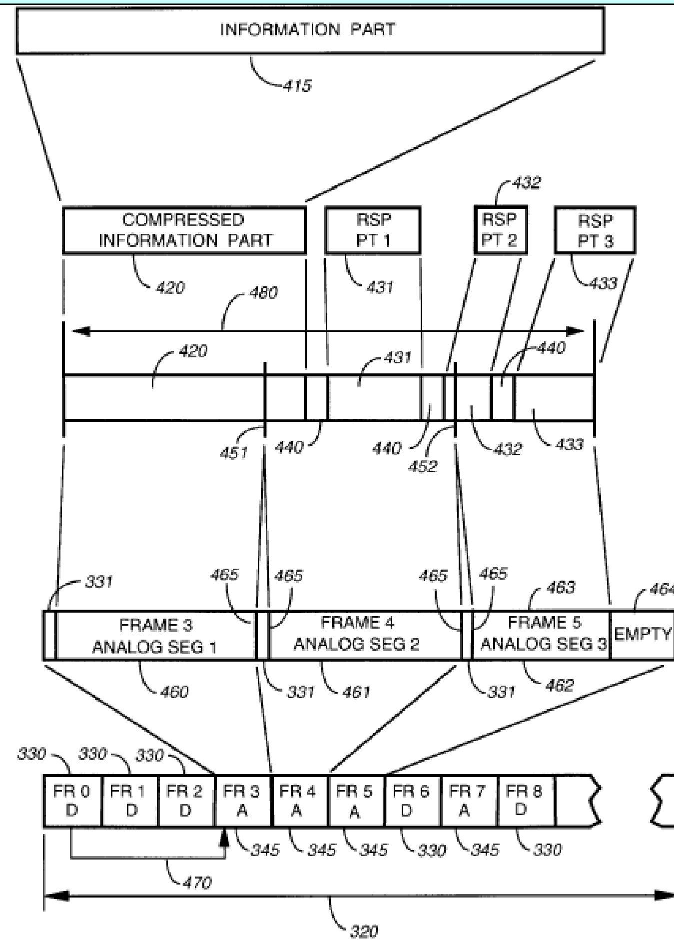
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 *FIG. 4* “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein.” Col. 6:55-62. “As described above, messages may have either digital information, such as a alphanumeric message, or analog information,

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49. “When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:25-35. “The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in FIG. 4 by the arrow 470.” Col. 8:62-65. “The synchronization signal 331 includes a first sync portion 337, a frame information word 338, and a second sync portion 339. A bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps is usable during the blocks 340 of each control frame 330. The bit rate of the blocks 340 of each control frame 330 is communicated to the selective call radios 122 during the synchronization signal 331.” Col. 6:42-48. “The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202.” Col. 4:51-55. *See also*, Col. 6:19-9:33. “Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330.” Col. 6:67-7:6. “The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet.” Col. 7:14-21. Figures 3, annotated to show a “group of transmission sequences” with a “first portion” and a long message “payload portion”:

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 Figures 3 and 4 annotated to show a “group of transmission sequences” with a “first portion” and an analog message “payload portion”:

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 FIG. 4
1[d]	wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,	**Motorola ’448 (incorporating by reference Motorola ’440) discloses wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion.** **Motorola ’448 (incorporating by reference Motorola ’440) discloses that the first information (e.g., “address,” “vector,” “pointer information”) indicates whether the selective call radio is receiving a “long message” modulated using the first modulation method (e.g., “FSK”) or an “analog message” modulated using the second modulation method (e.g., “QAM”).** Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 *FIG. 3* Fig. 4, reproduced below.

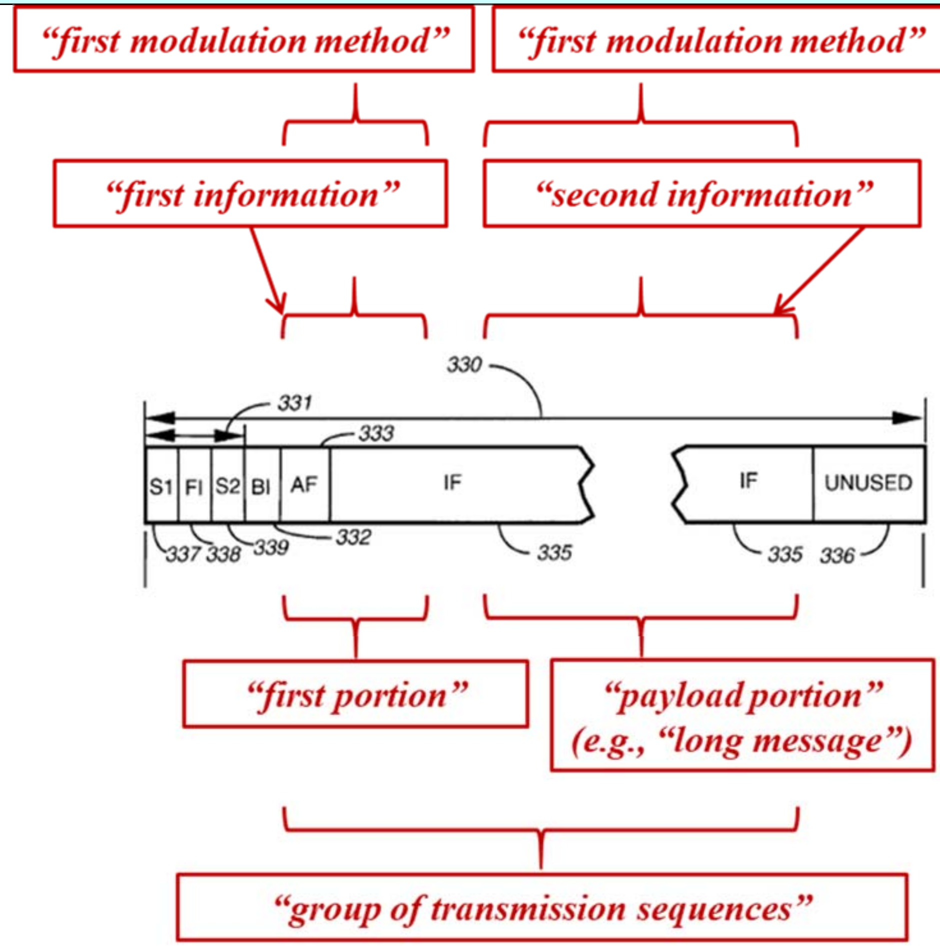
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 ***FIG. 4*** “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the decoded message information is received and stored in the microcomputer RAM 638, or in the analog conversion and message storage section 668, as will be explained further below,

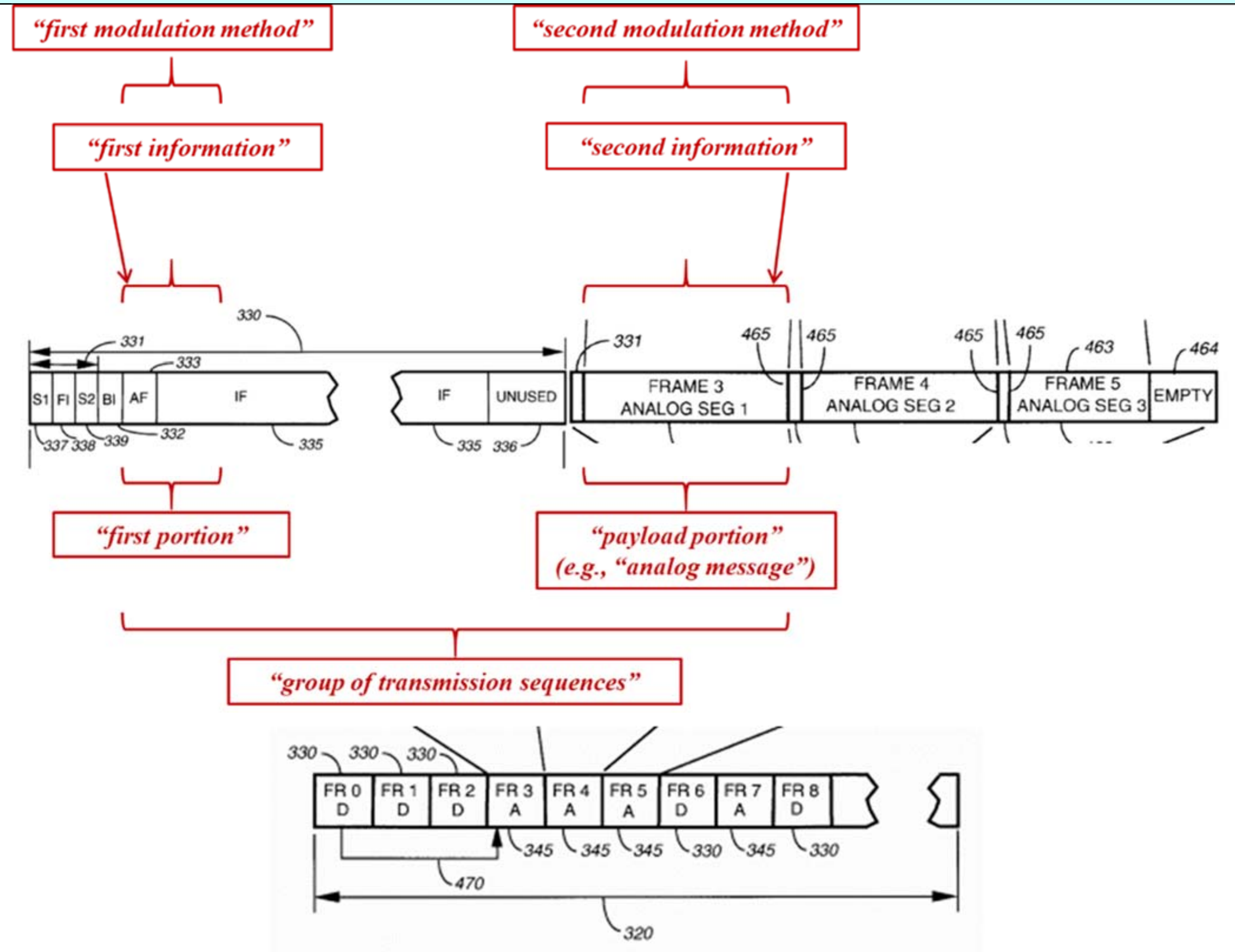
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		and an alerting signal is generated by alert generator function 642.” Col. 12:13-24. “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein.” Col. 6:55-62. “Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330.” Col. 6:67-7:6. “As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49. “Included in a control frame 330 are an address of the selective call radio 122 and position identifier (pointer information) for a multipart analog message 480. The intercepted signal is coupled to the receiver 602, where it is FM demodulated by the FM demodulator 608. At step 720, the processor section 606 digitally decodes address data in the control frame 330 and determines that the predetermined address of the selective call radio 122 matches one of the digitally decoded addresses in the control frame. Position identifier information is digitally decoded by the processor section 606 at step 730. The position identifier includes a vector identifying the frame number of the frame 345 in which the multipart analog message 480 starts, and further indicates in which sidebands segments of the multipart message are located, as well as how many frames include segments of the multipart analog message 480. In accordance with the preferred embodiment of the present invention, the segments of the multi part analog message 480 are located in consecutive analog frames 345. Using the position identifier, the processor section 606 controls power to the receiver 602 to turn off the FM demodulator 608, turn on the linear output section 624, and begin recovering the multipart analog message 480 after the synchronizing signal 331 of the frame 345 has been recovered, at step 740. Recovery of the multipart analog message 480 involves digital sampling of the compressed analog waveform and digital signal processing to decompress the compressed waveform, as described herein, above. In accordance with the preferred embodiment of the present invention, while the processor section 606 is processing the digitally sampled multipart analog message 480 to decompress the compressed analog signal, the processor section 606, at step 750, analyzes the decompressed, digital samples of the analog signal, using conventional digital signal processing techniques, to detect any of a set of predetermined analog part delimiter signals, which are dual tone multifrequency (DTMF) signals of a common predetermined duration, such as 60 milliseconds. It will be appreciated that the detection of the analog part delimiter 440 is done without reference to the synchronous periods or clock edges which define the synchronous protocol. When one of the set of DTMF signals is detected at step 750, the processor section 606 identifies a boundary between a preceding independent analog part and a succeeding independent analog part, at step 760, and determines which digit the DTMF signal represents.” Col. 14:19-56. “The term "position" in this context means the identification of the beginning of all segments of the multipart analog

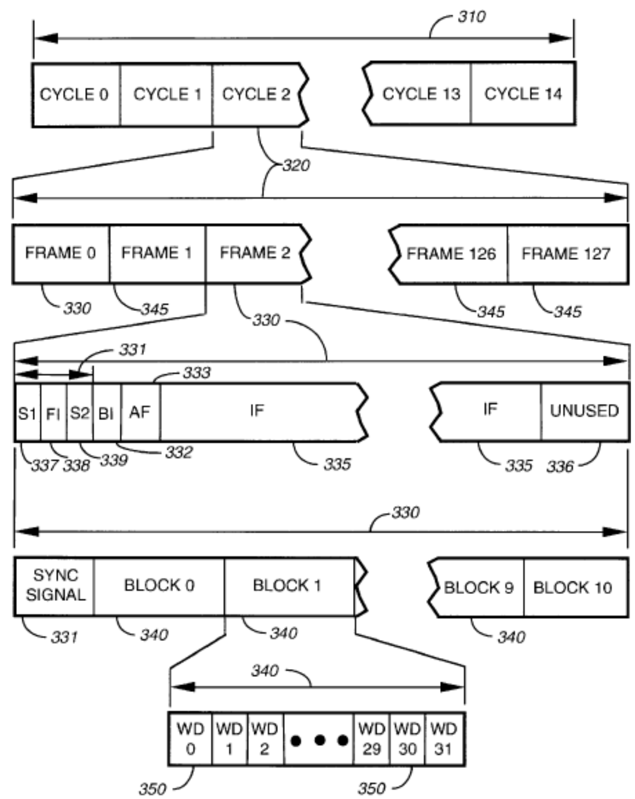
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		message 480, as well as their duration and ordering within the multipart analog message 480, so that the multipart analog message 480 can be reconstructed. At step 570 (FIG. 5), the processor section 210 includes a digital code within the synchronous protocol which identifies the position of the multipart analog message 480 within the synchronous protocol. In accordance with the preferred embodiment of the present invention, the position is identified by a binary code included in a data frame 330 which identifies the frame number (3, in this example) of the analog frame 345 at which the multipart analog message 480 starts, and how many frames it occupies. The data frame 330 and analog frames 345 are coupled from the system controller 112 to the transmitter 202, where they are modulated on a radio carrier and transmitted by the antenna 120, at step 580." Col. 8:45-61. "The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet. When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345." Col. 7:14-31. "The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in FIG. 4 by the arrow 470." Col. 8:62-65. "Additionally, in response to an FM modulated address (and message position code words), the processor section 606 initiates the operation of the analog conversion and message storage section 668, which samples either or both of an I (In-phase) and a Q (quadrature) linearly modulated signal at outputs of the linear demodulator 650. The I and Q signal samples are written directly to the dual port RAM 674 with the aid of the address counter 672, in response to a control signal from the processor section 606, which is a well known direct memory access technique." Col. 10:47-56. "When the message information or control data is digital, it is transmitted in the FM modulation format, and the IF signal is coupled to the FM demodulator 608." Col. 11:19-21. "When analog information is to be transmitted in the linear modulation format (such as SSB or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information." Col. 12:29-39. "When digital data is received in a digital portion of a message, the processor section 606 decodes the digital information (performing symbol decoding and error detection and correction decoding in a manner well known to one of ordinary skill in the art), and controls the address counter 672 to store the decoded binary information in the RAM 674." Col. 13:4-9. "The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal,

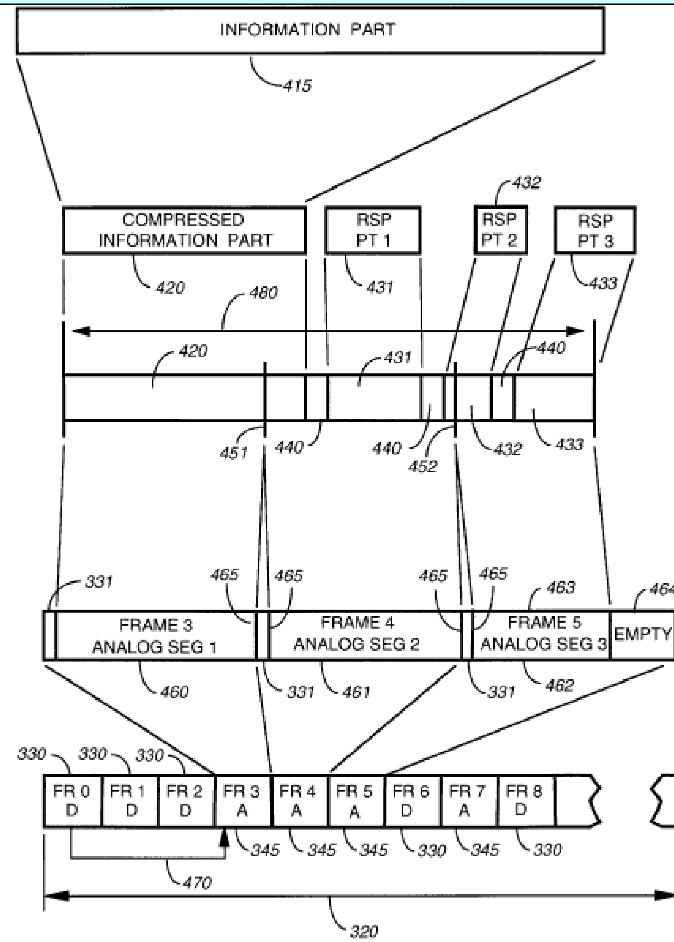
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202.” Col. 4:51-55. “When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:25-31. “When analog information is to be transmitted in the linear modulation format (such as SSE or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information. The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section 606, through 1/0 port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion and message storage section 668, thus starting a process of recovering an analog signal, as will be described below. The IF signal, which now carries the SSE (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals.” Col. 12:29-60. “The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet.” Col. 7:14-24. “ At step 560 (FIG. 5), the processor section includes the multipart analog message 480 within a cycle of the synchronous protocol, at a position in the synchronous protocol. In this example, the multipart analog message 480 is included in frames 3, 4, 5 of the outbound synchronous protocol, by being broken into analog segments 460, 461, 462 (FIG. 4). It will be appreciated that the segments 460, 461, 462 are generated by the processor section by splitting the seamless multipart analog message 480 at boundaries 451, 452 (FIG. 4) such that the segments 460, 461, 462 will fit within frames 345 of the synchronous protocol. It will be appreciated that the first two segments 460, 461 fill the frames number 3 and 4, but that the third segment 463 does not fill frame number 5, leaving an empty portion 464 of that frame.” Col. 8:30-44. “One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320.” Col. 6:62-67.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		“Referring to FIGS. 4 and 5, a timing diagram and a flow chart illustrate an example of an assembly and inclusion of a multipart analog message in analog form within a cycle 320 of the synchronous outbound protocol transmitted in the radio communication system, in accordance with the preferred embodiment of the present invention. The processor section 210 obtains and stores in the mass memory 214, at step 510 (FIG. 5), an information portion 415 (FIG. 4) of an analog message which is to be transmitted to a selective call radio 122. For example, the information portion is an analog signal generated by a voice message received from an originating caller by means of the telephone 111, in which the originating caller says "Can you go to lunch with me at 12:30?"” Col. 7:32-45. “The independent information portion and response portions thus obtained and stored at these first steps 510, 520 of sending a multipart analog message are then time compressed at step 530 (FIG. 5) by the processor section 210 into shorter independent analog parts 420, 431, 432,433 (FIG. 4) which are stored in the mass media 214 in digitally sampled form.” Col. 7:67-8:6. “The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in 65 FIG. 4 by the arrow 470.” Col. 8:62-65. *See also* 1[b] discussion of “FSK” as the first modulation method and “QAM” as the second modulation method. **Motorola ’440 (incorporated by reference into Motorola ’448) discloses the first modulation method (e.g., “FSK”) and the second modulation method (e.g., “QAM”).** *See* 1[b] discussion of “FSK” as the first modulation method, and “QAM)” as the second modulation method. Figures 3, annotated to show “first information” in the “first portion” and “second information” in the “payload portion” when the “payload portion” comprises a long message:

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 Figures 3 and 4, annotated to show "first information" in the "first portion" and "second information" in the "payload portion" when the "payload portion" comprises an analog message:

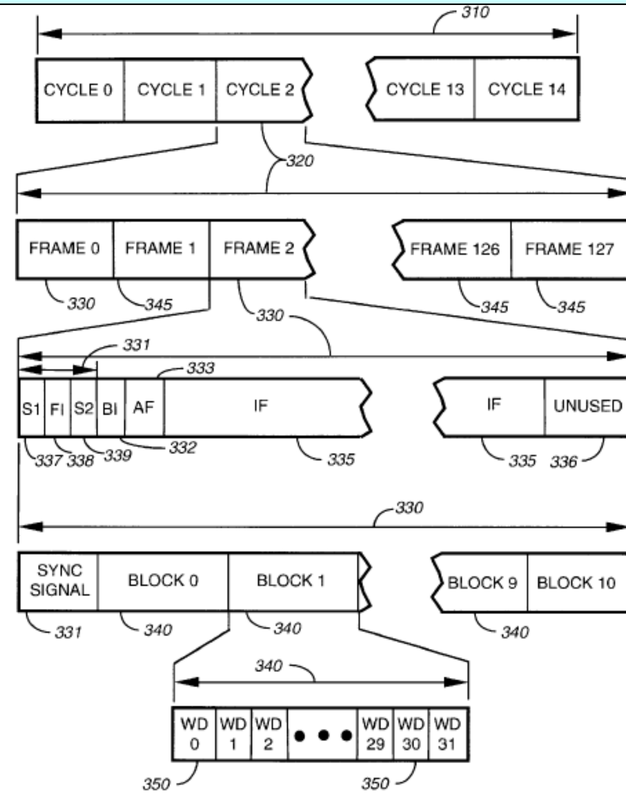
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 FIG. 4
1[e]	wherein at least one group of transmission	**Motorola '448 discloses wherein at least one group of transmission sequences is addressed for an intended destination**

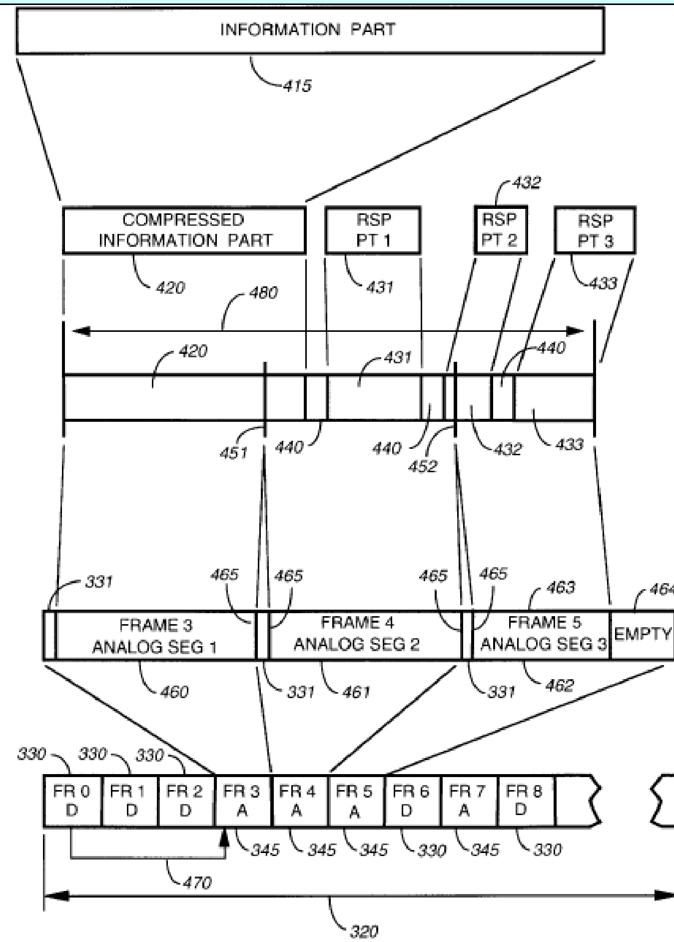
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
	sequences is addressed for an intended destination of the payload portion, and	**of the payload portion.** Motorola ’448 discloses that each selective call radio has a unique address which enables the transmission of a message to only that selective call radio. Fig. 3, reproduced below.  *FIG. 3* Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 ***FIG. 4*** "Each of the selective call radios 122 assigned for use in the radio communication system has an address assigned thereto which is a unique selective call address. The address enables the transmission of a message from the system controller 112 only to the addressed selective call radio, and identifies messages and responses received at the system controller 112 from the selective call radio." Col. 4:19-25. "Information is included in each control frame 330 in information fields, comprising system information in the frame

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein.” Col. 6:55-62. “Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330.” Col. 6:67-7:6. “When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:22-31. “When the information in the recovered data signal matches any of several stored predetermined addresses,” Col. 12:13-14. “The RF signals transmitted by the base stations 116 to the selective call radios 122 (outbound messages) comprise selective call addresses identifying the selective call radios 122, and data or voice messages originated by a caller.” Col. 3:8-12. “The code memory is preferably an EEPROM (electrically erasable programmable read only memory) which stores one or more predetermined addresses to which selective call radio 122 is responsive.” Col. 12:6-9. “One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320.” Col. 6:62-67. “[S]ubsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format.” Col. 12:15-18.
1[f]	wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method, and	**Motorola ’448 (incorporating by reference Motorola ’440) discloses wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method.** **For example, Motorola ’448 discloses a “first sequence” (e.g., “address,” “vector,” “pointer information”) in the first portion and modulated according to the “first modulation method” (e.g., “FSK”).** “When the message information or control data is digital, it is transmitted in the FM modulation format, and the IF signal is coupled to the FM demodulator 608.” Col. 11:19-21. “Voice messages transmitted by the base stations 116 utilize mixed signaling techniques. A voice message preferably

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		includes a digital message portion and an analog message portion. The digital message portion includes at least the addressing information which is used to identify the selective call radio 122, and a message vector identifying the location of the analog message. The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols as described more fully in U.S. Pat. No. 5,168,493 issued Dec. 1, 1992 to Nelson et al., which is hereby incorporated herein by reference, and hereinafter referred to as Nelson '493. This synchronous protocol utilizes well-known error detection and error correction techniques and is therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous in any one code word. Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Outbound channel transmissions of the analog message portion transmitted by the base stations 116 preferably utilize single side band (SSE) transmission. A voice message portion preferably comprises at least an upper side band (USE), a lower side band (LSE) and a pilot carrier. It will be appreciated that, alternatively, a voice message portion can comprise the pilot carrier and a single one of the sidebands. A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Col. 3:31-65. “Included in a control frame 330 are an address of the selective call radio 122 and position identifier (pointer information) for a multipart analog message 480. The intercepted signal is coupled to the receiver 602, where it is FM demodulated by the FM demodulator 608. At step 720, the processor section 606 digitally decodes address data in the control frame 330 and determines that the predetermined address of the selective call radio 122 matches one of the digitally decoded addresses in the control frame. Position identifier information is digitally decoded by the processor section 606 at step 730. The position identifier includes a vector identifying the frame number of the frame 345 in which the multipart analog message 480 starts, and further indicates in which sidebands segments of the multipart message are located, as well as how many frames include segments of the multipart analog message 480.” Col. 14:19-34. **Motorola ’448 (incorporating by reference Motorola ’440) discloses that the “first sequence” (e.g., “address,” “vector,” “pointer information”) “indicates an impending change from the first modulation method to the second modulation method” (e.g., from “FSK” to “QAM”).** Fig. 3, reproduced below.

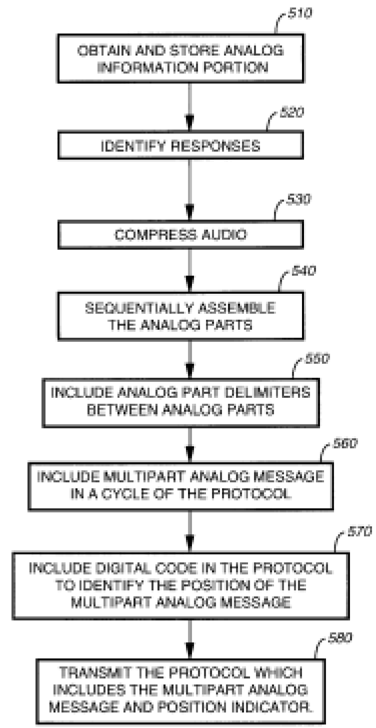
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 *FIG. 3* Fig. 4, reproduced below.

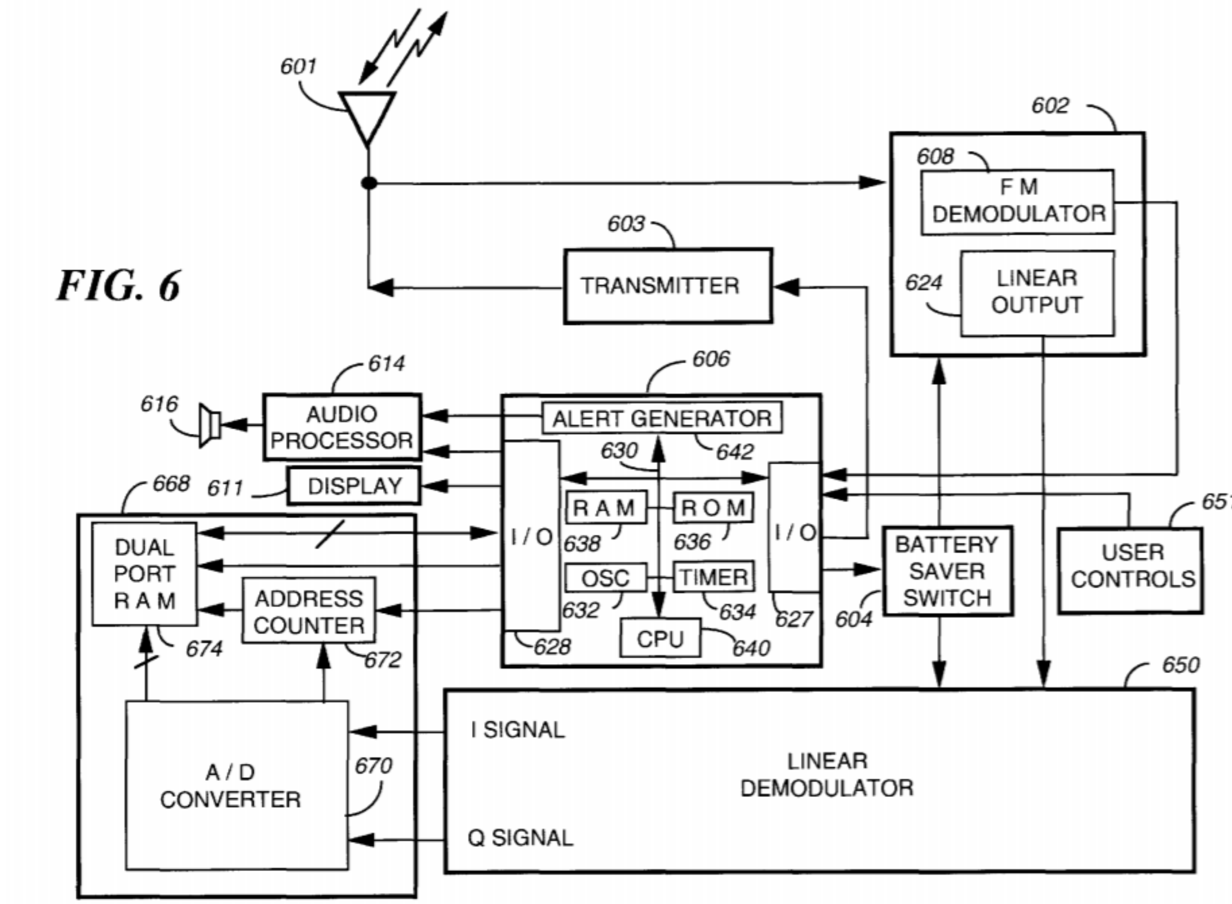
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 *FIG. 4* "When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the decoded message information is received and stored in the microcomputer RAM 638, or in the analog conversion and message storage section 668, as will be explained further below,

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		and an alerting signal is generated by alert generator function 642." Col. 12:13-24. "When analog information is to be transmitted in the linear modulation format (such as SSB or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information." Col. 12:29-39. "Using the position identifier, the processor section 606 controls power to the receiver 602 to turn off the FM demodulator 608, turn on the linear output section 624, and begin recovering the multipart analog message 480 after the synchronizing signal 331 of the frame 345 has been recovered, at step 740." Col. 14:37-42. "Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein." Col. 6:55-62. "Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330." Col. 6:67-7:6. "The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet. When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345." Col. 7:14-31. "The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in FIG. 4 by the arrow 470." Col. 8:62-65. "Additionally, in response to an FM modulated address (and message position code words), the processor section 606 initiates the operation of the analog conversion and message storage section 668, which samples either or both of an I (In-phase) and a Q (quadrature) linearly modulated signal at outputs of the linear demodulator 650. The I and Q signal samples are written directly to the dual port RAM 674 with the aid of the address counter 672, in response to a control signal from the processor section 606, which is a well known direct memory access technique." Col. 10:47-56. "The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		reconverted back to the analog message portion by the transmitter 202.” Col. 4:51-55. “The term "position" in this context means the identification of the beginning of all segments of the multipart analog message 480, as well as their duration and ordering within the multipart analog message 480, so that the multipart analog message 480 can be reconstructed. At step 570 (FIG. 5), the processor section 210 includes a digital code within the synchronous protocol which identifies the position of the multipart analog message 480 within the synchronous protocol. In accordance with the preferred embodiment of the present invention, the position is identified by a binary code included in a data frame 330 which identifies the frame number (3, in this example) of the analog frame 345 at which the multipart analog message 480 starts, and how many frames it occupies. The data frame 330 and analog frames 345 are coupled from the system controller 112 to the transmitter 202, where they are modulated on a radio carrier and transmitted by the antenna 120, at step 580.” Col. 8:45-61. “When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:25-31. “The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in 65 FIG. 4 by the arrow 470.” Col. 8:62-65. “The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet.” Col. 7:14-25. “ At step 560 (FIG. 5), the processor section includes the multipart analog message 480 within a cycle of the synchronous protocol, at a position in the synchronous protocol. In this example, the multipart analog message 480 is included in frames 3, 4, 5 of the outbound synchronous protocol, by being broken into analog segments 460, 461, 462 (FIG. 4). It will be appreciated that the segments 460, 461, 462 are generated by the processor section by splitting the seamless multipart analog message 480 at boundaries 451, 452 (FIG. 4) such that the segments 460, 461, 462 will fit within frames 345 of the synchronous protocol. It will be appreciated that the first two segments 460, 461 fill the frames number 3 and 4, but that the third segment 463 does not fill frame number 5, leaving an empty portion 464 of that frame.” Col. 8:30-44. “When the FM modulated signaling information is received, it is decoded by the processor section 606, functioning as a decoder in a manner well known to one skilled in the art.” Col. 12:10-13. “In accordance with the preferred embodiment of the present invention, the segments of the multi part analog message 480 are located in consecutive analog frames 345.” Col. 14:34-37. “As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		“One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320.” Col. 6:62-67. “The independent information portion and response portions thus obtained and stored at these first steps 510, 520 of sending a multipart analog message are then time compressed at step 530 (FIG. 5) by the processor section 210 into shorter independent analog parts 420, 431, 432,433 (FIG. 4) which are stored in the mass media 214 in digitally sampled form.” Col. 7:67-8:6. “The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section 606, through 1/0 port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion and message storage section 668, thus starting a process of recovering an analog signal, as will be described below. The IF signal, which now carries the SSE (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals.” Col. 12:39-60. Fig. 5, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 *FIG. 5* Fig. 6, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		FIG. 6  Fig. 7, reproduced below.

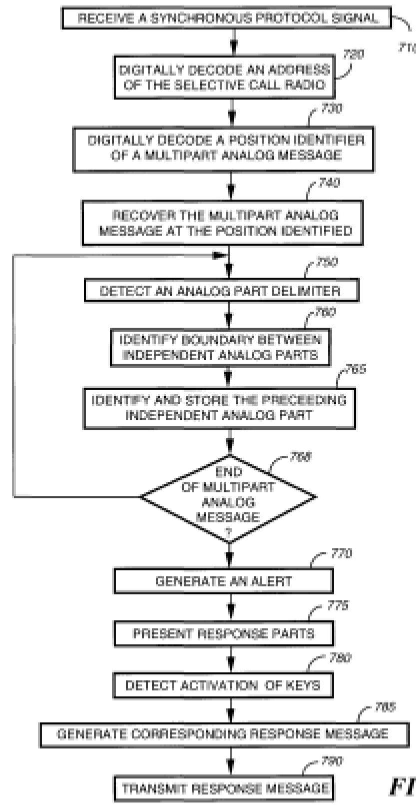
<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,023,580
(“the ’580 patent”)</th><th>The Motorola ’448 patent</th></tr>
<tr><td></td><td></td><td>


FIG. 7

See also 1[b] discussion of “FSK” as the first modulation method and “QAM” as the second modulation method.

Figures 3 and 4, annotated to show a “first sequence” in the “first portion” that is “modulated according to the first modulation method” and a “second sequence that is modulated according to the second modulation method” in the “second information”:
</td></tr>
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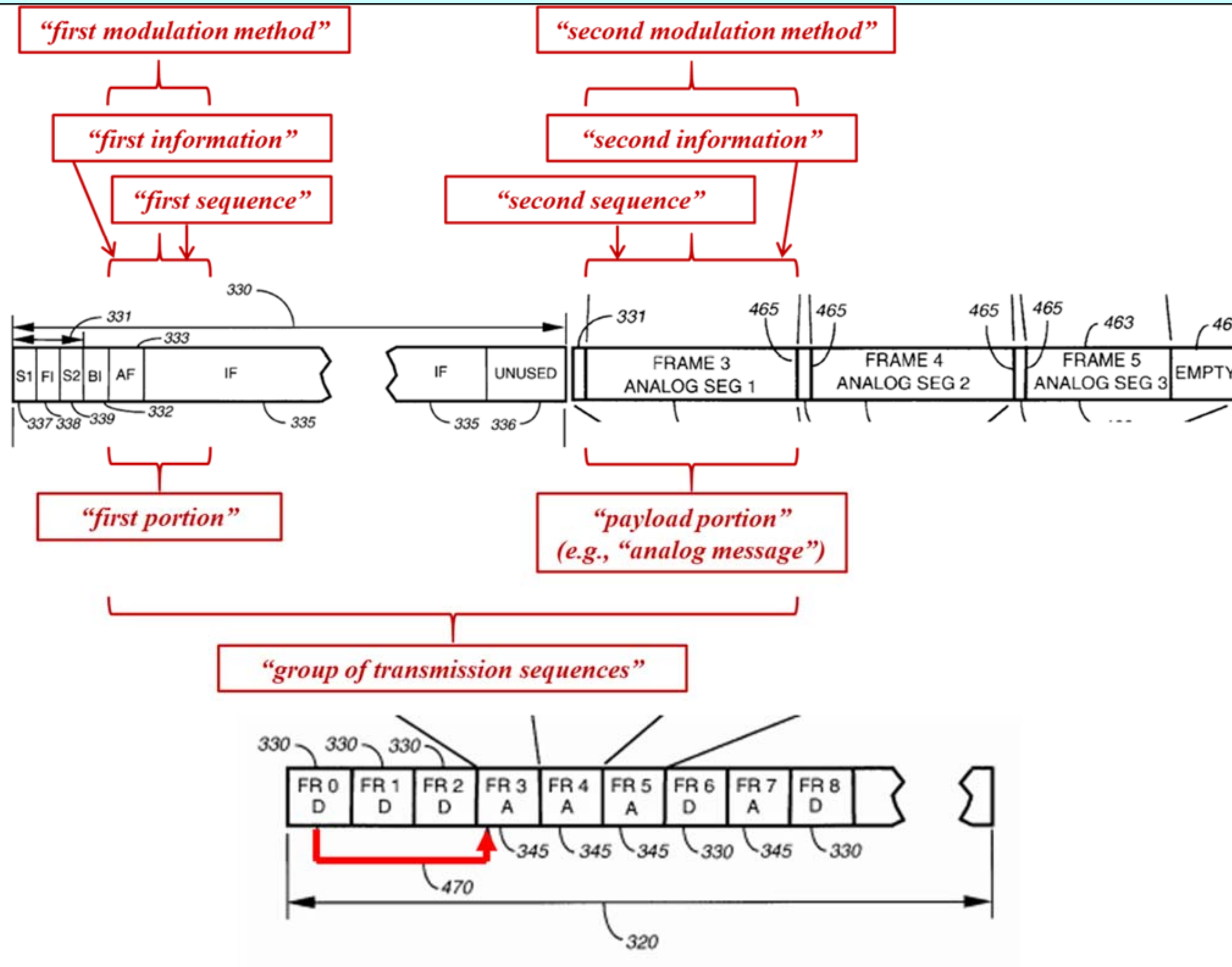
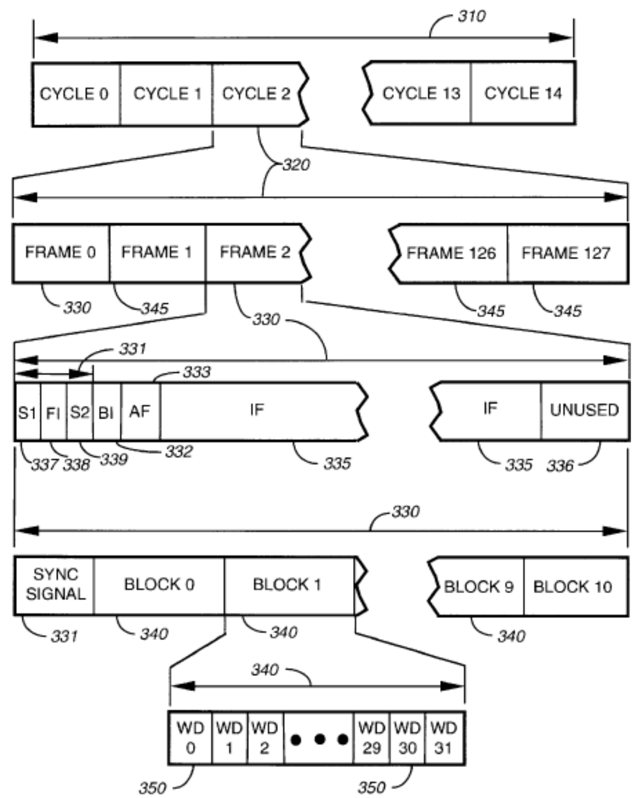
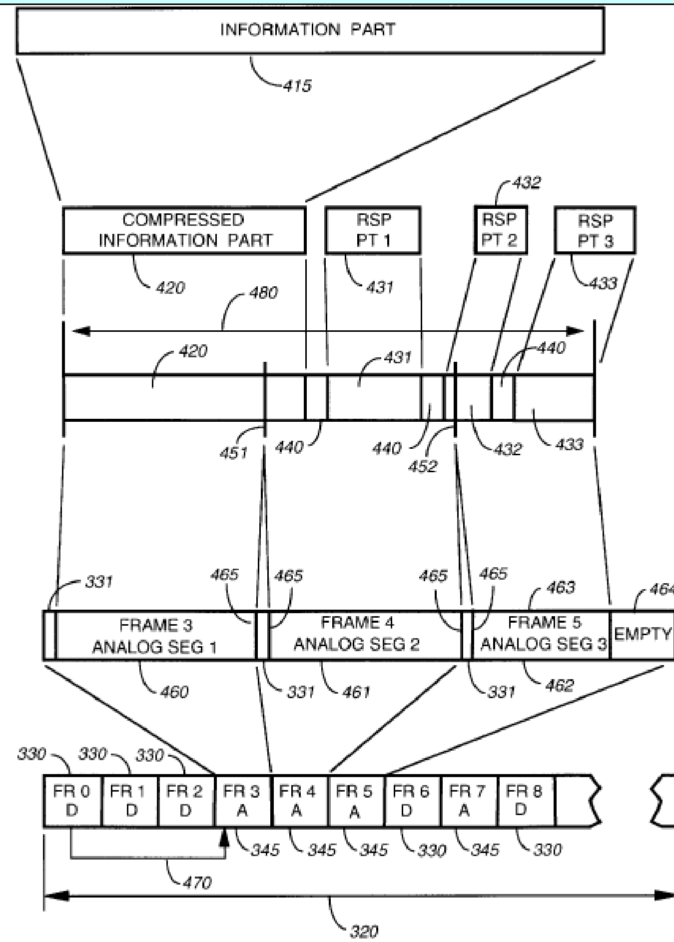
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		 *FIG. 4* **Motorola '448 (incorporating by reference Motorola '440) discloses address and pointer information within control frame 330 indicates an impending change from the first modulation method to the second modulation method, as**

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		occurs, for example, when the transceiver transmits a long message to a selective call receiver and then addresses that same receiver again to transmit an analog message. **Motorola ’440 (incorporated by reference into Motorola ’448) discloses the first modulation method (e.g., “FSK”) and the second modulation method (e.g., “QAM”).** *See* 1[b] discussion of “FSK” as the first modulation method and “QAM” as the second modulation method.
1[g]	the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.	**Motorola ’448 (incorporating by reference Motorola ’440) discloses the second information (e.g., “analog message”) for said at least one group of transmission sequences comprises a second sequence (e.g., “analog message”) that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence (e.g., “analog frame 345” transmitted after “control frame 330” (which includes “address,” “vector,” “pointer information”)).** *See* 1[f] discussion of “address,” “vector,” “pointer information” as first sequence and “analog message” as the second sequence.

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
2	The device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	**Motorola ’448 (incorporating by reference Motorola ’440) discloses device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method** *See* Claim 1; *see also* **For example, Motorola ’448 discloses a transceiver configured to send transmissions to a selective call radio where communication switches between modulation methods.** *See* 1[pre] and 1[a] discussion of base station 116, controller 112, antennas 118/120 which comprise a transceiver in the role of a master according to the master/slave relationship; *See also* 1[b] discussion of “FSK” as the first modulation method and “QAM” as the second modulation method. **Motorola ’448 (incorporating by reference Motorola ’440) further discloses that the transceiver is configured to send a control frame 330 modulated using a first modulation method (e.g., “FSK”) after an analog frame 345 modulated using a second modulation method (e.g., “QAM”). For example, the “address,” “vector,” “pointer information” within the subsequent control frame 330 indicates the modulation method (e.g., “FSK”) used for the “long message”**

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		in that control frame. Fig. 3, reproduced below.  *FIG. 3* Fig. 4, reproduced below.

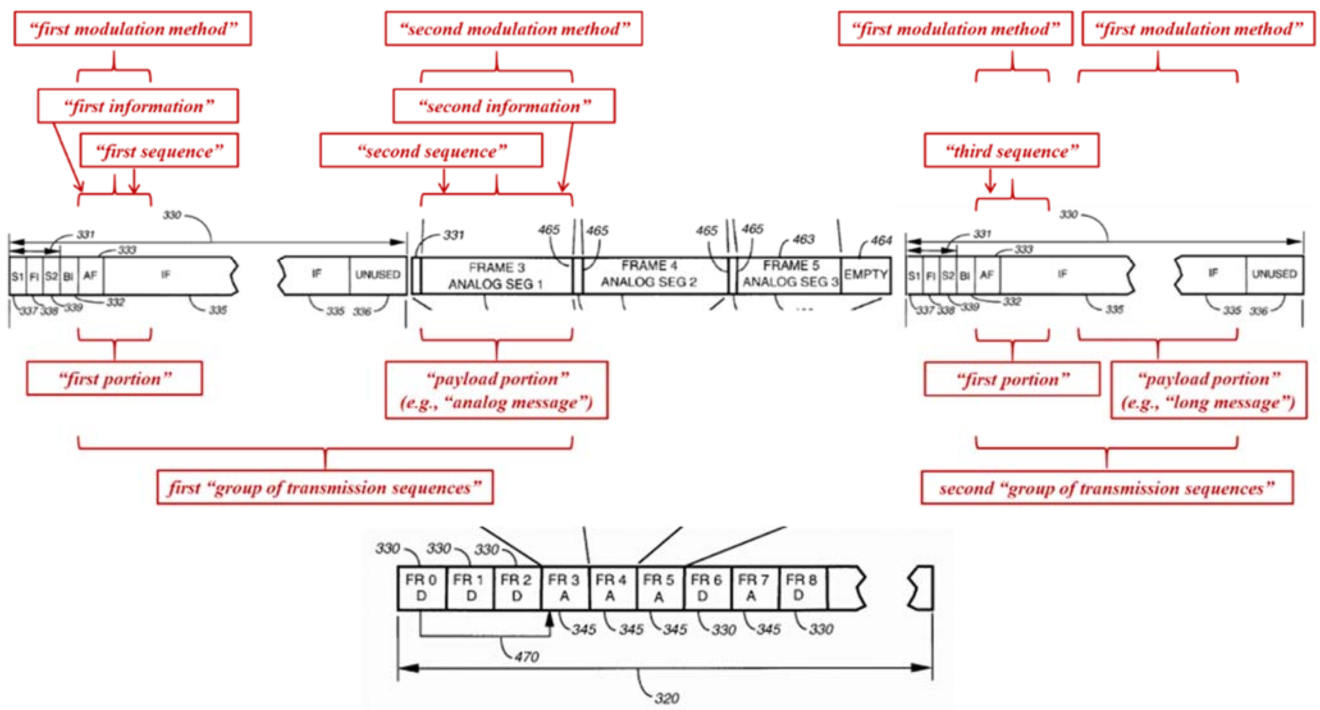
	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		 ***FIG. 4*** “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the decoded message information is received and stored in the microcomputer RAM 638, or in the analog conversion and message storage section 668, as will be explained further below,

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		and an alerting signal is generated by alert generator function 642." Col. 12:13-24. "The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet. When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345." Col. 7:14-31. "As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame." Col. 5:44-49 "Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein." Col. 6:55-62. "Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330." Col. 6:67-7:6. "When the message information or control data is digital, it is transmitted in the FM modulation format, and the IF signal is coupled to the FM demodulator 608. The FM demodulator 608 demodulates the IF signal in a manner well known to one of ordinary skill in the art, to provide a recovered digital signal, which is a stream of binary information corresponding to the received address and message digital information transmitted in the FM modulation format. The recovered digital signal is coupled to the input of the processor section 606, which functions as a decoder and controller, through an input of input/output port, or I/O port 627." Col. 11:19-30. "When digital data is received in a digital portion of a message, the processor section 606 decodes the digital information (performing symbol decoding and error detection and correction decoding in a manner well known to one of ordinary skill in the art), and controls the address counter 672 to store the decoded binary information in the RAM 674. When analog data is received in an analog portion of a message, the A/D converter 670 is enabled to allow sampling of the information symbol pairs. The A/D converter 670 generates high speed sample clock signals which are used to clock the address counter 672 which in turn sequentially generates addresses for loading the sampled voice signals into a dual port random access memory 674 through data lines going from the converter 670 to the RAM 674. The analog signals which are loaded at high speed into the dual port RAM 674 in real time, are processed by the microcomputer 606 after all analog signals in a message have been received. The microcomputer 606 accesses the data stored in RAM 674 through data lines and address lines, and in the

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		preferred embodiment of the present invention, generates either character encoded information in the case of alphanumeric message data having been received, or digitized sampled data of the information symbol pairs in the case voice was transmitted. The digitized voice samples can alternatively stored in formats such as CVSD (Continuous Variable Slope Delta modulation), or LPC (Linear Predictive Coding) based formats. In the case of time compressed voice signals, the stored ADC samples are processed by CPU 640 by bringing them in from the dual port RAM 674 and second I/O 628 to (1) amplitude expand the audio signal and (2) time-expand the signal as described in Leitch '747, and store the now decompressed analog (typically, voice) signal in RAM 674, in digitally sampled form. The alphanumeric or voice data is stored in the dual portRAM 674 until the information is requested for presentation by manipulation of the user controls 651. When a stored alphanumeric encoded message is to be read, the user actuates a display message read switch (a portion of the user controls 651) which enables processor section 606 to recover the data, and to present the recovered data to a display 611, such as a liquid crystal display. When a voice message is to be presented audibly, the user actuates an audio message read switch which enables the processor section 606 to recover the data from the dual port RAM 674, and to present the recovered digitally sampled data to the audio processor 614 which converts the digitally sampled data into an analog voice signal which is coupled to a speaker 616 for presentation of the voice message to the user." Col. 13:4-51. "Recovered voice is played back through the audio processor 614 and transducer 616, while alphanumeric data can be displayed on display 611, which is a limited display (≤16 characters) in accordance with the preferred embodiment of the present invention. An information signal, modulated in the FM modulation format, or in a linear modulation format (such as SSB), is intercepted by the antenna 601, which couples the information signal to the receiver 602." Col. 11:5-13. "The processor section 606 provides complete operational control of the selective call radio 122, providing such functions as decoding, message storage and retrieval, display control, and alerting, just to name a few." Col. 11:30-33. "The internal bus 630 connects each of the operational elements of the processor section 606. Second I/O port 628 provides a plurality of control and data lines providing communications between the processor section 606 and external circuits, such as the battery saver switch 604, the audio processor 614, the display 611, and the analog conversion and message storage section 668. A timing means, such as timer 634 is used to generate the timing signals required for the operation of the selective call radio 122, such as for battery saver timing, alert timing, and message storage and display timing. Oscillator 632 provides the clock for operation of CPU 640, and provides the reference clock for timer 634. RAM 638 is used to store information utilized in executing the various firmware routines controlling the operation of the selective call radio 122, and can also be used to store short messages, such as numeric messages. The ROM 636 contains masked program instructions (binary program codes) used to control the processor section 606 operation, including conventional routines as required for decoding the recovered data signal, battery saver control, message storage and retrieval in the analog conversion and message storage section 668, and general control of the selective call radio 122 operation and message presentation." Col. 11:40-62. "The I and Q audio signals are coupled to the analog conversion and message storage section 668, in particular to the inputs of the analog to digital converter 670." Col. 12-61-63. "It will be appreciated that other types of conventional computer systems 212 can be utilized, and that additional computer

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
		systems 212 and mass storage media 214 of the same or alternative type can be added as required to handle the processing requirements of the processor section 210. The processor section 210 provides message handling functions which schedule outbound messages having selective call addresses associated therewith, for transmission within a transmission cycle of the synchronous protocol. This is accomplished by scheduling, as necessary, portions of messages within different frames of a transmission cycle." Col. 5:38-43. "The processor section 606 comprises a microprocessor 640, RAM 638, a read only memory (ROM) 636, a timer 634, an oscillator (OSC) 632, a data bus 630, a first input/output (1/0) 627, a second 1/0 628, and an alert generator function 642." Col. 11:1-5. "The non-volatile code memory is coupled to the processor section 606 through the I/O port 627. The code memory is preferably an EEPROM (electrically erasable programmable read only memory) which stores one or more predetermined addresses to which selective call radio 122 is responsive. When the FM modulated signaling information is received, it is decoded by the processor section 606, functioning as a decoder in a manner well known to one skilled in the art. When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the decoded message information is received and stored in the microcomputer RAM 638, or in the analog conversion and message storage section 668, as will be explained further below, and an alerting signal is generated by alert generator function 642. The alerting signal is coupled to the audio processing circuit 614 which drives transducer 616, delivering an audible alert. Other forms of sensible alerting, such as tactile or vibrating alert, can also be provided to alert the user. When analog information is to be transmitted in the linear modulation format (such as SSB or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information. The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section 606, through I/O port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion and message storage section 668, thus starting a process of recovering an analog signal, as will be described below." Col. 12:4-53. "When digital data is received in a digital portion of a message, the processor section 606 decodes the digital information

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		(performing symbol decoding and error detection and correction decoding in a manner well known to one of ordinary skill in the art), and controls the address counter 672 to store the decoded binary information in the RAM 674. When analog data is received in an analog portion of a message, the A/D converter 670 is enabled to allow sampling of the information symbol pairs. The A/D converter 670 generates high speed sample clock signals which are used to clock the address counter 672 which in turn sequentially generates addresses for loading the sampled voice signals into a dual port random access memory 674 through data lines going from the converter 670 to the RAM 674. The analog signals which are loaded at high speed into the dual port RAM 674 in real time, are processed by the microcomputer 606 after all analog signals in a message have been received. The microcomputer 606 accesses the data stored in RAM 674 through data lines and address lines, and in the preferred embodiment of the present invention, generates either character encoded information in the case of alphanumeric message data having been received, or digitized sampled data of the information symbol pairs in the case voice was transmitted. The digitized voice samples can alternatively stored in formats such as CVSD (Continuous Variable Slope Delta modulation), or LPC (Linear Predictive Coding) based formats. In the case of time compressed voice signals, the stored ADC samples are processed by CPU 640 by bringing them in from the dual port RAM 674 and second I/O 628 to (1) amplitude expand the audio signal and (2) time-expand the signal as described in Leitch '747, and store the now decompressed analog (typically, voice) signal in RAM 674, in digitally sampled form. The alphanumeric or voice data is stored in the dual portRAM 674 until the information is requested for presentation by manipulation of the user controls 651. When a stored alphanumeric encoded message is to be read, the user actuates a display message read switch (a portion of the user controls 651) which enables processor section 606 to recover the data, and to present the recovered data to a display 611, such as a liquid crystal display. When a voice message is to be presented audibly, the user actuates an audio message read switch which enables the processor section 606 to recover the data from the dual port RAM 674, and to present the recovered digitally sampled data to the audio processor 614 which converts the digitally sampled data into an analog voice signal which is coupled to a speaker 616 for presentation of the voice message to the user.” Col. 13:4-51. “As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49. “The data frame 330 and analog frames 345 are coupled from the system controller 112 to the transmitter 202, where they are modulated on a radio carrier and transmitted by the antenna 120, at step 580.” Col. 8:58-61. “One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320.” Col. 6:62-67. “The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet.” Col. 7:14-21. Figures 3 and 4 annotated to show, following the “second sequence,” a “third sequence” that is modulated in the first

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
		modulation method and that indicates that communication has reverted to the first modulation method:  FIG. 4 **Motorola ’448 (incorporating by reference Motorola ’440) discloses its master transceiver is configured to transmit, after the “second sequence,” a “third sequence” that indicates that communication to the selective call radio has reverted to the first modulation method for a “long message” directed to that receiver. For example, a POSITA would have understood such a scenario occurs when the transceiver addresses and sends a long message to the selective call receiver before addressing and sending an analog message to that receiver; and after sending the analog message, again addresses that receiver to send a long message.**

	Claim 58 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
58[pre]	A communication device capable of	*See* 1[pre].

	Claim 58 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
	communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave, the device comprising:	
58[a]	a transceiver, in the role of the master according to the master/slave relationship,	*See* 1[a].
58[b]	capable of transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method, and	*See* 1[b].
58[c]	wherein the transceiver is configured to transmit messages with: a first sequence, in the first modulation method, that indicates at least which of the first modulation method and the second modulation method is used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method,	*See* 1[a] for discussion of "transceiver", 1[c] for discussion of "group of transmission sequences", 1[d] for "first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion," and 1[f] for "first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method."
58[d]	and wherein the at least one message is addressed for an intended destination of the second sequence, and	*See* 1[e].
58[e]	the second sequence, modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the second sequence is transmitted after the first sequence.	*See* 1[f] for "the first sequence indicates an impending change from the first modulation method to the second modulation method" and 1[g] for "second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence."

	Claim 59 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '448 patent
59	The device of claim 58, wherein the	*See* Claims 1, 2, and 58.

	Claim 59 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’448 patent
	transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	

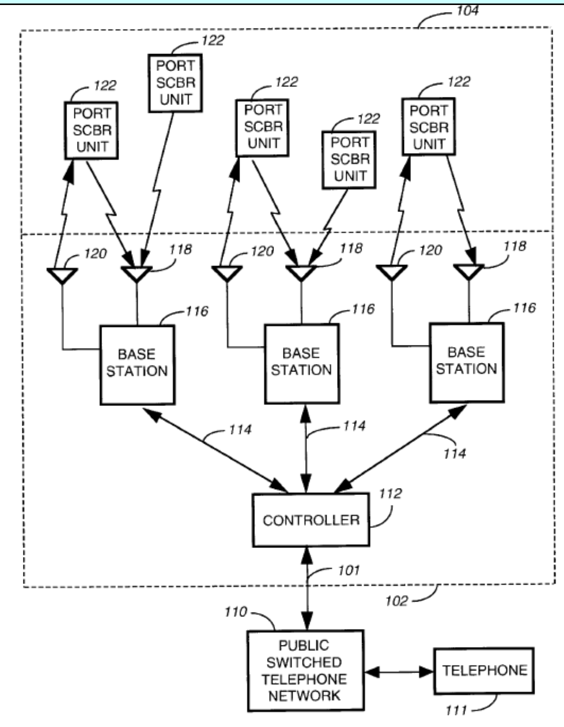
EXHIBIT E

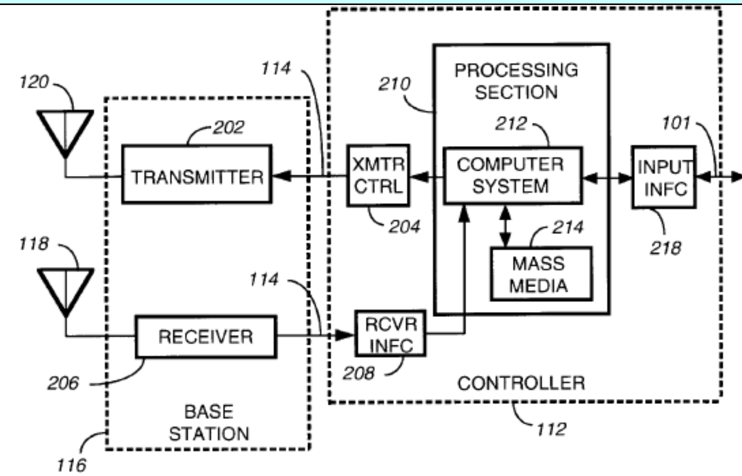
EXHIBIT E

Comparison of the Asserted Claims of the ‘228 Patent to U.S. Patent No. 5,905,448 (“the Motorola ’448 patent” or “Motorola ’448”)

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,457,228 (“the ’228 patent”) are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by U.S. Patent No. 5,905,448 (“Motorola ’448”) (which incorporates by reference U.S. Patent No. 5,689,440 (“Motorola ’440”)) and (b) under 35 U.S.C. § 103(a) as obvious over Motorola ’448 (incorporating by reference Motorola ’440) standing alone and as set forth herein, and/or in view of the teachings of U.S. Patent No. 5,644,568 (“Motorola ’568). One of ordinary skill in the art, as of the priority date of the ’228 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	**The Motorola ’448 patent**
1[pre]	A master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device comprising:	**Motorola ’448 discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device.** **For example, Motorola ’448 discloses a communication device (e.g., “base station[] 116,” “controller 112,” antennas 118/120) acting as a master communication device in master/slave relationship capable of transmitting communications to and receiving communications from a slave device (e.g., “selective call radio 122”). The controller/base station communicates with the selective call radios using a synchronous protocol controlled by the controller/base station.** “FIG. 1 is an electrical block diagram of a radio communication system, in accordance with the preferred embodiment of the present invention.” Col. 2:22-24. “FIG. 2 is an electrical block diagram of a system controller used in the radio communication system, in accordance with the preferred and alternative embodiments of the present invention. Col. 2:22-28. Fig. 1, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG. 1* Fig. 2, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 **FIG. 2** “Referring to FIG. 1, an electrical block diagram of a communication system in accordance with the preferred embodiment of the present invention comprises a fixed portion 102 and a portable portion 104. The fixed portion 102 includes a plurality of base stations 116, for communicating with the portable portion 104, utilizing conventional radio frequency (RF) techniques well known in the art, and coupled by communication links 114 to a system controller 112 which controls the base stations 116.” Col. 2:50-58. “Each of the base stations 116 transmits RF signals to the portable portion 104 comprising a plurality of selective call radios 122 via a transmitting antenna 120. The base stations 116 each receive RF signals from the plurality of selective call radios 122 via a receiving antenna 118.” Col. 3:1-5. “The hardware of the system controller 112 is preferably a combination of the Wireless Messaging Gateway (WMG™) Administrator! paging terminal, and the RF-Conductor!™ message distributor manufactured by Motorola, Inc. The hardware of the base stations 116 is preferably a combination of the Nucleus® Orchestra! transmitter and RF-Audience!™ receivers manufactured by Motorola, Inc. It will be appreciated that other similar hardware can be utilized for the system controller 112 and the base stations 116.” Col. 2:58-67. “The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols as described more fully in U.S. Pat. No. 5,168,493 issued Dec. 1, 1992 to Nelson et al., which is hereby incorporated

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		herein by reference, and hereinafter referred to as Nelson '493." Col. 3:37-44. "Inbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions. The outbound and inbound channels preferably operate on separate carrier frequencies utilizing frequency division multiplex (FDM) techniques well known in the art. A detailed description of FDM techniques is more fully described in U.S. Pat. No. Siwiak '038. It will be appreciated that, alternatively, the outbound and inbound channels can operate on a single carrier frequency using time division duplex (TDD) techniques as described more fully in Nelson '493. It will be further appreciated that, alternatively, other synchronous signaling protocols can be used to transmit the digital and analog portions of the message…" Col. 4:1-14. "Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention. Control frames 330 are also classified as data frames 330. The outbound signaling protocol is subdivided into protocol divisions, which are an hour 310, a cycle 320, a frame 330, 345, a block 340, a word 350, and bits (not shown in FIG. 3). All protocol divisions are defined with reference to a synchronous period of a synchronous clock; the protocol division boundaries are coincident with edges of the synchronous clock. Up to fifteen 4 minute uniquely identified cycles are transmitted in each hour 310. Normally, all fifteen cycles 320 are transmitted each hour. Up to one hundred twenty eight 1.875 second uniquely identified frames including control frames 330 and analog frames 345 are transmitted in each of the cycles 320. Normally, all one hundred twenty eight frames are transmitted. One synchronization signal 331 lasting one hundred fifteen milliseconds and 11 one hundred sixty millisecond uniquely identified blocks 340 are transmitted in each of the control frames 330. The synchronization signal 331 includes a first sync portion 337, a frame information word 338, and a second sync portion 339. A bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps is usable during the blocks 340 of each control frame 330. The bit rate of the blocks 340 of each control frame 330 is communicated to the selective call radios 122 during the synchronization signal 331." Col. 6:19-48. "The receiver 206 demodulates four-level FSK and is preferably collocated with the base stations 116, as implied in FIG. 2, but can be positioned remotely from the base stations 116 to avoid interference from the transmitter 202. The receiver 206 is for receiving one or more acknowledgments (ACKs or NAKs) from the selective call radios 122." Col. 4:63-5:2. "The IF signal, which now carries the SSE (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals." Col. 12:13-60. **Motorola '448 further discloses a "slave communication" (e.g., "inbound message") from a slave device to a**

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		master communication device occurs "in response to a master communication from the master to the slave" (e.g., "response message" and/or "acknowledgements" made in response to an "outbound message" from the controller/base station to a selective call radio). "The RF signals transmitted by the selective call radios 122 to the base stations 116 (inbound messages) comprise positive acknowledgments (ACKs) which indicate that the message was received reliably by the selective call radio 122, or negative acknowledgments (NAKs) which indicate that the selective call radio 122 did not receive the message reliably. A detailed description of inbound acknowledge-back messaging is more fully described in Siwiak '038, which is hereby incorporated by reference. It will be appreciated that a portion of the selective call radios 122 are utilized for RF reception only (i.e., one-way receivers)." Col. 3:13-21.[1] "Inbound messages (response messages and acknowledgments) are generated in conventional digital form by a inbound message function of the processor section 606, in response to user manipulation of the user controls 651 or an event detected by the processor section 606, such as receipt of an outbound message or occurrence of a predetermined time of day. A digital inbound message is encoded using a conventional FM protocol and coupled by the first 1/0 port 627 to the transmitter 603, in a manner well known to one of ordinary skill in the art. The conventional transmitter 603 generates an FM radio signal, which is radiated by the antenna 601." Col. 13:52-63. "As one example of an operation of the system controller 112, the delivery of an outbound message stored in the mass memory 214 is completed when: the outbound message has been communicated to the intended selective call radio 122; the outbound message is acknowledged by an inbound acknowledgment generated by the selective call radio 122; the outbound message and some possible responses are presented either on a display or by a speaker of the selective call radio 122 in response to a user manipulation of controls; one of the possible responses is selected by the user and identified within an inbound response transmitted back to the system controller 112 from the selective call radio 122; and the user inbound response is identified by the message handler function as having been generated by the user specifically in response to the outbound message." Col. 5:56-6:4. "Referring to FIG. 2, an electrical block diagram of elements of the fixed portion 102 in accordance with the preferred embodiment of the present invention comprises portions of the System controller 112 and the base Stations 116. The System controller 112 comprises a processor section 210 for directing operation of the system controller 112. The System controller 112 Schedules and queues data and stored voice messages for transmission to the selective call radios 122, connects telephone calls from the PSTN 110, and receives acknowledgments, demand responses, unsolicited data and stored audio messages, and telephone calls from the selective call radios 122. The processor section 210 preferably is coupled through a conventional transmitter controller 204 to a transmitter 202 via the communication links 114. The communication links 114 use conventional means well known in the art, such as a direct wire line (telephone) link, a data communication link, or any number of radio frequency links, such as a

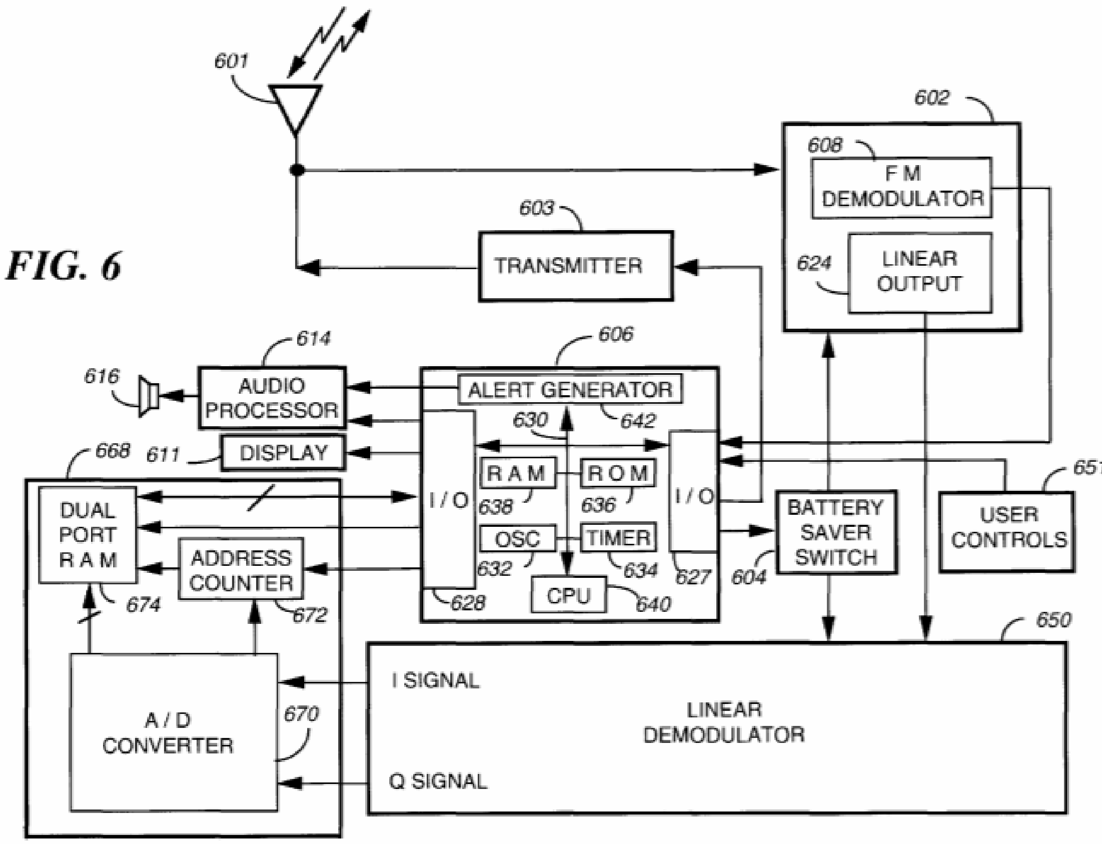
[1] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		radio frequency (RF) transceiver link, a microwave transceiver link, or a satellite link, just to mention a few.” Col. 4:32-51. “In two way communication systems such as those described in U.S. Pat. No. 4,875,038 filed Jan. 7, 1988 by Siwiak et al., entitled "Frequency Division Multiplexed Acknowledge Hack Paging System," hereinafter referred to as Siwiak '038, it is desirable to provide a pager radio user with several possible responses from which one response is selected to be transmitted back to the paging fixed network, where it is sent lo the caller who initiated the call. One method of providing such responses in a pager is described in U.S. Pat. No. 5,153,582 filed Aug. 7, 1989 by Davis, entitled "Method and Apparatus for Acknowledging and Answering a Paging Signal," hereinafter referred to as Davis '582.” Col. 1:19-32. “In a system using such an analog protocol for signals sent from the paging fixed network to the pager, as described in Leitch ' 747, and having acknowledge capability, as described in Siwiak '038 and Davis '582, it is also desirable to be able to include, in a message that has an information part, a plurality of probable analog responses pertaining thereto, thus avoiding the problem of having either no responses available, or only a rigidly defined set of responses which have been predetermined for use by each pager user, and which may not turn out to pertain to an information part of a particular message. When such probable responses are included within the message received by the pager, they can then be stored in the pager. The user can review the responses, select one, and transmit the response, or an identifier corresponding to that response back to the paging fixed network for delivery to the caller.” Col. 1:43-58. “Another issue which arises in a pager having voice response capabilities is how to provide for user selection of one of the voice responses. Io an alphanumeric pager such as described in Davis ' 582, the problem is solved by dedicating several keys for response selection. When there are at least a moderate (say, 8 to 12) number of keys, dedicating several for response selection works well. However, in simple analog pagers, in which there may be only a very few keys (i.e., less than 8, and perhaps as few as 2), a problem arises as to how a selection o[a voice response is conveniently made.” Col. 2:4-14. “The hardware of the system controller 112 is preferably a combination of the Wireless Messaging Gateway (WMG™) Administrator! paging terminal, and the RF-Conductor!™ message distributor manufactured by Motorola, Inc. The hardware of the base stations 116 is preferably a combination of the Nucleus® Orchestra! transmitter and RF-Audience!™ receivers manufactured by Motorola, Inc. It will be appreciated that other similar hardware can be utilized for the system controller 112 and the base stations 116.” Col. 2:58-67. “Inbound channel transmissions from the selective call radios 122 to the base stations 116 preferably utilize four-level FSK modulation at a rate of eight hundred bits per second (bps). Inbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions. The outbound and inbound channels preferably operate on separate carrier frequencies utilizing frequency division multiplex (FDM) techniques well known in the art. A detailed description of FDM techniques is more fully described in U.S. Pat. No. Siwiak '038. It will be appreciated that, alternatively, the outbound and inbound channels can operate on a single carrier frequency using time division duplex (TDD) techniques as described more fully in

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		Nelson '493." Col. 3:65-4:11. "Referring to FIG. 6, an electrical block diagram of the selective call radio 122 is shown, in accordance with the preferred embodiment of the present invention. Selective call radio 122 is essentially equivalent to the selective call receiver 900 described with reference to FIG. 9 of Leitch 747, but additionally comprises a conventional transmitter 603 for transmitting response messages and acknowledgments, and further comprises functions for generating the response messages and acknowledgments. The selective call radio 122 comprises an antenna 601, which is different than the antenna included in the selective call receiver 900 of Leich '747 in that it is suitable for both intercepting and radiating radio signals." Col. 10:5-17. "The transmitter 202 transmits two and four-level FSK data messages to the selective call radios 122 during a digital message portion, and at least one LSE, USE and a pilot during the analog message portion for voice messages. The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202. The processor section 210 is also coupled to at least one receiver 206 through a conventional receiver interface 208 via the communication links 114." Col. 4:51-63. "The processor section 210 is also coupled to an input interface 218 for communicating with the PSTN 110 through the telephone links 101 for receiving selective call originations from a message originator. In order to perform the functions (to be described below) necessary in controlling the elements of the system controller 112, as well as the elements of the base stations 116, the processor section 210 preferably includes a conventional computer system 212, and conventional mass storage media 214. The conventional mass storage media 214 includes the subscriber data base which has subscriber user information such as, for example, selective call radio 122 addressing, programming options, etc. The conventional computer system 212 is programmed by way of program instructions included in the conventional mass storage media 214. The conventional computer system 212 preferably comprises a plurality of processors such as VME Spare processors manufactured by Sun Microsystems, Inc., and is alternatively described as the computer 212. The plurality of processors include memory such as dynamic random access memory (DRAM), which serves as a temporary memory storage device for scratch pad processing such as, for example, storing analog and digital messages originated by callers using the PSTN 110, processing acknowledgments received from the selective call radios 122, and for protocol processing of analog and digital messages destined for the selective call radios 122, just to mention a few. The conventional mass storage media 214 is preferably a conventional hard disk mass storage device, which can also serve as a message memory for digitally encoded analog signals." Col. 5:3-32. "It will be appreciated that other types of conventional computer systems 212 can be utilized, and that additional computer systems 212 and mass storage media 214 of the same or alternative type can be added as required to handle the processing requirements of the processor section 210." Col. 5:33-37. "The processor section 210 provides message handling functions which schedule outbound messages having

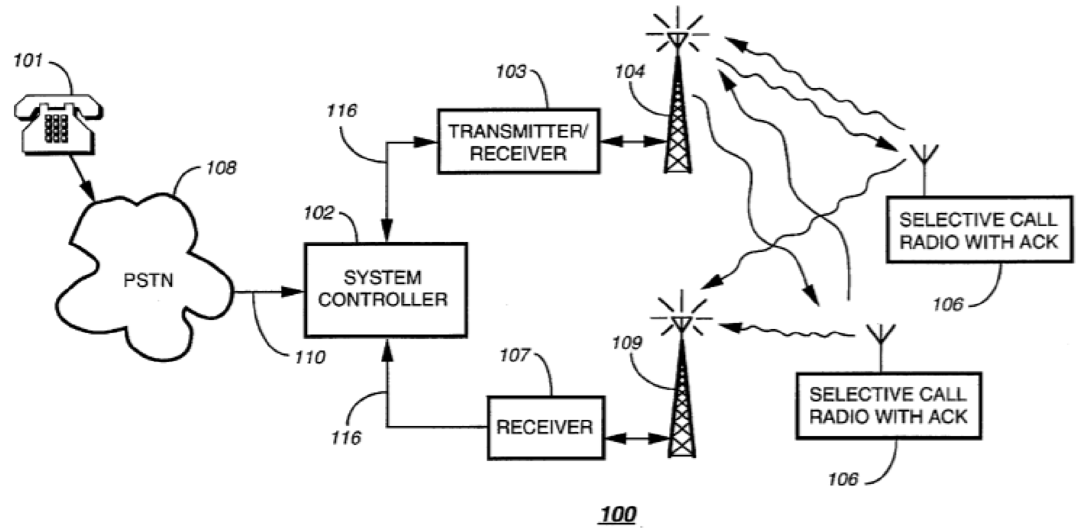
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		selective call addresses associated therewith, for transmission within a transmission cycle of the synchronous protocol. This is accomplished by scheduling, as necessary, portions of messages within different frames of a transmission cycle. As described above, messages may have either digital “information, such as a alphanumeric message, or analog information, such as voice.” Col. 5:3-46. “The processor section 210, while performing the message handling functions, also identifies inbound messages as being associated with one of the selective call radios in the subscriber data base 220 and identifies response messages as being associated with one of the outbound messages in an outbound message memory, which is a portion of the mass media 214.” Col. 5:50-56. “Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention. Control frames 330 are also classified as data frames 330. The outbound signaling protocol is subdivided into protocol divisions, which are an hour 310, a cycle 320, a frame 330, 345, a block 340, a word 350, and bits (not shown in FIG. 3). All protocol divisions are defined with reference to a synchronous period of a synchronous clock; the protocol division boundaries are coincident with edges of the synchronous clock. Up to fifteen 4 minute uniquely identified cycles are transmitted in each hour 310. Normally, all fifteen cycles 320 are transmitted each hour. Up to one hundred twenty eight 1.875 second uniquely identified frames including control frames 330 and analog frames 345 are transmitted in each of the cycles 320. Normally, all one hundred twenty eight frames are transmitted. One synchronization signal 331 lasting one hundred fifteen milliseconds and 11 one hundred sixty millisecond uniquely identified blocks 340 are transmitted in each of the control frames 330. The synchronization signal 331 includes a first sync portion 337, a frame information word 338, and a second sync portion 339. A bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps is usable during the blocks 340 of each control frame 330. The bit rate of the blocks 340 of each control frame 330 is communicated to the selective call radios 122 during the synchronization signal 331. Depending on the bit rate used, 8 to 32 thirty two bit uniquely identified words 350 are transmitted in each block 340. The bits and words 350 in each block 340 are transmitted in an interleaved fashion using techniques well known to one of ordinary skill in the art to improve the burst error correction capability of the protocol.” Col. 6:19-54. “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the decoded message information is received and stored in the microcomputer RAM 638, or in the analog conversion and message storage section 668, as will be explained further below, and an alerting signal is generated by alert generator function 642. The alerting signal is coupled to the audio processing circuit 614 which drives transducer 616, delivering an audible alert. Other forms of sensible alerting, such as tactile or vibrating alert, can also be provided to alert the user.” Col. 12:13-28.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		“When analog information is to be transmitted in the linear modulation format (such as SSE or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information. The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section 606, through 1/0 port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion and message storage section 668, thus starting a process of recovering an analog signal, as will be described below.” Col. 12:29-53. Fig. 6, reproduced below.

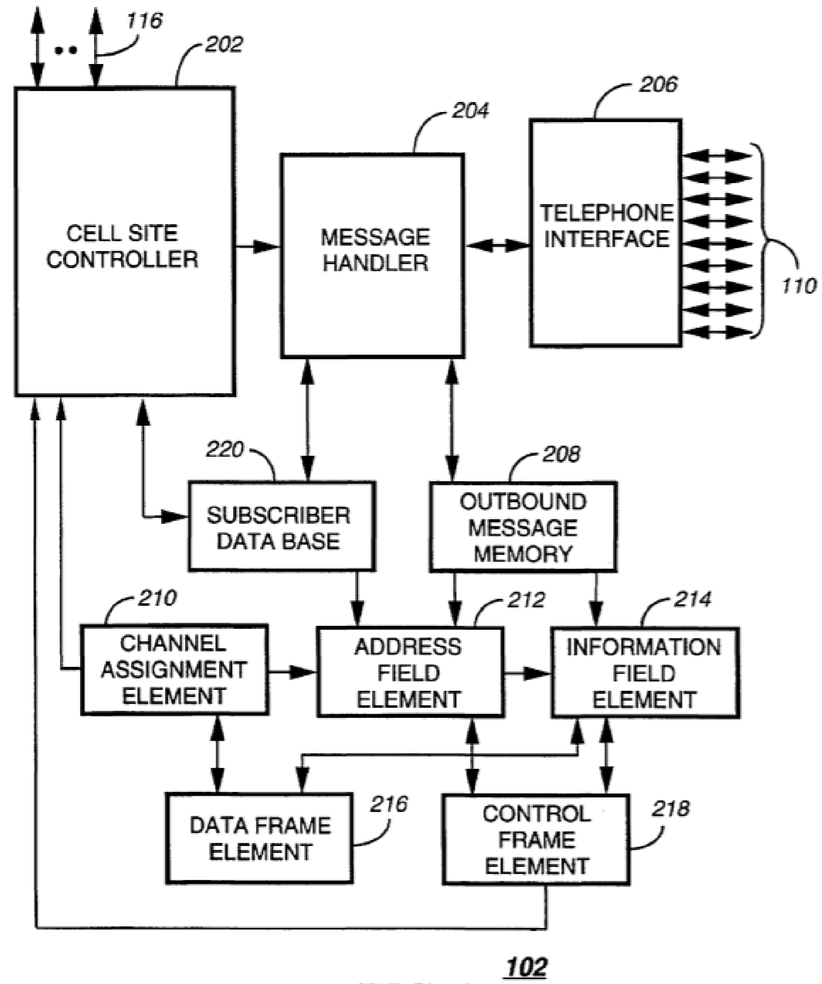
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		FIG. 6  **To the extent it is argued that Motorola '448 does not expressly disclose a master/slave relationship, a POSITA would have understood that Motorola '448 renders obvious a master/slave relationship based on the disclosures above. In particular, (1) the controller/base station communicates with the selective call radios in a synchronous protocol; (2) the inbound messages from the selective call radio to the controller/base station are made in response to outbound messages from the controller/base station to the selective call radio; and (3) the selective call radios do not communicate directly with each other. A POSITA would understand such a system to disclose and/or render obvious a master/slave relationship.** **Alternatively, Motorola '448 in view of the teachings of Motorola '568 discloses a communication device**

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		capable of communicating according to a master/slave relationship in which a slave communication from a slave device to a master communication device occurs in response to a master communication from the master communication device to the slave device. **For example, as discussed above, Motorola ’448 discloses a communication device. Motorola ’568 further discloses a master/slave relationship and slave communications from a slave device to a master communication device (e.g., “response messages”) in response to a master communication from a master communication device to a slave device (e.g., “outbound message”):** “The system controller 102 also functions to digitally encode and schedule outbound messages, which can include such information as digitized audio messages, alphanumeric messages, and response commands, for transmission by the radio frequency transmitter/receivers 103 to a plurality of selective call radios 106. The system controller 102 further functions to decode inbound messages, including unsolicited and response messages, received by the radio frequency transmitter/receivers 103 and the fixed system receivers 107 from the plurality of selective call radios 106. Examples of response messages are acknowledgments and designated response messages. Designated response messages are communicated in the inbound channel in portions named data units. An acknowledgment is a response to an outbound message initiated at the system controller 102. An example of an outbound alphanumeric message intended for a selective call radio 106 is a page message entered from the telephone 101. The acknowledgment indicates successful reception of the outbound mes sage. A designated response message is a message sent from a selective call radio in response to a command included in an outbound message from the system controller 102. An example of a designated response message is a message initiated by the selective call radio 106, but which is not transmitted until after a response command is received from the system controller 102. The response command, in turn, is sent by the system controller 102 after an inbound. message requesting permission to transmit the designated response message is communicated from the selective call radio 106 to the system controller 102. The response messages are preferably transmitted at a time designated within the outbound message or response command, but alternatively can be transmitted using a non-scheduled protocol, such as the ALOHA or slotted ALOHA protocol, which are well known to one of ordinary skill in the art.” Cols. 4:41-5:8. “It should be noted that the system controller 102 is capable of operating in a distributed transmission control environment that allows mixing conventional cellular, simulcast, master/slave, or other coverage schemes involving a plurality of radio frequency transmitter/receivers 103, conventional antennas 104, 109, and fixed system receivers 107, for providing reliable radio signals within a geographic area as large as a nationwide network. Moreover, as one of ordinary skill in the art would recognize, the telephonic and selective call radio communication system functions may reside in separate system controllers 102 which operate either independently or in a networked fashion. It should also be noted that the radio frequency transmitter/receiver 103 may comprise the fixed system receiver 107 collocated with a conventional radio frequency transmitter.” Col. 5:26-41. “The message handler 204 schedules outbound messages and the selective call addresses associated therewith

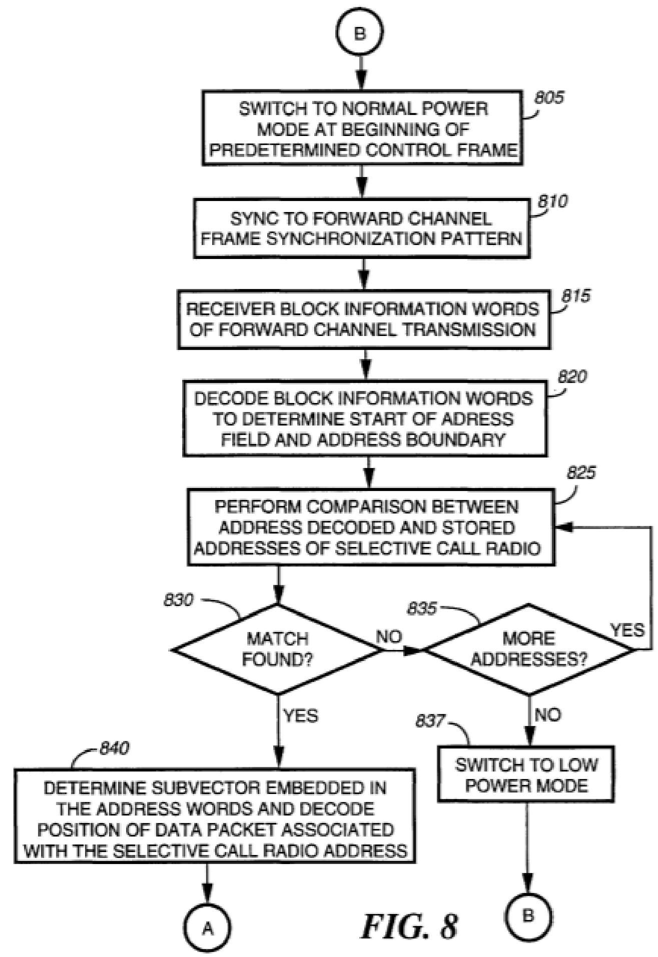
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		within a transmission cycle. The message handler 204 also determines response schedules for response messages which minimize contention of messages at transmitter/receivers 103 and fixed system receivers 107, and includes response timing information in outbound messages so that selective call radios 106 will respond according to the response schedule.” Col. 6:43-51. “Examples of response messages are acknowledgments and designated response messages. Designated response messages are communicated in the inbound channel in portions named data units. An acknowledgment is a response to an outbound message initiated at the system controller 102. An example of an outbound alphanumeric message intended for a selective call radio 106 is a page message entered from the telephone 101. The acknowledgment indicates successful reception of the outbound message. A designated response message is a message sent from a selective call radio in response to a command included in an outbound message from the system controller 102. An example of a designated response message is a message initiated by the selective call radio 106, but which is not transmitted until after a response command is received from the system controller 102. The response command, in turn, is sent by the system controller 102 after an inbound message requesting permission to transmit the designated response message is communicated from the selective call radio 106 to the system controller 102. The response messages are preferably transmitted at a time designated within the outbound message or response command, but alternatively can be transmitted using a non-scheduled protocol, such as the ALOHA or slotted ALOHA protocol, which are well known to one of ordinary skill in the art.” Cols. 4:51-5:8. “System controller 102 is preferably a model MPS20006) paging terminal manufactured by Motorola, Inc., of Schaumburg Ill., modified with unique firmware elements in accordance with the preferred embodiment of the present invention, as described herein. The cell site controller 202, the message handler 204, the outbound message memory 208, the subscriber data base 220, the telephone interface 206, the channel assignment element 210, the address field element 212, the information field element 214, the data frame element 216, and the control frame element 218 are preferably implemented within portions of the model MPS2000(8) paging terminal which include, but are not limited to those portions providing program memory, a central processing unit, input/output peripherals, and a random access memory. The system controller alternatively could be implemented using a model E09PED0552. Page Bridge(8) paging terminal manufactured by Motorola, Incorporated of Schaumburg, Ill. The subscriber data base 220 and the outbound message memory 208 can alternatively be implemented as magnetic or optical disk memory, which can alternatively be external to the system controller 102.” Col. 8:39-59. “For example, a selective call radio 106 can be vectored from a synchronous control frame 360 as described above to a radio channel that contains only Post Office Committee Standardization Advisory Group (POCSAG) formatted one way asynchronous paging signaling.” Col. 15:35-39. Fig. 1, reproduced below.

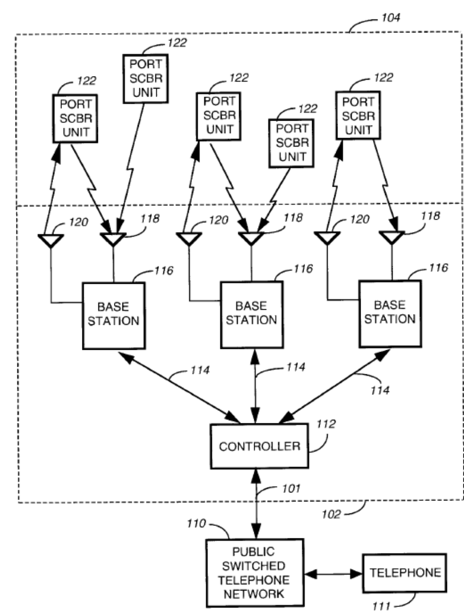
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG. 1* "Accordingly, in a third aspect of the present invention, a method is used in a system controller for generating a radio signal transmitted on a first radio channel. The radio signal has short and long messages included in a plurality of control frames and data frames. Each of the short and long messages has an address signal and related message information. The method includes the steps of generating each address field; generating an information field; assembling each control frame; assembling each data frame; and transferring the control frames and data frames to a transmitter for radio transmission. In the step of generating each address field, each address field of a control frame is generated having a set of address signals. Each of the set of address signals includes an address and a subvector indicating, respectively, a selective call radio for which one of the short and long messages is intended, and a starting position of a data packet within the control frame. In the step of generating an information field, an information field following the address field and having a set of data packets is generated. Each data packet in the set of data packets has the starting position of the data packet indicated by at least one subvector within the control frame. Each data packet in the set of data packets is one of a vector packet and a short message packet. Vector packets indicate starting positions of long messages within the plurality of control frames and data frames. In the step of assembling each control frame, each control frame is assembled including an address field and an information field. In the step of assembling each data frame, each data frame is assembled including a set of long messages. Each long message

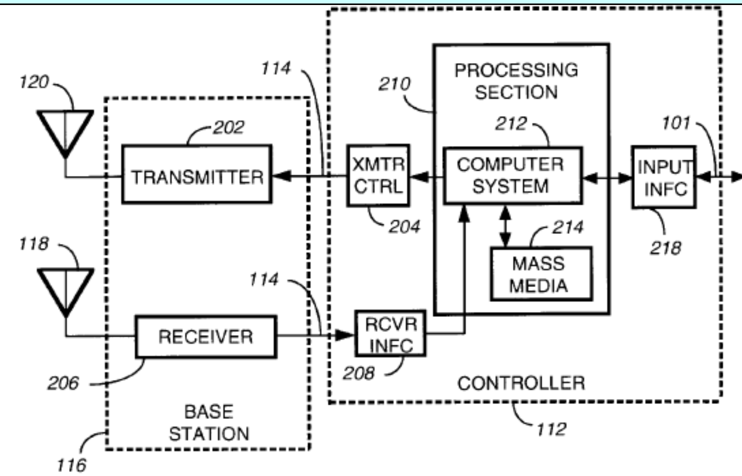
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		in the set of long messages has a starting position indicated by at least one vector packet in a control frame. Accordingly, in a fourth aspect of the present invention, a system controller is used for generating a radio signal transmitted on a first radio channel. The radio signal has short and long messages included in a plurality of control frames and data frames. Each of the short and long messages has an address signal and related message information. The system controller includes a control frame element, an address field element, an information field element, a data frame element, and a cell site controller. The control frame element assembles each control frame including an address field and an information field. The address field element, which is coupled to an outbound message memory which stores the short and long messages, and which is also coupled to the control frame element, generates an address field of a control frame having a set of address signals." Col. 2:66-3:49. "Referring to FIG. 2, an electrical block diagram of the system controller 102 is shown, in accordance with the preferred embodiment of the present invention. The system controller 102 comprises a cell site controller 202, a message handler 204, an outbound message memory 208, a subscriber data base 220, a telephone interface 206, a channel assignment element 210, an address field element 212, an information field element 214, a data frame element 216, and a control frame element 218. The cell site controller 202 is coupled to the radio frequency transmitter/receivers 103 (FIG. 1) and fixed system receivers 107 (FIG. 1) by the links 116. The cell site controller 202 couples outbound messages including selective call addresses to the transmitter/receivers 103 and controls the transmitter/receivers 103 to transmit transmission cycles which include the outbound messages. The cell site controller 202 also processes inbound messages from the selective call radios 106. The inbound messages are received by the transmitter/receivers 103 and fixed system receivers 107, and are coupled to the cell site controller 202. The message handler 204, which routes and processes messages, is coupled to the telephone interface 206, the subscriber data base 220, and the outbound message memory 208. The telephone interface 206 handles the switched telephone network 108 (PSTN) (FIG. 1) physical connection, connecting and disconnecting telephone calls at the telephone links 110, and routing the audio signals between the telephone links 110 and the message handler 204." Col. 6:1-28. Fig. 2, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 *FIG. 2* “All vector packets and short messages intended for a particular selective call radio 106 are preferably scheduled for transmission in a predetermined one or more of the frames 330 of each cycle 320, so as to allow the particular selective call radio 106 to go into a low power mode during other frames when short messages and vectors are not

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		included for the particular selective call radio 106.” Col. 9:60-67. “At step 740, the next predetermined control frame 360 which will be decoded by the selective call radio is determined by the system controller 102. The control frame determination is based on the selective call radio's address and system management information. The input message type is determined at step 750. When the input message is a short message, it is assembled in the information field of the next control frame 360, at step 780. The address of the selective call radio 106 is included in the same control frame 360 as the one containing the short message. The starting position of the short message packet is stored in the system controller 102. When the input message is a long message, it is generated in the information field of control or data frames which will be transmitted in one of the radio channels present in the radio communication system 100, at step 760. The starting position of the long message is stored. At step 770, a vector packet is assembled in the information field of the control frame in which the selective call radio is addressed. The starting position of the long message and the channel assigned for transmission of the long message, are included in the vector packet. The starting position of the vector packet is stored. At step 790, the selective call radio address is generated in the address field of the control frame. The position of the data packet (short message packet or vector packet), is included as a subvector in the selective call radio's address. At step 795, the formatted control and data frames containing addresses and messages for selective call radios are transferred to the cell site controller 202 for transmission by the radio transmitter/receiver 103.” Col. 17:36-43. “It will be further appreciated that for improved battery life in the selective call radios 106, selective call addresses for messages intended for a particular selective call radio 106 are included in a control frame which is at a predetermined position of a transmission cycle, so that the selective call radio 106 need only go into a normal power mode at the beginning of the predetermined control frame.” Col. 8:32-38. “At step 805, the selective call radio 106 switches from a low power mode to a normal power mode operation. The switching is done at the beginning of predetermined control frames 360 that the selective call radio 106 receives and decodes.” Col. 17:51-54. “When no more addresses are present in the address field 333 of the control frame 360, at step 835, the selective call radio 106 switches to the low power mode at the address boundary 334, at step 837, and waits for the next predetermined control frame that it has to decode.” Col. 18:6-9. “When the data packet, at step 860, is a vector packet, the selective call radio decodes a starting position and length of a long message, at step 865. At step 870, the selective call radio 106 switches to the low power mode at the end of the vector packet to conserve battery life. The selective call radio 106 switches to the normal power mode before the beginning of the long message, at step 875. The long message is processed in the control frame 360 or data frame 370 identified by the vector packet in a cycle 320 transmitted on any one of the radio channels operating in the radio communication system 100. At step 885, the selective call radio 106 switches to low power mode at the end of the long message to conserve battery life, and waits for the next predetermined control frame 360 that it has to decode.” Col. 18:31-44.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		See also Claims 1, 3. Fig. 8, reproduced below.  *FIG. 8*
1[a]	a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers,	**Motorola ’448 discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers.**

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		See 1[pre] discussion of base station 116, controller 112, antennas 118/120 which comprise a transceiver in the role of a master communication device according to the master/slave relationship; *see also* **For example, Motorola '448 further discloses transmitting a first message (e.g., "transmissions") over a communication medium (e.g., "RF").** "FIG. 1 is an electrical block diagram of a radio communication system, in accordance with the preferred embodiment of the present invention." Col. 2:22-24. "FIG. 2 is an electrical block diagram of a system controller used in the radio communication system, in accordance with the preferred and alternative embodiments of the present invention. Col. 2:22-28. Fig. 1, reproduced below.  *FIG. 1* Fig. 2, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 ***FIG. 2*** “Each of the base stations 116 transmits RF signals to the portable portion 104 comprising a plurality of selective call radios 122 via a transmitting antenna 120. The base stations 116 each receive RF signals from the plurality of selective call radios 122 via a receiving antenna 118.” Col. 3:1-5. “As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49. “Referring to FIG. 2, an electrical block diagram of elements of the fixed portion 102 in accordance with the preferred embodiment of the present invention comprises portions of the system controller 112 and the base stations 116. The system controller 112 comprises a processor section 210 for directing operation of the system controller 112. The system controller 112 schedules and queues data and stored voice messages for transmission to the selective call radios 122, connects telephone calls from the PSTN 110, and receives acknowledgments, demand responses, unsolicited data and stored audio messages, and telephone calls from the selective call radios 122. The processor section 210 preferably is coupled through a conventional transmitter controller 204 to a transmitter 202 via the communication links 114. The communication links 114 use conventional means well known in the art, such as a direct wire line (telephone) link, a data communication link, or any number of radio frequency links, such as a radio frequency (RF) transceiver link, a microwave transceiver link, or a satellite link, just to mention a few.” Col. 4:32-51. “The RF signals transmitted by the selective call radios 122 to the base stations 116 (inbound messages) comprise

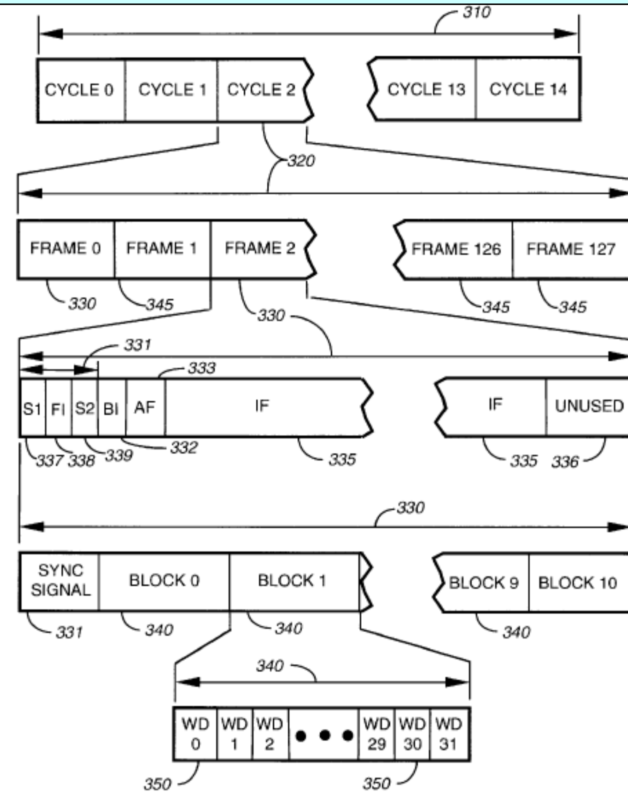
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		positive acknowledgments (ACKs) which indicate that the message was received reliably by the selective call radio 122, or negative acknowledgments (NAKs) which indicate that the selective call radio 122 did not receive the message reliably. A detailed description of inbound acknowledge-back messaging is more fully described in Siwiak '038, which is hereby incorporated by reference. It will be appreciated that a portion of the selective call radios 122 are utilized for RF reception only (i.e., one-way receivers).” Col. 3:13-21.[2] “Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Outbound channel transmissions of the analog message portion transmitted by the base stations 116 preferably utilize single side band (SSB) transmission. A voice message portion preferably comprises at least an upper side band (USB), a lower side band (LSB) and a pilot carrier. It will be appreciated that, alternatively, a voice message portion can comprise the pilot carrier and a single one of the sidebands. A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Col. 3:49-65.[3] “The receiver 206 demodulates four-level FSK and is preferably collocated with the base stations 116, as implied in FIG. 2, but can be positioned remotely from the base stations 116 to avoid interference from the transmitter 202. The receiver 206 is for receiving one or more acknowledgments (ACKs or NAKs) from the selective call radios 122.” Col. 4:63-5:2. “Control frames 330 are also classified as data frames 330.” Col. 6:25-26. “When the message information or control data is digital, it is transmitted in the FM modulation format, and the IF signal is coupled to the FM demodulator 608.” Col. 11:19-21. “In two way communication systems such as those described in U.S. Pat. No. 4,875,038 filed Jan. 7, 1988 by Siwiak et al., entitled “Frequency Division Multiplexed Acknowledge Hack Paging System,” hereinafter referred to as Siwiak '038, it is desirable to provide a pager radio user with several possible responses from which one response is selected to be transmitted back to the paging fixed network, where it is sent lo the caller who initiated the call. One method of providing such responses in a pager is described in U.S. Pat. No. 5,153,582 filed Aug. 7, 1989 by Davis, entitled "Method and Apparatus for Acknowledging and Answering a Paging Signal," hereinafter referred to as Davis '582.” Col. 1:19-32.

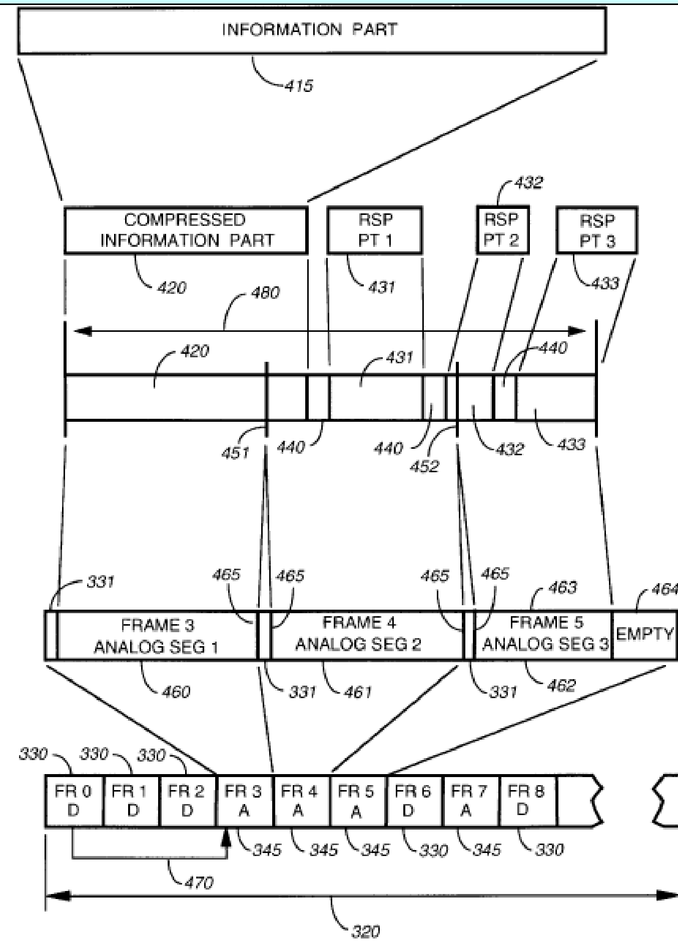
[2] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

[3] U.S. Patent No. 5,689,440 (Motorola ’440) is a continuation of U.S. Patent Application No. 08/395,747 (“Leitch ’747”) and the respective disclosures of each are incorporated by reference herein as if the disclosures were fully set forth.

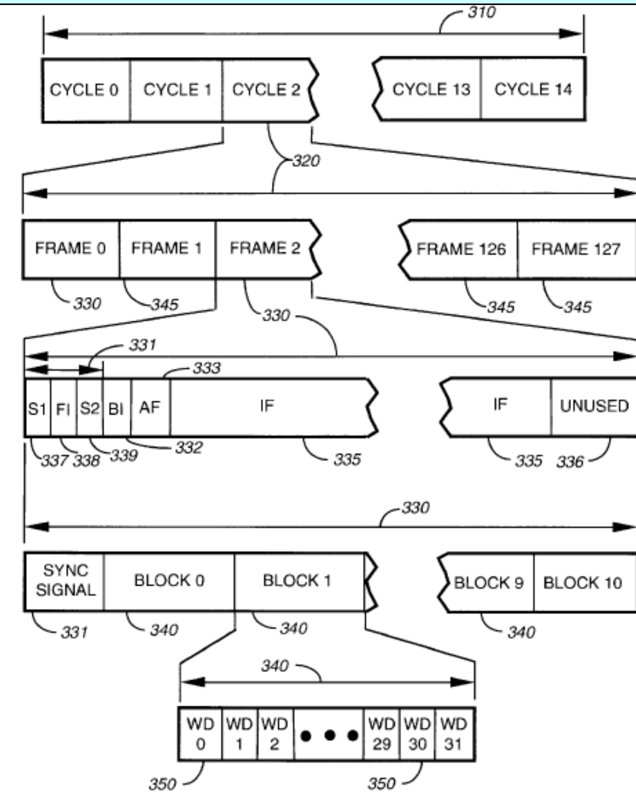
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		“In a system using such an analog protocol for signals sent from the paging fixed network to the pager, as described in Leitch ' 747, and having acknowledge capability, as described in Siwiak '038 and Davis '582, it is also desirable to be able to include, in a message that has an information part, a plurality of probable analog responses pertaining thereto, thus avoiding the problem of having either no responses available, or only a rigidly defined set of responses which have been predetermined for use by each pager user, and which may not turn out to pertain to an information part of a particular message. When such probable responses are included within the message received by the pager, they can then be stored in the pager. The user can review the responses, select one, and transmit the response, or an identifier corresponding to that response back to the paging fixed network for delivery to the caller.” Col. 1:43-58. “Another issue which arises in a pager having voice response capabilities is how to provide for user selection of one of the voice responses. Io an alphanumeric pager such as described in Davis ' 582, the problem is solved by dedicating several keys for response selection. When there are at least a moderate (say, 8 to 12) number of keys, dedicating several for response selection works well. However, in simple analog pagers, in which there may be only a very few keys (i.e., less than 8, and perhaps as few as 2), a problem arises as to how a selection of a voice response is conveniently made.” Col. 2:4-14. “Referring to FIG. 1, an electrical block diagram of a communication system in accordance with the preferred embodiment of the present invention comprises a fixed portion 102 and a portable portion 104. The fixed portion 102 includes a plurality of base stations 116, for communicating with the portable portion 104, utilizing conventional radio frequency (RF) techniques well known in the art, and coupled by communication links 114 to a system controller 112 which controls the base stations 116. The hardware of the system controller 112 is preferably a combination of the Wireless Messaging Gateway (WMG™) Administrator! paging terminal, and the RF-Conductor!™ message distributor manufactured by Motorola, Inc. The hardware of the base stations 116 is preferably a combination of the Nucleus® Orchestra! transmitter and RF-Audience!™ receivers manufactured by Motorola, Inc. It will be appreciated that other similar hardware can be utilized for the system controller 112 and the base stations 116.” Col. 2:50-67. “Inbound channel transmissions from the selective call radios 122 to the base stations 116 preferably utilize four-level FSK modulation at a rate of eight hundred bits per second (bps). Inbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions. The outbound and inbound channels preferably operate on separate carrier frequencies utilizing frequency division multiplex (FDM) techniques well known in the art. A detailed description of FDM techniques is more fully described in U.S. Pat. No. Siwiak '038. It will be appreciated that, alternatively, the outbound and inbound channels can operate on a single carrier frequency using time division duplex (TDD) techniques as described more fully in Nelson '493.” Col. 3:65-4:11. “As one example of an operation of the system controller 112, the delivery of an outbound message stored in the mass memory 214 is completed when: the outbound message has been communicated to the intended selective call radio 122; the outbound message is acknowledged by an inbound acknowledgment generated by the selective call radio 122; the outbound message and some possible responses are presented either on a display or by a speaker of

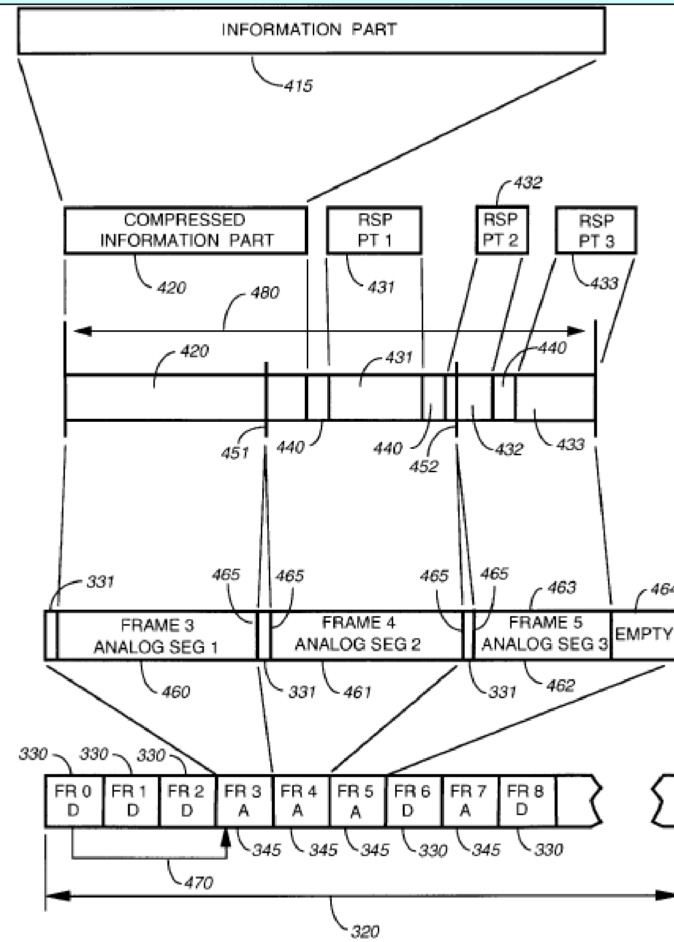
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		the selective call radio 122 in response to a user manipulation of controls; one of the possible responses is selected by the user and identified within an inbound response transmitted back to the system controller 112 from the selective call radio 122; and the user inbound response is identified by the message handler function as having been generated by the user specifically in response to the outbound message.” Col. 5:56-6:4. “Referring to FIG. 6, an electrical block diagram of the selective call radio 122 is shown, in accordance with the preferred embodiment of the present invention. Selective call radio 122 is essentially equivalent to the selective call receiver 900 described with reference to FIG. 9 of Leitch 747, but additionally comprises a conventional transmitter 603 for transmitting response messages and acknowledgments, and further comprises functions for generating the response messages and acknowledgments. The selective call radio 122 comprises an antenna 601, which is different than the antenna included in the selective call receiver 900 of Leich ‘747 in that it is suitable for both intercepting and radiating radio signals.” Col. 10:5-17. “Inbound messages (response messages and acknowledgments) are generated in conventional digital form by a inbound message function of the processor section 606, in response to user manipulation of the user controls 651 or an event detected by the processor section 606, such as receipt of an outbound message or occurrence of a predetermined time of day. A digital inbound message is encoded using a conventional FM protocol and coupled by the first 1/0 port 627 to the transmitter 603, in a manner well known to one of ordinary skill in the art. The conventional transmitter 603 generates an FM radio signal, which is radiated by the antenna 601.” Col. 13:52-63. “The fixed portion 102 includes a plurality of base stations 116, for communicating with the portable portion 104, utilizing conventional radio frequency (RF) techniques well known in the art, and coupled by communication links 114 to a system controller 112 which controls the base stations 116.” Col. 2:53-58. “Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention.” Col. 6:19-25. Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 *FIG. 3* Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 ***FIG. 4*** "An information signal, modulated in the FM modulation format, or in a linear modulation format (such as SSE), is intercepted by the antenna 601, which couples the information signal to the receiver 602. The message information is transmitted on any suitable RF channel, such as those in the VHF bands and UHF bands." Col. 11:10-15.
1[b]	wherein the first message comprises: first information modulated according to a first modulation method,	**Motorola '448 discloses wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first**

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
	second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers and	**modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers.** *See* 1[pre] discussion of base station 116, controller 112, antennas 118/120 which comprise a transceiver in the role of a master communication device according to the master/slave relationship; *see also* **For example, Motorola '448 discloses a "first message" including "first information" (e.g., "address," "vector," "pointer information").** "Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention. Control frames 330 are also classified as data frames 330." Col. 6:19-26. "Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein." Col. 6:55-62. **Motorola '448 also discloses a "first message" including "second information" (e.g., "long message"), including a "payload portion" (e.g., "long message"), intended for one of the one or more slave transceivers.** Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG. 3* Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 FIG. 4 "Each of the selective call radios 122 assigned for use in the radio communication system has an address assigned thereto which is a unique selective call address. The address enables the transmission of a message from the system controller 112 only to the addressed selective call radio, and identifies messages and responses received at the system controller 112 from the selective call radio. Furthermore, each of one or more of the selective call radios 122 can have a unique telephone number or access number assigned thereto. A list of the assigned selective call

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		addresses and correlated telephone numbers for the selective call radios is stored in the system controller 112 in the form of a subscriber data base.” Col. 4:19-31. “As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49. “Referring to FIG. 3 a timing diagram which illustrates features of the transmission format of a synchronous outbound signaling protocol utilized by the radio communication system of FIG. 1, and which includes details of a control frame 330 (alternatively described as a data frame 330), in accordance with the preferred and alternative embodiments of the present invention. Control frames 330 are also classified as data frames 330.” Col. 6:19-26. “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein.” Col. 6:55-62. “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein. One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320. Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330. The length of each of the fields 332, 333, 335, 336 can be shorter or longer than a block 340. The unused field 336 can be zero length when the total of the lengths of the other fields 332, 333, 335 equals eleven blocks 340. The block information field 332 in frame zero includes the following real time information: year, month, day, date, hour, minute, and one eighth minute.” Cols. 6:55-7:13. “The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet.” Col. 7:14-21. “When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330.” Col. 6:25-7:25.

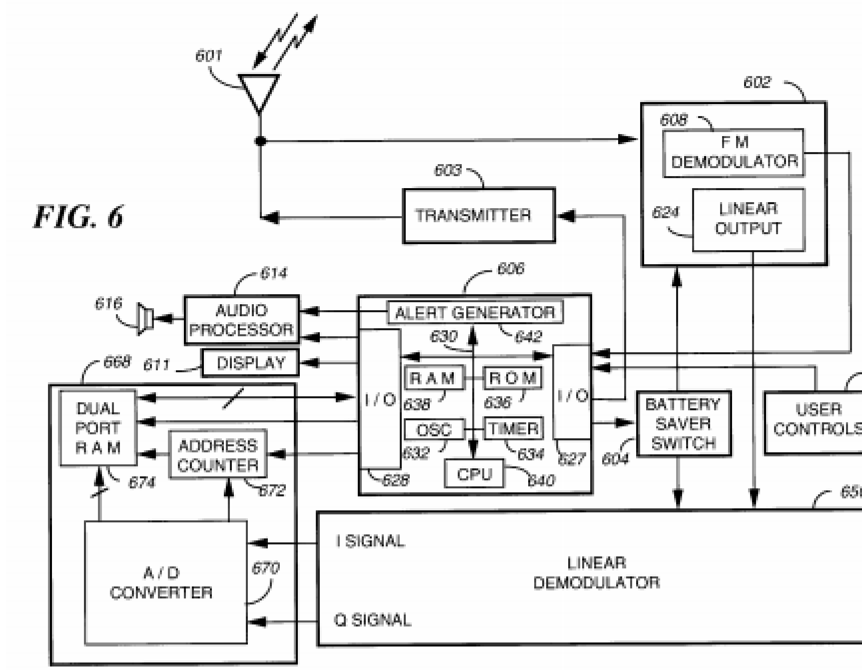
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		“The message information is transmitted on any suitable RF channel, such as those in the VHF bands and UHF bands.” Col. 12:13-14. “The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202.” Col. 4:51-55. “Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330.” Col. 6:67-7:6. “When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:22-31. “The receiver 602 is preferably a modified FM receiver including the addition of a DAFC (digital automatic frequency control) as described in U.S. Pat. No. 5,239,306 issued to Siwiak et al. (which is assigned to the assignee of the present invention and which is hereby incorporated by reference herein,” Col. 10:33-38.[4] “A voice signal can be sent as an SSB signal occupying a single voice bandwidth on the outbound channel, or equivalently on either of the one or more I or Q channels as described in more detail in Leitch '747.” Col. 10:57-60. “Recovered voice is played back through the audio processor 614 and transducer 616, while alphanumeric data can be displayed on display 611, which is a limited display (~16 characters) in accordance with the preferred embodiment of the present invention. An information signal, modulated in the FM modulation format, or in a linear modulation format (such as SSB), is intercepted by the antenna 601, which couples the information signal to the receiver 602.” Col. 11:5-13. “When analog information is to be transmitted in the linear modulation format (such as SSB or ‘I and Q’), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located.” Col. 12:29-37. “The RF signals transmitted by the base stations 116 to the selective call radios 122 (outbound messages) comprise selective call addresses identifying the selective call radios 122, and data or voice messages originated by a caller.”

[4] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

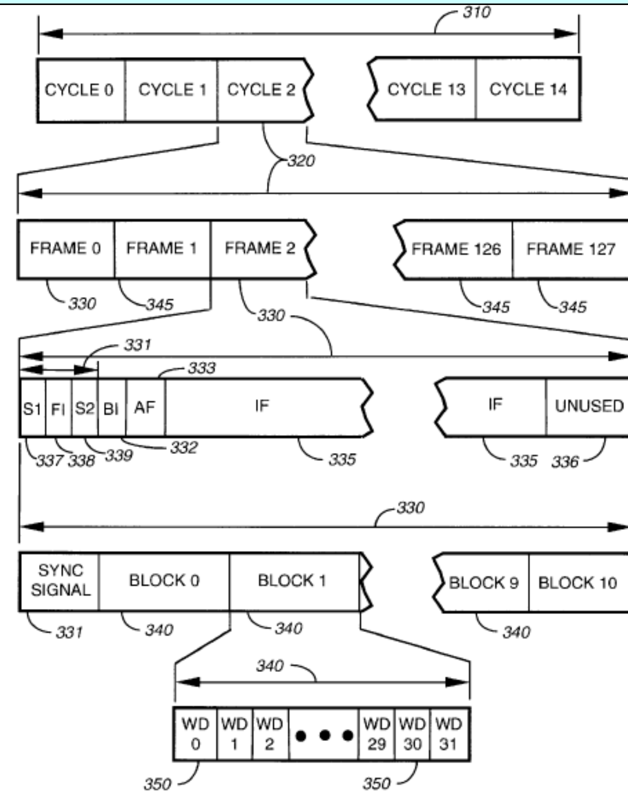
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		Col. 3:8-12. “Referring to FIGS. 4 and 5, a timing diagram and a flow chart illustrate an example o(an assembly and inclusion of a multipart analog message in analog form within a cycle 320 of the synchronous outbound protocol transmitted in the radio communication system, in accordance with the preferred embodiment of the present invention. The processor section 210 obtains and stores in the mass memory 214, at step 510 (FIG. 5), an information portion 415 (FIG. 4) of an analog message which is to be transmitted to a selective call radio 122. For example, the information portion is an analog signal generated by a voice message received from an originating caller by means of the telephone 111, in which the originating caller says "Can you go to lunch with me at 12:30?" The information portion 415 is preferably stored as a digitally sampled analog signal in the mass media 214.” Col. 7:32-46. “At step 520 (FIG. 5), the originating caller further identifies, at the time of the call, several responses from which the user of the selective call radio 122 can select to respond to the question posed. For example, a first response is "Yes," a second is "No," and a third is "Maybe." These responses are preferably obtained from the originating caller by the use of an interactive session which is controlled by the processor section 210, using stored voice prompts presented to the caller and a combination of voice and keypad responses on the part of the originating caller. For example, when the originating caller has stated his initial information portion of the message, the processor section presents a stored voice message "Do you wish to add possible responses to your message? Press 1 for yes and 2 for no." When the processor section receives a dual tone multifrequency (DTMF) code representing a 1, the processor section presents a stored voice message "Please enter each response, followed by the pound key." This is the preferred method of obtaining the response portions. The response portions are likewise stored in a digitized sampled analog form in mass memory 214. The independent information portion and response portions thus obtained and stored al these first steps 510, 520 of sending a multipart analog message are then time compressed at step 530 (FIG. 5) by the processor section 210 into shorter independent analog parts 420, 431, 432,433 (FIG. 4) which are stored in the mass media 214 in digitally sampled form. The preferred compression technique is described in Leitch '747. The information and response portions are termed independent analog parts because each of them conveys appropriately complete information when presented independently from the other. In a first alternative approach, ten predetermined, commonly used voice responses are obtained, compressed, and stored in the mass media 214 in digitized analog form during a configuration of the system controller 112, and the originating caller selects from among them by the use of the keypad of the telephone 111 at step 520.” Cols. 7:47-8:16. “Having thus identified independent analog parts 420, 431, 432, 433 of a message which is to be transmitted to a selective call radio 122, the processor section sequentially assembles the independent analog parts 420, 431, 432, 433 at step 540 (FIG. 5), with the response parts 431, 432, 433 preferably following the information part 420, although other sequences could alternatively be used. The processor section then, at step 550 (FIG. 5), includes analog part delimiters 440 (FIG. 4) between the successive independent analog parts 420, 431, 432, 433 which are sequentially assembled, with no analog signal gaps between the analog part delimiters 440 and the independent analog parts 420, 431, 432, 433, thereby generating a seamless multipart analog message 480. At step 560 (FIG. 5), the processor section includes the multipart analog message 480 within a cycle of the synchronous protocol, at a

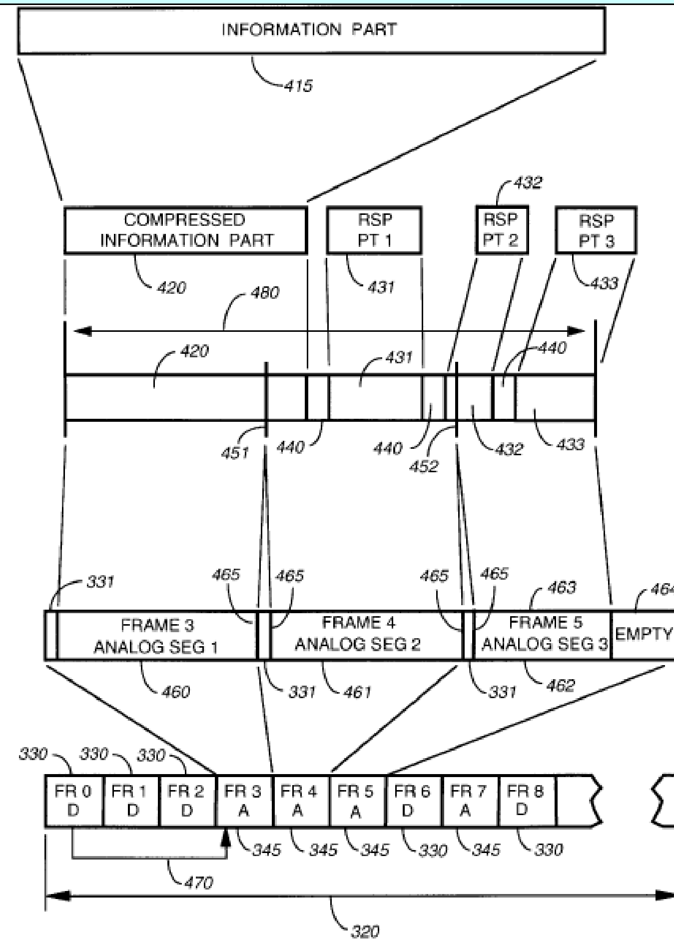
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		position in the synchronous protocol. In this example, the multipart analog message 480 is included in frames 3, 4, 5 of the outbound synchronous protocol, by being broken into analog segments 460, 461, 462 (FIG. 4). It will be appreciated that the segments 460, 461, 462 are generated by the processor section by splitting the seamless multipart analog message 480 at boundaries 451, 452 (FIG. 4) such that the segments 460,461,462 will fit within frames 345 of the synchronous protocol. It will be appreciated that the first two segments 460, 461 fill the frames number 3 and 4, but that the third segment 463 does not fill frame number 5, leaving an empty portion 464 of that frame. The term "position" in this context means the identification of the beginning of all segments of the multipart analog message 480, as well as their duration and ordering within the multipart analog message 480, so that the multipart analog message 480 can be reconstructed. At step 570 (FIG. 5), the processor section 210 includes a digital code within the synchronous pro loco I which identifies the position of the multipart analog message 480 within the synchronous protocol. In accordance with the preferred embodiment of the present invention, the position is identified by a binary code s included in a data frame 330 which identifies the frame number (3, in this example) of the analog frame 345 at which the multipart analog message 480 starts, and how many frames it occupies. The data frame 330 and analog frames 345 are coupled from the system controller 112 to the transmitter 202, where they are modulated on a radio carrier and transmitted by the antenna 120, at step 580.” Col. 8:17-61. “The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in FIG. 4 by the arrow 470. In accordance with the preferred embodiment of the present invention, analog message segments predeterminedly begin immediately after the end of the synchronizing signal 331. Also, an analog frame 345 is defined to include a segment of only one analog message, and multiple segments are included in order, within sequential frames. Thus, the position is conveyed only by the position of the first frame (its hour, cycle, and frame number) and the number of frames. It will be appreciated that there are other ways to transmit the segments and convey the position of the multipart analog message 480, which work equally well. For example, in some systems the segments 460, 461, 462 may be included within one frame. Such an arrangement is useful in a radio communication system in which there are several analog subbands within an outbound channel resource, and several analog segments can be transmitted simultaneously. In such a case, to include the position of the multipart analog message 480 within the protocol, the order and subband number of the analog segments must either by conveyed in a message, or predetermined. In another example, segments of a multipart message which are transmitted in order and in consecutive frames can have their position identified by a continuation indication within the synchronizing portion of each frame.” Cols. 8:62-9:21. “It will be appreciated that, in accordance with the preferred embodiment of the present invention, although the beginning of the multipart analog message 480 is coincident with an edge of the synchronous clock occurring at the end of the synchronizing signal 331, the durations of the independent analog parts 420, 431, 432, 433, and the duration of the analog part delimiters 440 are determined irrespective of the synchronous clock and therefore are not necessarily synchronized to the synchronous periods, and the boundaries between the analog part delimiters

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		440, and the independent part are not necessarily coincident with the edges of the synchronous clock.” Col. 7:31-9:33. “In accordance with the preferred embodiment of the present invention, analog message segments predeterminedly begin immediately after the end of the synchronizing signal 331. Also, an analog frame 345 is defined to include a segment of only one analog message, and multiple segments are included in order, within sequential frames. Thus, the position is conveyed only by the position of the first frame (its hour, cycle, and frame number) and the number of frames. It will be appreciated that there are other ways to transmit the segments and convey the position of the multipart analog message 480, which work equally well. For example, in some systems the segments 460, 461, 462 may be included within one frame. Such an arrangement is useful in a radio communication system in which there are several analog subbands within an outbound channel resource, and several analog segments can be transmitted simultaneously. In such a case, to include the position of the multipart analog message 480 within the protocol, the order and subband number of the analog segments must either by conveyed in a message, or predetermined. In another example, segments of a multipart message which are transmitted in order and in consecutive frames can have their position identified by a continuation indication within the synchronizing portion of each frame.” Col. 8:65-9:21. “As described in Leitch '747, the selective call radio 122 further comprises a means for detecting and decoding the FM modulated control signals and the SSE analog signals which are included in the synchronous protocol, which is similar to the well known InFLEXion™ protocol, licensed by Motorola, Inc. The selective call radio 122 further comprises a receiver 602, a processor section 606, a battery saver switch 604, user controls 651, a linear demodulator 650, an analog conversion and message storage section 668, a display 611, an audio processor 614, and a speaker 616. The receiver 602, which is coupled to the antenna, comprises an FM demodulator 608 and a linear output section 624.” Col. 10:16-28. “The code memory is preferably an EEPROM (electrically erasable programmable read only memory) which stores one or more predetermined addresses to which selective call radio 122 is responsive.” Col. 12:6-9. **Motorola ’448 also discloses that both the “first” and the “second information” are modulated using the “first modulation method” (e.g., “FSK”).** Fig. 6, reproduced below.

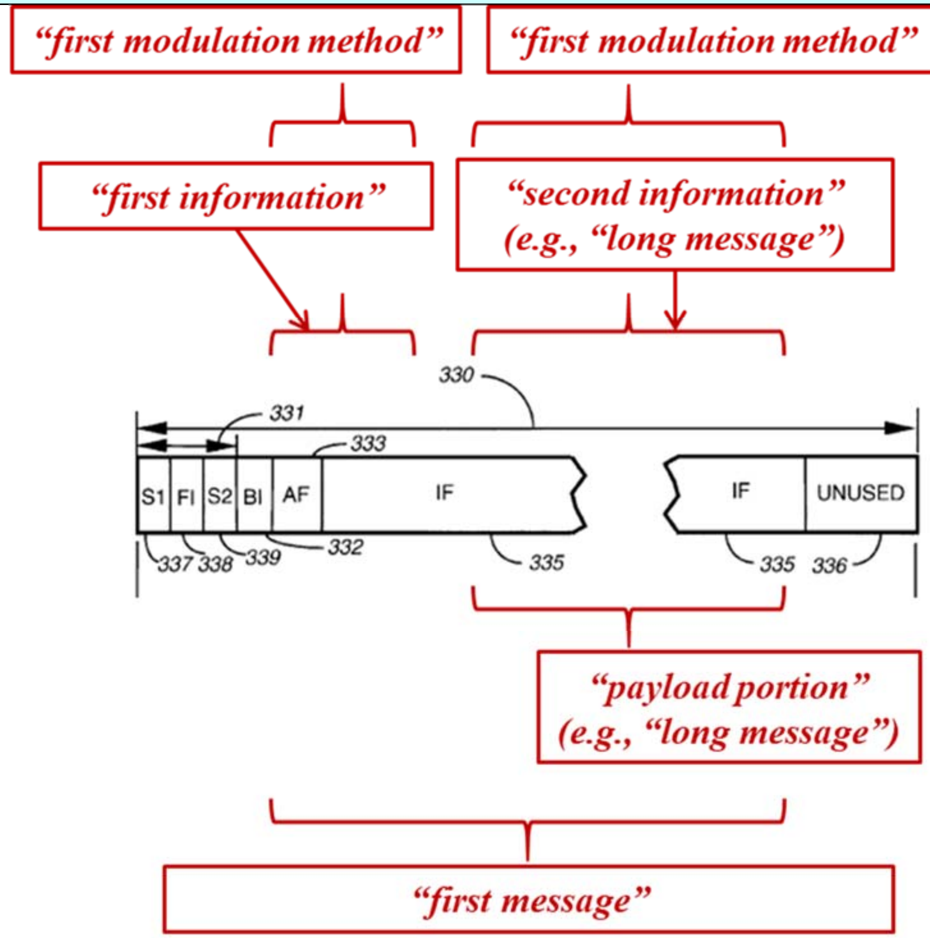
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		FIG. 6  “Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Outbound channel transmissions of the analog message portion transmitted by the base stations 116 preferably utilize single side band (SSB) transmission. A voice message portion preferably comprises at least an upper side band (USB), a lower side band (LSB) and a pilot carrier. It will be appreciated that, alternatively, a voice message portion can comprise the pilot carrier and a single one of the sidebands. A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Col. 3:49-65. “When the message information or control data is digital, it is transmitted in the FM modulation format, and the IF signal is coupled to the FM demodulator 608.” Col. 11:19-21. “When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:25-31. “Voice messages transmitted by the base stations 116 utilize mixed signaling techniques. A voice message preferably includes a digital message portion and an analog message portion. The digital message portion includes at least the addressing information which is used to identify the selective call radio 122, and a message vector identifying the location of the analog message. The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols as described more fully in U.S. Pat. No. 5,168,493 issued Dec. 1, 1992 to Nelson et al., which is hereby incorporated herein by reference, and hereinafter referred to as Nelson '493. This synchronous protocol utilizes well-known error detection and error correction techniques and is therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous in any one code word.” Col. 3:31-48. “Control frames 330 are also classified as data frames 330. The outbound signaling protocol is subdivided into protocol divisions, which are an hour 310, a cycle 320, a frame 330, 345, a block 340, a word 350, and bits (not shown in FIG. 3). All protocol divisions are defined with reference to a synchronous period of a synchronous clock; the protocol division boundaries are coincident with edges of the synchronous clock. Up to fifteen 4 minute uniquely identified cycles are transmitted in each hour 310. Normally, all fifteen cycles 320 are transmitted each hour. Up to one hundred twenty eight 1.875 second uniquely identified frames including control frames 330 and analog frames 345 are transmitted in each of the cycles 320. Normally, all one hundred twenty eight frames are transmitted. One synchronization signal 331 lasting one hundred fifteen milliseconds and 11 one hundred sixty millisecond uniquely identified blocks 340 are transmitted in each of the control frames 330. The synchronization signal 331 includes a first sync portion 337, a frame information word 338, and a second sync portion 339. A bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps is usable during the blocks 340 of each control frame 330. The bit rate of the blocks 340 of each control frame 330 is communicated to the selective call radios 122 during the synchronization signal 331. Depending on the bit rate used, 8 to 32 thirty two bit uniquely identified words 350 are transmitted in each block 340. The bits and words 350 in each block 340 are transmitted in an interleaved fashion using techniques well known to one of ordinary skill in the art to improve the burst error correction capability of the protocol.” Col. 6:25-54. Fig. 3, reproduced below.

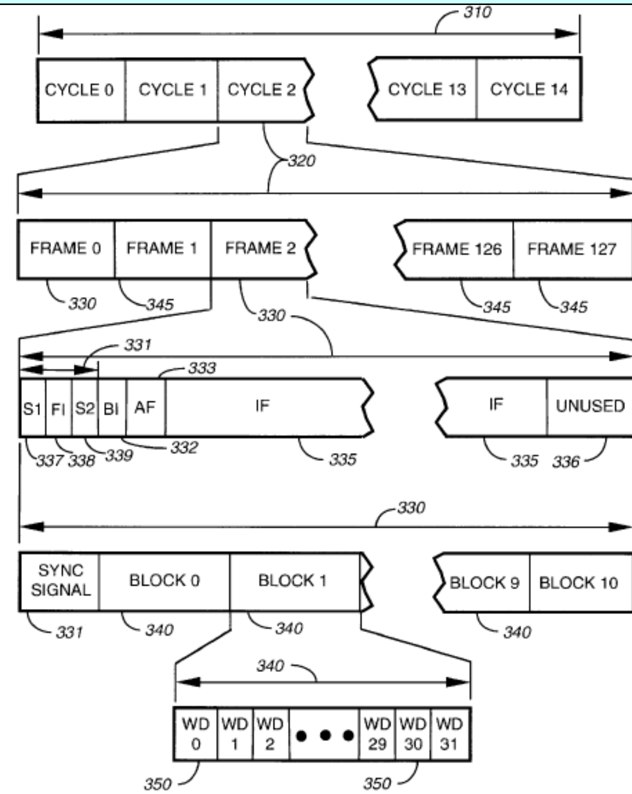
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 ***FIG. 3*** Fig. 4, reproduced below.

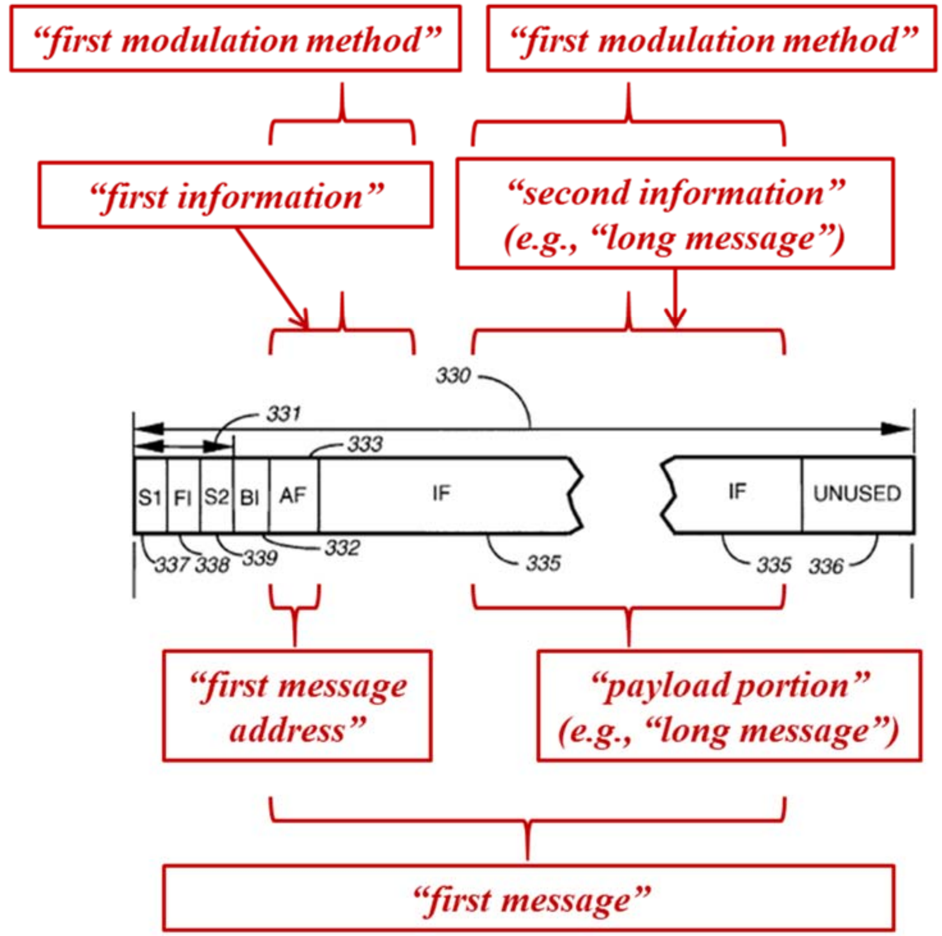
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG. 4* "Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Outbound channel transmissions of the analog message portion transmitted by the base stations 116 preferably utilize single side band (SSE) transmission. A voice message portion preferably comprises at least an upper side band (USE), a

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		lower side band (LSE) and a pilot carrier. It will be appreciated that, alternatively, a voice message portion can comprise the pilot carrier and a single one of the sidebands. A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Col. 3:49-65. “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format.” Col. 12:13-18. Figure 3, annotated:

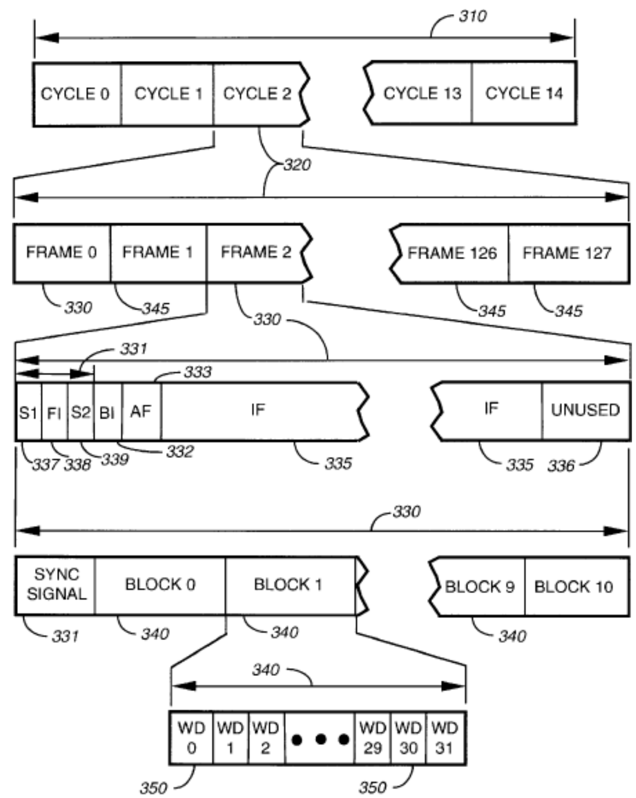
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		
1[c]	first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information; and	**Motorola ’448 discloses first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information.** *See* 1[pre] discussion of base station 116, controller 112, antennas 118/120 which comprise a transceiver in the role of a master communication device according to the master/slave relationship; *see also* **For example, Motorola ’448 first message address information (e.g., “address”) indicating the intended**

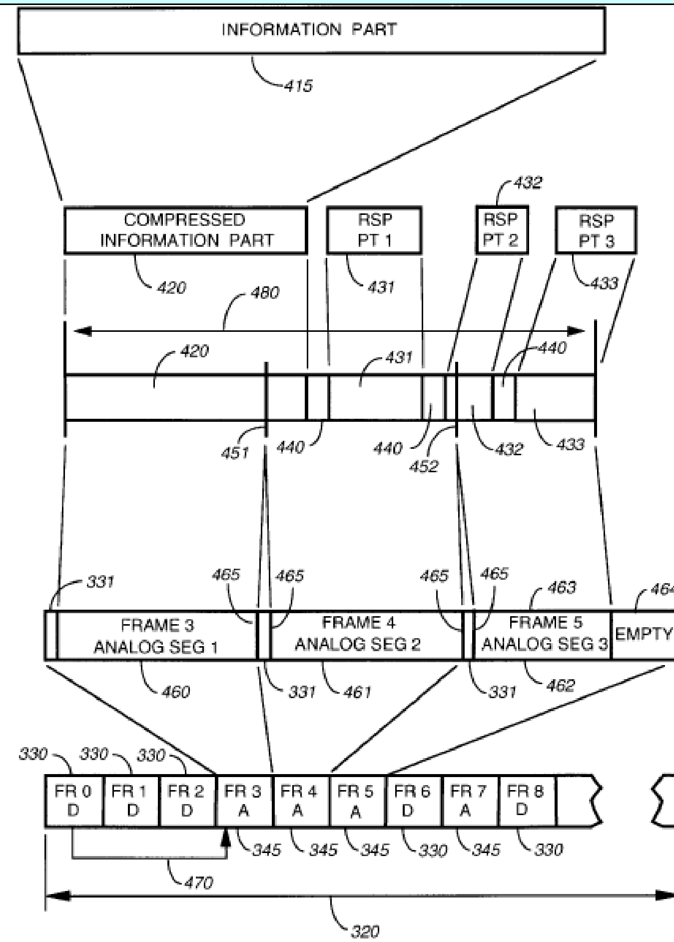
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		destination of the second information (e.g., “long message”). “Each of the selective call radios 122 assigned for use in the radio communication system has an address assigned thereto which is a unique selective call address. The address enables the transmission of a message from the system controller 112 only to the addressed selective call radio, and identifies messages and responses received at the system controller 112 from the selective call radio. Furthermore, each of one or more of the selective call radios 122 can have a unique telephone number or access number assigned thereto. A list of the assigned selective call addresses and correlated telephone numbers for the selective call radios is stored in the system controller 112 in the form of a subscriber data base.” Col. 4:19-31. “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein.” Col. 6:55-62. “Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330.” Col. 6:67-7:6. “When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:22-31. “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format.” Col. 12:13-18. Fig. 3, reproduced below.

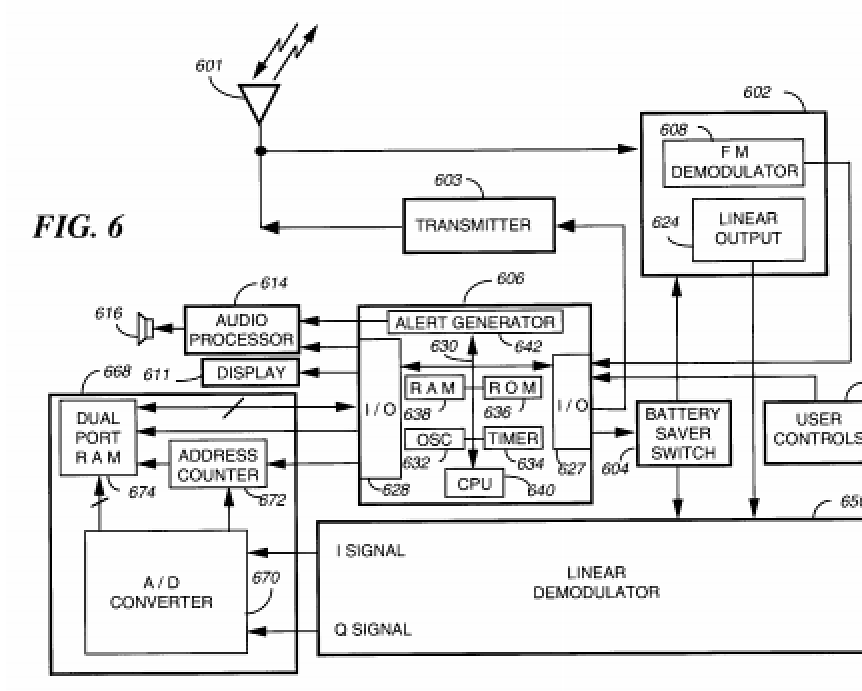
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 ***FIG. 3*** “One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320.” Col. 6:62-67. “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format.” Col. 12:13-18.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		Figure 3, annotated: 
1[d]	said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third	**Motorola '448 (incorporating by reference Motorola '440) discloses said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending**

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
	information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers, and	**change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers.** *See* 1[pre] discussion of base station 116, controller 112, antennas 118/120 which comprise a transceiver in the role of a master communication device according to the master/slave relationship; *see also* **Motorola ’448 ((incorporating by reference Motorola ’440) discloses the master transceiver is configured to transmit a “second message” including “third information” (e.g., “address,” “vector,” “pointer information”) modulated according to the “first modulation method” (e.g., “FSK”).** “Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Outbound channel transmissions of the analog message portion transmitted by the base stations 116 preferably utilize single side band (SSB) transmission. A voice message portion preferably comprises at least an upper side band (USB), a lower side band (LSB) and a pilot carrier. It will be appreciated that, alternatively, a voice message portion can comprise the pilot carrier and a single one of the sidebands. A detailed explanation of the preferred analog voice messaging system can be found in Leitch '747, which is assigned to the assignee of the present invention and which is hereby incorporated by reference.” Col. 3:49-65. “Voice messages transmitted by the base stations 116 utilize mixed signaling techniques. A voice message preferably includes a digital message portion and an analog message portion. The digital message portion includes at least the addressing information which is used to identify the selective call radio 122, and a message vector identifying the location of the analog message. The digital message portion and analog message portion are transmitted using a synchronous protocol which is preferably similar to Motorola's well-known FLEX™ family of digital selective call signaling protocols as described more fully in U.S. Pat. No. 5,168,493 issued Dec. 1, 1992 to Nelson et al., which is hereby incorporated herein by reference, and hereinafter referred to as Nelson '493. This synchronous protocol utilizes well-known error detection and error correction techniques and is therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous in any one code word.” Col. 3:31-48. “When the message information or control data is digital, it is transmitted in the FM modulation format, and the IF signal is coupled to the FM demodulator 608.” Col. 11:19-21. **Motorola ’448 (incorporating by reference Motorola ’440) discloses the “third information” that “is indicative of an impending change in modulation to a second modulation method” (e.g., “QAM”) and the “fourth information,” (e.g., “analog message”) intended for a single slave transceiver, transmitted according**

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		to the second modulation method, transmitted after the third information. Fig. 3, reproduced below.  *FIG. 3* Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 FIG. 4 Fig. 6, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 “As described above, messages may have either digital information, such as a alphanumeric message, or analog information, such as voice. An analog message is included within one or more analog frames. Inasmuch as the analog information is typically a voice signal, the analog frame is alternatively called a voice frame.” Col. 5:44-49. “When the information in the recovered data signal matches any of several stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the decoded message information is received and stored in the microcomputer RAM 638, or in the analog conversion and message storage section 668, as will be explained further below, and an alerting signal is generated by alert generator function 642.” Col. 12:13-24. “The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions described above, and additionally, radio channel information such as radio channel frequency, and

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		subchannel offset from the radio channel frequency. The starting position and length of a long message, a short message, or a vector packet define the protocol position of the long message, short message, or vector packet. When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345. Referring to FIGS. 4 and 5, a timing diagram and a flow chart illustrate an example of an assembly and inclusion of a multipart analog message in analog form within a cycle 320 of the synchronous outbound protocol transmitted in the radio communication system, in accordance with the preferred embodiment of the present invention." Col. 7:14-37. "Each of the selective call radios 122 assigned for use in the radio communication system has an address assigned thereto which is a unique selective call address. The address enables the transmission of a message from the system controller 112 only to the addressed selective call radio, and identifies messages and responses received at the system controller 112 from the selective call radio. Furthermore, each of one or more of the selective call radios 122 can have a unique telephone number or access number assigned thereto. A list of the assigned selective call addresses and correlated telephone numbers for the selective call radios is stored in the system controller 112 in the form of a subscriber data base." Col. 4:19-31. "Included in a control frame 330 are an address of the selective call radio 122 and position identifier (pointer information) for a multipart analog message 480. The intercepted signal is coupled to the receiver 602, where it is FM demodulated by the FM demodulator 608. At step 720, the processor section 606 digitally decodes address data in the control frame 330 and determines that the predetermined address of the selective call radio 122 matches one of the digitally decoded addresses in the control frame. Position identifier information is digitally decoded by the processor section 606 at step 730. The position identifier includes a vector identifying the frame number of the frame 345 in which the multipart analog message 480 starts, and further indicates in which sidebands segments of the multipart message are located, as well as how many frames include segments of the multipart analog message 480. In accordance with the preferred embodiment of the present invention, the segments of the multi part analog message 480 are located in consecutive analog frames 345. Using the position identifier, the processor section 606 controls power to the receiver 602 to turn off the FM demodulator 608, turn on the linear output section 624, and begin recovering the multipart analog message 480 after the synchronizing signal 331 of the frame 345 has been recovered, at step 740. Recovery of the multipart analog message 480 involves digital sampling of the compressed analog waveform and digital signal processing to decompress the compressed waveform, as described herein, above. In accordance with the preferred embodiment of the present invention, while the processor section 606 is processing the digitally sampled multipart analog message 480 to decompress the compressed analog signal, the processor section 606, at step 750, analyzes the decompressed, digital samples of the analog signal, using conventional digital signal processing techniques, to detect any of a set of predetermined analog part delimiter signals, which are dual tone multifrequency (DTMF) signals of a common predetermined duration, such as 60

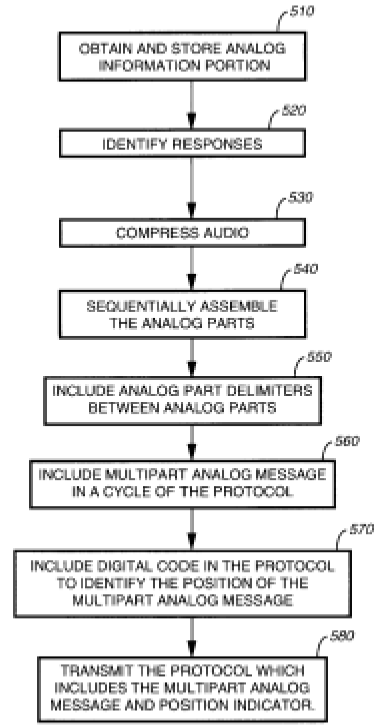
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		milliseconds.” Col. 14:19-56 “When analog information is to be transmitted in the linear modulation format (such as SSB or "I and Q"), the processor section 606 decodes pointer information (also called a position identifier) in the digital portion of the message. The pointer information includes information indicating to the receiver 602 on what combination of sidebands (or on what combination of I and Q components) within the channel bandwidth the additional information is to be transmitted and where the sidebands are located. Vectors, as described above with reference to FIG. 3, form a part of the pointer information.” Col. 12:29-39. “At step 560 (FIG. 5), the processor section includes the multipart analog message 480 within a cycle of the synchronous protocol, at a position in the synchronous protocol. In this example, the multipart analog message 480 is included in frames 3, 4, 5 of the outbound synchronous protocol, by being broken into analog segments 460, 461, 462 (FIG. 4).” Col. 8:30-36. “The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in FIG. 4 by the arrow 470.” Col. 8:62-65. “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein. One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320. Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330.” Col. 6:55-7:6. “The vectors contain information which specifies the starting word of a long message in terms of the protocol divisions” Col. 7:14-15. “Referring to FIGS. 4 and 5, a timing diagram and a flow chart illustrate an example of an assembly and inclusion of a multipart analog message in analog form within a cycle 320 of the synchronous outbound protocol transmitted in the radio communication system, in accordance with the preferred embodiment of the present invention. The processor section 210 obtains and stores in the mass memory 214, at step 510 (FIG. 5), an information portion 415 (FIG. 4) of an analog message which is to be transmitted to a selective call radio 122. For example, the information portion is an analog signal generated by a voice message received from an originating caller by means of the telephone 111, in which the originating caller says "Can you go to lunch with me at 12:30?"” Col. 7:32-45. “The independent information portion and response portions thus obtained and stored at these first steps 510, 520 of sending a multipart analog message are then time compressed at step 530 (FIG. 5) by the processor section 210 into shorter independent analog parts 420, 431, 432,433 (FIG. 4) which are stored in the mass media 214 in digitally

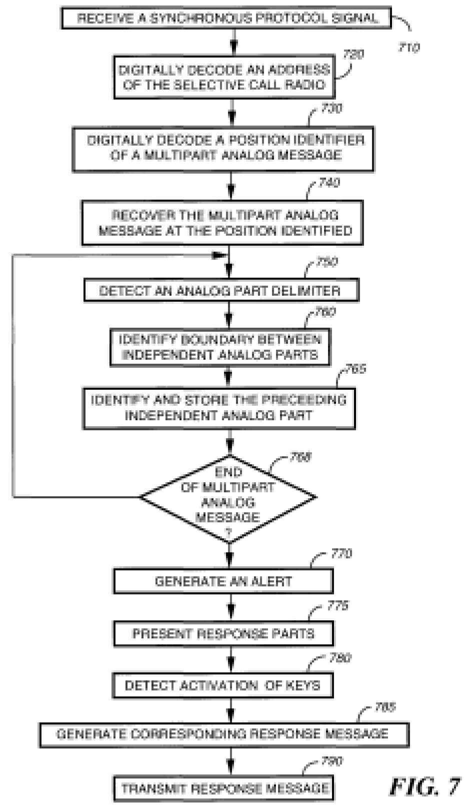
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		sampled form." Col. 7:67-8:6. "The digital code which provides the identification of the analog frame 345 at which the multipart analog message 480 starts is a vector, as described above, and is illustrated in 65 FIG. 4 by the arrow 470." Col. 8:62-65. "The receiver 602 is preferably a modified FM receiver including the addition of a DAFC (digital automatic frequency control) as described in U.S. Pat. No. 5,239,306 issued to Siwiak et al. (which is assigned to the assignee of the present invention and which is hereby incorporated by reference herein," Col. 10:33-38.[5] "Additionally, in response to an FM modulated address (and message position code words), the processor section 606 initiates the operation of the analog conversion and message storage section 668, which samples either or both of an I (In-phase) and a Q (quadrature) linearly modulated signal at outputs of the linear demodulator 650. The I and Q signal samples are written directly to the dual port RAM 674 with the aid of the address counter 672, in response to a control signal from the processor section 606, which is a well known direct memory access technique. A voice signal can be sent as an SSB signal occupying a single voice bandwidth on the outbound channel, or equivalently on either of the one or more I or Q channels as described in more detail in Leitch '747." Col. 10:47-60. "An information signal, modulated in the FM modulation format, or in a linear modulation format (such as SSB), is intercepted by the antenna 601, which couples the information signal to the receiver 602." Col. 11:10-13. "The IF signal, which now carries the SSB (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals. The I and Q audio signals are coupled to the analog conversion and message storage section 668, in particular to the inputs of the analog to digital converter 670. The A/D converter 670 samples the signals at a rate at least twice the highest frequency component of the I and Q signals coupled from the linear demodulator 650. The sampling rate is preferably 6.4 kilohertz per I and Q channel. It will be appreciated, that the data sampling rate indicated is for example only, and other sampling rates may be used depending upon the bandwidth of the audio message received. When digital data is received in a digital portion of a message, the processor section 606 decodes the digital information (performing symbol decoding and error detection and correction decoding in a manner well known to one of ordinary skill in the art), and controls the address counter 672 to store the decoded binary information in the RAM 674. When analog data is received in an analog portion of a message, the A/D converter 670 is enabled to allow sampling of the information symbol pairs. The A/D converter 670 generates high speed sample clock signals which are used to clock the address counter 672 which in turn sequentially generates addresses for loading the sampled voice signals into a dual port random access memory 674 through data lines going from the converter 670 to the RAM 674. The analog signals which are loaded

[5] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		at high speed into the dual port RAM 674 in real time, are processed by the microcomputer 606 after all analog signals in a message have been received.” Col. 12:54-13:20. “Using the position identifier, the processor section 606 controls power to the receiver 602 to turn off the FM demodulator 608, turn on the linear output section 624, and begin recovering the multipart analog message 480 after the synchronizing signal 331 of the frame 345 has been recovered, at step 740.” Col. 14:37-42. “The RF signals transmitted by the base stations 116 to the selective call radios 122 (outbound messages) comprise selective call addresses identifying the selective call radios 122, and data or voice messages originated by a caller.” Col. 3:8-12. “The transmitter 202 transmits two and four-level FSK data messages to the selective call radios 122 during a digital message portion, and at least one LSE, USE and a pilot during the analog message portion for voice messages. The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202.” Col. 4:51-60. *See also* Col. 6:19-9:33. “The processor section 210 obtains and stores in the mass memory 214, at step 510 (FIG. 5), an information portion 415 (FIG. 4) of an analog message which is to be transmitted to a selective call radio 122. For example, the information portion is an analog signal generated by a voice message received from an originating caller by means of the telephone 111, in which the originating caller says "Can you go to lunch with me at 12:30?"” Col. 7:37-46. “The term "position" in this context means the identification of the beginning of all segments of the multipart analog message 480, as well as their duration and ordering within the multipart analog message 480, so that the multipart analog message 480 can be reconstructed. At step 570 (FIG. 5), the processor section 210 includes a digital code within the synchronous protocol which identifies the position of the multipart analog message 480 within the synchronous protocol. In accordance with the preferred embodiment of the present invention, the position is identified by a binary code included in a data frame 330 which identifies the frame number (3, in this example) of the analog frame 345 at which the multipart analog message 480 starts, and how many frames it occupies. The data frame 330 and analog frames 345 are coupled from the system controller 112 to the transmitter 202, where they are modulated on a radio carrier and transmitted by the antenna 120, at step 580.” Col. 8:45-61. “In accordance with the preferred embodiment of the present invention, analog message segments predeterminedly begin immediately after the end of the synchronizing signal 331. Also, an analog frame 345 is defined to include a segment of only one analog message, and multiple segments are included in order, within sequential frames. Thus, the position is conveyed only by the position of the first frame (its hour, cycle, and frame number) and the number of frames. It will be appreciated that there are other ways to transmit the segments and convey the position of the multipart analog message 480, which work equally well. For example, in some systems the segments 460, 461, 462

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		may be included within one frame. Such an arrangement is useful in a radio communication system in which there are several analog subbands within an outbound channel resource, and several analog segments can be transmitted simultaneously. In such a case, to include the position of the multipart analog message 480 within the protocol, the order and subband number of the analog segments must either be conveyed in a message, or predetermined. In another example, segments of a multipart message which are transmitted in order and in consecutive frames can have their position identified by a continuation indication within the synchronizing portion of each frame.” Col. 8:65-9:21. “As described in Leitch '747, the selective call radio 122 further comprises a means for detecting and decoding the FM modulated control signals and the SSE analog signals which are included in the synchronous protocol, which is similar to the well known InFLEXion™ protocol, licensed by Motorola, Inc. The selective call radio 122 further comprises a receiver 602, a processor section 606, a battery saver switch 604, user controls 651, a linear demodulator 650, an analog conversion and message storage section 668, a display 611, an audio processor 614, and a speaker 616. The receiver 602, which is coupled to the antenna, comprises an FM demodulator 608 and a linear output section 624.” Col. 10:16-28. “The code memory is preferably an EEPROM (electrically erasable programmable read only memory) which stores one or more predetermined addresses to which selective call radio 122 is responsive.” Col. 12:6-9. “The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section 606, through 1/0 port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion and message storage section 668, thus starting a process of recovering an analog signal, as will be described below. The IF signal, which now carries the SSE (or "I and Q") information is coupled to the linear output section 624. The output of the linear output section 624 is processed by the linear demodulator 650 as described in Leitch '747 (with reference to quadrature detector 850 therein) to provide a pair of baseband I and Q audio signals which represent the compressed and companded voice signals.” Col. 12:39-60. Fig. 5, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG. 5* Fig. 7, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG. 7* Figures 3 and 4, annotated:

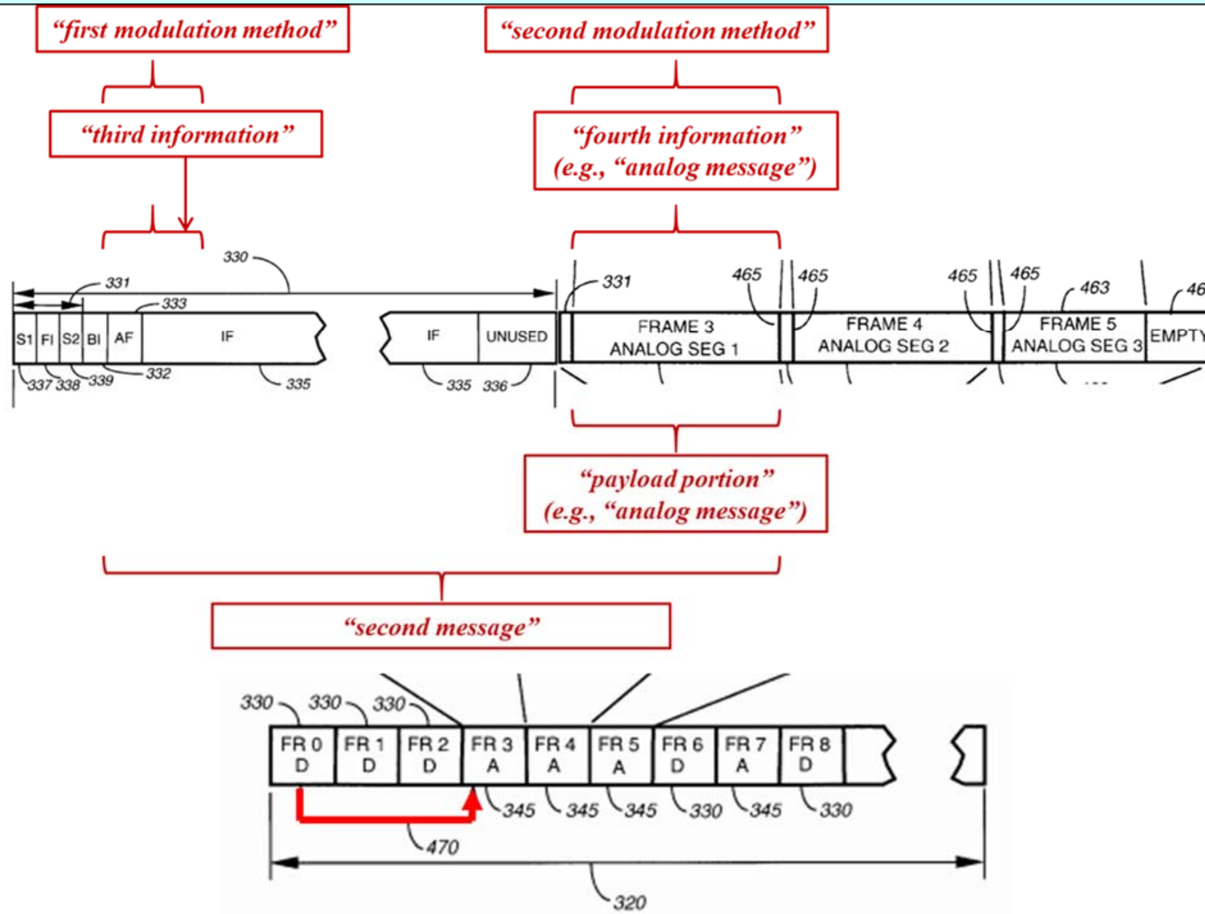
<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,457,228
(“the ’228 patent”)</th><th>The Motorola ’448 patent</th></tr>
<tr><td></td><td></td><td>


FIG. 4

Motorola ’448 incorporates by reference U.S. Patent No. 5,689,440 (“Motorola ’440”) which discloses transmissions modulated using a “first modulation method” (e.g., “FSK”) and a “second modulation method” (e.g., “QAM”) of a different “type” than the “first modulation method.”

“With regard to modulation, two types of modulation are preferably used on the forward channel of the present
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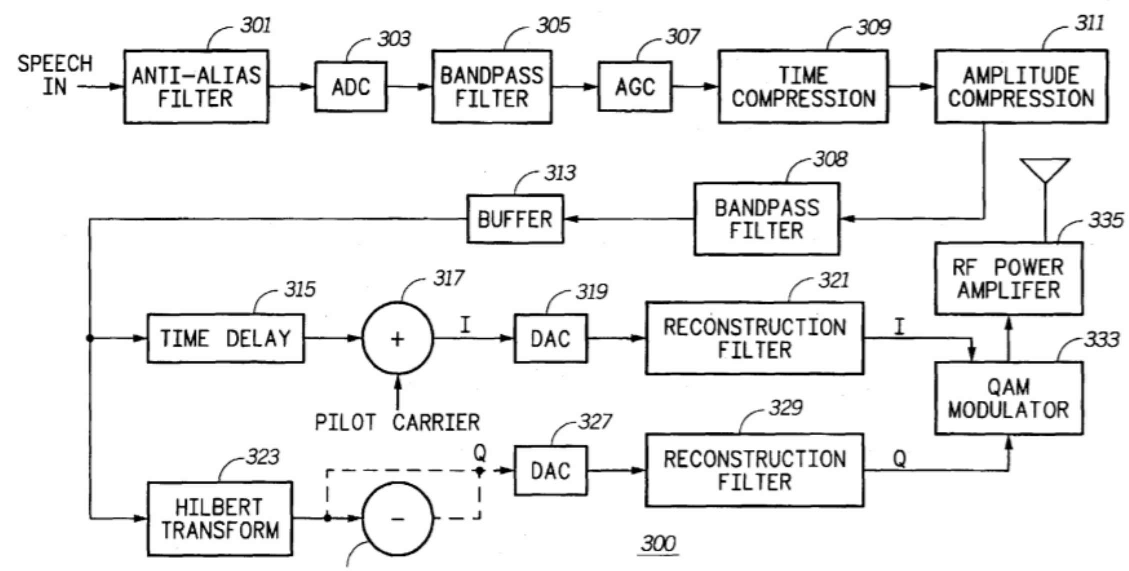
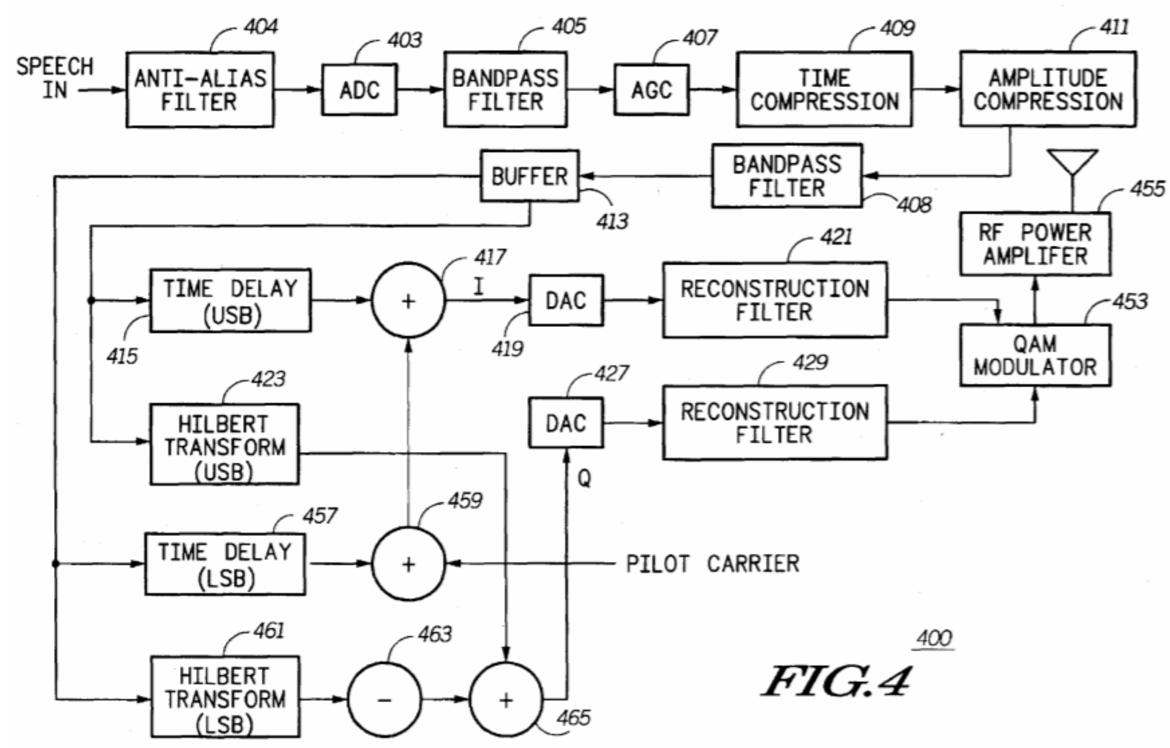
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		invention: Digital FM (2-level and 4-level FSK) and AM (SSB or QAM with pilot carrier). Digital FM modulation is used for the sync portions of both types of frames, and for the address and data fields of the control frames. AM modulation (each sideband may be used independently or combined together in a single message) is used in the voice message field of the voice frames.” Col. 6:14-22. “Please keep in mind that this compressed voice paging system is highly bandwidth efficient and intended to support typically 6 to 30 voice messages per 25 kHz channel using the basic concepts of quadrature amplitude (QAM) or single-side band (SSB) modulation and time scaling of speech signals.” Col. 4:44-49. “Alternatively, the quadrature amplitude modulation may be used where the two independent signals are transmitted directly via I and Q components of the signal to form each sub-channel signal.” Col. 4:60-63. “The present invention can operate as a mixed-mode (voice or digital) one or two way communications system for delivering analog voice and/or digital messages to selective call receiver units on a forward channel (outbound from the base transmitter) and for receiving acknowledgments from the same selective call receiver units which additionally have optional transmitters (on an optional reverse channel (inbound to a base receiver). The system of the present invention preferably utilizes a synchronous frame structure similar to FLEX.TM. (a high speed paging protocol by Motorola, Inc. and subject of U.S. Pat. No. 5,282,205, which is hereby incorporated by reference) on the forward channel for both addressing and voice messaging. Two types of frames are used: control frames and voice frames. The control frames are preferably used for addressing and delivery of digital data to selective call receivers in the form of portable voice units (PVU's). The voice frames are used for delivering analog voice messages to the PVU's. Both types of frames are identical in length to standard FLEX.TM. frames and both frames begin with the standard FLEX.TM. synchronization. These two types of frames are time multiplexed on a single forward channel. The frame structure for the present invention will be discuss in greater detail later on with regard to FIGS. 10, 11 and 12. With regard to modulation, two types of modulation are preferably used on the forward channel of the present invention: Digital FM (2-level and 4-level FSK) and AM (SSB or QAM with pilot carrier). Digital FM modulation is used for the sync portions of both types of frames, and for the address and data fields of the control frames. AM modulation (each sideband maybe used independently or combined together in a single message) is used in the voice message field of the voice frames. The digital FM portions of the transmission support 6400 BPS (3200 Baud symbols) signaling. The AM portions of the transmissions support band limited voice (2800 Hz) and require 6.25 KHz for a pair of voice signals. The protocol, as will be shown later, takes advantage of the reduced AM bandwidth by subdividing a full channel into 6.25 KHz subchannels, and by using each subchannel and the AM sidebands for independent messages.” Col. 5:57-6:30.[6] “If the speech processing, encoding and modulation portion of the present invention were to be implemented into hardware, the implementation of FIG. 5 could be used. For instance, transmitter 500 of FIG. 5 would include a

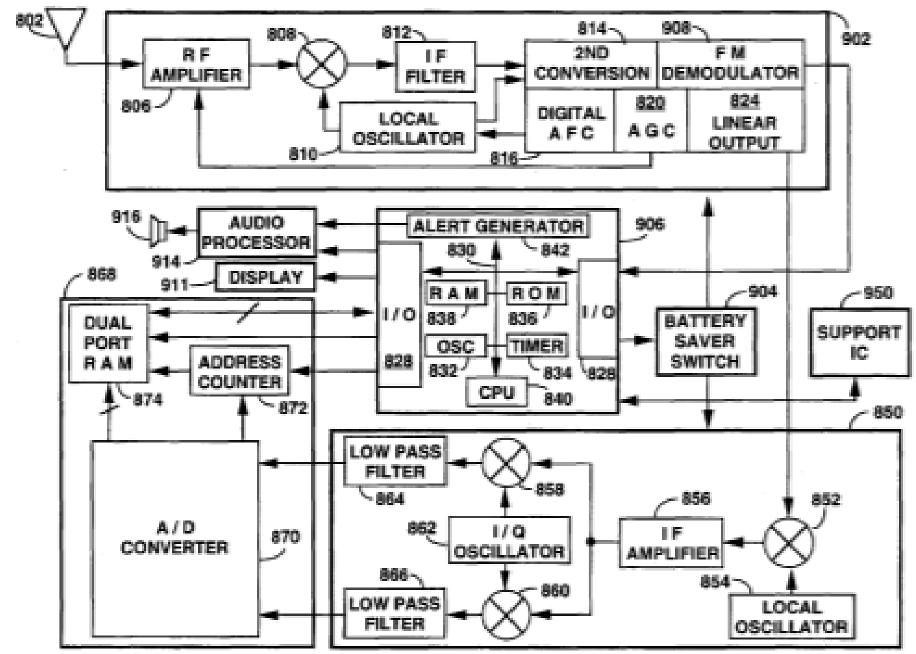
[6] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

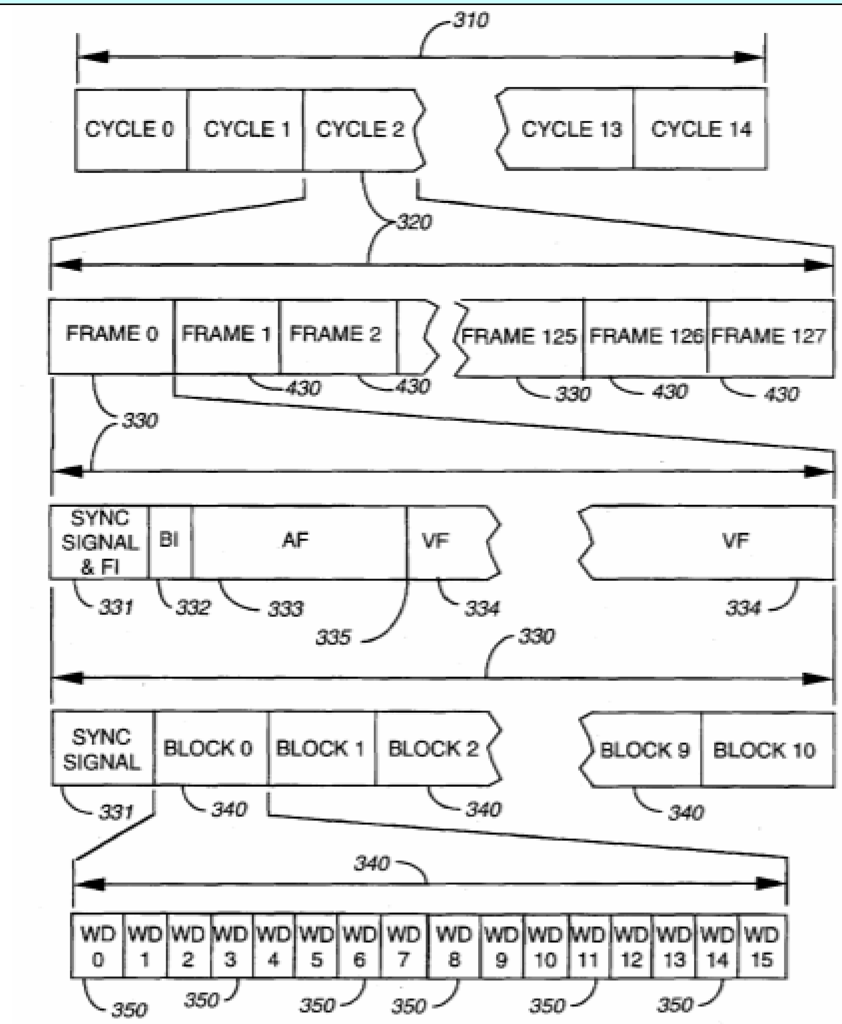
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		series of pairs of single-sideband exciters (571-576) set to the frequencies of their respective pilot carriers (581-583). Exciters 571-576 and pilot carriers 581-583 correspond to the separate voice processing paths. All these signals, including a signal from an FM signal exciter 577 (for the digital FM modulation used for the synchronization, address and data fields previously described) would be fed into a summing amplifier 570 which in turn is amplified by a linear amplifier 580 and subsequently transmitted. The low level output of FM exciter 577 is also linearly combined in summing amplifier 570. The composite output signal of summing amplifier 570 is amplified to the desired power level, usually 50 watts or more, by linear RF power amplifier 580. The output of linear RF power amplifier 580 is then coupled to the transmitting antenna.” Col. 11:62-12:13. “The maintenance of receiver tuning is especially important for the proper reception of QAM (that is, I and Q components) and/or SSB information which is transmitted in the linear modulation format.” Col. 13:57-60. “The transmitter base station comprises an input device for receiving an audio signal, a processing device for compressing the audio signal using a time-scale compression technique and a single side band modulation technique to provide a processed signal and a quadrature amplitude modulator for the subsequent transmission of the processed signal.” Cols. 2:2-8. “In yet another aspect of the present invention, a paging base station for transmitting selective call signals on a communication resource having a predetermined bandwidth, comprises, an input device for receiving a plurality of audio signals, a device for subchannelizing the communication resource into a predetermined number of subchannels, an amplitude compression and filtering module for each subchannel for compressing the amplitude of the respective audio signal and filtering the respective audio signal, a time compression module for compression of the time of the respective audio signal for each subchannel, and a quadrature amplitude modulator for the subsequent transmission of the processed signal.” Cols. 2:24-36. “The selective call is then input to the selective call transmitter 102 where it is applied as modulation to a radio frequency signal which is sent over the air through an antenna 103. Preferably, the transmitter is a quadrature amplitude modulation transmitter for transmitting the processed signal” Cols. 3:39-44. “Preferably, in a first embodiment and also referring to FIG. 6, the compressed voice channel or voice communication resource consists of 3 sub-channels that are separated by 6250 Hz. Each sub-channel consists of two side-bands and a pilot carrier. Each of these two side-bands may have the same message in a first method or separate speech messages on each sideband or a single message split between the upper and lower sidebands in a second method. The single sub-channel has a bandwidth of substantially 6250 Hz with each side-band occupying a bandwidth of substantially 3125 Hz. The actual speech bandwidth is substantially 300-2800 Hz.” Cols. 4:49-60. “This signal is Hilbert transformed to obtain a single-sideband signal. Alternatively, the signal is quadrature modulated to obtain a QAM signal. A pilot carrier is then added to the signal and the final signal is interpolated, preferably, to a 16 kHz sampling rate and converted to analog. This is then modulated and transmitted.” Cols. 5:50-56.

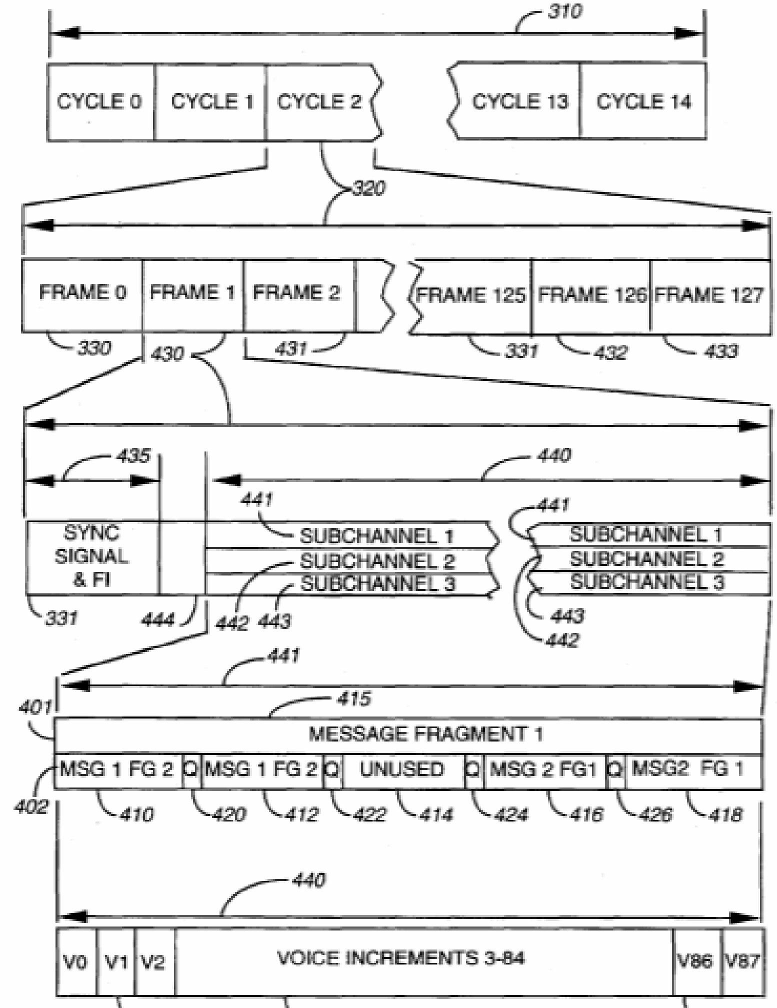
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		“FIG. 3 illustrates a block diagram of a first embodiment of a transmitter 300 in accordance with the present invention. An analog speech signal is input to an anti-aliasing low pass filter 301 which strongly attenuates all frequencies above one-half the sampling rate of an analog-to-digital converter (ADC) 303 which is further coupled to the filter 301. The ADC 303 preferably converts the analog speech signal to a digital signal so that further signal processing can be done using digital processing techniques. Digital processing is the preferred method, but the same functions could also be performed with analog techniques or a combination of analog and digital techniques. A band pass filter 305 coupled to the ADC 303 strongly attenuates frequencies below and above its cutoff frequencies. The lower cutoff frequency is preferably 300 Hz which allows the significant speech frequencies to pass, but attenuates lower frequencies which would interfere with a pilot carrier. The upper cutoff frequency is preferably 2800 Hz which allows the significant speech frequencies to pass but attenuates higher frequencies which would interfere with adjacent transmission channels. An automatic gain control (AGC) block 307 preferably coupled to the filter 305 equalizes the volume level of different voices. A time compression block 309 preferably coupled to the AGC block 307 shortens the time required for transmission of the speech signal while maintaining essentially the same signal spectrum as at the output of the bandpass filter 305. The time compression method is preferably WSOLA-SD (as will be explained later on), but other methods could be used. An amplitude compression block 311, and the corresponding amplitude expansion block 720 in a receiver 700 (FIG. 7), form a companding device which is well known to increase the apparent signal-to-noise ratio of the received speech. The companding ratio is preferably 2 to 1 in decibels, but other ratios could be used in accordance with the present invention. In the particular instance of a communication system such as a paging system, the devices 301-309 may be included in a paging terminal (113 of FIG. 1) and the remaining components in FIG. 3 could constitute a paging transmitter (102 of FIG. 1). In such a case, there would typically be a digital link between the paging terminal and paging transmitter. For instance, the signal after block 309 could be encoded using a pulse code modulation (PCM) technique and then subsequently decoded using PCM to reduce the number of bits transferred between the paging terminal and paging transmitter.” Cols. 7:26-8:4. “A quadrature amplitude modulation (QAM) modulator 333 modulates the I and Q signals onto a radio frequency (RF) carrier at low power level. Other modulation methods, e.g. direct digital synthesis of the modulated signal would accomplish the same purpose as the DACs (319 and 327), reconstruction filters (321 and 329), and QAM modulator 333.” Cols. 9:5-11. *See also* Cols. 9:20-10:19. “A transition portion 444 exists between the header portion 435 and analog portion 440. In accordance with the preferred embodiment of the present invention, the transition portion includes amplitude modulated pilot subcarriers for up to three subchannels 441, 442, 443. The analog portion 440 illustrates the three subchannels 441, so 442, 443 which are transmitted simultaneously, and each subchannel includes an upper sideband signal 401 and a lower sideband signal 402 (or alternatively, an in-phase and a quadrature signal).” Cols. 17:45-54. “1. A method for compressing a plurality of voice signals within a voice communication resource having a given

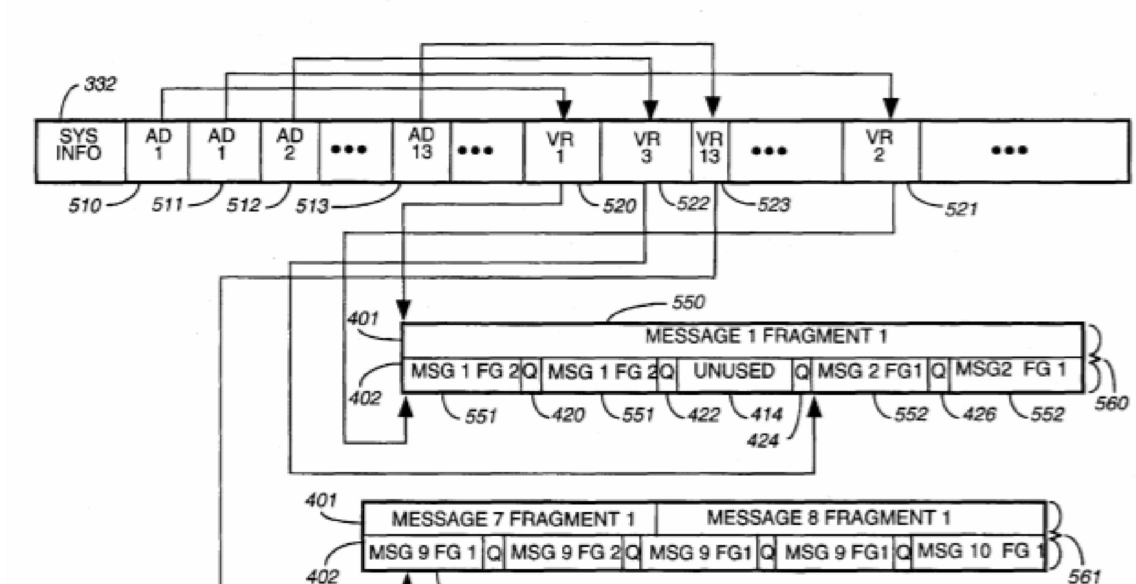
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		bandwidth within a voice communication system, comprising the steps of: (a) subchanneling the voice communication resource into a plurality of subchannels and simultaneously placing a pair of the plurality of voice signals on a subchannel; (b) modulating the pair of the plurality of voice signals about a pilot signal within the subchannel within the voice communication resource using single sideband modulation; and(c) compressing the time of each of the voice signals within the plurality of subchannels, wherein the result of steps (a), (b), and (c) provides a compressed voice signal. 2. The method of claim 1, wherein the step of subchanneling further comprises the step of using quadrature amplitude modulation.” Claims 1-2. *See also* Claims 10-14, 20. Fig. 3, reproduced below.  FIG.3 Fig. 4, reproduced below.

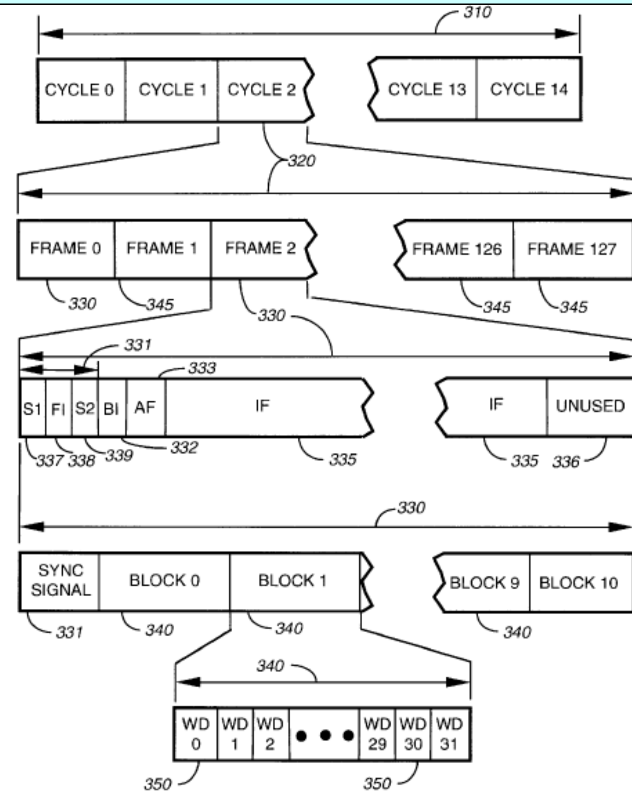
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 Fig. 9, reproduced below.

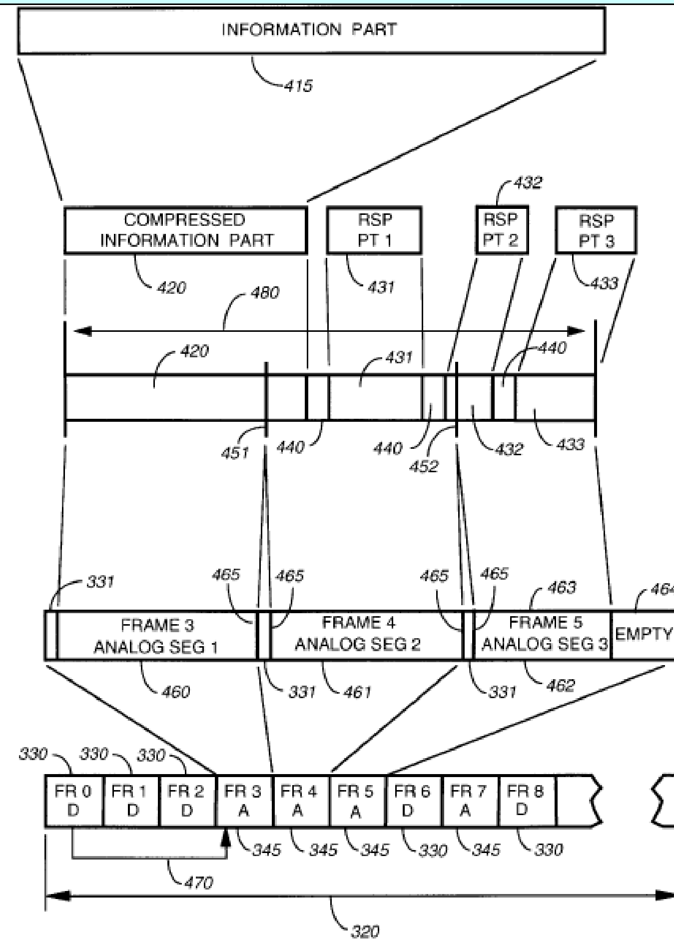
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 FIG. 9 900 Fig. 10, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG.10* Fig. 11, reproduced below.

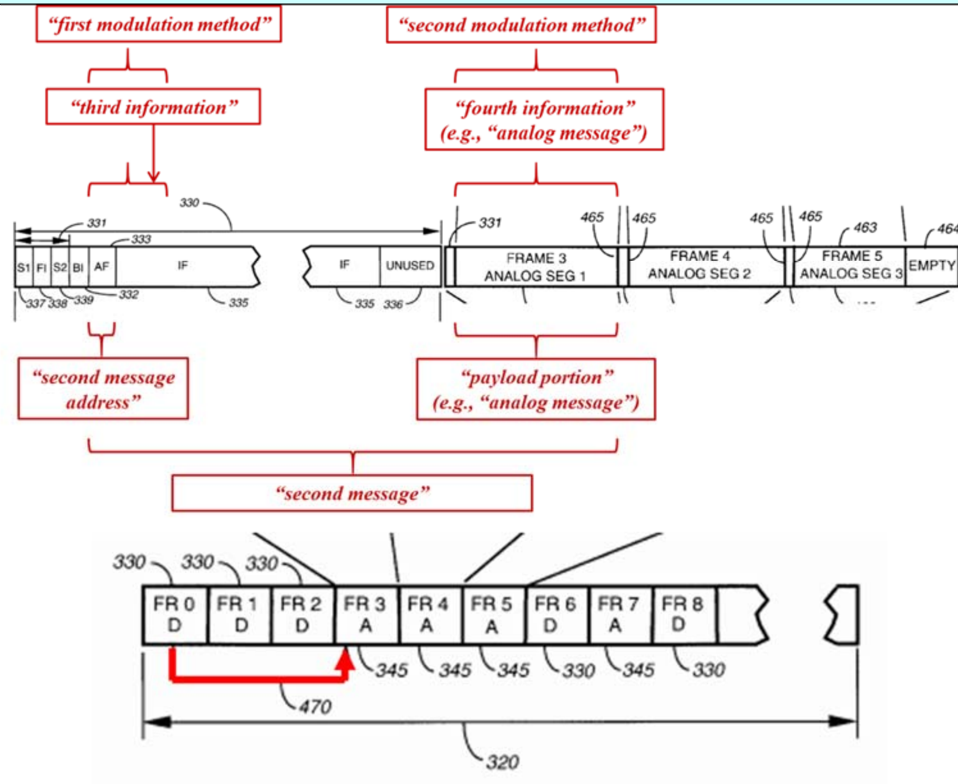
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 FIG. 11 Fig. 12, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 FIG.12
1[e]	second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and	**Motorola '448 ((incorporating by reference Motorola '440) discloses second message address information (e.g., "address") that is indicative of the single slave transceiver (e.g., "selective call radio[] 122") being an intended destination of the fourth information.** *See* 1[b] discussion of "FSK" as the first modulation method. *See also* 1[d] discussion of "FSK" as the first modulation method and "QAM" as the second modulation method disclosed by **Motorola '448** (incorporating by reference **Motorola '440**); *see also* Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 FIG. 3 Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		 *FIG. 4* “Each of the selective call radios 122 assigned for use in the radio communication system has an address assigned thereto which is a unique selective call address. The address enables the transmission of a message from the system controller 112 only to the addressed selective call radio, and identifies messages and responses received at the system controller 112 from the selective call radio. Furthermore, each of one or more of the selective call radios 122 can have a unique telephone number or access number assigned thereto. A list of the assigned selective call

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		addresses and correlated telephone numbers for the selective call radios is stored in the system controller 112 in the form of a subscriber data base.” Col. 4:19-31. “Information is included in each control frame 330 in information fields, comprising system information in the frame information word 338 and a block information field (BI) 332, one or more selective call addresses in an address field (AF) 333, one or more of a set of vector packets, short message packets, and long messages in the information field (IF) 335, and an unused field 336 having no useful information therein.” Col. 6:55-62. “Each vector packet and short message packet in the information field 335 of a control frame 330 corresponds to at least one of the addresses in the address field 333 of the same control frame 330. Each long message in the information field 335 corresponds to at least one vector packet in the information field 335 of at least one or more control frames 330.” Col. 6:67-7:6. “When a selective call radio 122 detects its own address within a control frame 330, the selective call radio 122 processes the associated vector packet or short message packet within the control frame 330. When a selective call radio 122 decodes a vector packet in a control frame 330 which corresponds with its selective call address, the selective call radio 122 is directed to receive and decode a long message or an analog message in either the same control frame 330, or another control frame 330 or an analog frame 345.” Col. 7:22-31. “The RF signals transmitted by the base stations 116 to the selective call radios 122 (outbound messages) comprise selective call addresses identifying the selective call radios 122, and data or voice messages originated by a caller.” Col. 3:8-12. “The code memory is preferably an EEPROM (electrically erasable programmable read only memory) which stores one or more predetermined addresses to which selective call radio 122 is responsive.” Col. 12:6-9. “When the information in the recovered data signal matches any of several stored predetermined addresses,” Col. 12:13-14. “One aspect of system information included in the frame information word 338 is the frame number and the cycle number. The cycle number is a number from zero to 15 which identifies each cycle 320. The frame number is a number from zero to one hundred twenty seven which identifies each frame 330, 345 of a cycle 320.” Col. 6:62-67. “[S]ubsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format.” Col. 12:15-18. Figures 3 and 4, annotated:

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '448 patent
		 *FIG. 4*
1[f]	wherein the second modulation method results in a higher data rate than the first modulation method.	**Motorola '448 (incorporating by reference Motorola '440) discloses wherein the second modulation method results in a higher data rate than the first modulation method.** *See* 1[d] discussion of "FSK" as the first modulation method, and "QAM" as the second modulation method disclosed by **Motorola '448** (incorporating by reference into **Motorola '448**); *see also* "The processor section 606 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of a current portion of the synchronous protocol, at which time a supply of power is suspended to the receiver 602 until the analog frame 345 identified by the pointer is reached, at the beginning of which high speed data is transmitted. When the synchronizing signal 331 has been received, the processor section

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		606, through I/O port 628 generates a battery saving control signal which couples to battery saver switch 604 to suspend the supply of power to the FM demodulator 608, and to supply power to linear output section 624, the linear demodulator 650, and the analog conversion and message storage section 668, thus starting a process of recovering an analog signal, as will be described below.” Col. 12:39-53. “The I and Q audio signals are coupled to the analog conversion and message storage section 668, in particular to the inputs of the analog to digital converter 670. The A/D converter 670 samples the signals at a rate at least twice the highest frequency component of the I and Q signals coupled from the linear demodulator 650. The sampling rate is preferably 6.4 kilohertz per I and Q channel. It will be appreciated, that the data sampling rate indicated is for example only, and other sampling rates may be used depending upon the bandwidth of the audio message received. When digital data is received in a digital portion of a message, the processor section 606 decodes the digital information (performing symbol decoding and error detection and correction decoding in a manner well known to one of ordinary skill in the art), and controls the address counter 672 to store the decoded binary information in the RAM 674. When analog data is received in an analog portion of a message, the A/D converter 670 is enabled to allow sampling of the information symbol pairs. The A/D converter 670 generates high speed sample clock signals which are used to clock the address counter 672 which in turn sequentially generates addresses for loading the sampled voice signals into a dual port random access memory 674 through data lines going from the converter 670 to the RAM 674. The analog signals which are loaded at high speed into the dual port RAM 674 in real time, are processed by the microcomputer 606 after all analog signals in a message have been received.” Col. 12:61-13:20. “A bit rate of 1600 bits per second (bps), 3200 bps, or 6400 bps is usable during the blocks 340 of each control frame 330. The bit rate of the blocks 340 of each control frame 330 is communicated to the selective call radios 122 during the synchronization signal 331. Depending on the bit rate used, 8 to 32 thirty two bit uniquely identified words 350 are transmitted in each block 340. The bits and words 350 in each block 340 are transmitted in an interleaved fashion using techniques well known to one of ordinary skill in the art to improve the burst error correction capability of the protocol.” Col. 6:44-54. “The transmitter 202 transmits two and four-level FSK data messages to the selective call radios 122 during a digital message portion, and at least one LSB, USB and a pilot during the analog message portion for voice messages. The analog message portion is preferably analog to digital converted to a conventional high speed digitally sampled signal, in a manner well known to one of ordinary skill in the art, for transmission over the communication links 114, then reconverted back to the analog message portion by the transmitter 202.” Col. 4:51-60. “The receiver 602 is preferably a modified FM receiver including the addition of a DAFC (digital automatic frequency control) as described in U.S. Pat. No. 5,239,306 issued to Siwiak et al. (which is assigned to the assignee of the present invention and which is hereby incorporated by reference herein), an AGC (automatic gain control),

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
		and which provides for an intermediate frequency (IF) output (not shown in FIG. 6) at a point following most of the receiver gain but prior to the FM demodulator.” Col. 10:33-42.[7] “A voice signal can be sent as an SSB signal occupying a single voice bandwidth on the outbound channel, or equivalently on either of the one or more I or Q channels as described in more detail in Leitch '747. Direct memory access by the analog-to-digital converter 670 allows the use of a processor whose speed and power are not a direct function of the channel data rate. That is, a microprocessor can be used with direct memory access, whereas, a significantly higher speed processor would be required if the analog-to-digital converted data were read to memory through the microprocessor.” Col. 10:57-67. “Outbound channel transmissions of the digital message portion transmitted by the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen hundred or thirty two hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain.” Col. 3:49-54. **Motorola ’440 (incorporated by reference into Motorola ’448) discloses the first modulation method (e.g., “FSK” and the second modulation method (e.g., “QAM”).** “With regard to modulation, two types of modulation are preferably used on the forward channel of the present invention: Digital FM (2-level and 4-level FSK) and AM (SSB or QAM with pilot carrier). Digital FM modulation is used for the sync portions of both types of frames, and for the address and data fields of the control frames. AM modulation (each sideband maybe used independently or combined together in a single message) is used in the voice message field of the voice frames. The digital FM portions of the transmission support 6400 BPS (3200 Baud symbols) signaling. The AM portions of the transmissions support band limited voice (2800 Hz) and require 6.25 KHz for a pair of voice signals. The protocol, as will be shown later, takes advantage of the reduced AM bandwidth by subdividing a full channel into 6.25 KHz subchannels, and by using each subchannel and the AM sidebands for independent messages.” Col. 6:14-30. “A voice can be sent as an SSB signal occupying a single voice bandwidth on the channel, or equivalently on either of the I or Q channels as was described earlier. Each of the I and Q signals simultaneously occupy the same RF bandwidth as two analog-single sidebands (SSB). Voice bandwidths are on the order of 2.8 KHz, so a typical signal sampling rate of about 6.4 KHz each is required of the analog-to-digital converter if analog-SSB is recovered from the I and Q channel information. The analog-to-digital converter samples with 8 bit precision (although as much as 10 bits is preferred).” Col. 12:55-65.

	Claim 21 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent

[7] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 21 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’448 patent
21	The master communication device as in claim 1, wherein the first information that is included in the first message comprises the first message address data.	*See* 1[pre] discussion of base station 116, controller 112, antennas 118/120 which comprise a transceiver in the role of a master communication device according to the master/slave relationship; *See also* 1[b] discussion of address, vector, and pointer information as first information; *See also* 1[c] discussion of address as first message address data.

EXHIBIT F

EXHIBIT F

Comparison of the Asserted Claims of the ’580 Patent to U.S. Patent No. 5,239,306 (“the Motorola ’306 patent” or “Motorola ’306”)

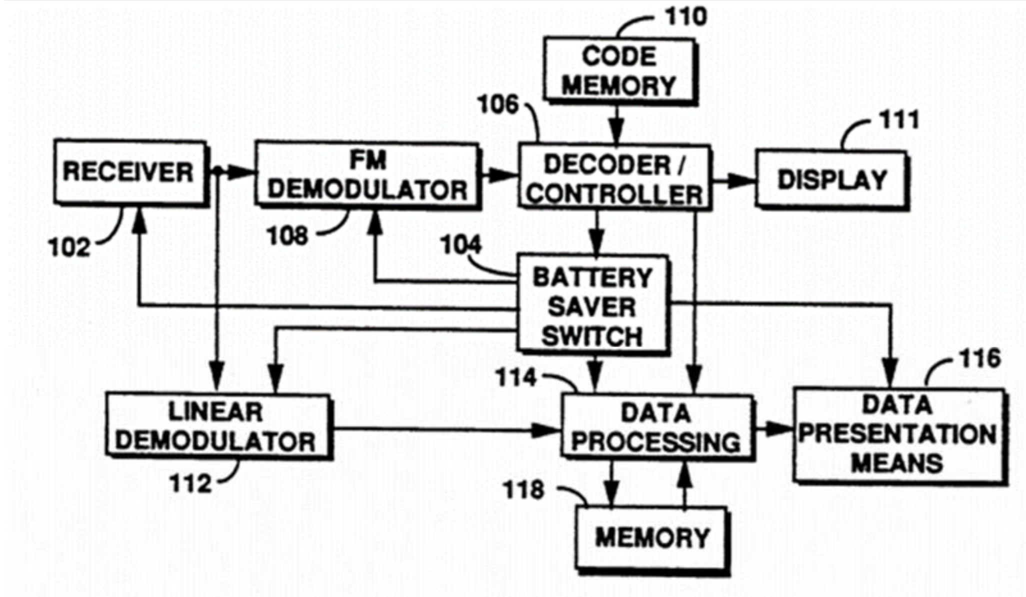
As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,023,580 (“the ’580 patent”) are invalid under 35 U.S.C. § 103(a) as obvious over Motorola ’306 in view of the teachings of U.S. Patent No. 4,875,038 (“Motorola ’038) and /or as obvious over Motorola ’306 in view of the teachings of Motorola ’038 and U.S. Patent No. 5,644,568 (“Motorola ’568). One of ordinary skill in the art, as of the priority date of the ’580 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	**The Motorola ’306 patent**
1[pre]	A communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, the device comprising:	**Motorola ’306 in view of the teachings of Motorola ’038 discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, Motorola ’306 discloses a communication device (e.g., “paging system[]” in which “information [is] transmitted on a common channel in a first and second modulation format”).** “FIG. 1 is an electrical block diagram of a dual mode communication receiver of the present invention which overcomes the problems described, and which is compatible for use on existing paging systems, using existing paging signaling protocols. The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols.” Col. 4:32-45. “A dual mode communication receiver a receiver for receiving information transmitted in a first and second modulation format on a common channel, a first demodulator for detecting information transmitted in the first modulation format, and a second demodulator, responsive to the information detected in the first modulation format, for detecting information transmitted in the second modulation format. A power conservation circuit is also provided for selectively supplying power to the first and second demodulators for enabling the detecting of the information transmitted in the first modulation format and the second modulation format, respectively.” Abstract. “This invention relates to the field of communication receivers, and more particularly to a selective call communication receiver providing high speed data and voice communication with battery saving capability.” Col. 1:10-13. “FIG. 1 is an electrical block diagram of a dual mode communication receiver of the present invention which overcomes the problems described, and which is compatible for use on existing paging systems, using existing paging signaling protocols. The dual mode communication receiver of the present invention, enables the

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols.” Col. 4:32- 45. “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein.” Col. 5:47-66.[1] “In a first embodiment of the present invention, a dual mode communication receiver comprises means for receiving information transmitted on a common channel in a first and second modulation format, a first means for detecting the information transmitted in the first modulation format on the common channel, and a second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Col. 2:14-22. “When used in simulcast transmission systems, standard FM modulation is not suitable for data transmission at high bit rates due to transmitter equalization problems. Because of the limitations of FM modulation for high speed message transmission, other forms of modulation, such as linear modulation techniques are required to provide for transmission at the higher data rates. While linear modulation techniques are available to provide the increased message transmission speeds, such modulation techniques generally are incompatible for use with existing receiver architectures, are incompatible with present day signaling protocols, and require significantly more current drain for operation than required for circuits receiving and demodulating existing signaling protocols transmitted using standard FM modulation techniques. There is a need to provide a receiver architecture which retains compatibility within existing FM modulated paging signaling protocols, thereby taking advantage of the battery saving capabilities

[1] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		of these existing paging signaling protocols. Furthermore, there is a need to provide a receiver architecture which includes linear demodulation for voice and high speed data capability, to provide the increased message throughput required for these ever expanding services, without compromising the battery saving performance of the existing paging signaling protocols." Col. 1:54-2:11. "As has been described above, prior art communication systems, such as paging systems, have provided address and message transmission in a predetermined signaling protocol using a single modulation format." Col. 3:36-39. "The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information." Col. 4:45-57. "When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data." Col. 7:22-26.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 FIG. 1

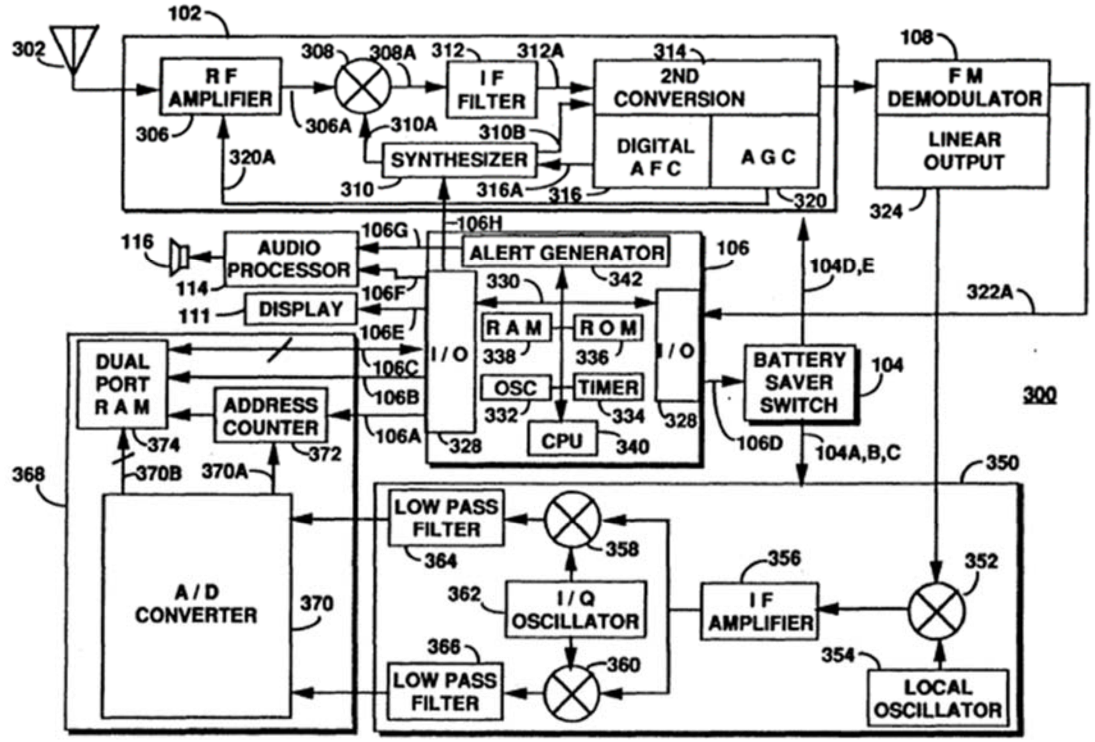
<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,023,580
(“the ’580 patent”)</th><th>The Motorola ’306 patent</th></tr>
<tr><td></td><td></td><td>

FIG. 3</td></tr>
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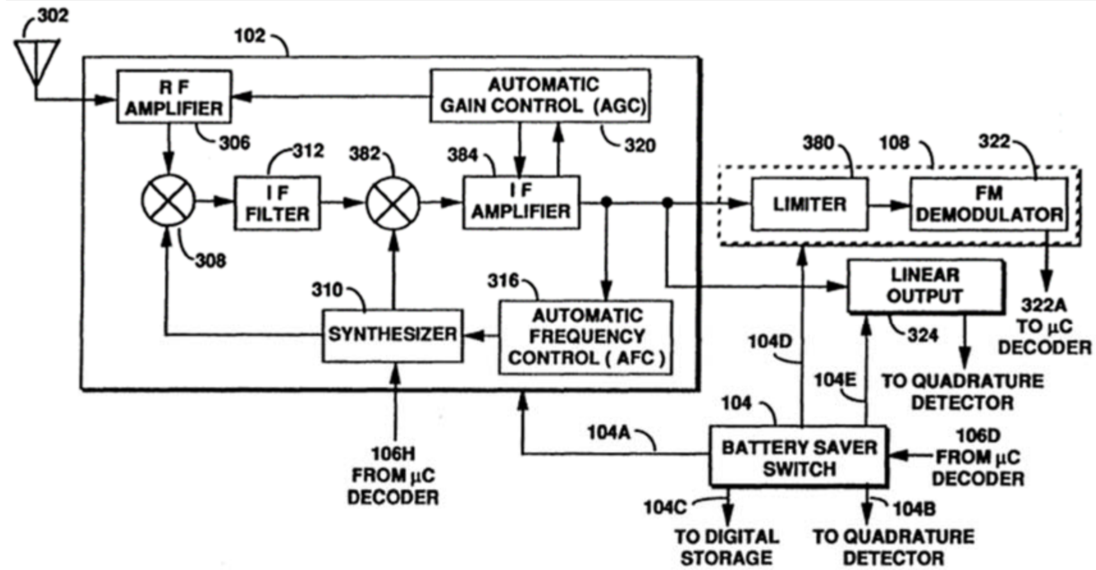
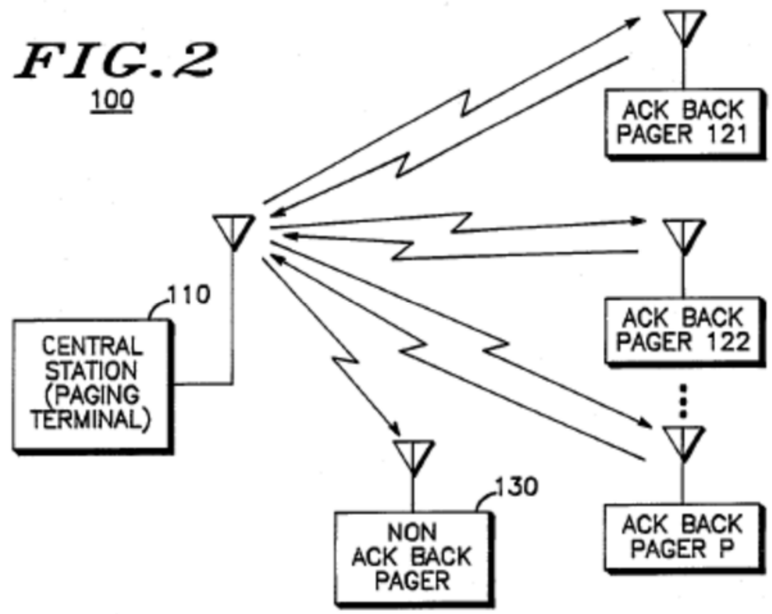
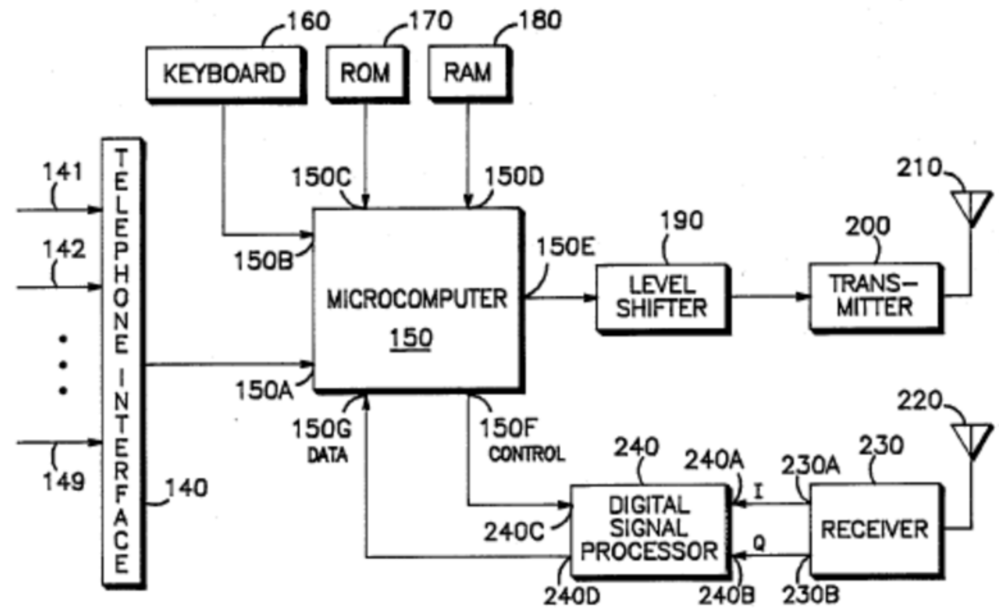
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 ***FIG. 4*** *See also*, Col. 8:1-11:47. **Further, Motorola ’306 in view of the teachings of Motorola ’038 discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, as discussed above, Motorola ’306 discloses a communication device. Motorola ’038 further discloses a communication device (*e.g.*, “central station 110”) capable of transmitting communications to and receiving communications from a slave (e.g., “selective call radio 122”). The central station communicates with the selective call radios using a synchronous protocol controlled by the controller/base station.** “FIG. 2 is a simplified block diagram of the acknowledge back paging system 100 of the present invention. Paging system 100 includes a central station or paging terminal 110 which is capable of both transmitting outgoing paging signals and of receiving acknowledge back (ack-back) paging signals. Paging system 100 includes a plurality of ack-back pagers 121, 122 . . . P, wherein P is the total number of ack-back pagers in the pager population of system 100. Each of ack-back pagers 121, 122 . . . P has the capability of receiving paging signals from central station 110 and of permitting the pager user to respond to such paging signals. That is, pagers 121, 122 . . . P permit the user to reply or

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		acknowledge back to a page from central station 110.” Col. 2:53-66. “Those skilled in the art will appreciate that T1 may have values greater than or less than 10 msec providing T1 is sufficiently long to permit the ackback receivers 121, 122 . . . P to synchronize to the paging signals transmitted by central station 110. Apparatus for synchronizing paging receivers to paging signals is well known to those skilled in the art and is included in ack-back pagers 121, 122 . . . P.” Col. 4:65-5:5. “The ack-back pager waits as per block 1270 for an ack-back field (time interval) before responding back to the central station 100 with the ack-back data provided by the pager user.” Col. 20:22-26. “Microcomputer output 150E is coupled via a level shifter 190 to the input of a transmitter 200. The output of transmitter 200 is coupled to an antenna 210 having dimensions and characteristics appropriate to the particular paging frequency channel selected for the operation of central station 110.” Col. 3:39-41. FIG.2 

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		FIG. 3 110  **Motorola ’038 further discloses slave communication (e.g., communications sent in “response to message 1”) from the slave to the master occurs in response to a master communication (e.g., “message 1”) from the master to the slave.** “Paging system 100 includes a plurality of ack-back pagers 121, 122. . . P, wherein P is the total number of ack-back pagers in the pager population of system 100. Each of ack-back pagers 121, 122. . . P has the capability of receiving paging signals from central station 110 and of permitting the pager user to respond to such paging signals. That is, pagers 121, 122 . . . P permit the user to reply or ac knowledge back to a page from central station 110. It is noted that conventional non ack-back pagers such as pager 130 are also includable in system 100. In FIG. 2, double arrows between central station 110 and each of ack-back pagers 121, 122. . . P are used to denote that two way communication exists between central station 110 and such ack-back pagers. A single arrow denotes that only one way communication exists between station 110 and pager 130.” Col. 2:58-3:6. “FIG. 4D is a time vs. event diagram of the status of receiver 230 in central station 110. Subsequent to time period

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		T4, receiver 230 at central station 110 is turned on to receive ack-back signals from the 20 pagers in the group of M during a time period T5.” Col. 6:37-41. “Referring to FIG. 4E, in conjunction with 4C, it is seen that the message 1 transmitted during time period T4 at 370 is received by pager AB-1 at 380 as shown in FIG. 4E. Pager AB-1 receives message 1 at 380 and matches message 1 to address 1. That is, by means later described in more detail, pager AB-1 is programmed to determine that message 1 is the particular message of the group of M messages which is intended for pager AB-1. Subsequent to reception and display of message 1 at 380 as shown in FIG. 4E, the user of pager AB-1 indicates his or her response to message 1 during a time period T6 at 385. Time period T6 is not drawn to scale with respect to the other time periods discussed. Time period T6 is sufficiently long to permit indication of a response by the pager user. Subsequent to time period T6, pagers AB-1, AB-2 . . . AB-M simultaneously transmit acknowledge back signals on respective frequency subbands (subchannels) back to central station 110 as at 390 during a time period T5. Subsequent to the ack-back transmission at 390, pagers AB-1, AB-2 . . . AB-M are placed in the "sleep state" until awakened again by a preamble as at 340. In an alternative embodiment of the invention, ack-back pagers AB-1 . . . AB-20 reply back automatically without action by the pager user. In such an embodiment, prior to being paged, the user preselects a reply already stored in the pager or keys into the pager a predetermined message which the pager uses as the ack back reply when it is later addressed by central station 110. For example, the ack-back pager user selects a “not available" response or otherwise keys into the pager a “not available” response when the pager user wishes to inform callers into central station 110 that the pager user is not taking any calls currently. Clearly, the reply data may be provided to the ack-back pagers in many different ways. In the case of a user selectable response already programmed into the pager, time period T6 can be arbitrarily short, that is just sufficiently long enough to permit transmission of such a selectable response whose length is predetermined and known to the microcomputer 150 in central station 110.” Col. 7:23-62. “For example, choice A when selected by the pager user could be a ‘Yes’ response to the caller's message. Choice B could be ‘No’ response. Choice C is a ‘Maybe’ response and Choice D is a ‘Cannot Reply Now’ response.” Col. 14:4-9. “Those skilled in the art will appreciate that other forms of modulation as well may be employed by acknowledge back pagers 121, 122-P to respond to the paging signals transmitted by central station 110. In such a PSK embodiment, central station 110 includes a receive antenna 220 for receiving the ackback signals transmitted by ack-back pagers 121, 122-P. In actual practice, antenna 210 may also be employed as antenna 220.” Col. 3:51-59. “The receiver portion of pager 121 is turned on and becomes synchronized with respect to the paging signals transmitted on the paging channel by central station 110.” Col. 19:9-12. “Accordingly, it is one object of the present invention is to provide a paging system in which the radio pager is capable of responding back to the paging terminal and the caller. Another object of the present invention is to provide a radio paging system in which a group of addressed pagers are capable of simultaneously transmitting ac knowledge back signals on a plurality of respective predetermined sub-

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		band frequencies. In one embodiment of the invention, an acknowledge back pager is provided which has a unique address associated therewith. The pager includes a receiver for receiving paging signals from a central station. Such paging signals include a batch of M pager addresses transmitted in a sequential order during a first time frame, wherein M is the number of pager addresses in the batch. The pager further includes a decoder, coupled to the receiver, for detecting the presence of the pager's address within the batch of M addresses. An address order determining apparatus is coupled to the decoder for determining the order of the pager's ad dress within the batch of M addresses. The pager further includes a sub-band transmitter for transmitting an acknowledge back signal on a selected one of a plurality of M predetermined frequency sub-bands, the selected one of the sub-bands exhibiting a predetermined relationship to the order of the address of the pager within the batch of M addresses." Col. 1:44-2:3. *See also*, Col. 2:53-4:9. "Apparatus for synchronizing paging receivers to paging signals is well known to those skilled in the art and is included in ack-back pagers 121, 22. . . P." Col. 5:2-5. "FIG. 4D is a time vs. event diagram of the status of receiver 230 in central station 110. Subsequent to time period T4, receiver 230 at central station 110 is turned on to receive ack-back signals from the 20 pagers in the group of M during a time period T5" Col. 6:37-41. "When pager AB-1 receives the preamble 340 during time period Tl, pager AB-1 is switched from a battery saving state to a fully operational state such that pager AB-1 is capable of receiving information transmitted thereto. That is, subsequent to reception of the preamble at 340, pager AB-1 is fully turned on such that pager AB-1 receives and decodes its address at 350 at the beginning of the T2 time period. In one embodiment of the invention, pager AB-1 conveniently returns to the "sleep state" for the remainder of the T2 time period during which pager addresses are transmitted. Prior to receiving the reference carrier FRX at time period T3, pager AB-1 is returned from the "sleep state" to the fully operational state. Upon reception of the reference carrier, FR at 360, pager AB-1 determines the frequency of such carrier in a manner described in more detail subsequently. Referring to FIG. 4E, in conjunction with 4C, it is seen that the message 1 transmitted during time period T4 at 370 is received by pager AB-1 at 380 as shown in FIG. 4E. Pager AB-1 receives message 1 at 380 and matches message 1 to address 1. That is, by means later described in more detail, pager AB-1 is programmed to determine that message 1 is the particular message of the group of M messages which is intended for pager AB-1. Subsequent to reception and display of message 1 at 380 as shown in FIG. 4E, the user of pager AB-1 indicates his or her response to message 1 during a time period T6 at 385. Time period T6 is not drawn to scale with respect to the other time periods discussed. Time period T6 is sufficiently long to permit indication of a response by the pager user. Subsequent to time period T6, pagers AB-1, AB-2 . . . AB-M simultaneously transmit acknowledge back signals on respective frequency subbands (subchannels) back to central station 110 as at 390 during a time period T5. Subsequent to the ack-back transmission at 390, pagers AB-1, AB-2 . . . AB-M are placed in the "sleep state" until awakened again by a preamble as at 340. In an alternative embodiment of the invention, ack-back pagers AB-1 . . .

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		AB-20 reply back automatically without action by the pager user. In such an embodiment, prior to being paged, the user preselects a reply already stored in the pager or keys into the pager a predetermined message which the pager uses as the ack back reply when it is later addressed by central station 110. For example, the ack-back pager user selects a "not available" response or otherwise keys into the pager a "not available" response when the pager user wishes to inform callers into central station 110 that the pager user is not taking any calls currently. Clearly, the reply data may be provided to the ack-back pagers in many different ways. In the case of a user selectable response already programmed into the pager, time period T6 can be arbitrarily short, that is just sufficiently long enough to permit transmission of such a selectable response whose length is predetermined and known to the microcomputer 150 in central station 110. FIG. 4F is a time versus event diagram of the status of ack-back pager AB-2, that is, the second pager addressed of the group of M ack-back pagers. Pager AB-2 receives the preamble at 340 and then switches from a "sleep state" to a fully turned on state. Pager AB-2 receives address 1 (the address of pager AB-1) at 350. Pager AB-2 decodes such address 1 at 350 and determines that the decoded address is not its own address. At 400, pager AB-2 receives its own address, namely address 2. Pager AB-2 decodes and determines that address 2 is its own address. As with pager AB-1 of FIG. 4E, pager AB-2 of FIG. 4F goes to the "sleep state" for the remainder of the T2 time period. Pager AB-2 "wakes up" in time for reception of the reference carrier FRX at 360 during time period T3. As seen by examining FIG. 4F in conjunction with FIG. 4C, pager AB-2 receives the AB-1 page data transmitted at 370 within time period T4. As explained in more detail subsequently, pager AB-2 determines that the AB-1 message data is not a match. That is, pager AB-2 determines that the pager AB-1 message data (message 1) is not intended for pager AB-2. After the end of message (EOM) marker following message 1, pager AB-2 receives the AB-2 message data (message 2) at 410 within time period T4. Pager AB-2 determines that the message 2 data at 410 is a match and that such message 2 data is intended for AB-2. The message 2 data is then displayed to the user of pager AB-2 who indicates an acknowledge back response to pager AB-2 during time period T6 at 415. During the subsequent time period T5, hhe acknowledge back message is sent to central station 110 on a second frequency sub-band different from the first frequency sub-band on which pager AB-1 transmits. Subsequent to transmission of the acknowledge back response at time period T5, pager AB-2 is caused to go to sleep. FIG. 4G is a time versus event diagram of the status of ack-back pager AB-M, the last of the group of M pagers to be addressed. Pager AB-M receives the preamble at 340 to switch it from a "battery saver state" to a fully operational state. Pager AB-M then receives the 19 addresses of the other pagers in the group of M, such as at 350 and 400 until finally pager AB-M receives and decodes its own address at 420. Pager AB-M is thus signaled that a message for it will be transmitted momentarily. Pager AB-M receives the reference carrier signal FRX at 360. Referring to FIG. 4G in conjunction with FIG. 4C, it is seen that pager AB-M receives message 1, message 2 . . . message M-1 and determines that all of these messages are not matches. That is, such page data messages are not intended for AB-M. Pager AB-M receives the page data message M transmitted at 430 (FIG. 4C) and received at 440 (FIG. 4G) within time period T4. Pager AB-M determines that such message M at 440 is intended for pager AB-M and displays the contents as such message M to the pager user. During time period T6 at 415, the pager user supplies ack-back pager AB-M with an acknowledge back response. During the subsequent time period T5, pager

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		AB-M sends such acknowledge back response back to the central station 110 on a frequency sub-band M at 450 different from the frequency sub-bands on which the remaining ack-back pagers AB-1, AB-2 . . . AB-(M-1) transmit. Subsequent to the transmission of the ack-back response at 450 during time period T5, pager AB-M switches to the "sleep state"." Col. 7:2-8:60. "After it is determined that the transmission of the group of M messages is complete as per block 670, flow continues to block 690 at which central station 110 pauses to permit the ack-back pager users which have received messages to key an appropriate response into their ack-back pagers for transmission subsequently back to central station 110. For example, such ack-back pagers may include a keyboard or a switch that is toggled by the message recipient to signify a yes or a no. It will be appreciated that it will take significantly less time for a user to toggle one key to indicate a predetermined response, for example a yes or a "canned message' (for example, I will call you back), than it would take for a user to key in a response on a keyboard or keypad situated on the pager. However, such keyboard or keypad embodiments of the ack-back pager herein are considered to be within the scope of the invention in that they provide alternative ways of indicating the user's response to the ack-back pager. After pausing to permit the addressed pager users to key in their responses, central station 110 simultaneously receives M ack-back signals from a group of M addressed pagers as per block 700. These ack-back responses are then provided to the appropriate corresponding callers via telephone interface 140. Flow then continues back to block 510 to permit other paging messages to be input into central station 110. FIG. 6 is a block diagram of one of ack-back pagers 121, 122 . . . P., namely ack-back pager 121. In one embodiment of the invention, ack-back pagers 121, 122 . . . P transmit acknowledge back signals on the same radio frequency as that on which central station 110 transmits although this is not necessarily a requirement of the system. That is, other embodiments of the invention are contemplated wherein the ack-back pagers transmit ack-back signals at frequencies other than within the spectrum of the paging channel employed by central station 110." Col. 11:40-12:9. "Ack-back pager 121 includes a transmit/receive antenna 800 exhibiting an appropriate size and geometry to permit transmission and reception of radio frequency signals on the radio frequency paging channel on which central station 110 transmits and receives. Antenna 800 is coupled to a common port 10A of a transmit receive switch 810. Transmit/receive switch 810 includes a receive port 810B and a transmit port 810C in addition to the above mentioned antenna input port 810A." Col. 12:40-48. "For example, choice A when selected by the pager user could be a "Yes" response to the caller's message. Choice B could be "No" response. Choice C is a "Maybe" response and Choice D is a "Cannot Reply Now" response." Col. 14:4-9. "The reply data is then transmitted back to central station 110 by pager 121 during acknowledge back reply field 390 as shown in the acknowledge back protocol shown in FIG. 4E" Col. 14:22-25. "Each of the group of M pagers designated AB-1, AB-2 . . . AB-20, and in fact all of the pagers of the population of P acknowledge back pagers are capable of acknowledging back on any one of the M different frequency sub-bands.

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		That is, the control program stored within memory 910 is capable of directing microcomputer 820 and associated frequency synthesis circuitry later described to transmit acknowledge back signals on a selected one of the M or 20 different sub bands.” Col. 14:59-68. “The receiver portion of pager 121 is turned on and becomes synchronized with respect to the paging signals transmitted on the paging channel by central station 110.” Col. 19:9-12. “Ack-back data is supplied to microcomputer 820 by the pager user as per block 1260. The ack-back pager waits as per block 1270 for an ack-backfield (time interval) before responding back to the central station 100 with the ack-back data provided by the pager user. It was discussed earlier that M different sub-bands are available in the pager of the invention for transmission of ack-back signals. Each ack-back pager within a group of M addressed pagers responds back to the central station 110 on a different respective sub-band based on the value of the ADRCOUNT variable determined above for such pager as per block 1280” Col. 20:21-33. *See also*, Claims 1, 5, 8, 12, 18-21. **Alternatively, Motorola ’306 in view of the teachings of Motorola ’038 and Motorola ’568 discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, Motorola ’568 further discloses a master/slave relationship and slave communications from a slave to a master (e.g., “response messages”) in response to a master communication from a master to a slave (e.g., “outbound message”):** “The system controller 102 also functions to digitally encode and schedule outbound messages, which can include such information as digitized audio messages, alphanumeric messages, and response commands, for transmission by the radio frequency transmitter/receivers 103 to a plurality of selective call radios 106. The system controller 102 further functions to decode inbound messages, including unsolicited and response messages, received by the radio frequency transmitter/receivers 103 and the fixed system receivers 107 from the plurality of selective call radios 106. Examples of response messages are acknowledgments and designated response messages. Designated response messages are communicated in the inbound channel in portions named data units. An acknowledgment is a response to an outbound message initiated at the system controller 102. An example of an outbound alphanumeric message intended for a selective call radio 106 is a page message entered from the telephone 101. The acknowledgment indicates successful reception of the outbound message.” Col. 4:41-60. “It should be noted that the system controller 102 is capable of operating in a distributed transmission control environment that allows mixing conventional cellular, simulcast, master/slave, or other coverage schemes involving a plurality of radio frequency transmitter/receivers 103, conventional antennas 104, 109, and fixed system receivers 107, for providing reliable radio signals within a geographic area as large as a nationwide network. Moreover, as one of ordinary skill in the art would recognize, the telephonic and selective call radio communication system functions

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		may reside in separate system controllers 102 which operate either independently or in a networked fashion. It should also be noted that the radio frequency transmitter/receiver 103 may comprise the fixed system receiver 107 collocated with a conventional radio frequency transmitter.” Col. 5:26-41. “The message handler 204 schedules outbound messages and the selective call addresses associated therewith within a transmission cycle. The message handler 204 also determines response schedules for response messages which minimize contention of messages at transmitter/receivers 103 and fixed system receivers 107, and includes response timing information in outbound messages so that selective call radios 106 will respond according to the response schedule.” Col. 6:43-51. “Accordingly, in a third aspect of the present invention, a method is used in a system controller for generating a radio signal transmitted on a first radio channel. The radio signal has short and long messages included in a plurality of control frames and data frames. Each of the short and long messages has an address signal and related message information.” Col. 2:66-3:5. “Referring to FIG. 2, an electrical block diagram of the system controller 102 is shown, in accordance with the preferred embodiment of the present invention. The system controller 102 comprises a cell site controller 202, a message handler 204, an outbound message memory 208, a subscriber data base 220, a telephone interface 206, a channel assignment element 210, an address field element 212, an information field element 214, a data frame element 216, and a control frame element 218. The cell site controller 202 is coupled to the radio frequency transmitter/receivers 103 (FIG. 1) and fixed system receivers 107 (FIG. 1) by the links 116. The cell site controller 202 couples outbound messages including selective call addresses to the transmitter/receivers 103 and controls the transmitter/receivers 103 to transmit transmission cycles which include the outbound messages. The cell site controller 202 also processes inbound messages from the selective call radios 106. The inbound messages are received by the transmitter/receivers 103 and fixed system receivers 107, and are coupled to the cell site controller 202. The message handler 204, which routes and processes messages, is coupled to the telephone interface 206, the subscriber data base 220, and the outbound message memory 208. The telephone interface 206 handles the switched telephone network 108 (PSTN) (FIG. 1) physical connection, connecting and disconnecting telephone calls at the telephone links 110, and routing the audio signals between the telephone links 110 and the message handler 204.” Col. 6:1-28. Fig. 2, reproduced below.

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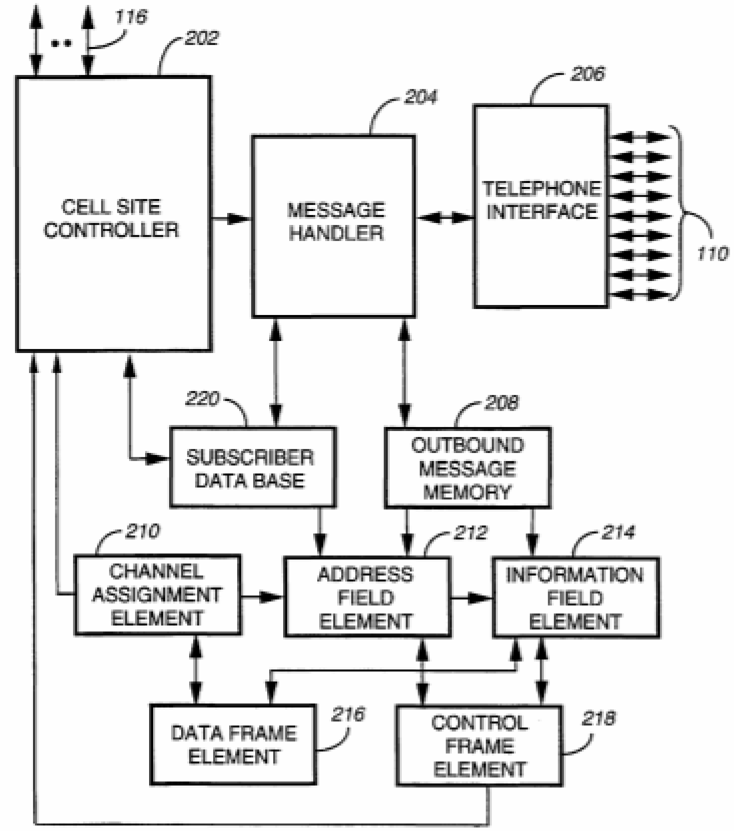
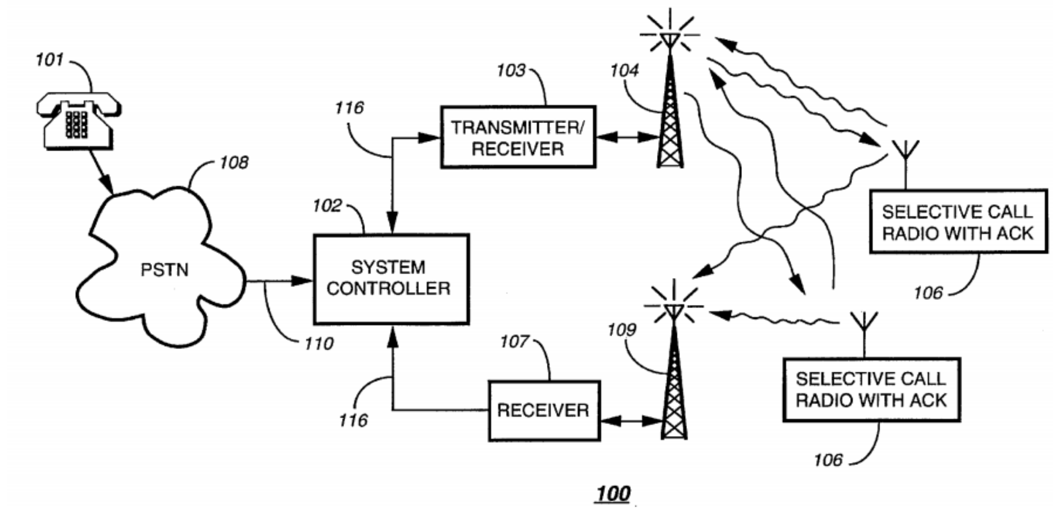
		 FIG. 2 Fig. 1, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 FIG. 1
1[a]	a transceiver, in the role of the master according to the master/slave relationship,	**Motorola ’306 in view of the teachings of Motorola ’038 discloses a transceiver, in the role of the master according to the master/slave relationship.** *See* 1[pre] discussion of paging systems as communication device disclosed by **Motorola ’306**; ack-back pagers, central station 110, messages and responses to them as master and slave communications, respectively, disclosed by **Motorola ’038**, and outbound and response messages as master and slave communications, respectively, disclosed by **Motorola ’568**.
1[b]	for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,	**Motorola ’306 in view of the teachings of Motorola ’038 discloses sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** **For example, Motorola ’306 discloses sending transmissions (e.g., “transmissions”) modulated using a “first modulation method” (e.g., “frequency shift keyed FM”) and a “second modulation method” (e.g., “QAM”) of a different “type” than the “first modulation method.”**

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		"A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel." Col. 13:46-51. "2. The dual mode selective call receiver according to claim 1, wherein the first modulation format is frequency shift keyed FM modulation." Col. 4:13-15. "Alternate modulation formats are available to provide improved throughput of message information. These alternate modulation formats include those modulation formats which are often termed linear modulation formats. Such linear modulation formats enable the modulation of the carrier signal whereby the message information is encoded in both the amplitude and the instantaneous phase angle of the carrier. Examples of linear modulation formats include, but are not limited to, quadrature amplitude modulation (QAM modulation), and spectrally efficient data modulation (SEDM modulation), such as described in U.S. Pat. No. 4,737,969 to Steel et al., entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention and which is hereby incorporated by reference herein. Other forms of linear modulation include those modulation formats which simultaneously modulate both the amplitude and the phase of the transmitted signal to encode the message information, and also shape the transmitted spectrum to provide adjacent channel protection." Col. 3:63- 4:17.[2] "5. The dual mode communication receiver according to claim 3, wherein the linear modulation format is QAM modulation." Claim 5. Fig. 3, reproduced below.

[2] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

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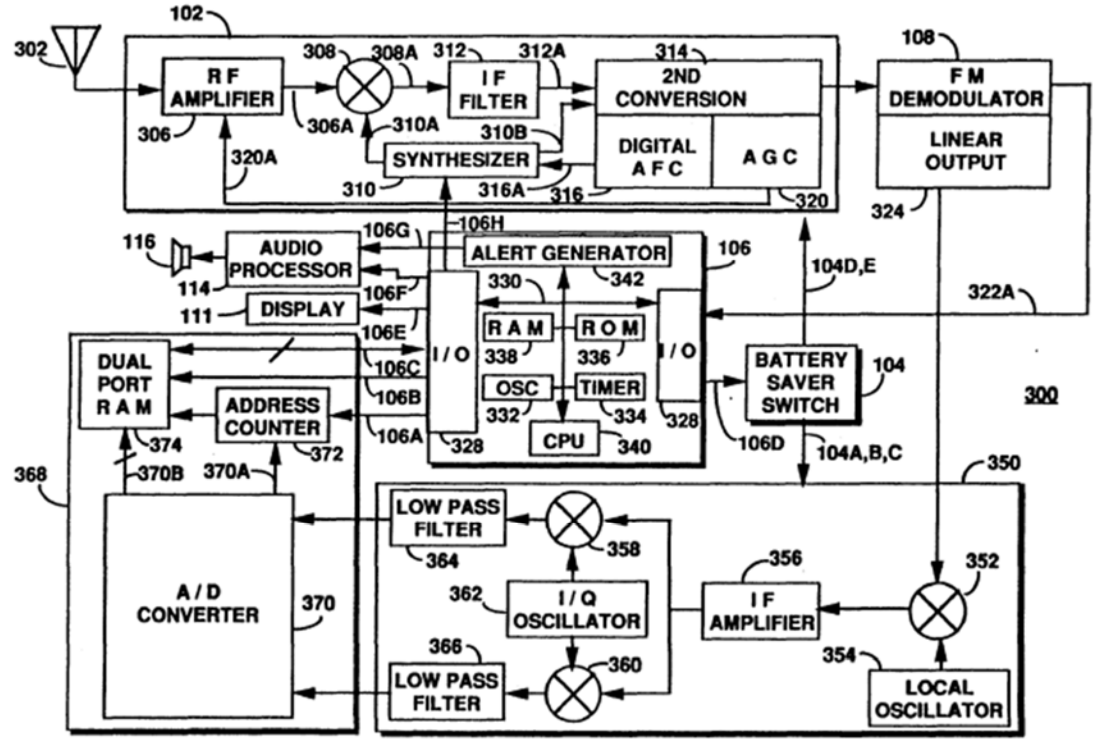
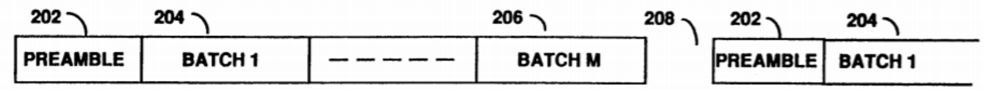
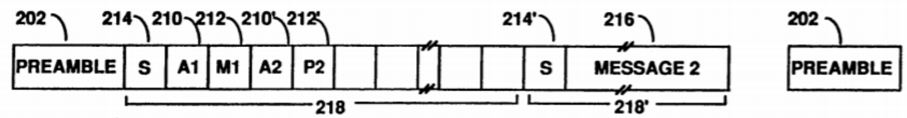
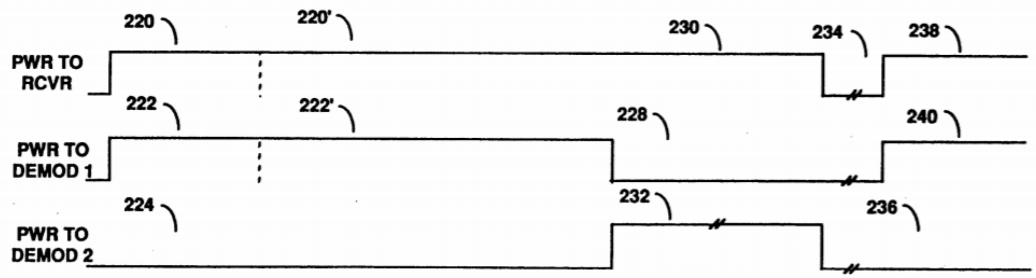
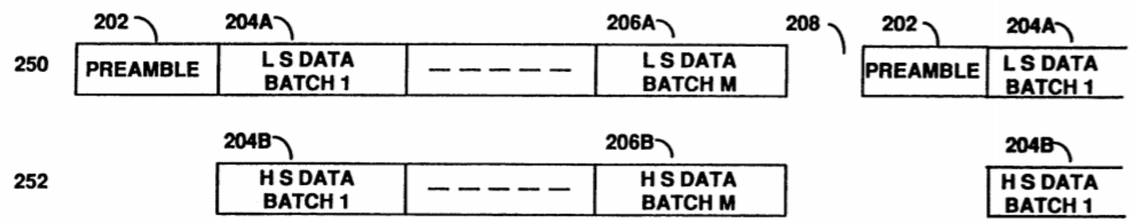
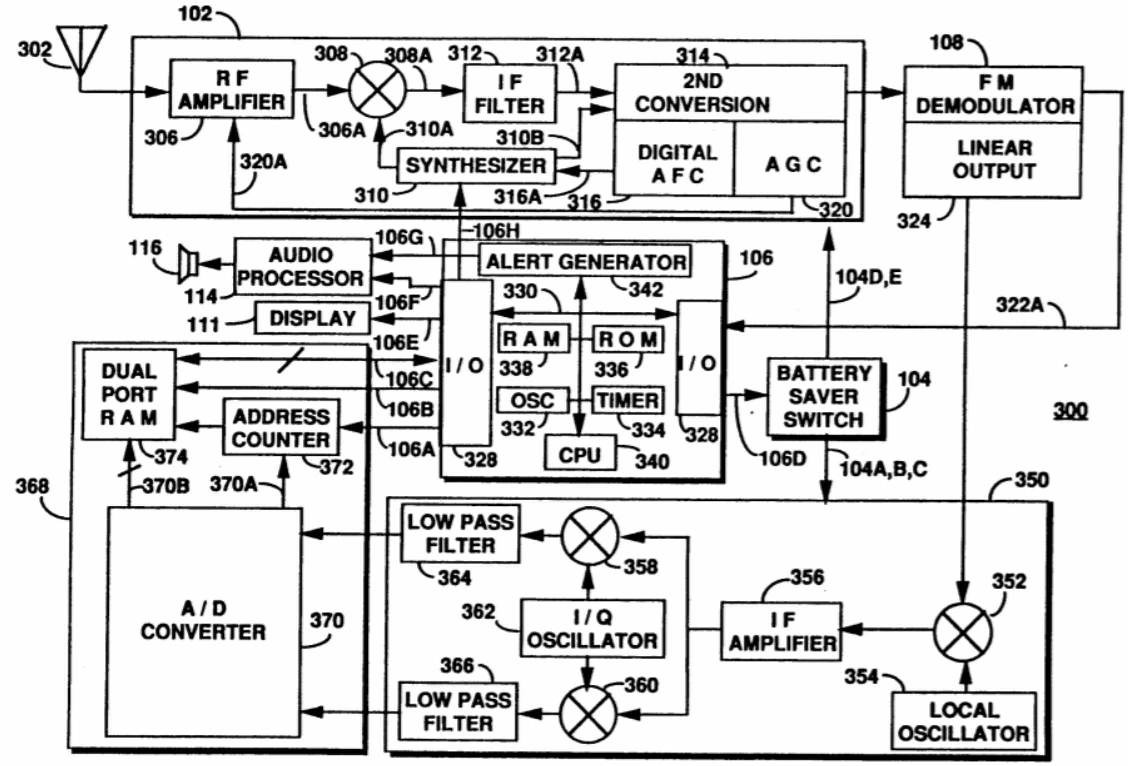
		 **FIG. 3** "Analog signaling protocols, such as two tone and five tone signaling protocols, and analog voice messages were modulated using either phase or angle modulation formats, or a direct frequency modulation format in FM modulated carrier systems which are prevalent in the industry today. Other signaling protocols, such as digital signaling protocols, have typically utilized a frequency shift keying (FSK) modulation format for both the address and message transmissions." Col. 3:40-48. "The transmission protocol of FIGS. 2A-2C enables the transmission of information which is modulated in a conventional FM modulation format, and further enables the transmission of message information which is modulated in a linear modulation format to enable high speed data transmission." Col. 4:58-64. "FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message

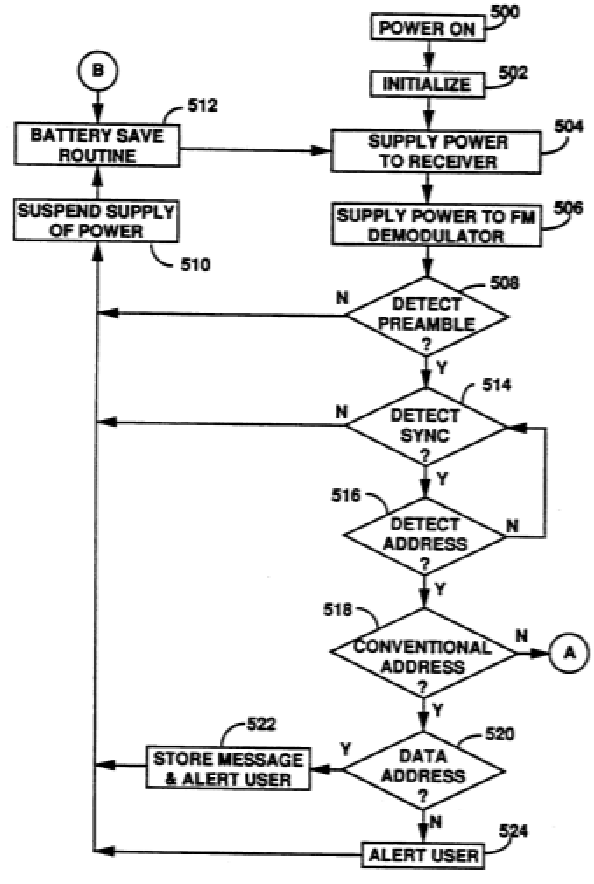
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein. All information transmitted in a given batch is modulated in a common modulation format. As will be described in further detail below, one or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format. Depending upon the channel loading, a break 208 in the transmission can occur, after which the preamble 202 is again transmitted to enable the receivers to re-synchronize with the batch transmission.” Col. 5:47-6:4. “FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially supplied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby conserving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220', and to the FM demodulator during time interval 222', in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator.” Col. 6:56-7:13. “When the message information is transmitted in the FM modulation format, the second IF signal is coupled to the FM demodulator section 108, as will be explained in detail below. The FM demodulator section 108 demodulates the second IF signal in a manner well known to one of skill in the art, to provide a recovered data signal 108A which is a stream of binary information corresponding to the received address and message information transmitted in the FM modulation format.” Col. 9:6-14. “FIG. 4 is an electrical block diagram showing details of the battery saving features of the dual mode communication receiver of the present invention. The microcomputer 106 controls the battery saving operation of the communication receiver through battery saver controls signals 106D coupled to the battery saver switch 104. The battery saver switch 104 enables power to be selectively supplied to the receiver section 102 via receiver supply line 104A, to the quadrature detector 350 via quadrature detector supply line 104B, to the digital storage section 368 via digital storage supply line 104C, to the FM demodulator section 108 which includes a data limiter 380 coupled to an

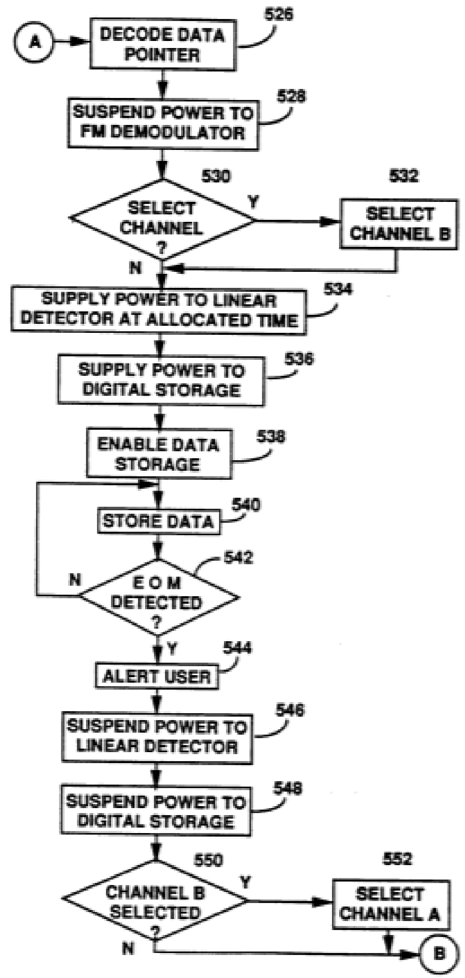
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		FM demodulator 322 via FM demodulator supply line 104D, and to the linear output section 324 via linear output supply line 104E.” Col. 11:48-63. “1. A dual mode communication receiver, comprising: means for receiving information transmitted on a common channel in a first and second modulation format; first means for detecting the information transmitted in the first modulation format on the common channel; and second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Claim 1. “3. The dual mode communication receiver according to claim 1, wherein the second modulation format is a linear modulation format. 4. The dual mode communication receiver according to claim 3, wherein the linear modulation format is spectrally efficient digital modulation.” Claim 3-4. “23. A dual mode communication receiver comprising: means for receiving information transmitted on a common channel in a first and second modulation format: first means for detecting the information transmitted in the first modulation format on the common channel; second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format; and third means, for supplying power to said receiving means for enabling the receiving of the information transmitted in the first and second modulation format said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the first modulation format; said third means further in response to the information detected in the first modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the second modulation format.” Claim 23. “28. A dual mode communication receiver, comprising: means for receiving information transmitted in a FM modulation format and a linear modulation format; first means for detecting the information transmitted in the FM modulation format; and second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format. 29. The dual mode communication receiver according to claim 28, wherein the FM modulation format utilizes

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		frequency shift keying. 30. The dual mode communication receiver according to claim 28, wherein the linear modulation format is spectrally efficient digital modulation. 31. The dual mode communication receiver according to claim 28, wherein the linear modulation format is QAM modulation.” Claim 28-31. “35. A dual mode communication receiver comprising: means for receiving information transmitted in a FM modulation format and a linear modulation format: first means for detecting the information transmitted in the FM modulation format; second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format; and third means, for supplying power to said receiving means for enabling the receiving of the information transmitted in the FM and linear modulation formats, said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the FM modulation format; said third means further in response to the information detected in the FM modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the linear modulation format.” Claim 35; Fig. 2A-D, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 2A*  *FIG. 2B*  *FIG. 2C*  *FIG. 2D* Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 FIG. 3 Figs. 5A-B, reproduced below.

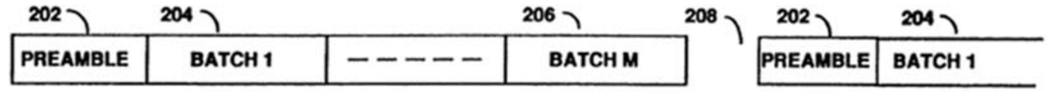
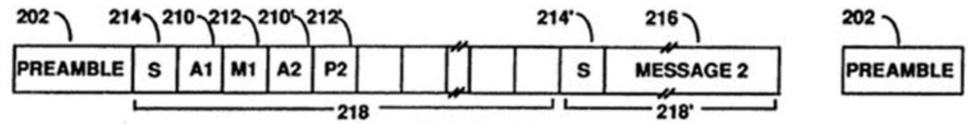
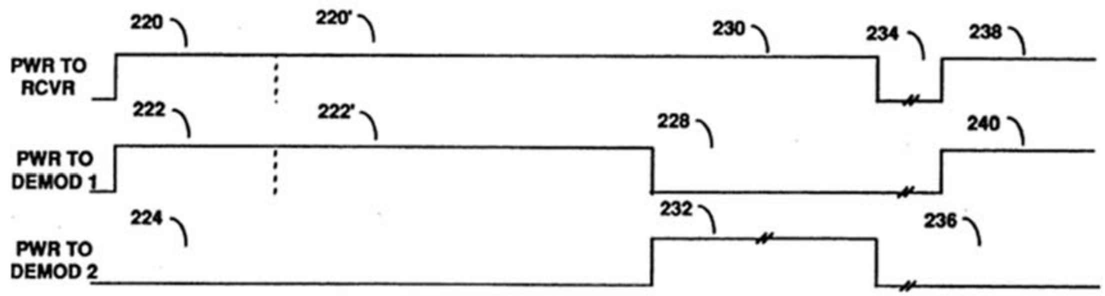
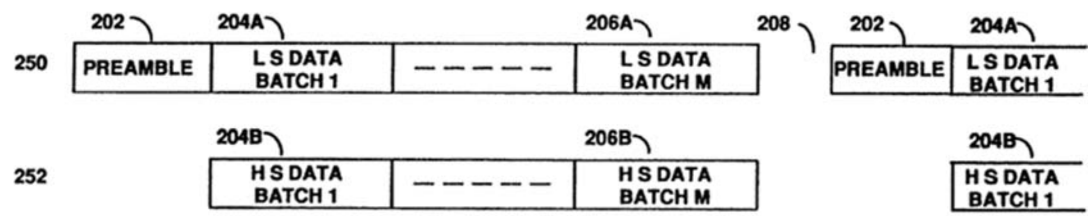
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 FIG. 5A

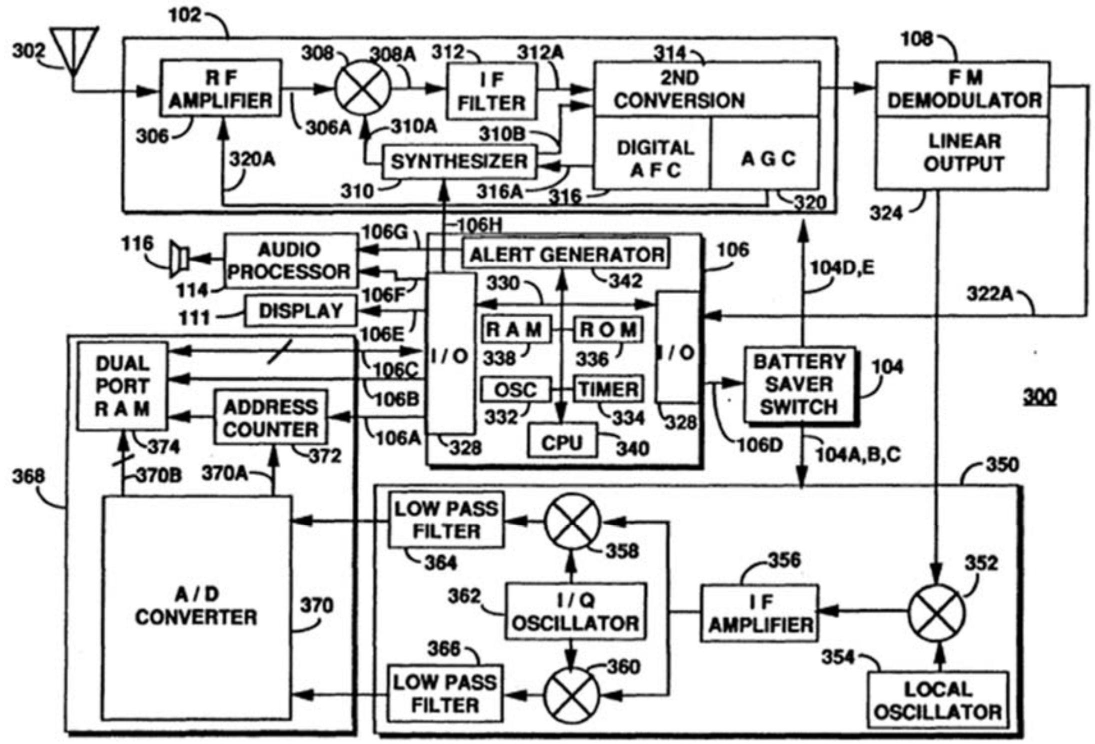
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 5B* “The transmission protocol of FIGS. 2A-2C enables the transmission of information which is modulated in a conventional FM modulation format, and further enables the transmission of message information which is

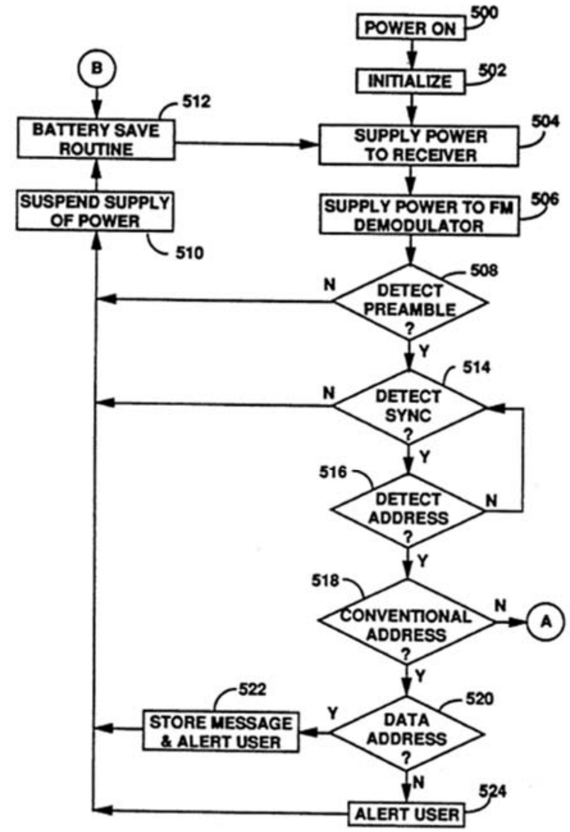
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		modulated in a linear modulation format to enable high speed data transmission.” Col. 4:58-64. “FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein. All information transmitted in a given batch is modulated in a common modulation format. As will be described in further detail below, one or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format.” Col. 5:47-6:4. “FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially supplied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby conserving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220’, and to the FM demodulator during time interval 222’, in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator.” Col. 6:56-7:13. “When the message information is transmitted in the FM modulation format, the second IF signal is coupled to the FM demodulator section 108, as will be explained in detail below. The FM demodulator section 108 demodulates the second IF signal in a manner well known to one of skill in the art, to provide a recovered data signal 108A which is a stream of binary information corresponding to the received address and message information transmitted in the FM modulation format.” Col. 9:6-14. “FIG. 4 is an electrical block diagram showing details of the battery saving features of the dual mode communication receiver of the present invention. The microcomputer 106 controls the battery saving operation of the communication receiver through battery saver controls signals 106D coupled to the battery saver switch 104. The battery saver switch 104 enables power to be selectively supplied to the receiver section 102 via receiver supply line

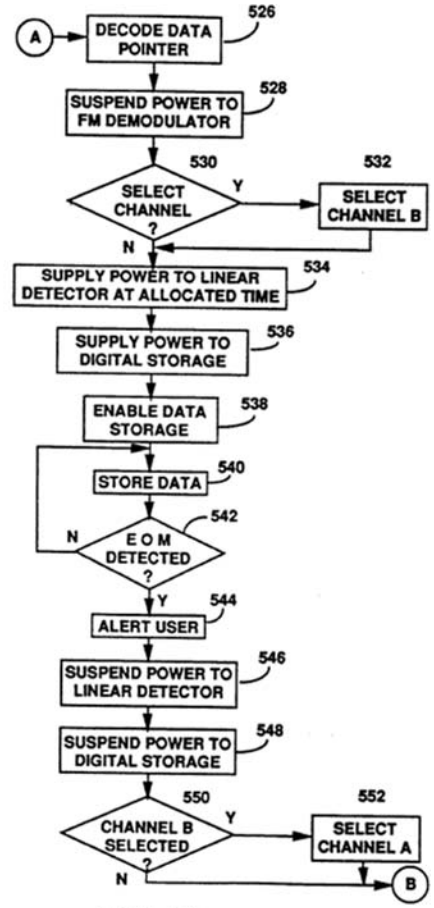
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		104A, to the quadrature detector 350 via quadrature detector supply line 104B, to the digital storage section 368 via digital storage supply line 104C, to the FM demodulator section 108 which includes a data limiter 380 coupled to an FM demodulator 322 via FM demodulator supply line 104D, and to the linear output section 324 via linear output supply line 104E.” Col. 11:48-63. “A dual mode communication receiver, comprising: means for receiving information transmitted on a common channel in a first and second modulation format; first means for detecting the information transmitted in the first modulation format on the common channel; and second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Claim 1. “The dual mode communication receiver according to claim 1, wherein the second modulation format is a linear modulation format.” Claim 3. “The dual mode communication receiver according to claim 3, wherein the linear modulation format is spectrally efficient digital modulation.” Claim 4. “A dual mode communication receiver comprising: means for receiving information transmitted on a common channel in a first and second modulation format: first means for detecting the information transmitted in the first modulation format on the common channel; second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format; and third means, for supplying power to said receiving means for enabling the receiving of the information transmitted in the first and second modulation format said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the first modulation format; said third means further in response to the information detected in the first modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the second modulation format.” Claim 23. “A dual mode communication receiver, comprising: means for receiving information transmitted in a FM modulation format and a linear modulation format; first means for detecting the information transmitted in the FM modulation format; and second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format.” Claim 28. “The dual mode communication receiver according to claim 28, wherein the FM modulation format utilizes frequency shift keying.” Claim 29. “The dual mode communication receiver according to claim 28, wherein the linear modulation format is spectrally

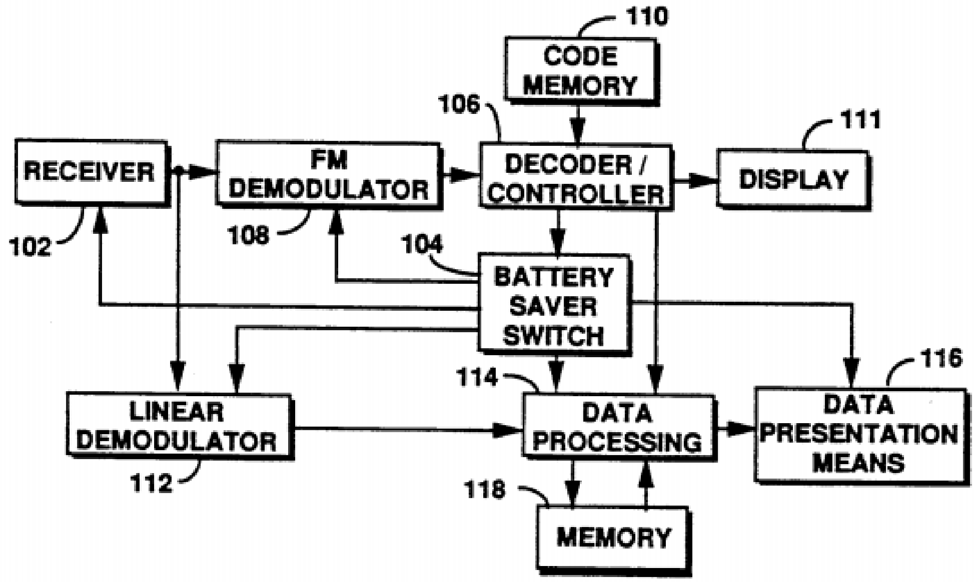
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		efficient digital modulation." Claim 30. "The dual mode communication receiver according to claim 28, wherein the linear modulation format is QAM modulation." Claim 31. "A dual mode communication receiver comprising: means for receiving information transmitted in a FM modulation format and a linear modulation format: first means for detecting the information transmitted in the FM modulation format; second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format; and third means, for supplying power to said receiving means for enabling the receiving of the information transmitted in the FM and linear modulation formats, said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the FM modulation format; said third means further in response to the information detected in the FM modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the linear modulation format." Claim 35.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		FIG. 2A FIG. 2B FIG. 2C FIG. 2D

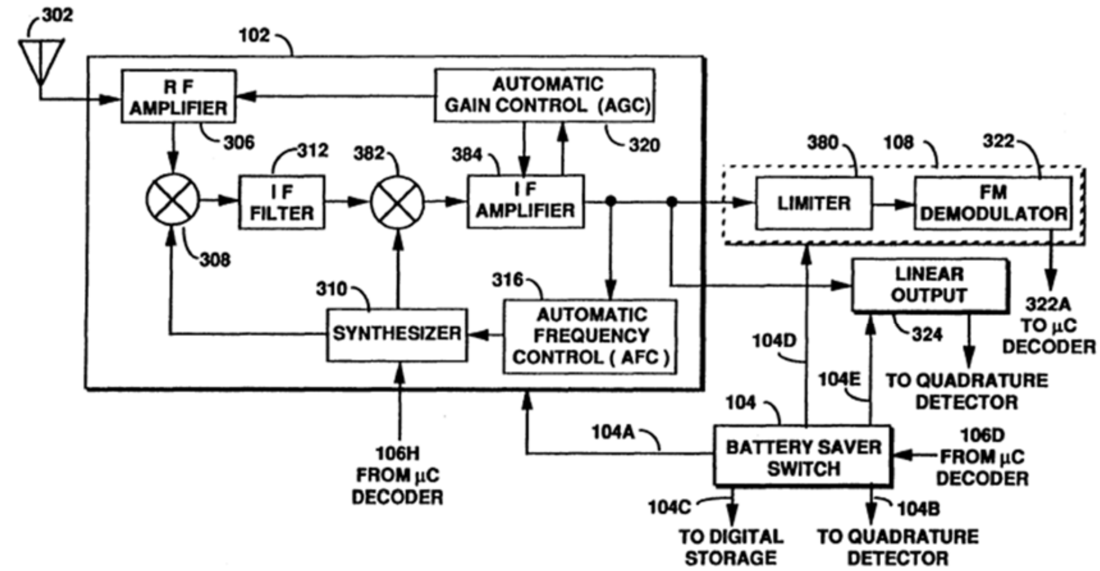
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 FIG. 3

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 FIG. 5A

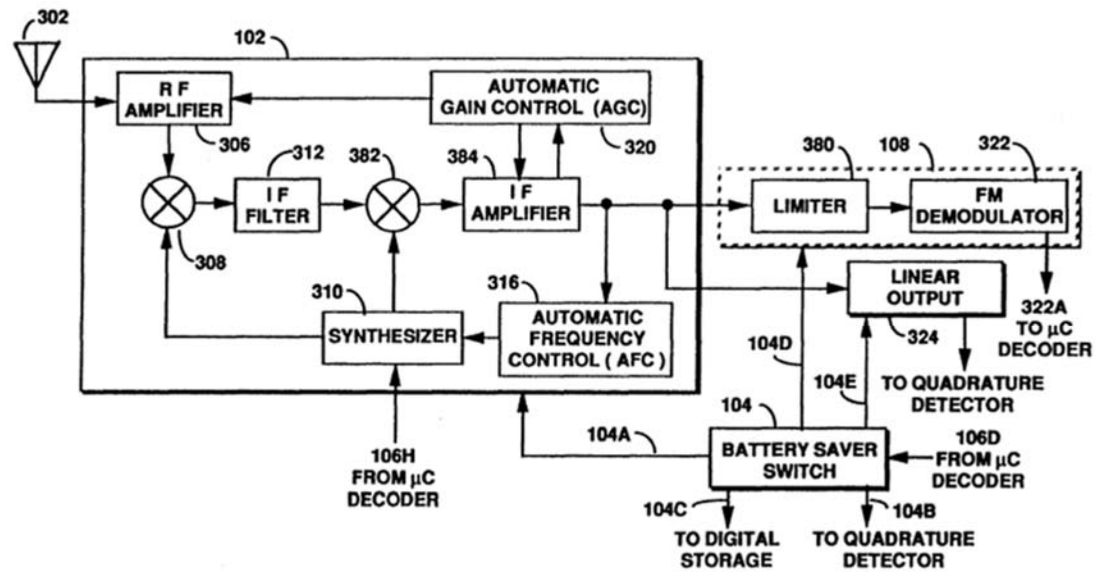
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 5B* Fig. 1, reproduced below.

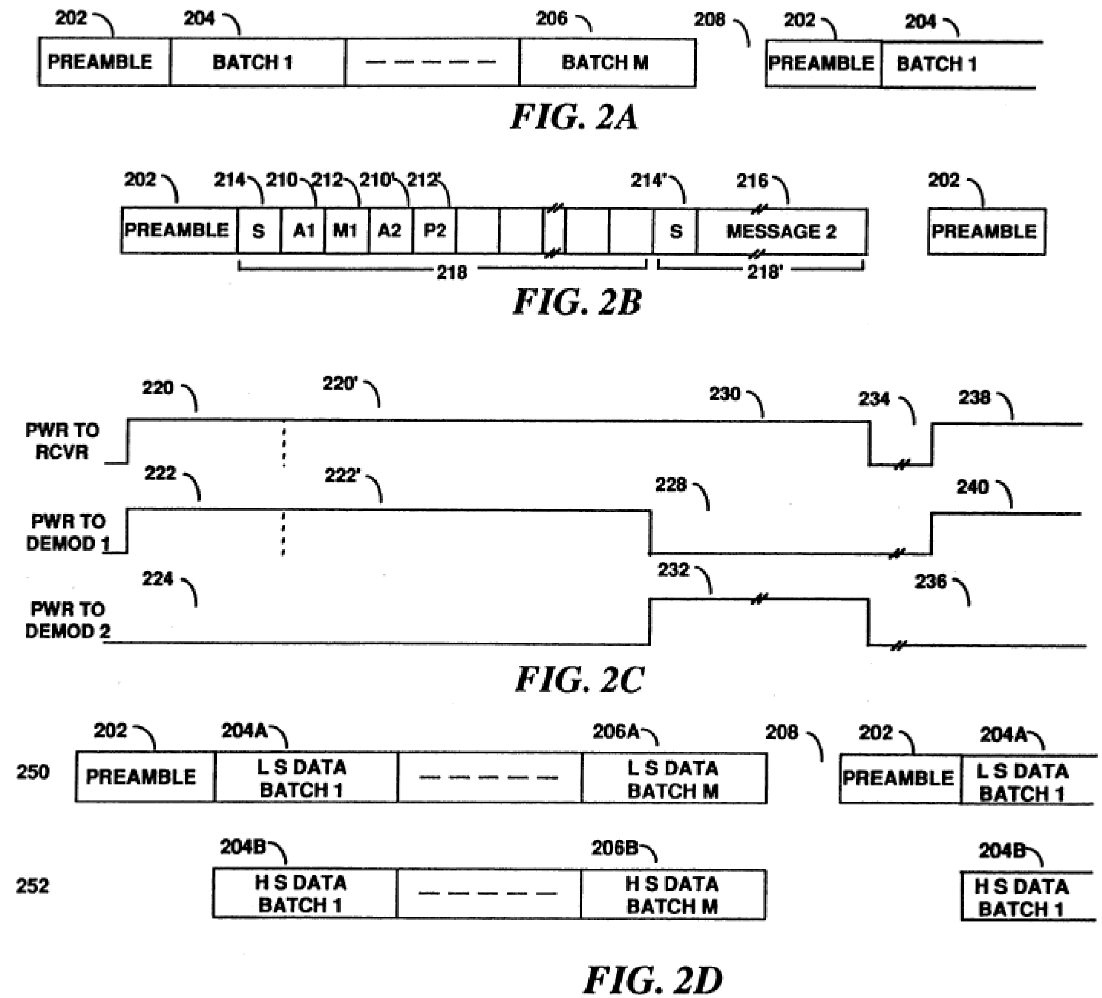
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 *FIG. 1* "Because of the limitations of FM modulation for high speed message transmission, other forms of modulation, such as linear modulation techniques are required to provide for transmission at the higher data rates." Col. 1:57-61. "In a fourth embodiment of the present invention, a dual mode communication receiver comprises a means for receiving information transmitted in a FM modulation format and a linear modulation format. A first means for detecting detects the information transmitted in the FM modulation format, and a second means for detecting, responsive to the information detected in the FM modulation format, detects the information transmitted in the linear modulation format. A third means supplies power to the receiving means for enabling the receiving of the information transmitted in the FM and linear modulation formats. The third means further supplies power to the first means for enabling the detecting of the information transmitted in the FM modulation format, and the third means further in response to the information detected in the FM modulation format, supplies power to the second means for enabling the detecting of the information transmitted in the linear modulation format." Col. 1:61-3:2. "The dual mode communication receiver of the present invention, enables the transmission of data at very high data

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information." Col. 4:36-57. "Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions." Col. 7:13-17. "When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data." Col. 7:22-26. Fig. 4, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 4* “While linear modulation techniques are available to provide the increased message transmission speeds, such modulation techniques generally are incompatible for use with existing receiver architectures, are incompatible with present day signaling protocols, and require significantly more current drain for operation than required for circuits receiving and demodulating existing signaling protocols transmitted using standard FM modulation techniques. There is a need to provide a receiver architecture which retains compatibility within existing FM modulated paging signaling protocols, thereby taking advantage of the battery saving capabilities of these existing paging signaling protocols. Furthermore, there is a need to provide a receiver architecture which includes linear demodulation for voice and high speed data capability, to provide the increased message throughput required for these ever expanding services, without compromising the battery saving performance of the existing paging signaling protocols.” Col. 1:54-2:11. “SUMMARY OF THE INVENTION” Col. 2:13. “In a first embodiment of the present invention, a dual mode communication receiver comprises means for receiving information transmitted on a common channel in a first and second modulation format, a first means for detecting the information transmitted in the first modulation format on the common channel, and a second means, responsive

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Col. 2:14-22. “In a second embodiment of the present invention, a dual mode communication receiver comprises means for receiving information transmitted on a common channel in a first and second modulation format: first means for detecting the information transmitted in the first modulation format on the common channel and second means, responsive to the information detected in the first modulation format, for receiving the information transmitted in the second modulation format. A third means supplies power to the receiving means for enabling the receiving of the information transmitted in the first and second modulation formats, supplies power to the first means for enabling the detecting of the information transmitted in the first modulation format, and further in response to the information received and detected in the first modulation format, supplies power to the second means for enabling the detecting of the information transmitted in the second modulation format.” Col. 2:23-42. “In a third embodiment of the present invention, a dual mode communication receiver comprises a means for receiving information transmitted in a FM modulation format and a linear modulation format. A first means for detecting detects the information transmitted in the FM modulation format, and second means for detecting, responsive to the information detected in the FM modulation format, detects the information transmitted in the linear modulation format.” Col. 2:43-51. “In a fourth embodiment of the present invention, a dual mode communication receiver comprises a means for receiving information transmitted in a FM modulation format and a linear modulation format. A first means for detecting detects the information transmitted in the FM modulation format, and a second means for detecting, responsive to the information detected in the FM modulation format, detects the information transmitted in the linear modulation format. A third means supplies power to the receiving means for enabling the receiving of the information transmitted in the FM and linear modulation formats. The third means further supplies power to the first means for enabling the detecting of the information transmitted in the FM modulation format, and the third means further in response to the information detected in the FM modulation format, supplies power to the second means for enabling the detecting of the information transmitted in the linear modulation format.” Col. 1:61-3:2. “The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col.

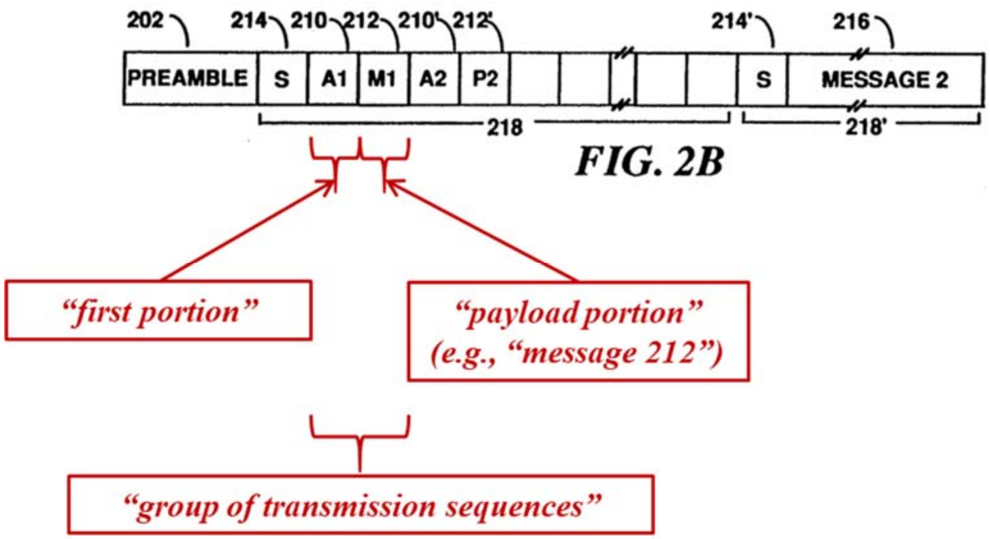
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		4:36-57. “Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions.” Col. 7:13-17. “When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data.” Col. 7:22-26.  *FIG. 4*
1[c]	wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion	**Motorola ’306 in view of the teachings of Motorola ’038 discloses wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion.** **For example, Motorola ’306 discloses transmitting a “first portion” (e.g., “address 210,” “address 210′”) and**

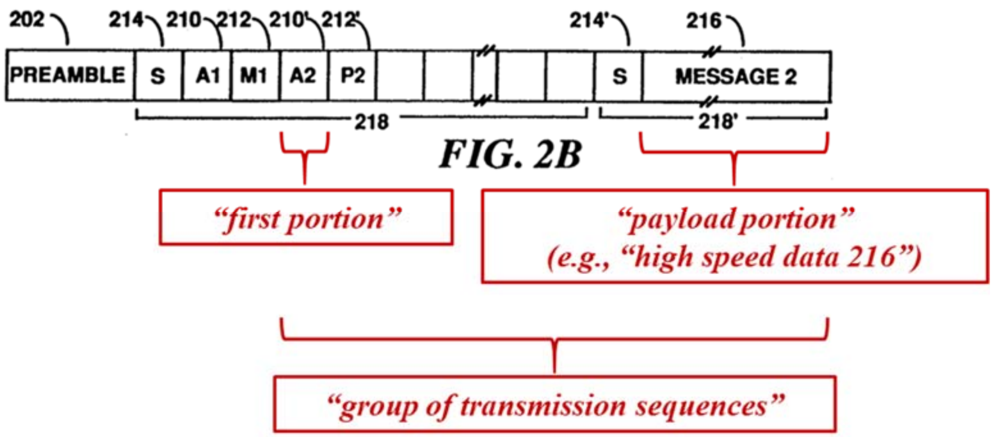
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		a “payload portion” (e.g., “message 212,” “high speed data 216”). Figs. 2A-D, reproduced below.  “As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206.” Col.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		5:49-53. “FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein. All information transmitted in a given batch is modulated in a common modulation format. As will be described in further detail below, one or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format. Depending upon the channel loading, a break 208 in the transmission can occur, after which the preamble 202 is again transmitted to enable the receivers to resynchronize with the batch transmission.” Col. 5:47-6:4. “FIG. 2B shows in further detail the interleaving of batches modulated in the FM modulation format with batches modulated in the linear modulation format. In the preferred embodiment of the present invention, the preamble 202 is a sequence of alternating one and zero bits which are modulated using the FM modulation format. The preamble 202 enables the receiver to awake from a battery saving time interval, recognize that a transmission on the channel bas been initiated, and enables the receiver to obtain bit synchronization with the transmitted signal. Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmitted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of address and/or message information code words, which, as for example, is sixteen. As shown, the address 210 of a first receiver and the associated message 212 are transmitted, followed by the address 210' of a second receiver and the associated message 212', and so forth. Message 212' for the second receiver is not a normal message information code word, but is a predetermined "batch" pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'. As shown, batch 218' contains the high speed message information 216 which is modulated in a linear modulation format. Batch 218' begins with the synchronization code word 214' which is used to signal the start of the message information, as will be described below. Following the transmission of batch 218', additional high speed message information can be transmitted in additional batches, other conventionally modulated address and message information can be transmitted in

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		additional batches, or as shown, the batch transmission can be terminated until a later time when additional address and message information is available for transmission." Col. 6:9-55. "FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially supplied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby conserving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220', and to the FM demodulator during time interval 222', in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator. Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions." Cols. 6:56-7:17. "In summary, power is regularly supplied to the receiver and to the FM demodulator to enable reception of an address and message information using a signaling 2, protocol which provides battery saving capability to the receiver. When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data. By supplying power to the linear demodulator and high speed data storage sections only during the transmission of high speed data, the receiver battery life can be greatly extended as compared to receiving alt information in the linear modulation format." Col. 7:18-31. "An alternate embodiment of the signaling format for the dual mode receiver of the present invention is shown in FIG. 2D. In this embodiment, information is transmitted on two channels, a first channel 250 which is utilized for the transmission of low speed message information modulated in an FM modulation format, and a second channel 252 which is utilized for the transmission of high speed message information modulated in a linear modulation format. The batches of low speed data 204A-206A overlay in time the batches of high speed data 204B-206B. The dual mode receiver of the present invention operates on the first channel receiving message information, which can include conventional numeric or alphanumeric messages intended for the dual mode receiver. When long alphanumeric messages or voice messages are to be transmitted, the message pointer information is transmitted on the first channel directing the dual mode receiver to a predetermined message batch to be transmitted on the second channel. After having received the pointer information, the dual mode receiver selects the second channel for receiving the high speed message information during the predetermined batch identified by the pointer. After having received the high speed message, the receiver again selects the first channel. The alternate embodiment of the

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		present invention shown in FIG. 2D allows a very efficient method of mixing conventional paging receivers which receive information modulated in an FM modulation format, with the dual mode receivers of the present invention by maintaining alt low speed message transmission on the first channel, and alt high speed message transmission on the second channel. This enables the use of conventional signaling formats to be utilized for the transmission of information in the batches 204A-206A on the first channel, enabling both conventional receivers and dual mode receivers to be readily intermixed.” Col. 7:32-68. “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:36-57. “When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received. After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Col. 12:59-13:9. “When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/ A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540.” Col. 12:59-13:28. “13. The dual mode communication receiver according to claim 10, wherein the message information received in the first modulation format is an alphanumeric data message.” Col. 15:1-4. Figure 2B, annotated to show a “group of transmission sequences” with a “first portion” and a “payload portion” where the payload portion is a conventional “message”:  Figure 2B annotated to show a “group of transmission sequences” with a “first portion” and a “payload portion” where the payload portion is “high speed data”:

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 FIG. 2B
1[d]	wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,	**Motorola '306 in view of the teachings of Motorola '038 discloses wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion.** **For example, Motorola '306 discloses that the first information (e.g., "address 210," "address 210‴) indicates "if the message information being transmitted is low speed [FSK-modulated] or high speed [QAM-modulated] message information."** Figs. 2A-D, reproduced below.

<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,023,580
(“the ’580 patent”)</th><th>The Motorola ’306 patent</th></tr>
<tr><td></td><td></td><td>

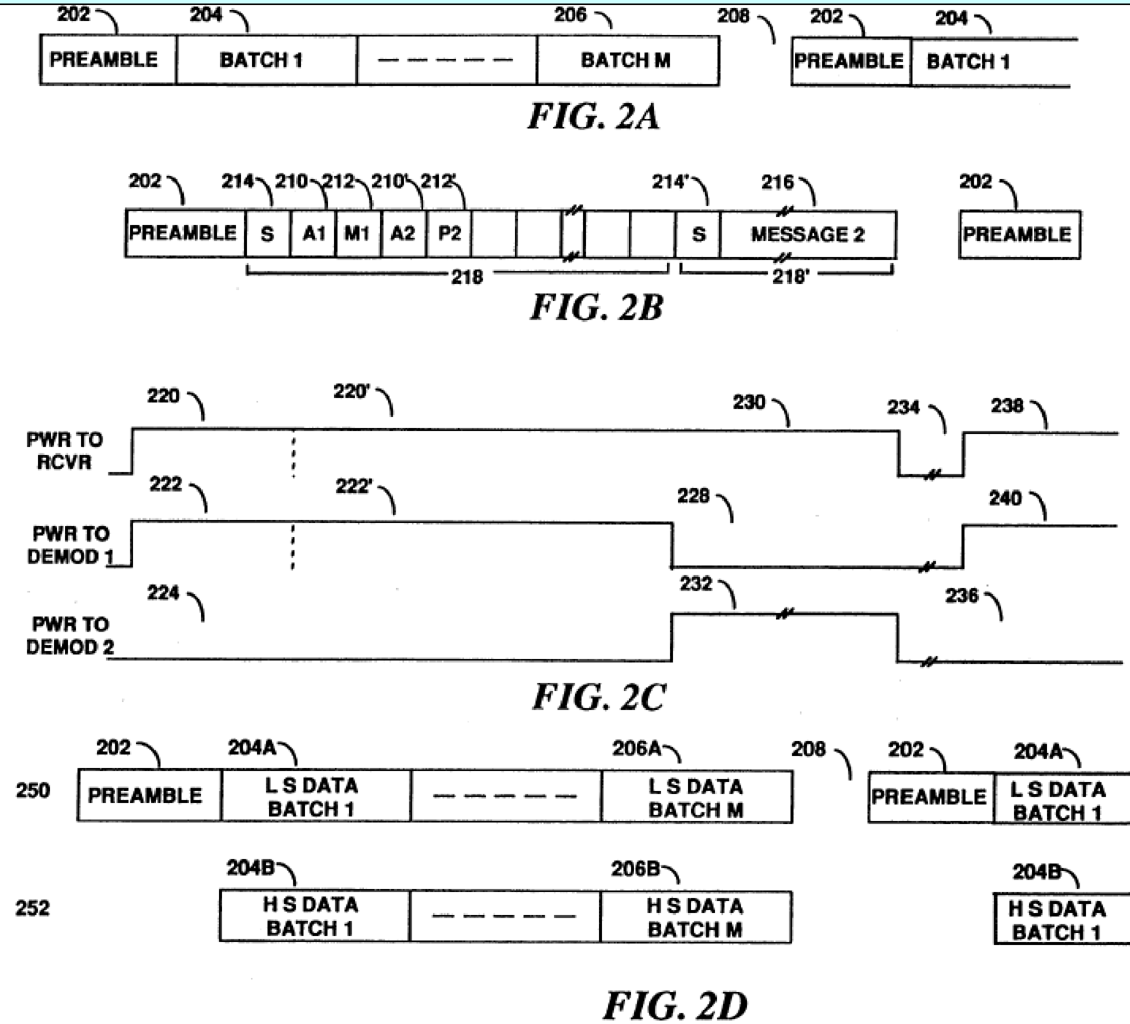
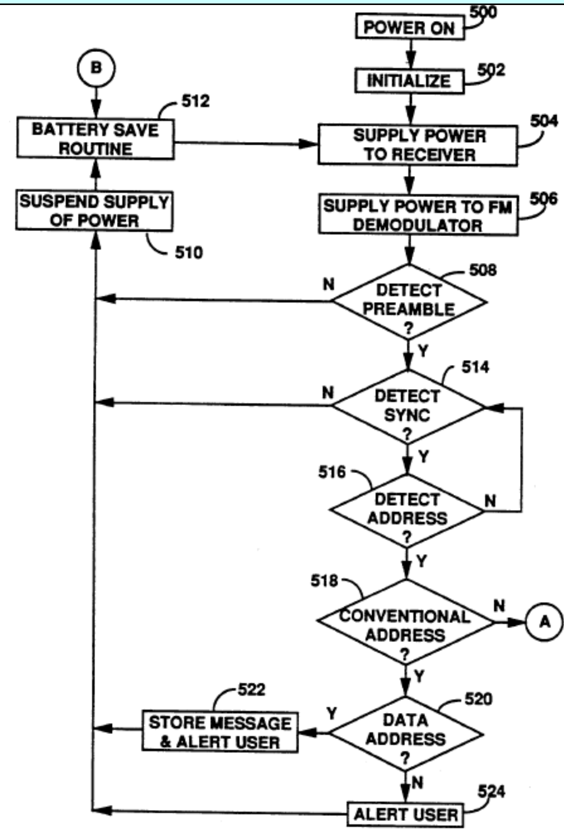
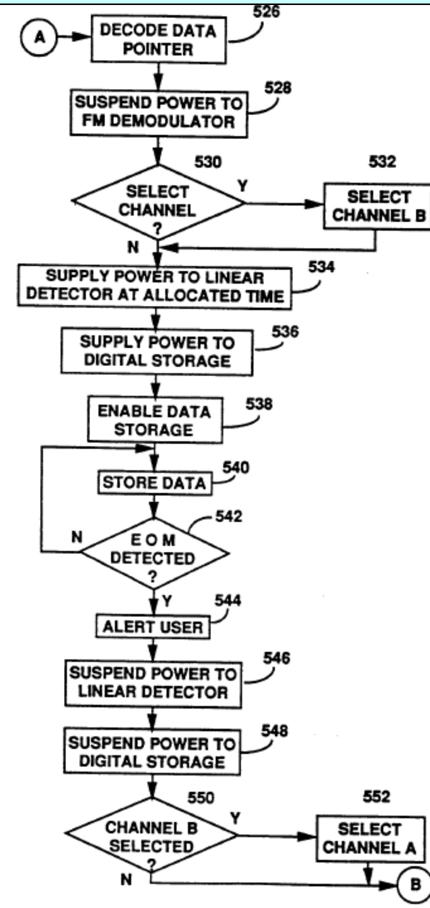


Fig. 5A, reproduced below.

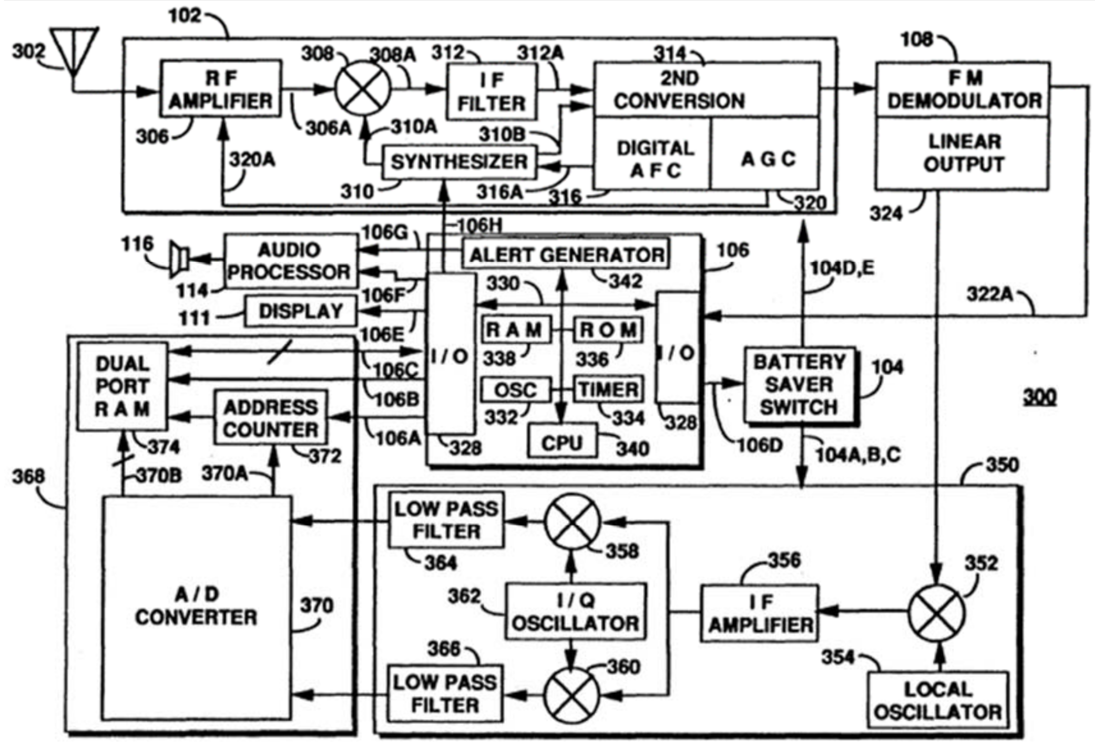
</td></tr>
</table>

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 *FIG. 5A* Fig. 5B, reproduced below.

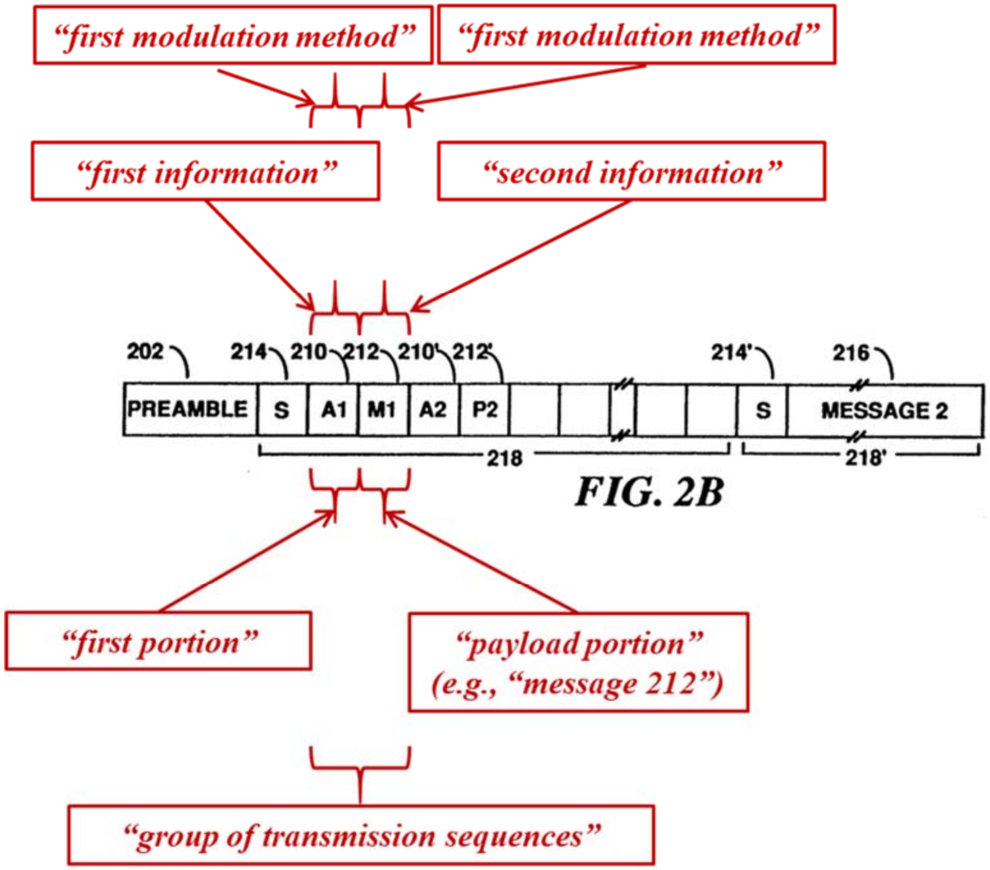
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 5B* “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmitted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of address and/or message information code words,

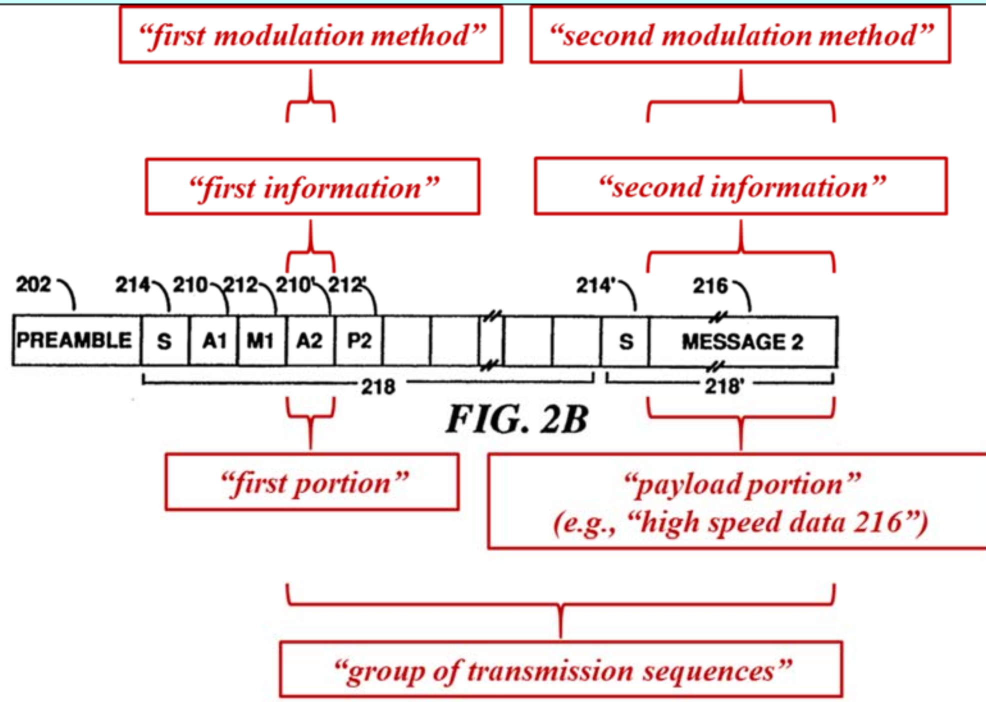
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		which, as for example, is sixteen. As shown, the address 210 of a first receiver and the associated message 212 are transmitted, followed by the address 210' of a second receiver and the associated message 212', and so forth. Message 212' for the second receiver is not a normal message information code word, but is a predetermined "batch" pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'. As shown, batch 218' contains the high speed message information 216 which is modulated in a linear modulation format. Batch 218' begins with the synchronization code word 214' which is used to signal the start of the message information, as will be described below.” Col. 6:19-48. “When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received.” Col. 12:59-13:4. “When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540.” Col. 13:10-28. “When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the recovered message information is received and stored in the microcomputer RAM 338, or in the digital storage section 368, as will be explained in further detail below, and an alerting signal 106G is generated by alert generator 342.” Col. 9:60-10:4. “When additional information is to be transmitted in the linear modulation format, the microcomputer 106 decodes the pointer information. The microcomputer 106 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of the current batch, at which time the supply of power is suspended to the receiver until the next assigned batch, or until the batch identified by the pointer is reached, during which high speed data is transmitted.” Col. 10:10-19.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		“When additional information is to be transmitted in the linear modulation format, the microcomputer 106 decodes the pointer information. The microcomputer 106 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of the current batch, at which time the supply of power is suspended to the receiver until the next assigned batch, or until the batch identified by the pointer is reached, during which high speed data is transmitted.” Col. 10:10-26. “When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below. In the first instance, the battery saving switch 104, under the control of the decoder/controller 106 will maintain the supply of power to the FM demodulator 108 to enable further demodulation of message information received in the FM modulation format.” Col. 5:9-18. “However, unlike the prior art receivers, power to the FM demodulator 108 is suspended by battery saver switch 104, under the control of the decoder/controller 106, and power is then supplied to the linear demodulator 112, to enable the demodulation of information received in the second modulation format. The information received in the second modulation format is received by receiver 102, which then couples the received information to the linear demodulator 112.” Col. 5:26-34. “A dual mode communication receiver, comprising: means for receiving information transmitted on a common channel in a first and second modulation format; first means for detecting the information transmitted in the first modulation format on the common channel; and second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Claim 1. Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 ***FIG. 3*** “When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data.” Col. 7:22-26. “The dual mode communication receiver of the present invention, enables the trans mission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by pro viding a second receiving means which is responsive to the information detected by the first receiving means in the

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:36-57. “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmit ted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of ad dress and/or message information code words, which, as for example, is sixteen. As shown, the address 210 of a first receiver and the associated message 212 are trans mitted, followed by the address 210' of a second receiver and the associated message 212, and so forth. Message 212 for the second receiver is not a normal message information code word, but is a predetermined “batch” pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218".” Col. 6:19-43. “The alerting signal 106G is coupled to the audio processing circuit 344 which drives a transducer 346, delivering an audible alert. Other forms of sensible alerting, such as a tactile or vibrating alert, can also be provided to alert the user as well.” Col. 10:4-9. “The microcomputer 106, through I/O port 328 generates a battery saving control signal 1060 which couples to battery saver switch 104 to suspend the supply of power to the FM demodulator 108, and to supply power to the linear demodulator 112, including linear output section 3.24, the quadrature demodulator 350, and the digital storage section 368, as will be described in detail below.” Col. 10:19-26. “After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Col. 13:4-9. “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “2. The dual mode selective call receiver according to claim 1, wherein the first modulation format is frequency shift keyed FM modulation.” Claim 2. “5. The dual mode communication receiver according to claim 3, wherein the linear modulation. Format is QAM modulation.” Claim 5. Figure 2B annotated to show “first information” in the “first portion” and “second information” in the “payload

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		portion when the payload portion comprises a conventional message:  Figure 2B annotated to show "first information" in the "first portion" and "second information" in the "payload portion when the payload portion comprises high speed data:

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		
1[e]	wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion, and	**Motorola ’306 in view of the teachings of Motorola ’038 discloses wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion (e.g., “address 210 of a … receiver”).** “A code memory 110 is provided which couples to the decoder/controller 106, and which stores address information assigned to the dual mode communication receiver. When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below.” Col. 5:6-13. “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216.” Col. 6:19-22. “A code memory 110 (not shown in FIG. 3) couples to microcomputer 106 through the I/O port 328. The code memory is preferably an EEPROM (Electrically Erasable Programmable Read Only Memory) which stores one or more predetermined addresses to which communication receiver 300 is responsive. Col. 9:50-56.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		“The microcomputer 106 also controls the supply of power to the receiver section, the linear demodulator and the digital storage during the transmission of linearly modulated message information. The microcomputer 326 also controls the supply of power to the the digital storage section during the processing of the stored high speed message information, and during the reading of the stored message. In summary, the battery saver switch 104 under the control of the microcomputer 106, supplies power only to those circuits which are currently utilized in the receiving or processing of information, thereby minimizing the energy consumption of the battery.” Col. 12:7-19. “FIGS. 5A and 5B are flow charts describing the operation of the dual mode communication receiver of the present invention. Referring to FIG. SA, when the user turns power on to the receiver, at step 500, the microcomputer is initialized, at step 502, enabling the battery saving routine. Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine. The decoder monitors the information received on the channel, searching for a preamble signal, at step 508, or some other signal by which bit synchronization can be obtained. When a preamble signal, or other signal is not detected within a predetermined search window time interval, at step 508, the microcomputer suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator.” Col. 12:20-49. “When preamble is detected, at step 508, and bit synchronization is obtained, in a manner well known in the art, the microcomputer begins the synchronization code word acquisition routine, at step 514. When the synchronization code word is not detected within a predetermined period of time, at step 514, the microcomputer is suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator.” Col. 12:39-49. “When the synchronization code word is detected, at step 514, corresponding to the batch to which the receiver is assigned, the microcomputer monitors the received address and message information, in order that any addresses and messages directed to the receiver can be detected, at step 516.” Col. 7:50-55.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent

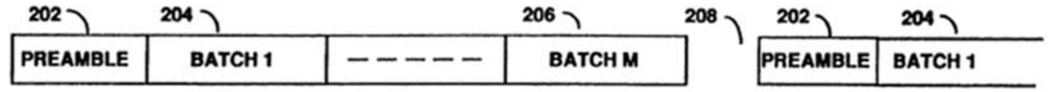


FIG. 2A

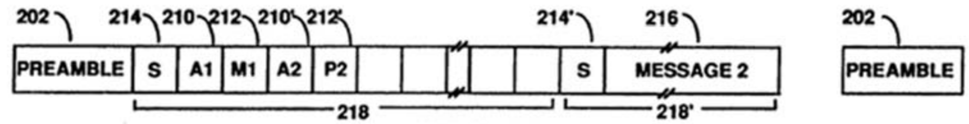


FIG. 2B

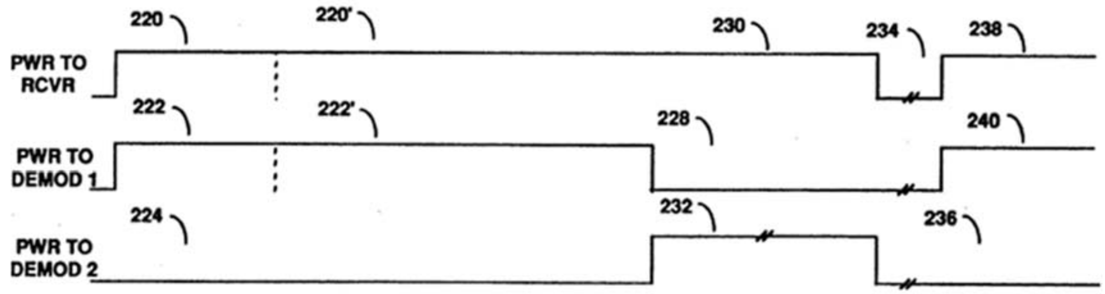


FIG. 2C

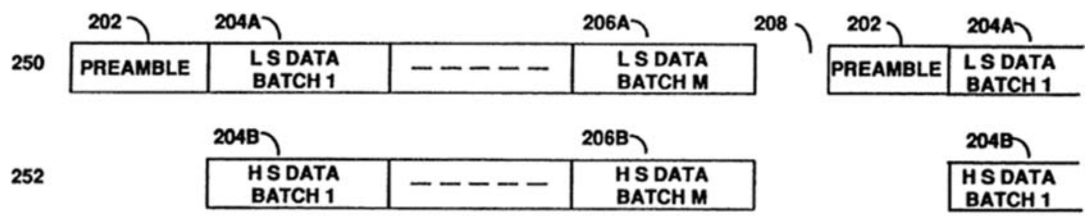
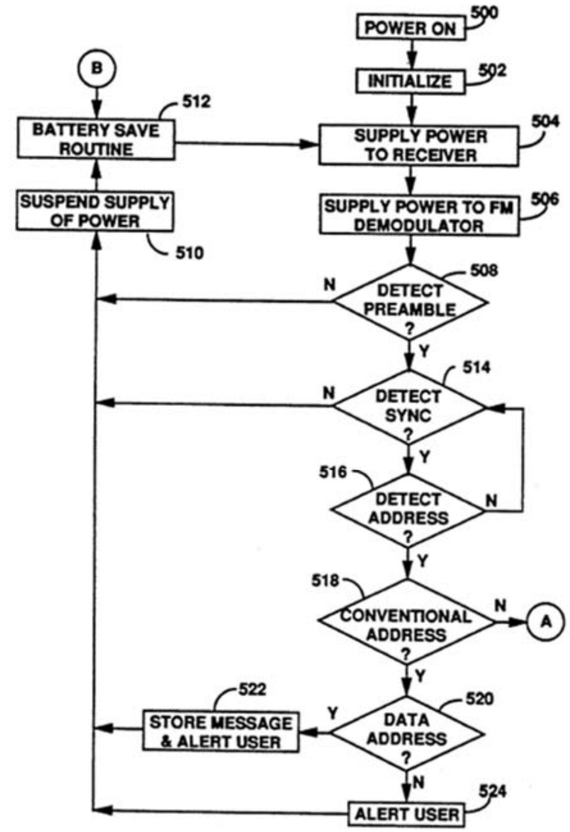
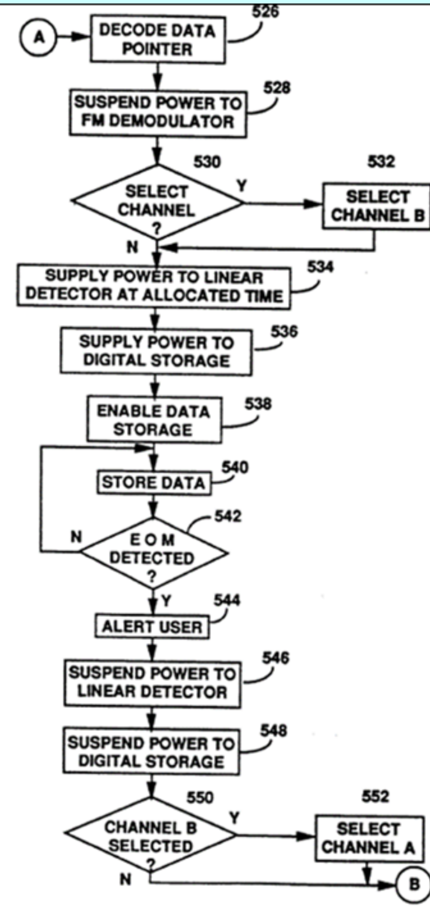
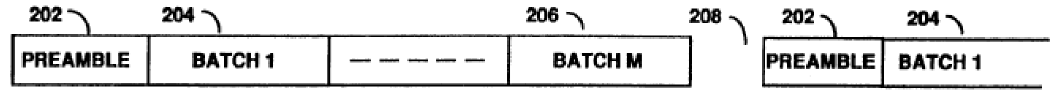
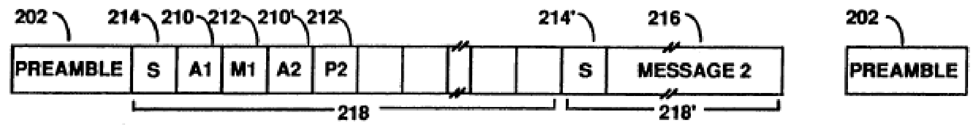
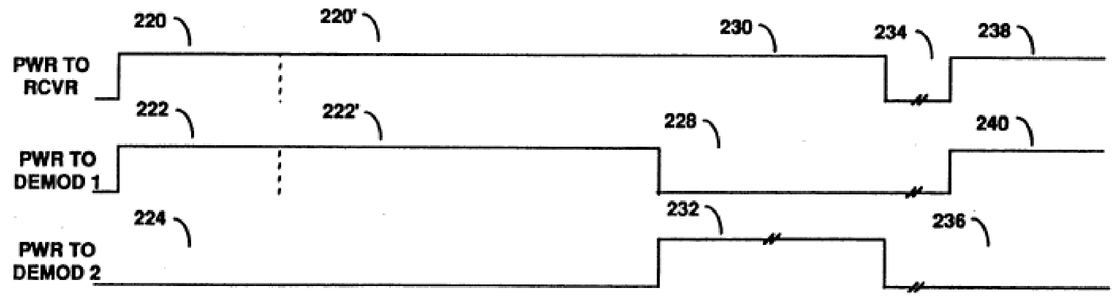
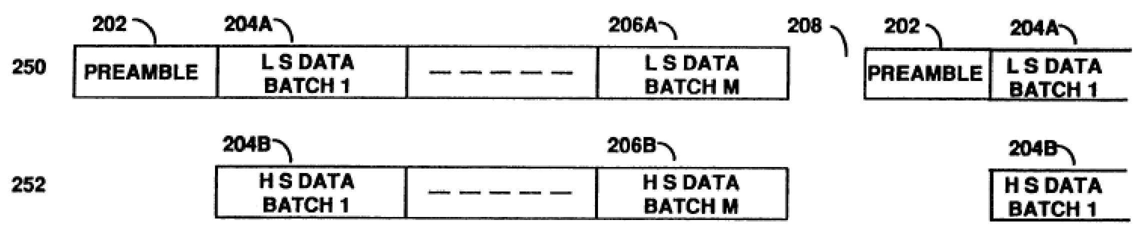


FIG. 2D

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 5A*

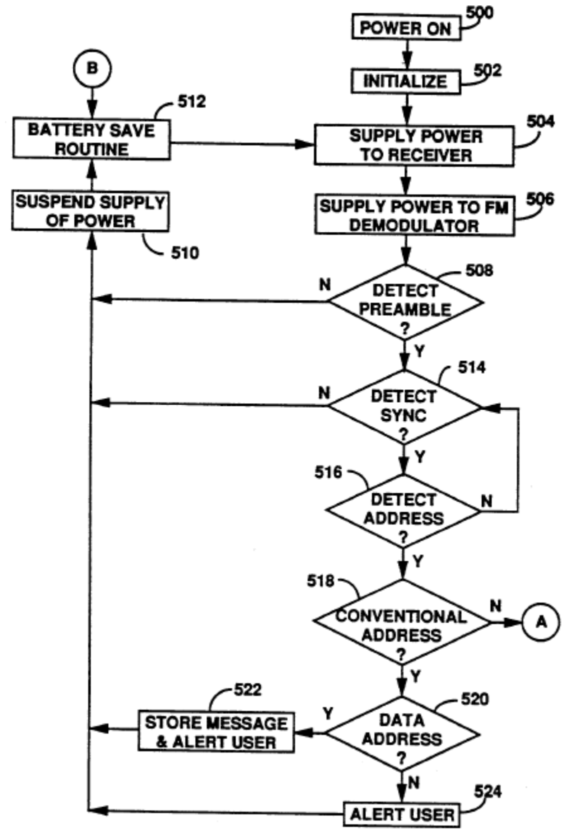
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 5B* “As shown, the address 210 of a first receiver and the associated message 212 are trans mitted, followed by the address 210' of a second receiver and the associated message 212, and so forth. Message 212 for the second receiver is not a normal message information code word, but is a predetermined “batch” pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218".” Col. 6:34-43. “When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to

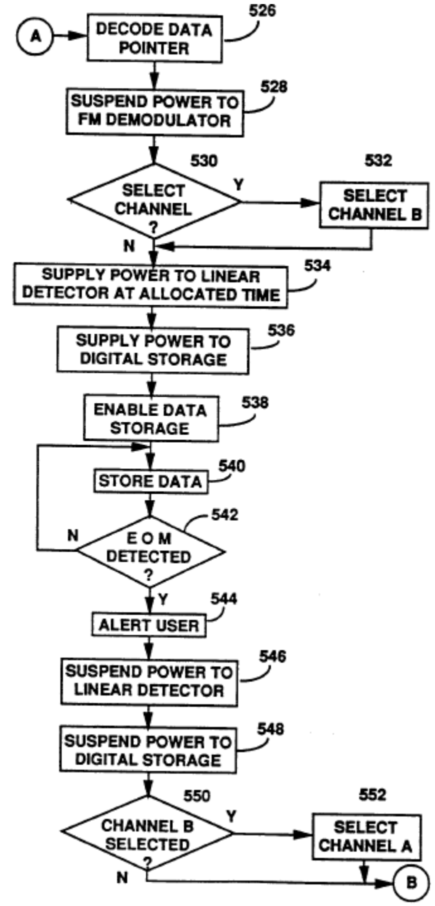
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received. After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch." Col. 12:59-13:9. "When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526of FIG. SB. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/ A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540." Col. 13:10-28.
1[f]	wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method, and	**Motorola '306 in view of the teachings of Motorola '038 discloses wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method.** **Motorola '306 discloses the "first sequence" (e.g., "address 210′") in the first portion and modulated according to the "first modulation method" (e.g., "FSK") and the "second sequence" (e.g., "high speed data 216") that is modulated according to the second modulation method (e.g., "QAM").** Figs. 2A-D.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 *FIG. 2A*  *FIG. 2B*  *FIG. 2C*  *FIG. 2D* "As shown, the address 210 of a first receiver and the associated message 212 are transmitted, followed by the address 210' of a second receiver and the associated message 212', and so forth. Message 212' for the second receiver is not a normal message information code word, but is a predetermined 'batch' pointer, directing the

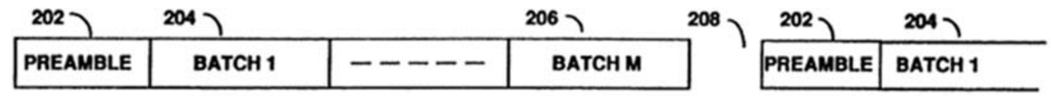
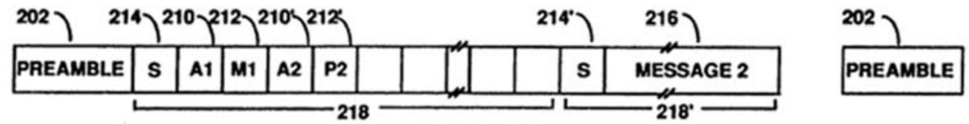
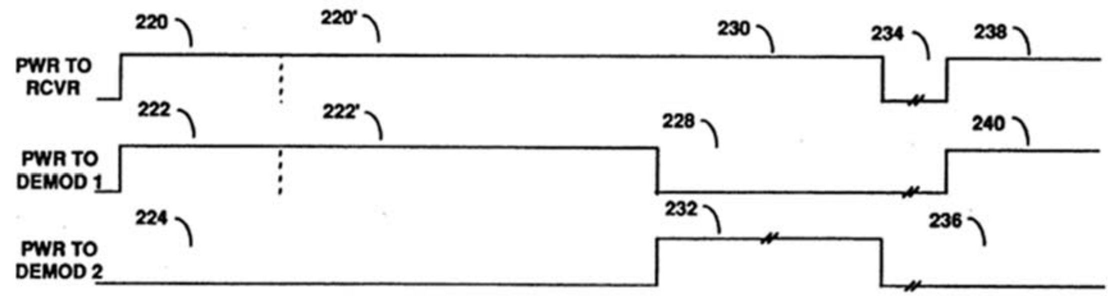
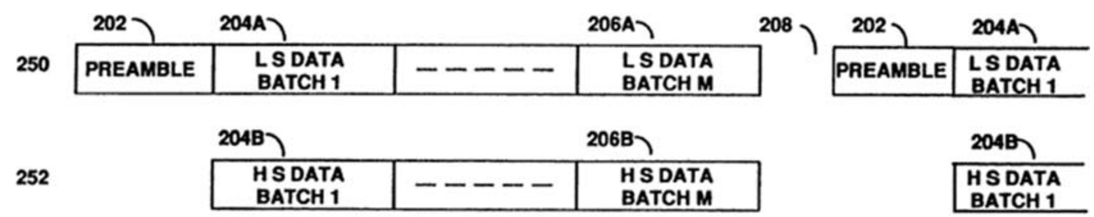
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'. As shown, batch 218' contains the high speed message information 216 which is modulated in a linear modulation format.” “As shown, the address 210 of a first receiver and the associated message 212 are trans mitted, followed by the address 210' of a second receiver and the associated message 212, and so forth. Message 212 for the second receiver is not a normal message information code word, but is a predetermined "batch' pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218". As shown, batch 218" contains the high speed message information 216 which is modulated in a linear modulation format.” Col. 6:34-45. “As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art.” Col. 5:49-60. “When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data.” Col. 7:22-26. “When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below.” Col. 5:9-13. “The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:36-57. “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmitted in the batch, and enables

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of address and/or message information code words, which, as for example, is sixteen.” Col. 6:19-34. **Motorola ’306 discloses that the “first sequence” (e.g., “address 210′”) “indicates an impending change from the first modulation method to the second modulation method.”** Fig. 5A, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 *FIG. 5A* Fig. 5B, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 *FIG. 5B* "When additional information is to be transmitted in the linear modulation format, the microcomputer 106 decodes the pointer information. The microcomputer 106 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of the current batch, at which time the supply of power is suspended to the receiver until the next assigned batch, or until the batch identified by the pointer is reached, during which high speed data is transmitted. The microcomputer 106, through I/O port 328 generates a battery saving

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		control signal 106D which couples to battery saver switch 104 to suspend the supply of power to the FM demodulator 108, and to supply power to the linear demodulator 112, including linear output section 324, the quadrature demodulator 350, and the digital storage section 368, as will be described in detail below.” Col. 10:10-26. “However, unlike the prior art receivers, power to the FM demodulator 108 is suspended by battery saver switch 104, under the control of the decoder/controller 106, and power is then supplied to the linear demodulator 112, to enable the demodulation of information received in the second modulation format. The information received in the second modulation format is received by receiver 102, which then couples the received information to the linear demodulator 112. The demodulated message information is coupled from the output of the linear demodulator 112, to the input of a data processing unit 114.” Col. 5:26-37. “When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format.” Col. 9:60-66. “When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information.” Col. 12:59-63. “When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540.” Col. 13:10-28. “In summary, power is regularly supplied to the receiver and to the FM demodulator to enable reception of an address and message information using a signaling protocol which provides battery saving capability to the receiver.” Col. 7:18-22. Figs. 2A-D, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		FIG. 2A FIG. 2B FIG. 2C FIG. 2D "All information transmitted in a given batch is modulated in a common modulation format." Col. 5:66-68. "When the message information indicates a high speed data transmission is forthcoming, the supply of power to the

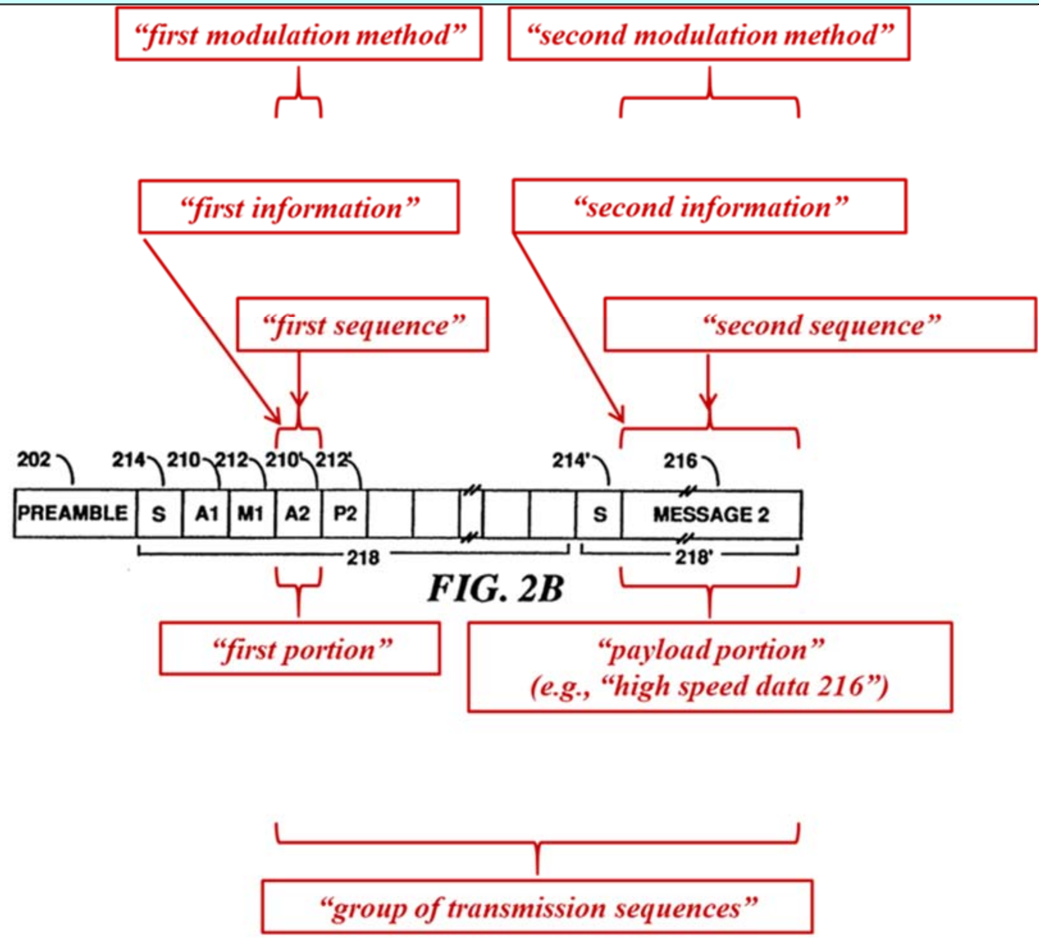
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data.” Col. 7:22-26. “When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received. After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch. When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540. When an end of message (EOM) character is received, or after a predetermined number of message bits have been received, at step 540, the user is alerted that a message has been received, at step 544. The microcomputer suspends the supply of power to the linear demodulator, at step 546. Power is maintained to the digital storage section during which time the received high speed data is processed. Upon the completion of the processing of the high speed message information, the supply of power is then suspended to the digital storage section, at step 548. The microcomputer determines if a second channel was selected for receiving the high speed message information at step 550. When a second channel was selected, at step 550, the microcomputer reselects the first channel at step 552. When the first channel was selected at steps 550 or 552, the microcomputer returns to the normal battery saving routine, at step 512 of FIG. 5A. A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 12:59-13:51. “2. The dual mode selective call receiver according to claim 1, wherein the first modulation format is frequency shift keyed FM modulation.” Claim 2. “The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:36-57. “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmitted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of address and/or message information code words, which, as for example, is sixteen.” Col. 6:19-34. “Batch 218' begins with the synchronization code word 214' which is used to signal the start of the message information, as will be described below. Following the transmission of batch 218', additional high speed message information can be transmitted in additional batches, other conventionally modulated address and message information can be transmitted in additional batches, or as shown, the batch transmission can be terminated until a later time when additional address and message information is available for transmission. FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially supplied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby conserving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220', and to the FM demodulator during time interval 222', in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator. Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions.” Col. 6:46-7:17.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		“When the message information is transmitted in the FM modulation format, the second IF signal is coupled to the FM demodulator section 108, as will be explained in detail below. The FM demodulator section 108 demodulates the second IF signal in a manner well known to one of skill in the art, to provide a recovered data signal 108A which is a stream of binary information corresponding to the received address and message information transmitted in the FM modulation format. The recovered data signal 108A couples to the input of a microcomputer 106, which functions as a decoder and controller, through a single data input line of input/output port, or I/O port 328. The microcomputer 106 provides complete operational control of the communication receiver 300, providing such functions as decoding, message storage and retrieval, display control, and alerting, just to name a few. The microcomputer 106 is preferably a single chip microcomputer, such as the MC68HC05 microcomputer manufactured by Motorola, and includes a CPU 340 for operational control. An internal bus 330 connects each of the operational elements of the microcomputer 106. I/O port 328 (shown split in FIG. 3) provides a plurality of control and data lines providing communications to microcomputer 106 from external circuits, such as the battery saver switch 104, audio processor 114, a display 111, and digital storage 368. A timing means, such as timer 334 is used to generate the timing signals required for the operation of the communication receiver, such as for battery saver timing, alert timing and message storage and display timing. Oscillator 332 provides the clock for operation of CPU 340, and provides the reference clock for timer 334. RAM 338 is used to store information utilized in executing the various firmware routines controlling the operation of the communication receiver 300, and can also be used to store short messages, such as numeric messages. ROM 336 contains the firmware routines used to control the microcomputer 106 operation, including such routines as required for decoding the recovered data signal 322A, battery saver control, message storage and retrieval in the digital storage section 368, and general control of the pager operation and message presentation. An alert generator 342 provides an alerting signal 106G in response to decoding the FM modulated signalling information. A code memory 110 (not shown in FIG. 3) couples to microcomputer 106 through the I/O port 328. The code memory is preferably an EEPROM (Electrically Erasable Programmable Read Only Memory) which stores one or more predetermined addresses to which communication receiver 300 is responsive. When the FM modulated signaling information is received, it is decoded by the microcomputer 106, functioning as a decoder in a manner well known to one skilled in the art. When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the recovered message information is received and stored in the microcomputer RAM 338, or in the digital storage section 368, as will be explained in further detail below, and an alerting signal 106G is generated by alert generator 342. The alerting signal 106G is coupled to the audio processing circuit 344 which drives a transducer 346, delivering an audible alert. Other forms of sensible alerting, such as a tactile or vibrating alert, can also be provided to alert the user as well.” Col. 9:6-10:10. “5. The dual mode communication receiver according to claim 3, wherein the linear modulation format is QAM

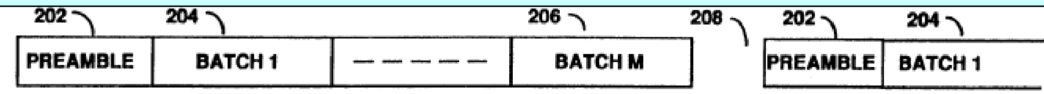
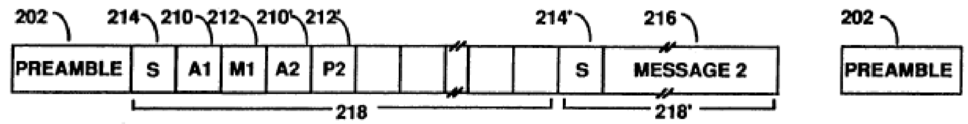
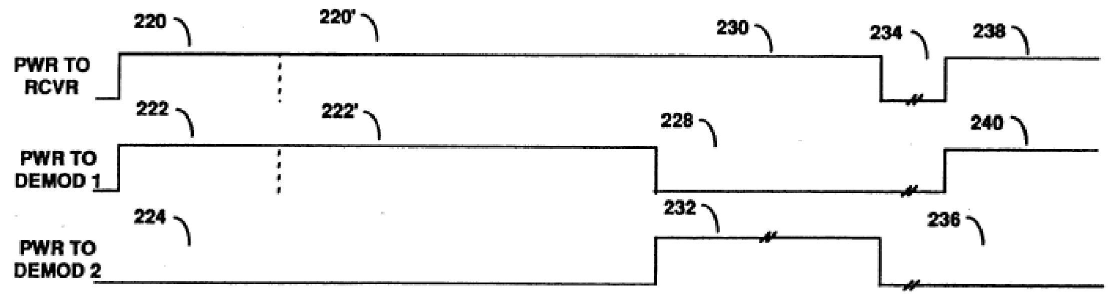
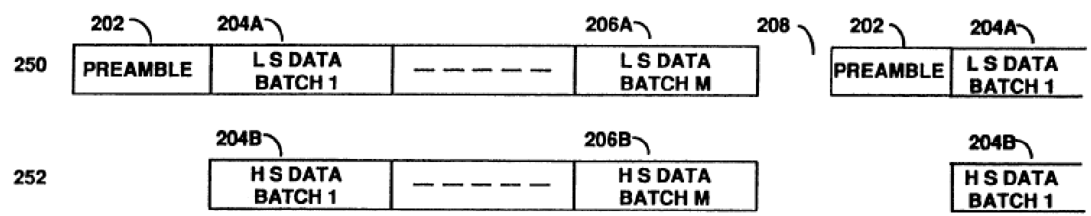
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		modulation.” Claim 5. “Batch 218' begins with the synchronization code word 214' which is used to signal the start of the message information, as will be described below. Following the transmission of batch 218', additional high speed message information can be transmitted in additional batches, other conventionally modulated address and message information can be transmitted in additional batches, or as shown, the batch transmission can be terminated until a later time when additional address and message information is available for transmission.” Col. 6:46-55. “FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially supplied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby conserving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220', and to the FM demodulator during time interval 222', in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the 11 supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator. Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions.” Col. 6:56-7:17. “When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the recovered message information is received and stored in the microcomputer RAM 338, or in the digital storage section 368, as will be explained in further detail below, and an alerting signal 106G is generated by alert generator 342.” Col. 9:60-10:4. “When the message information is transmitted in the FM modulation format, the second IF signal is coupled to the FM demodulator section 108, as will be explained in detail below. The FM demodulator section 108 demodulates the second IF signal in a manner well known to one of skill in the art, to provide a recovered data signal 108A which is a stream of binary information corresponding to the received address and message information transmitted in the FM modulation format. The recovered data signal 108A couples to the input of a microcomputer 106, which functions as a decoder and controller, through a single data input line of input/output port, or 1/0 port 328. The microcomputer 106 provides complete operational control of the communication receiver 300, providing such functions as decoding, message storage and retrieval, display control, and alerting, just to name a few. The microcomputer 106 is preferably a single chip microcomputer, such as the MC68HCOS microcomputer

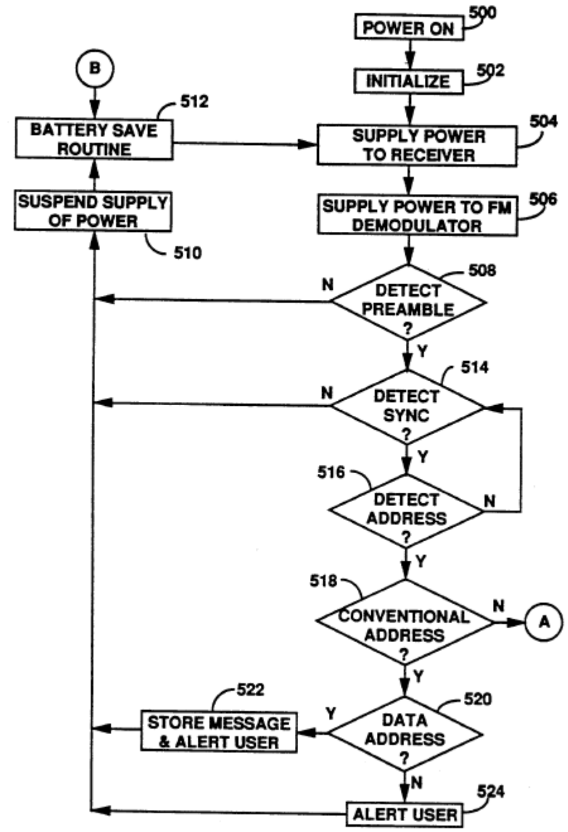
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		manufactured by Motorola, and includes a CPU 340 for operational control. An internal bus 330 connects each of the operational elements of the microcomputer 106. 1/0 port 328 (shown split in FIG. 3) provides a plurality of control and data lines providing communications to microcomputer 106 from external circuits, such as the battery saver switch 104, audio processor 114, a display 111, and digital storage 368. A timing means, such as timer 334 is used to generate the timing signals required for the operation of the communication receiver, such as for battery saver timing, alert timing and message storage and display timing. Oscillator 332 provides the clock for operation of CPU 340, and provides the reference clock for timer 334. RAM 338 is used to store information utilized in executing the various firmware routines controlling the operation of the communication receiver 300, and can also be used to store short messages, such as numeric messages. ROM 336 contains the firmware routines used to control the microcomputer 106 operation, including such routines as required for decoding the recovered data signal 322A, battery saver control, message storage and retrieval in the digital storage section 368, and general control of the pager operation and message presentation. An alert generator 342 provides an alerting signal 106G in response to decoding the FM modulated signalling information. A code memory 110 (not shown in FIG. 3) couples to microcomputer 106 through the 1/0 port 328. The code memory is preferably an EEPROM (Electrically Erasable Programmable Read Only Memory) which stores one or more predetermined addresses to which communication receiver 300 is responsive.” Col. 9:6-56. “When the FM modulated signaling information is received, it is decoded by the microcomputer 106, functioning as a decoder in a manner well known to one skilled in the art. When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the recovered message information is received and stored in the microcomputer RAM 338, or in the digital storage section 368, as will be explained in further detail below, and an alerting signal 106G is generated by alert generator 342. The alerting signal 106G is coupled to the audio processing circuit 344 which drives a transducer 346, delivering an audible alert. Other forms of sensible alerting, such as a tactile or vibrating alert, can also be provided to alert the user as well.” Col. 9:6-10:9. “5. The dual mode communication receiver according to claim 3, wherein the linear modulation. format is QAM modulation.” Claim 5. annotated to show a “first sequence” in the “first portion” that is “modulated according to the first modulation method” and a “second sequence that is modulated according to the second modulation method” in the “second information”:

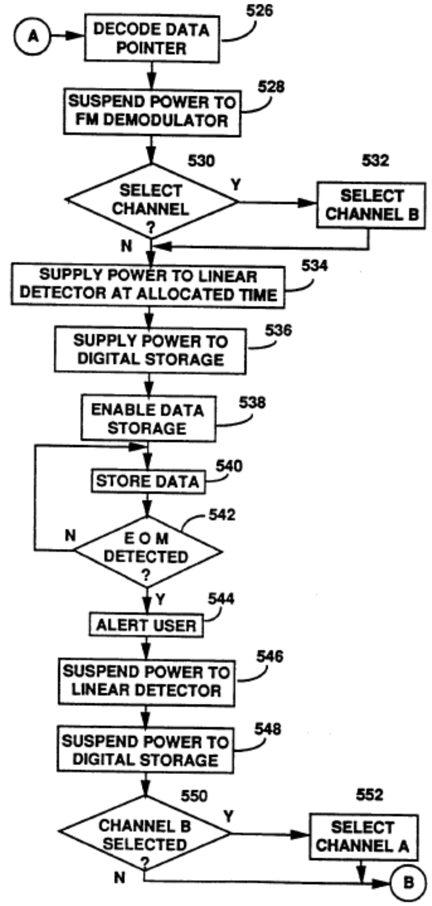
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 **Motorola ’306 in view of the teachings of Motorola ’038 discloses that address information indicates an impending change from the first to the second modulation method, as occurs, for example, when the transceiver transmits an FM-modulated message to a receiver, and then addresses that same receiver to transmit a QAM-modulated high speed message.**
1[g]	the second information for said at least one group of	**Motorola ’306 in view of the teachings of Motorola ’038 discloses the second information for said at least one**

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
	transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.	**group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.** *See* 1[f] discussion of address 210′ , modulated in FSK as first modulation method, and high speed data 216, modulated in QAM as second modulation method.

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
2	The device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	**Motorola '306 in view of the teachings of Motorola '038 discloses the device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.** *See* Claim 1; *see also* **For example, Motorola '306 teaches that "following the transmission" of the high speed data 216, other "conventionally modulated," (i.e. FSK-modulated) batches, including address and message information, can follow.** Figs. 2A-D, reproduced below.

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 FIG. 2A  FIG. 2B  FIG. 2C  FIG. 2D Fig. 5A, reproduced below.

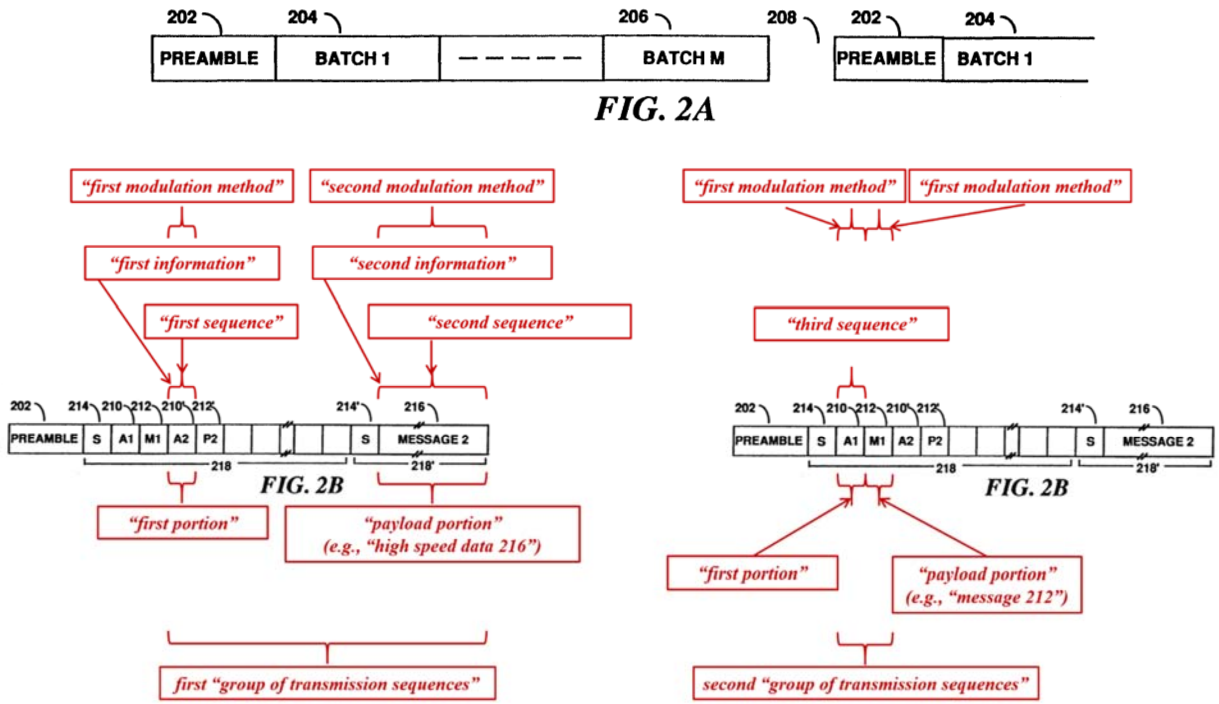
	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		 *FIG. 5A* Fig. 5B, reproduced below.

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		 ***FIG. 5B*** “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmitted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		and allows for the transmission of a predetermined number of address and/or message information code words, which, as for example, is sixteen. As shown, the address 210 of a first receiver and the associated message 212 are transmitted, followed by the address 210' of a second receiver and the associated message 212', and so forth. Message 212' for the second receiver is not a normal message information code word, but is a predetermined "batch" pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'. As shown, batch 218' contains the high speed message information 216 which is modulated in a linear modulation format. Batch 218' begins with the synchronization code word 214' which is used to signal the start of the message information, as will be described below. Following the transmission of batch 218', additional high speed message information can be transmitted in additional batches, other conventionally modulated address and message .information can be transmitted in additional batches, or as shown, the batch transmission can be terminated until a later time when additional address and message information is available for transmission." Col. 6:19-55. "Referring to FIG. 5A, when the user turns power on to the receiver, at step 500, the microcomputer is initialized, at step 502, enabling the battery saving routine. Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine. The decoder monitors the information received on the channel, searching for a preamble signal, at step 508, or some other signal by which bit synchronization can be obtained. When a preamble signal, or other signal is not detected within a predetermined search window time interval, at step 508, the microcomputer suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator. When preamble is detected, at step 508, and bit synchronization is obtained, in a manner well known in the art, the microcomputer begins the synchronization code word acquisition routine, at step 514. When the synchronization code word is not detected within a predetermined period of time, at step 514, the microcomputer suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator. When the synchronization code word is detected, at step 514, corresponding to the batch to which the receiver is assigned, the microcomputer monitors the received address and message information, in order that any addresses and messages directed to the receiver can be detected, at step 516. When an address is not detected within the current batch, the microcomputer monitors the received signal for the synchronization code word, at step 514. When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received. After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		received in the current batch. When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540. When an end of message (EOM) character is received, or after a predetermined number of message bits have been received, at step 540, the user is alerted that a message has been received, at step 544. The microcomputer suspends the supply of power to the linear demodulator, at step 546. Power is maintained to the digital storage section during which time the received high speed data is processed. Upon the completion of the processing of the high speed message information, the supply of power is then suspended to the digital storage section, at step 548. The microcomputer determines if a second channel was selected for receiving the high speed message information at step 550. When a second channel was selected, at step 550, the microcomputer reselects the first channel at step 552. When the first channel was selected at steps 550 or 552, the microcomputer returns to the normal battery saving routine, at step 512 of FIG. 5A.” Col. 12:22-13:45. “When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below. In the first instance, the battery saving switch 104, under the control of the decoder/controller 106 will maintain the supply of power to the FM demodulator 108 to enable further demodulation of message information received in the FM modulation format.” Col. 5:9-18. “After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator. Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions.” Col. 7:9-17. “By supplying power to the linear demodulator and high speed data storage sections only during the transmission of high speed data, the receiver battery life can be greatly extended as compared to receiving all information in the linear modulation format.” Col. 7:26-31. “When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the recovered message information is received and stored in the microcomputer RAM 338, or in the digital storage section 368, as will be

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		explained in further detail below, and an alerting signal 106G is generated by alert generator 342.” Col. 9:60-10:4. “Depending upon the channel loading, a break 208 in the transmission can occur, after which the preamble 202 is again transmitted to enable the receivers to re-synchronize with the batch transmission.” Col. 6:5-8. “All information transmitted in a given batch is modulated in a com mon modulation format. As will be described in further detail below, one or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format.” Col. 5:66-6:4. “As shown, batch 218" contains the high speed message information 216 which is modulated in a linear modulation format. Batch 218" begins with the synchronization code word 214 which is used to signal the start of the message information, as will be described below. Following the transmission of batch 218", additional high speed message information can be transmitted in additional batches, other conventionally modulated address and message information can be transmitted in additional batches, or as shown, the batch transmission can be terminated until a later time when additional address and message information is available for transmission.” Col. 6:43-55. “Following the preamble 202 trans mission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmit ted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format.” Col. 6:19-30. “FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially sup plied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby con serving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220, and to the FM demodulator during time interval 222, in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator. Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions.” Col. 6:56-7:17. “A dual mode receiver has been described which is capable of receiving addresses and messages which are

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
		transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. Figure 2B annotated to show, following the “second sequence,” a “third sequence” that is modulated in the first modulation method and that indicates that communication has reverted to the first modulation method: 

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
		Motorola '306 in view of the teachings of Motorola '038 discloses a master transceiver configured to transmit, after a high-speed "second sequence," a "third sequence" that indicates that communication to the receiver has reverted to the first modulation method for a conventionally-modulated message in "an additional batch[]" that follows high speed message batch 218'.

	Claim 58 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Motorola '306 patent
58[pre]	A communication device capable of communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave, the device comprising:	*See* 1[pre].
58[a]	a transceiver, in the role of the master according to the master/slave relationship,	*See* 1[a].
58[b]	capable of transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method, and	*See* 1[b].
58[c]	wherein the transceiver is configured to transmit messages with: a first sequence, in the first modulation method, that indicates at least which of the first modulation method and the second modulation method is used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method,	*See* 1[a] for discussion of "transceiver", 1[c] for discussion of "group of transmission sequences", 1[d] for "first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion," and 1[f] for "first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method."
58[d]	and wherein the at least one message is addressed for an intended destination of the second sequence, and	*See* 1[e].
58[e]	the second sequence, modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the second sequence is transmitted after the first sequence.	*See* 1[f] for "the first sequence indicates an impending change from the first modulation method to the second modulation method" and 1[g] for "second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence."

	Claim 59 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Motorola ’306 patent
59	The device of claim 58, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	*See* Claims 1, 2, and 58.

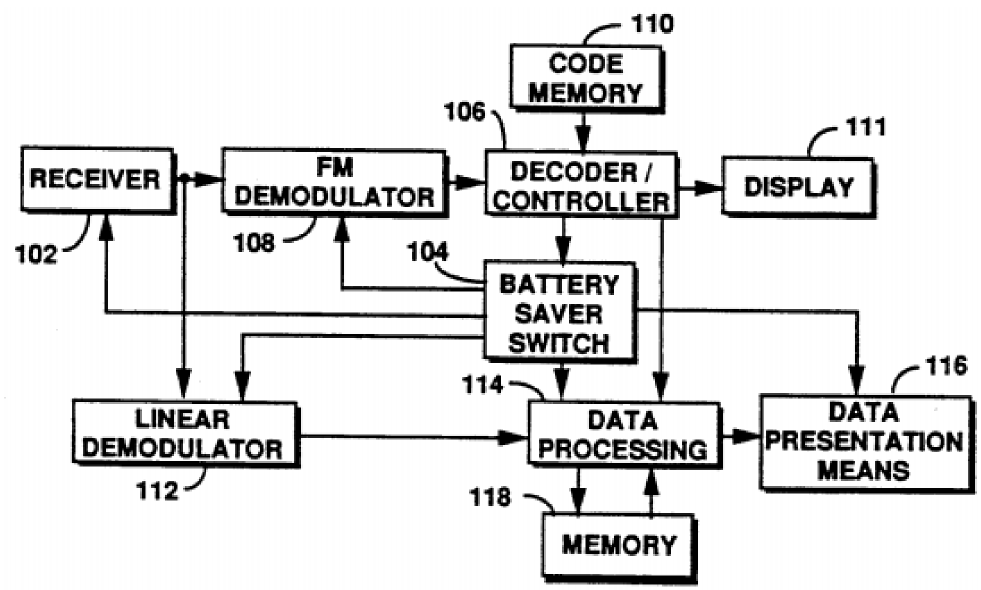
EXHIBIT G

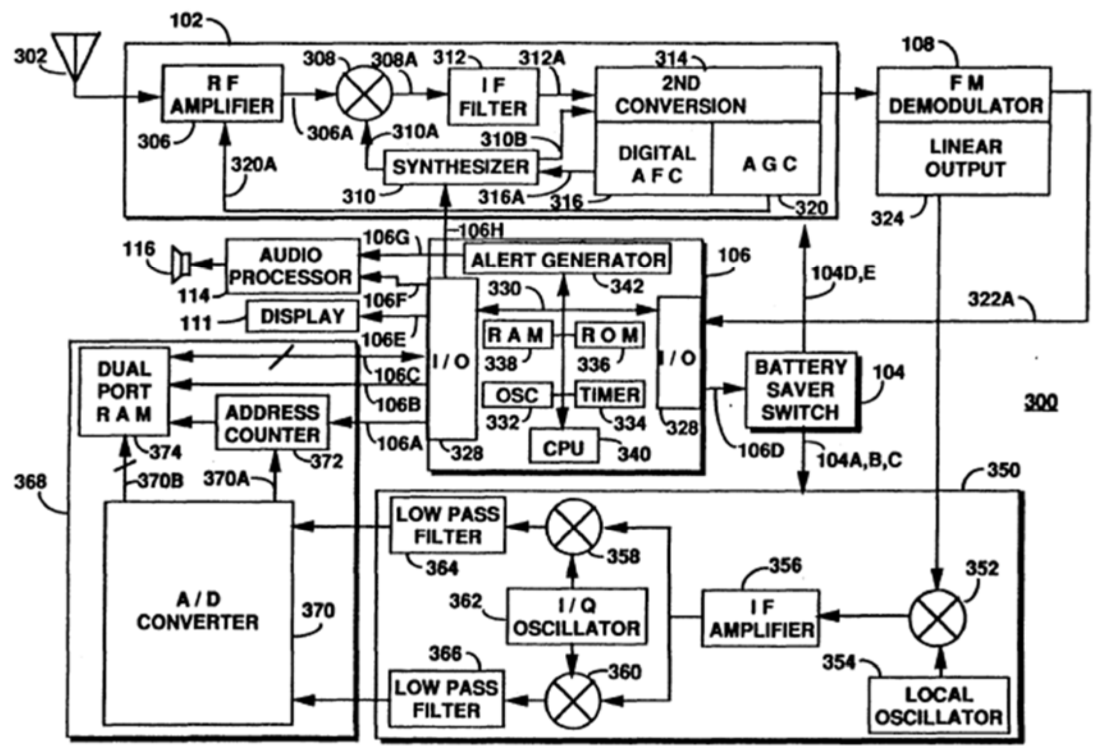
EXHIBIT G

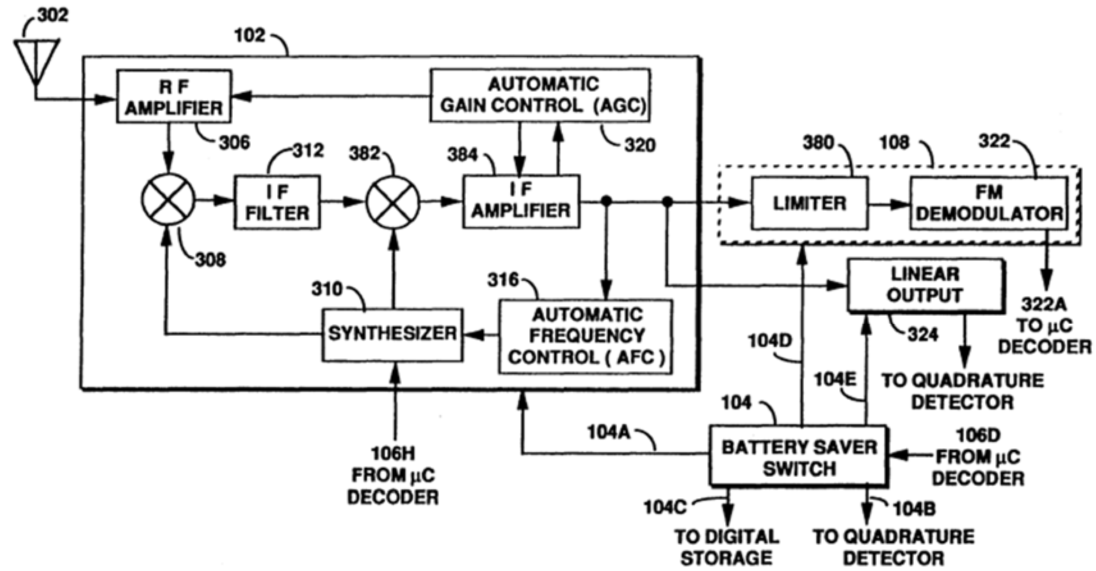
Comparison of the Asserted Claims of the '228 Patent to U.S. Patent No. 5,239,306 ("the Motorola '306 patent" or "Motorola '306")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,457,228 ("the '228 patent") are invalid under 35 U.S.C. § 103(a) as obvious over Motorola '306 in view of the teachings of U.S. Patent No. 4,875,038 ("Motorola '038) and /or as obvious over Motorola '306 in view of the teachings of Motorola '038 and U.S. Patent No. 5,644,568 ("Motorola '568). One of ordinary skill in the art, as of the priority date of the '228 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
1[pre]	A master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device comprising:	**Motorola '306 in view of the teachings of Motorola '038 discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device.** **For example, Motorola '306 discloses a communication device (e.g., "paging system[]" in which "information [is] transmitted on a common channel in a first and second modulation format").** "FIG. 1 is an electrical block diagram of a dual mode communication receiver of the present invention which overcomes the problems described, and which is compatible for use on existing paging systems, using existing paging signaling protocols. The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols." Col. 4:32-45. "A dual mode communication receiver a receiver for receiving information transmitted in a first and second modulation format on a common channel, a first demodulator for detecting information transmitted in the first modulation format, and a second demodulator, responsive to the information detected in the first modulation format, for detecting information transmitted in the second modulation format. A power conservation circuit is also provided for selectively supplying power to the first and second demodulators for enabling the detecting of the information transmitted in the first modulation format and the second modulation format, respectively." Abstract. "This invention relates to the field of communication receivers, and more particularly to a selective call communication receiver providing high speed data and voice communication with battery saving capability." Col. 1:10-13. "A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “FIG. 1 is an electrical block diagram of a dual mode communication receiver of the present invention which overcomes the problems described, and which is compatible for use on existing paging systems, using existing paging signaling protocols. The dual mode communication receiver of the present invention, enables the transmission of data at every high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the convention paging signaling protocols.” Col. 4:32-45. Fig. 1, reproduced below.  *FIG. 1*

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		Fig. 3, reproduced below.  FIG. 3 Fig. 4, reproduced below.

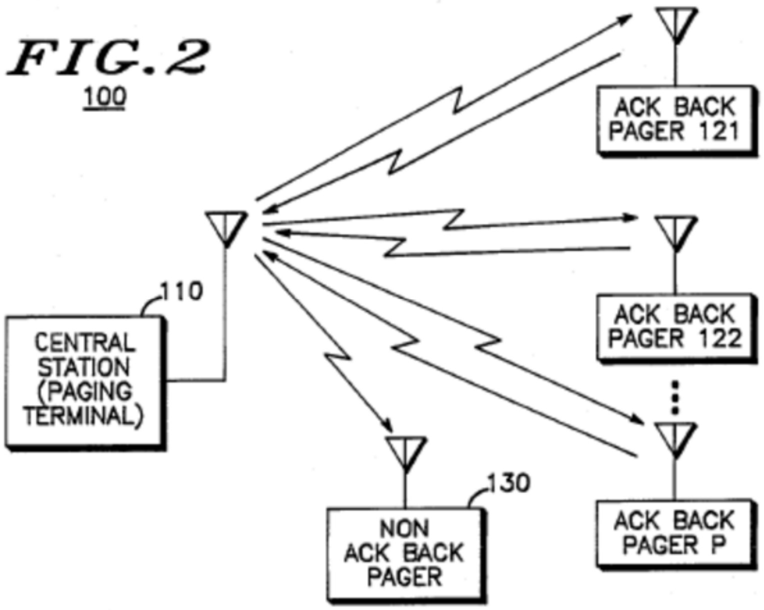
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 ***FIG. 4*** “FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein.” Col. 5:47-66.[1] *See also*, Col. 8:1-11:47.

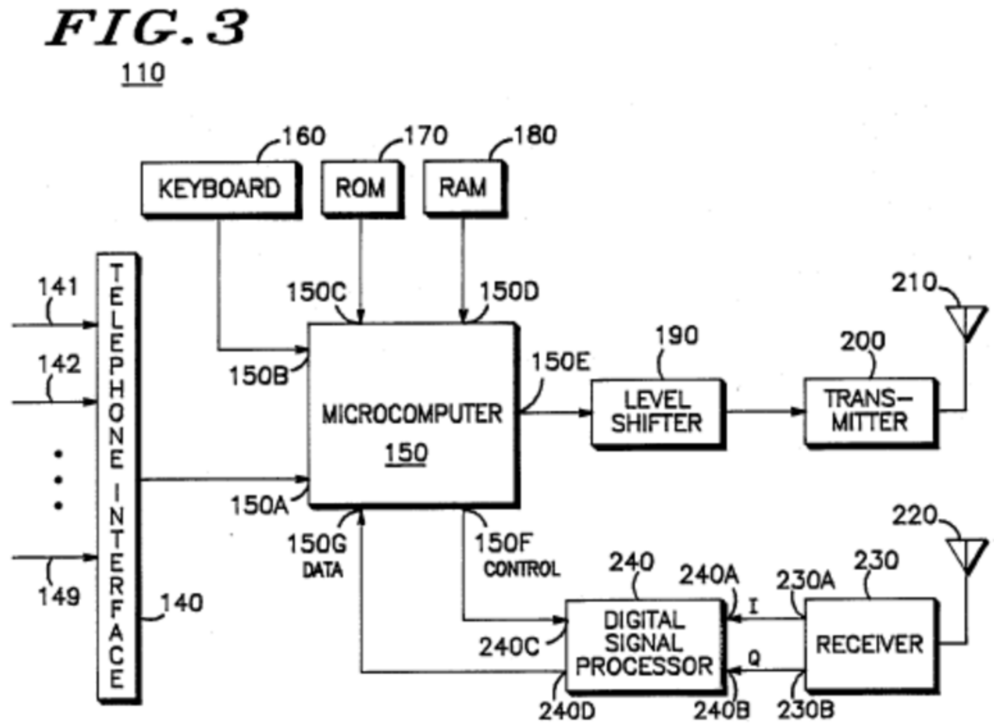
[1] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		“The second IF output signal, which now carries the high speed data information is coupled to the linear output section 3.24. The output of the linear output section 314 is coupled to the quadrature detector 350, specifically to the input of the third mixer 352. A third local oscillator also couples to the third mixer 352, which is preferably in the range of frequencies from 35-150 KHz, although it will be appreciated other frequencies may be utilized as well. The signal from the linear output section 3.24 is mixed with the third local oscillator signal 354, producing a third IF signal at the output of the third mixer 352, which is coupled to a third IF amplifier 356. The third IF amplifier is a low gain amplifier which buffers the output signal from the input signal. The third output signal is coupled to an I channel mixer 358 and a Q channel mixer 360. An I/Q oscillator 362 provides quadrature oscillator signals at the third IF frequency which arc mixed with the third output signals in the I channel mixer 358 and the Q channel mixer 360, to provide baseband I channel signals and Q channel signals at the mixer outputs. The baseband I channel signal is coupled to low pass filter 364, and the baseband Q channel signal is coupled to low pass filter 366, to provide a pair of baseband audio signals which represent a stream of information symbol pairs corresponding to the encoded high speed data information.” Col. 10:27-53. “The stream of information symbol pairs arc coupled to the digital storage section 368, in particular to the inputs of an analog to digital (AID) converter 370. The AID converter 370 samples the pair of information symbols at a rate at least twice the highest frequency component (in Hz) at the output of 364 and 366. For three kilohertz voice information encoded on the I and Q channels, the sampling rate is preferably six kilohertz per I and Q channel, or twelve kilohertz in total. It will be appreciated, the data sampling rate indicated is for example only, and other sampling rates may be used depending upon the rate at which the message information is originally encoded.” Col. 10:54-66. “During the batch during which the high speed data is transmitted, the microcomputer 106 provides a count enabling signal 106A which is coupled to the address counter 372. The AID converter 370 is also enabled to allow sampling of the information symbol pairs. The AID converter 370 generates high speed sample clock signals 370A which are used to clock the address counter 372 which in tum sequentially generates addresses for loading the sampled information symbol pairs into a dual port random access memory 374 through data lines 370B. The information symbol pairs which have been loaded at high speed into the dual port RAM 374 in real time, are processed by the microcomputer 106 after all high speed data has been received, thereby producing a significant reduction in the energy consumed by not requiring the microcomputer 106 to process the information in real time. The microcomputer 106 accesses the stored information symbol pairs through data lines 106C and address lines 106B, and in the preferred embodiment of the present invention, processes the information symbol pairs to generate either ASCII encoded information in the case of alphanumeric data having been transmitted, or CVSD encoded data in the case voice data was transmitted. Other data formats, such as a BCD data format for numeric messages or LPC encoded data format for voice messages, may be utilized as well. The ASCII encoded or CVSD encoded data is stored in the dual port RAM until the information is requested for presentation by the communication receiver user. The stored ASCII encoded data is recovered by the user using switches (not shown) to select and read the stored messages. When the stored ASCII encoded message is to be read, the user selects the message to be read and actuates a read switch which enables the microcomputer 106 to recover the data, and to present the recovered data

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		106E to a display 111, such as a liquid crystal display. When a CVSD encoded message is to be read, the user selects the message to be read and actuates the read switch which enables the microcomputer 106 to recover the data from the dual port RAM, and to present the recovered data 106E to the audio processor 114 which functions as a CVSD decoder, converting the digital voice information into an analog voice signal which is coupled to a speaker 116 for presentation of the voice message to the user. The microcomputer 106 can also generate a frequency selection signal 106H which is coupled to frequency synthesizer 310 to enable the selection of different operating frequencies as described above.” Cols. 10:67-11:47. “In a first embodiment of the present invention, a dual mode communication receiver comprises means for receiving information transmitted on a common channel in a first and second modulation format, a first means for detecting the information transmitted in the first modulation format on the common channel, and a second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Col. 2:14-22. “When used in simulcast transmission systems, standard FM modulation is not suitable for data transmission at high bit rates due to transmitter equalization problems. Because of the limitations of FM modulation for high speed message transmission, other forms of modulation, such as linear modulation techniques are required to provide for transmission at the higher data rates. While linear modulation techniques are available to provide the increased message transmission speeds, such modulation techniques generally are incompatible for use with existing receiver architectures, are incompatible with present day signaling protocols, and require significantly more current drain for operation than required for circuits receiving and demodulating existing signaling protocols transmitted using standard FM modulation techniques. There is a need to provide a receiver architecture which retains compatibility within existing FM modulated paging signaling protocols, thereby taking advantage of the battery saving capabilities of these existing paging signaling protocols. Furthermore, there is a need to provide a receiver architecture which includes linear demodulation for voice and high speed data capability, to provide the increased message throughput required for these ever expanding services, without compromising the battery saving performance of the existing paging signaling protocols.” Col. 1:54-2:11. “As has been described above, prior art communication systems, such as paging systems, have provided address and message transmission in a predetermined signaling protocol using a single modulation format.” Col. 3:36-39. “The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:45-57. “When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		speed data.” Col. 7:22-26. **Further, Motorola ’306 in view of the teachings of Motorola ’038 discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device.** **For example, as discussed above, Motorola ’306 discloses a communication device. Motorola ’038 further discloses a master/slave relationship and slave communications from a slave device (e.g., “ack-back pager[]”) to a master communication device (e.g., “central station 110”) in response to a master communication from a master communication device to a slave device.** “FIG. 2 is a simplified block diagram of the acknowledge back paging system 100 of the present invention. Paging system 100 includes a central station or paging terminal 110 which is capable of both transmitting outgoing paging signals and of receiving acknowledge back (ack-back) paging signals. Paging system 100 includes a plurality of ack-back pagers 121, 122 . . . P, wherein P is the total number of ack-back pagers in the pager population of system 100. Each of ack-back pagers 121, 122 . . . P has the capability of receiving paging signals from central station 110 and of permitting the pager user to respond to such paging signals. That is, pagers 121, 122 . . . P permit the user to reply or acknowledge back to a page from central station 110.” Col. 2:53-66. “Those skilled in the art will appreciate that T1 may have values greater than or less than 10 msec providing T1 is sufficiently long to permit the ackback receivers 121, 122 . . . P to synchronize to the paging signals transmitted by central station 110. Apparatus for synchronizing paging receivers to paging signals is well known to those skilled in the art and is included in ack-back pagers 121, 122 . . . P.” Col. 4:65-5:5. “The ack-back pager waits as per block 1270 for an ack-back field (time interval) before responding back to the central station 100 with the ack-back data provided by the pager user.” Col. 20:22-26. “Microcomputer output 150E is coupled via a level shifter 190 to the input of a transmitter 200. The output of transmitter 200 is coupled to an antenna 210 having dimensions and characteristics appropriate to the particular paging frequency channel selected for the operation of central station 110.” Col. 3:39-41.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		FIG. 2 

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 **Motorola '038 further discloses slave communication (e.g., communications sent in "response to message 1") from the slave device to the master communication device occurs in response to a master communication (e.g., "message 1") from the master communication device to the slave device.** "Paging system 100 includes a plurality of ack-back pagers 121, 122. . . P, wherein P is the total number of ack-back pagers in the pager population of system 100. Each of ack-back pagers 121, 122. . . P has the capability of receiving paging signals from central station 110 and of permitting the pager user to respond to such paging signals. That is, pagers 121, 122 . . . P permit the user to reply or ac knowledge back to a page from central station 110. It is noted that conventional non ack-back pagers such as pager 130 are also includable in system 100. In FIG. 2, double arrows between central station 110 and each of ack-back pagers 121, 122. . . P are used to denote that two way communication exists between central station 110 and such ack-back pagers. A single arrow denotes that only one way communication exists between station 110 and pager 130." Col. 2:58-3:6. "FIG. 4D is a time vs. event diagram of the status of receiver 230 in central station 110. Subsequent to time period

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		T4, receiver 230 at central station 110 is turned on to receive ack-back signals from the 20 pagers in the group of M during a time period T5.” Col. 6:37-41. “Referring to FIG. 4E, in conjunction with 4C, it is seen that the message 1 transmitted during time period T4 at 370 is received by pager AB-1 at 380 as shown in FIG. 4E. Pager AB-1 receives message 1 at 380 and matches message 1 to address 1. That is, by means later described in more detail, pager AB-1 is programmed to determine that message 1 is the particular message of the group of M messages which is intended for pager AB-1. Subsequent to reception and display of message 1 at 380 as shown in FIG. 4E, the user of pager AB-1 indicates his or her response to message 1 during a time period T6 at 385. Time period T6 is not drawn to scale with respect to the other time periods discussed. Time period T6 is sufficiently long to permit indication of a response by the pager user. Subsequent to time period T6, pagers AB-1, AB-2 . . . AB-M simultaneously transmit acknowledge back signals on respective frequency subbands (subchannels) back to central station 110 as at 390 during a time period T5. Subsequent to the ack-back transmission at 390, pagers AB-1, AB-2 . . . AB-M are placed in the "sleep state" until awakened again by a preamble as at 340. In an alternative embodiment of the invention, ack-back pagers AB-1 . . . AB-20 reply back automatically without action by the pager user. In such an embodiment, prior to being paged, the user preselects a reply already stored in the pager or keys into the pager a predetermined message which the pager uses as the ack back reply when it is later addressed by central station 110. For example, the ack-back pager user selects a “not available" response or otherwise keys into the pager a “not available” response when the pager user wishes to inform callers into central station 110 that the pager user is not taking any calls currently. Clearly, the reply data may be provided to the ack-back pagers in many different ways. In the case of a user selectable response already programmed into the pager, time period T6 can be arbitrarily short, that is just sufficiently long enough to permit transmission of such a selectable response whose length is predetermined and known to the microcomputer 150 in central station 110.” Col. 7:23-62. “For example, choice A when selected by the pager user could be a ‘Yes’ response to the caller's message. Choice B could be ‘No’ response. Choice C is a ‘Maybe’ response and Choice D is a ‘Cannot Reply Now’ response.” Col. 14:4-9. “Those skilled in the art will appreciate that other forms of modulation as well may be employed by acknowledge back pagers 121, 122-P to respond to the paging signals transmitted by central station 110. In such a PSK embodiment, central station 110 includes a receive antenna 220 for receiving the ackback signals transmitted by ack-back pagers 121, 122-P. In actual practice, antenna 210 may also be employed as antenna 220.” Col. 3:51-59. “The receiver portion of pager 121 is turned on and becomes synchronized with respect to the paging signals transmitted on the paging channel by central station 110.” Col. 19:9-12. “Accordingly, it is one object of the present invention is to provide a paging system in which the radio pager is capable of responding back to the paging terminal and the caller. Another object of the present invention is to provide a radio paging system in which a group of addressed pagers are capable of simultaneously transmitting ac knowledge back signals on a plurality of respective predetermined sub-

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		band frequencies. In one embodiment of the invention, an acknowledge back pager is provided which has a unique address associated therewith. The pager includes a receiver for receiving paging signals from a central station. Such paging signals include a batch of M pager addresses transmitted in a sequential order during a first time frame, wherein M is the number of pager addresses in the batch. The pager further includes a decoder, coupled to the receiver, for detecting the presence of the pager's address within the batch of M addresses. An address order determining apparatus is coupled to the decoder for determining the order of the pager's ad dress within the batch of M addresses. The pager further includes a sub-band transmitter for transmitting an acknowledge back signal on a selected one of a plurality of M predetermined frequency sub-bands, the selected one of the sub-bands exhibiting a predetermined relationship to the order of the address of the pager within the batch of M addresses.” Col. 1:44-2:3. *See also*, Col. 2:53-4:9. “Apparatus for synchronizing paging receivers to paging signals is well known to those skilled in the art and is included in ack-back pagers 121, 22. . . P.” Col. 5:2-5. “FIG. 4D is a time vs. event diagram of the status of receiver 230 in central station 110. Subsequent to time period T4, receiver 230 at central station 110 is turned on to receive ack-back signals from the 20 pagers in the group of M during a time period T5” Col. 6:37-41. “When pager AB-1 receives the preamble 340 during time period Tl, pager AB-1 is switched from a battery saving state to a fully operational state such that pager AB-1 is capable of receiving information transmitted thereto. That is, subsequent to reception of the preamble at 340, pager AB-1 is fully turned on such that pager AB-1 receives and decodes its address at 350 at the beginning of the T2 time period. In one embodiment of the invention, pager AB-1 conveniently returns to the "sleep state" for the remainder of the T2 time period during which pager addresses are transmitted. Prior to receiving the reference carrier FRX at time period T3, pager AB-1 is returned from the "sleep state" to the fully operational state. Upon reception of the reference carrier, FR at 360, pager AB-1 determines the frequency of such carrier in a manner described in more detail subsequently. Referring to FIG. 4E, in conjunction with 4C, it is seen that the message 1 transmitted during time period T4 at 370 is received by pager AB-1 at 380 as shown in FIG. 4E. Pager AB-1 receives message 1 at 380 and matches message 1 to address 1. That is, by means later described in more detail, pager AB-1 is programmed to determine that message 1 is the particular message of the group of M messages which is intended for pager AB-1. Subsequent to reception and display of message 1 at 380 as shown in FIG. 4E, the user of pager AB-1 indicates his or her response to message 1 during a time period T6 at 385. Time period T6 is not drawn to scale with respect to the other time periods discussed. Time period T6 is sufficiently long to permit indication of a response by the pager user. Subsequent to time period T6, pagers AB-1, AB-2 . . . AB-M simultaneously transmit acknowledge back signals on respective frequency subbands (subchannels) back to central station 110 as at 390 during a time period T5. Subsequent to the ack-back transmission at 390, pagers AB-1, AB-2 . . . AB-M are placed in the "sleep state" until awakened again by a preamble as at 340. In an alternative embodiment of the invention, ack-back pagers AB-1 . . .

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		AB-20 reply back automatically without action by the pager user. In such an embodiment, prior to being paged, the user preselects a reply already stored in the pager or keys into the pager a predetermined message which the pager uses as the ack back reply when it is later addressed by central station 110. For example, the ack-back pager user selects a "not available" response or otherwise keys into the pager a "not available" response when the pager user wishes to inform callers into central station 110 that the pager user is not taking any calls currently. Clearly, the reply data may be provided to the ack-back pagers in many different ways. In the case of a user selectable response already programmed into the pager, time period T6 can be arbitrarily short, that is just sufficiently long enough to permit transmission of such a selectable response whose length is predetermined and known to the microcomputer 150 in central station 110. FIG. 4F is a time versus event diagram of the status of ack-back pager AB-2, that is, the second pager addressed of the group of M ack-back pagers. Pager AB-2 receives the preamble at 340 and then switches from a "sleep state" to a fully turned on state. Pager AB-2 receives address 1 (the address of pager AB-1) at 350. Pager AB-2 decodes such address 1 at 350 and determines that the decoded address is not its own address. At 400, pager AB-2 receives its own address, namely address 2. Pager AB-2 decodes and determines that address 2 is its own address. As with pager AB-1 of FIG. 4E, pager AB-2 of FIG. 4F goes to the "sleep state" for the remainder of the T2 time period. Pager AB-2 "wakes up" in time for reception of the reference carrier FRX at 360 during time period T3. As seen by examining FIG. 4F in conjunction with FIG. 4C, pager AB-2 receives the AB-1 page data transmitted at 370 within time period T4. As explained in more detail subsequently, pager AB-2 determines that the AB-1 message data is not a match. That is, pager AB-2 determines that the pager AB-1 message data (message 1) is not intended for pager AB-2. After the end of message (EOM) marker following message 1, pager AB-2 receives the AB-2 message data (message 2) at 410 within time period T4. Pager AB-2 determines that the message 2 data at 410 is a match and that such message 2 data is intended for AB-2. The message 2 data is then displayed to the user of pager AB-2 who indicates an acknowledge back response to pager AB-2 during time period T6 at 415. During the subsequent time period T5, hhe acknowledge back message is sent to central station 110 on a second frequency sub-band different from the first frequency sub-band on which pager AB-1 transmits. Subsequent to transmission of the acknowledge back response at time period T5, pager AB-2 is caused to go to sleep. FIG. 4G is a time versus event diagram of the status of ack-back pager AB-M, the last of the group of M pagers to be addressed. Pager AB-M receives the preamble at 340 to switch it from a "battery saver state" to a fully operational state. Pager AB-M then receives the 19 addresses of the other pagers in the group of M, such as at 350 and 400 until finally pager AB-M receives and decodes its own address at 420. Pager AB-M is thus signaled that a message for it will be transmitted momentarily. Pager AB-M receives the reference carrier signal FRX at 360. Referring to FIG. 4G in conjunction with FIG. 4C, it is seen that pager AB-M receives message 1, message 2 . . . message M-1 and determines that all of these messages are not matches. That is, such page data messages are not intended for AB-M. Pager AB-M receives the page data message M transmitted at 430 (FIG. 4C) and received at 440 (FIG. 4G) within time period T4. Pager AB-M determines that such message M at 440 is intended for pager AB-M and displays the contents as such message M to the pager user. During time period T6 at 415, the pager user supplies ack-back pager AB-M with an acknowledge back response. During the subsequent time period T5, pager

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		AB-M sends such acknowledge back response back to the central station 110 on a frequency sub-band M at 450 different from the frequency sub-bands on which the remaining ack-back pagers AB-1, AB-2 . . . AB-(M-1) transmit. Subsequent to the transmission of the ack-back response at 450 during time period T5, pager AB-M switches to the "sleep state".” Col. 7:2-8:60. “After it is determined that the transmission of the group of M messages is complete as per block 670, flow continues to block 690 at which central station 110 pauses to permit the ack-back pager users which have received messages to key an appropriate response into their ack-back pagers for transmission subsequently back to central station 110. For example, such ack-back pagers may include a keyboard or a switch that is toggled by the message recipient to signify a yes or a no. It will be appreciated that it will take significantly less time for a user to toggle one key to indicate a predetermined response, for example a yes or a "canned message' (for example, I will call you back), than it would take for a user to key in a response on a keyboard or keypad situated on the pager. However, such keyboard or keypad embodiments of the ack-back pager herein are considered to be within the scope of the invention in that they provide alternative ways of indicating the user's response to the ack-back pager. After pausing to permit the addressed pager users to key in their responses, central station 110 simultaneously receives M ack-back signals from a group of M addressed pagers as per block 700. These ack-back responses are then provided to the appropriate corresponding callers via telephone interface 140. Flow then continues back to block 510 to permit other paging messages to be input into central station 110. FIG. 6 is a block diagram of one of ack-back pagers 121, 122 . . . P., namely ack-back pager 121. In one embodiment of the invention, ack-back pagers 121, 122 . . . P transmit acknowledge back signals on the same radio frequency as that on which central station 110 transmits although this is not necessarily a requirement of the system. That is, other embodiments of the invention are contemplated wherein the ack-back pagers transmit ack-back signals at frequencies other than within the spectrum of the paging channel employed by central station 110.” Col. 11:40-12:9. “Ack-back pager 121 includes a transmit/receive antenna 800 exhibiting an appropriate size and geometry to permit transmission and reception of radio frequency signals on the radio frequency paging channel on which central station 110 transmits and receives. Antenna 800 is coupled to a common port 10A of a transmit receive switch 810. Transmit/receive switch 810 includes a receive port 810B and a transmit port 810C in addition to the above mentioned antenna input port 810A.” Col. 12:40-48. “For example, choice A when selected by the pager user could be a “Yes” response to the caller's message. Choice B could be “No” response. Choice C is a “Maybe” response and Choice D is a “Cannot Reply Now” response.” Col. 14:4-9. “The reply data is then transmitted back to central station 110 by pager 121 during acknowledge back reply field 390 as shown in the acknowledge back protocol shown in FIG. 4E” Col. 14:22-25. “Each of the group of M pagers designated AB-1, AB-2 . . . AB-20, and in fact all of the pagers of the population of P acknowledge back pagers are capable of acknowledging back on any one of the M different frequency sub-bands.

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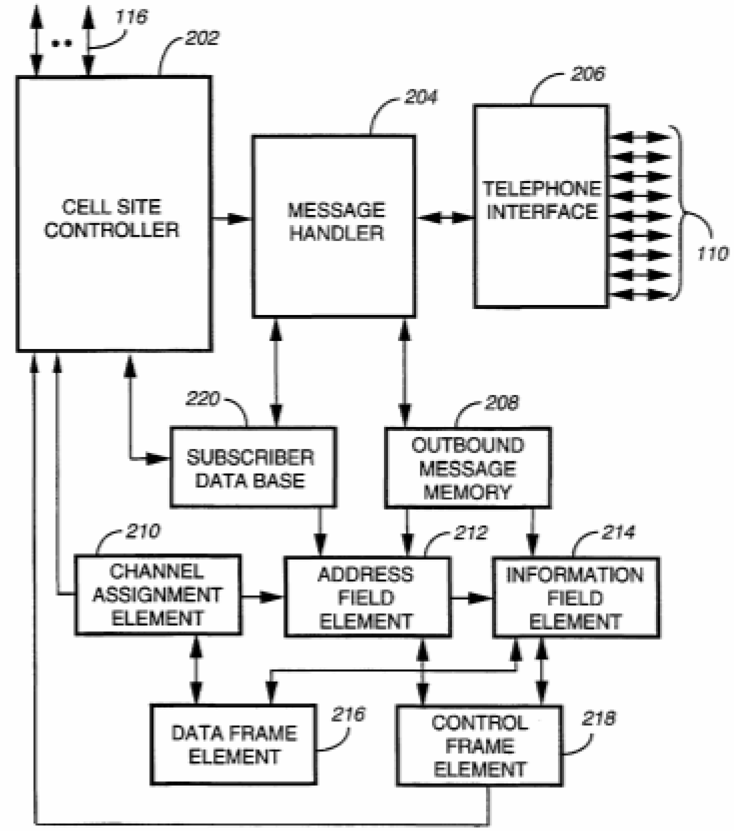
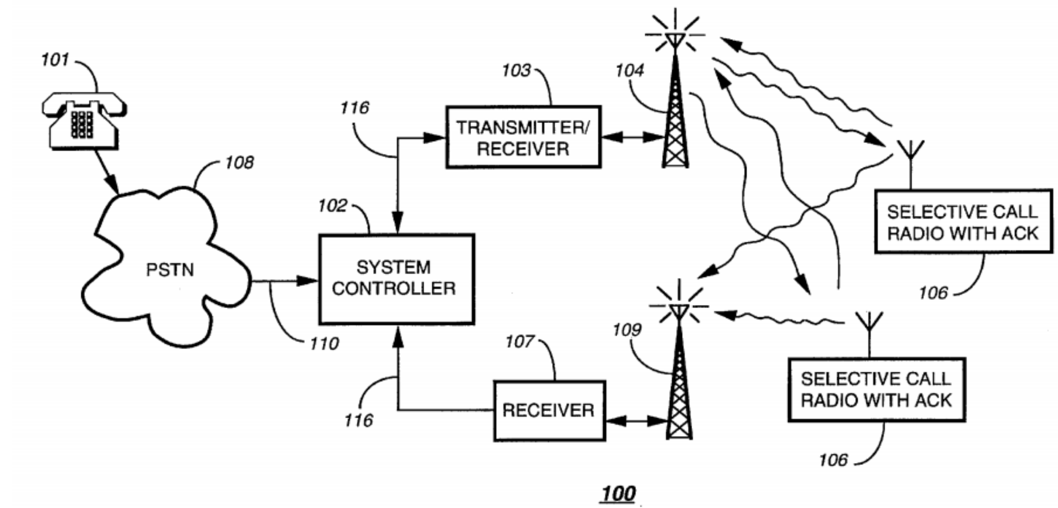
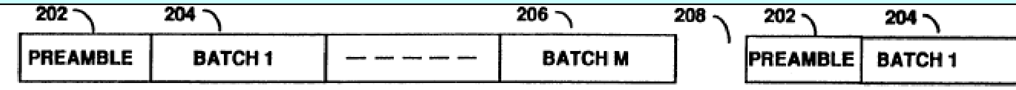
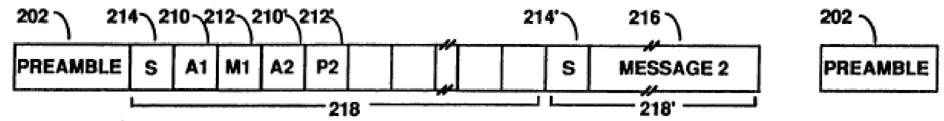
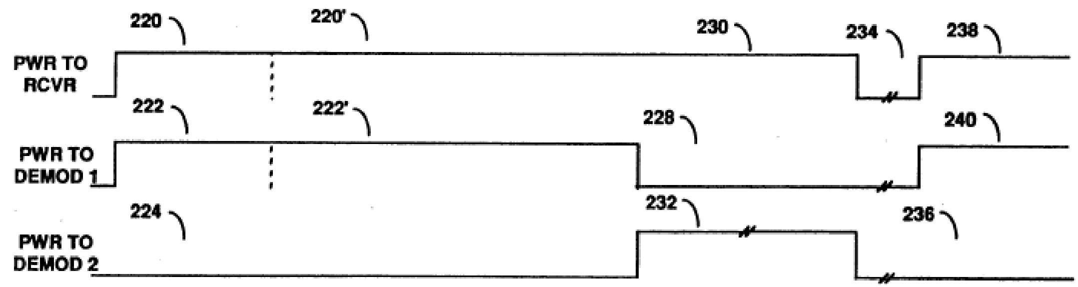
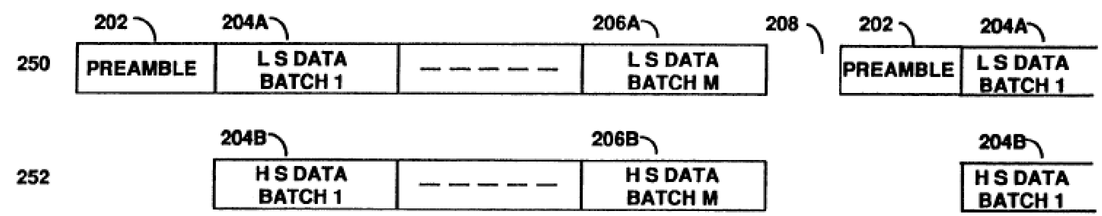
		That is, the control program stored within memory 910 is capable of directing microcomputer 820 and associated frequency synthesis circuitry later described to transmit acknowledge back signals on a selected one of the M or 20 different sub bands." Col. 14:59-68. "The receiver portion of pager 121 is turned on and becomes synchronized with respect to the paging signals transmitted on the paging channel by central station 110." Col. 19:9-12. "Ack-back data is supplied to microcomputer 820 by the pager user as per block 1260. The ack-back pager waits as per block 1270 for an ack-backfield (time interval) before responding back to the central station 100 with the ack-back data provided by the pager user. It was discussed earlier that M different sub-bands are available in the pager of the invention for transmission of ack-back signals. Each ack-back pager within a group of M addressed pagers responds back to the central station 110 on a different respective sub-band based on the value of the ADRCOUNT variable determined above for such pager as per block 1280" Col. 20:21-33. *See also*, Claims 1, 5, 8, 12, 18-21. **Alternatively, Motorola '306 in view of the teachings of Motorola '038 and Motorola '568 discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device.** **For example, Motorola '568 further discloses a master/slave relationship and slave communications from a slave device to a master communication device (e.g., "response messages") in response to a master communication from a master communication device to a slave device (e.g., "outbound message"):** "The system controller 102 also functions to digitally encode and schedule outbound messages, which can include such information as digitized audio messages, alphanumeric messages, and response commands, for transmission by the radio frequency transmitter/receivers 103 to a plurality of selective call radios 106. The system controller 102 further functions to decode inbound messages, including unsolicited and response messages, received by the radio frequency transmitter/receivers 103 and the fixed system receivers 107 from the plurality of selective call radios 106. Examples of response messages are acknowledgments and designated response messages. Designated response messages are communicated in the inbound channel in portions named data units. An acknowledgment is a response to an outbound message initiated at the system controller 102. An example of an outbound alphanumeric message intended for a selective call radio 106 is a page message entered from the telephone 101. The acknowledgment indicates successful reception of the outbound message." Col. 4:41-60. "It should be noted that the system controller 102 is capable of operating in a distributed transmission control environment that allows mixing conventional cellular, simulcast, master/slave, or other coverage schemes involving a plurality of radio frequency transmitter/receivers 103, conventional antennas 104, 109, and fixed system receivers 107, for providing reliable radio signals within a geographic area as large as a nationwide network. Moreover, as one

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		of ordinary skill in the art would recognize, the telephonic and selective call radio communication system functions may reside in separate system controllers 102 which operate either independently or in a networked fashion. It should also be noted that the radio frequency transmitter/receiver 103 may comprise the fixed system receiver 107 collocated with a conventional radio frequency transmitter." Col. 5:26-41. "The message handler 204 schedules outbound messages and the selective call addresses associated therewith within a transmission cycle. The message handler 204 also determines response schedules for response messages which minimize contention of messages at transmitter/receivers 103 and fixed system receivers 107, and includes response timing information in outbound messages so that selective call radios 106 will respond according to the response schedule." Col. 6:43-51. "Accordingly, in a third aspect of the present invention, a method is used in a system controller for generating a radio signal transmitted on a first radio channel. The radio signal has short and long messages included in a plurality of control frames and data frames. Each of the short and long messages has an address signal and related message information." Col. 2:66-3:5. "Referring to FIG. 2, an electrical block diagram of the system controller 102 is shown, in accordance with the preferred embodiment of the present invention. The system controller 102 comprises a cell site controller 202, a message handler 204, an outbound message memory 208, a subscriber data base 220, a telephone interface 206, a channel assignment element 210, an address field element 212, an information field element 214, a data frame element 216, and a control frame element 218. The cell site controller 202 is coupled to the radio frequency transmitter/receivers 103 (FIG. 1) and fixed system receivers 107 (FIG. 1) by the links 116. The cell site controller 202 couples outbound messages including selective call addresses to the transmitter/receivers 103 and controls the transmitter/receivers 103 to transmit transmission cycles which include the outbound messages. The cell site controller 202 also processes inbound messages from the selective call radios 106. The inbound messages are received by the transmitter/receivers 103 and fixed system receivers 107, and are coupled to the cell site controller 202. The message handler 204, which routes and processes messages, is coupled to the telephone interface 206, the subscriber data base 220, and the outbound message memory 208. The telephone interface 206 handles the switched telephone network 108 (PSTN) (FIG. 1) physical connection, connecting and disconnecting telephone calls at the telephone links 110, and routing the audio signals between the telephone links 110 and the message handler 204." Col. 6:1-28. Fig. 2, reproduced below.

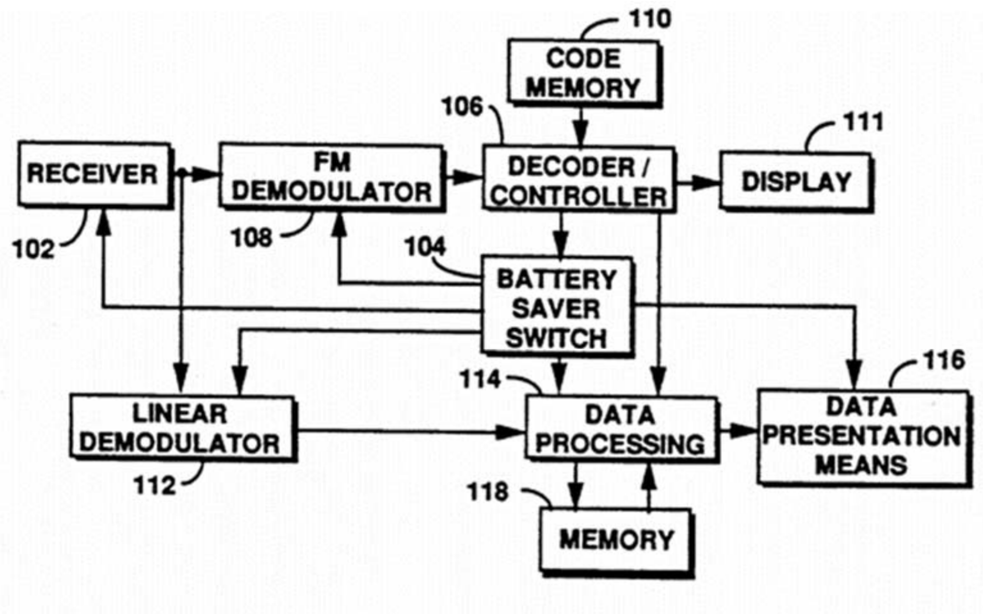
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 FIG. 2 102 Fig. 1, reproduced below.

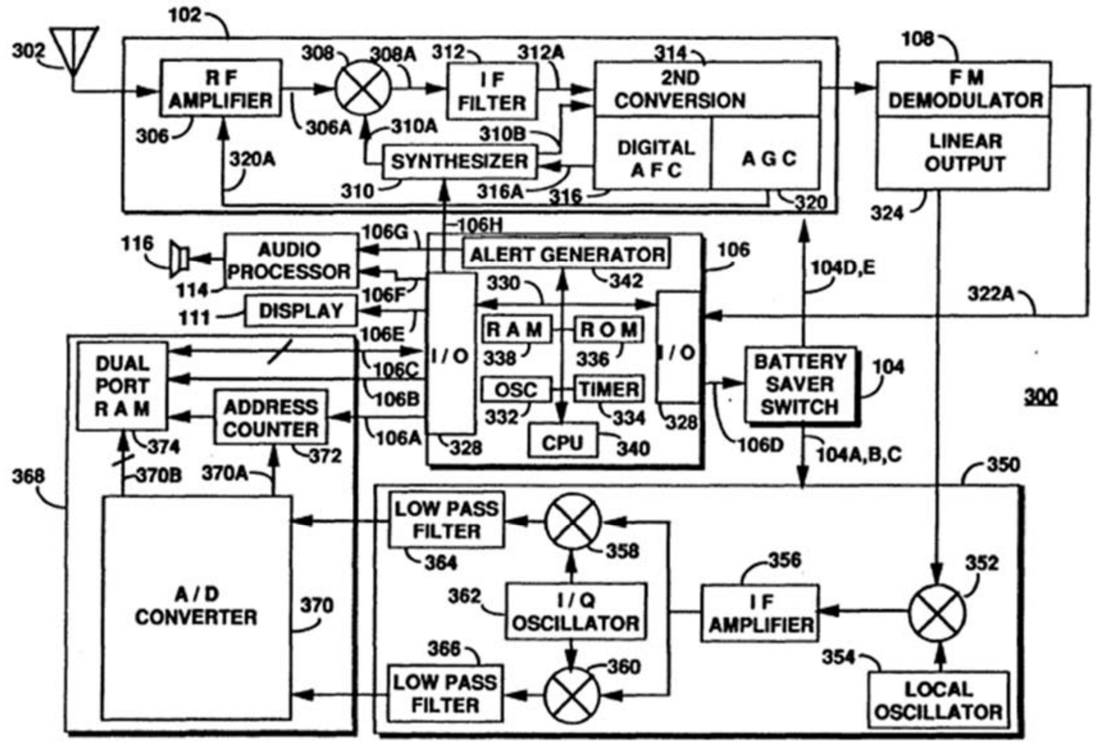
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 **FIG. 1**
1[a]	a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers,	**Motorola ’306 in view of the teachings of Motorola ’038 discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers.** *See* 1[pre] discussion of paging systems as communication device disclosed by **Motorola ’306**; ack-back pagers, central station 110, messages and responses to them as master and slave communications, respectively, disclosed by **Motorola ’038**, and outbound and response messages as master and slave communications, respectively, disclosed by **Motorola ’568.** **Motorola ’306 further discloses transmitting a first message over a communication medium (e.g., “RF”).** Figs. 2A-D, reproduced below.

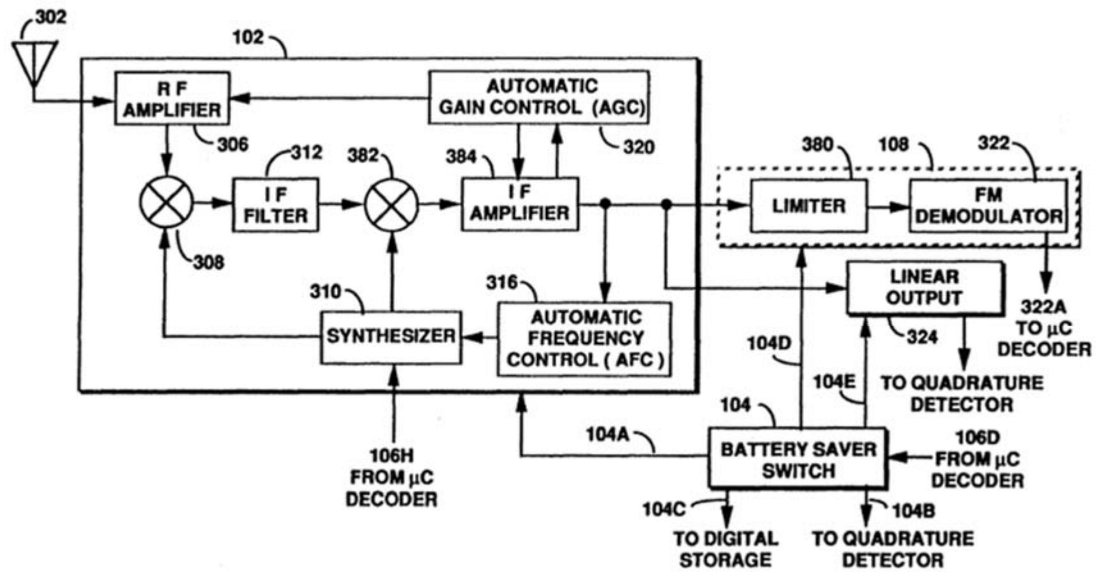
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 2A*  *FIG. 2B*  *FIG. 2C*  *FIG. 2D* “A dual mode communication receiver a receiver for receiving information transmitted in a first and second modulation format on a common channel, a first demodulator for detecting information transmitted in the first modulation format, and a second demodulator, responsive to the information detected in the first modulation format, for detecting information transmitted in the second modulation format. A power conservation circuit is also provided for selectively supplying power to the first and second demodulators for enabling the detecting of the information

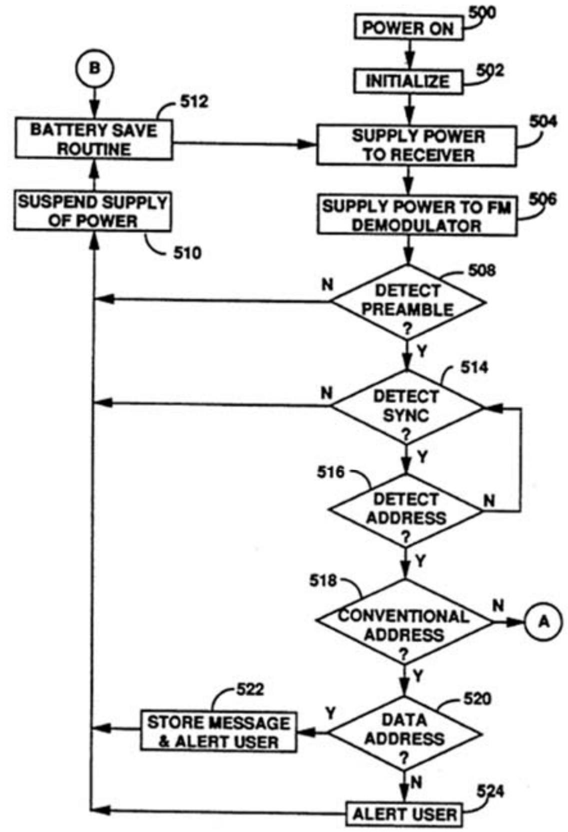
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		transmitted in the first modulation format and the second modulation format, respectively.” Abstract. “The transmitted information signal, modulated in the FM modulation format, or in a linear modulation format, is intercepted by the antenna 302 which couples the information signal to the receiver section 102, and in particular to the input of the radio frequency (RF) amplifier 306.” Col. 8:4-9. “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “This invention relates to the field of communication receivers, and more particularly to a selective call communication receiver providing high speed data and voice communication with battery saving capability.” Col. 1:10-13. “FIG. 1 is an electrical block diagram of a dual mode communication receiver of the present invention which overcomes the problems described, and which is compatible for use on existing paging systems, using existing paging signaling protocols. The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols.” Col. 4:32-45. “FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein.” Col. 5:47-66.[2] “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216.” Col. 6:19-22.

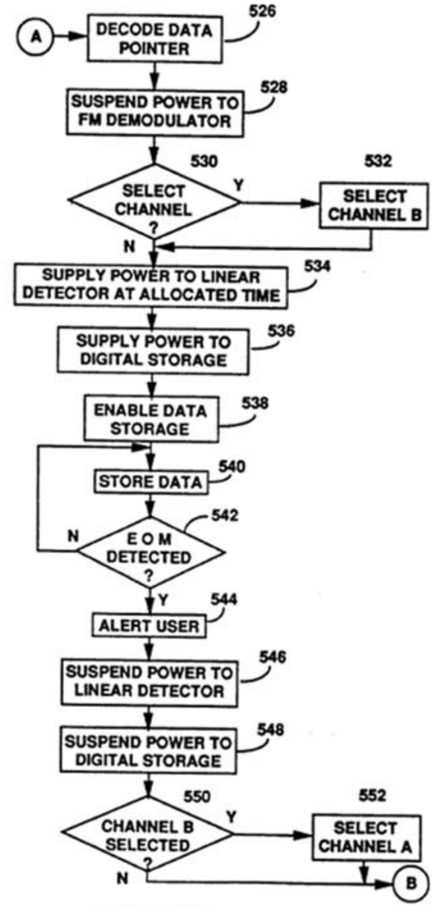
[2] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		"Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine." Col. 12:25-28. *See also*, Col. 8:1-11:47. Fig. 1, reproduced below.  FIG. 1 Fig. 3, reproduced below.

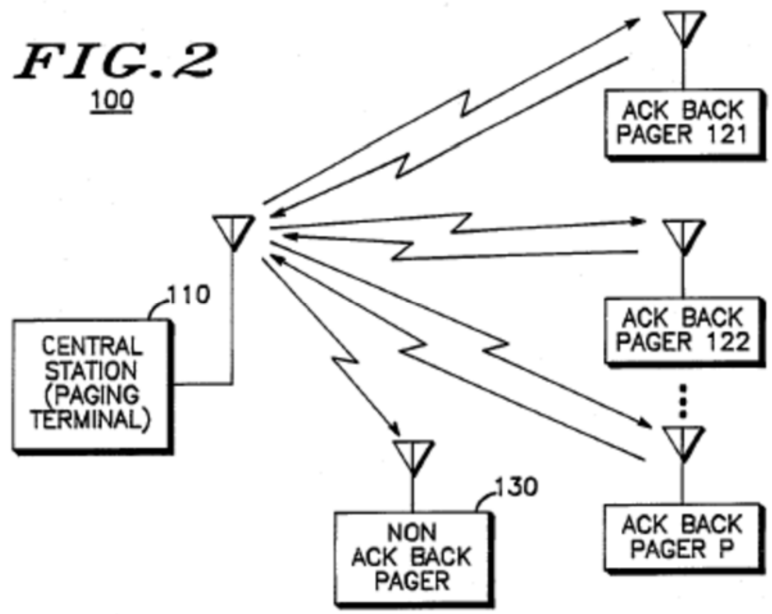
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 FIG. 3 Fig. 4, reproduced below.

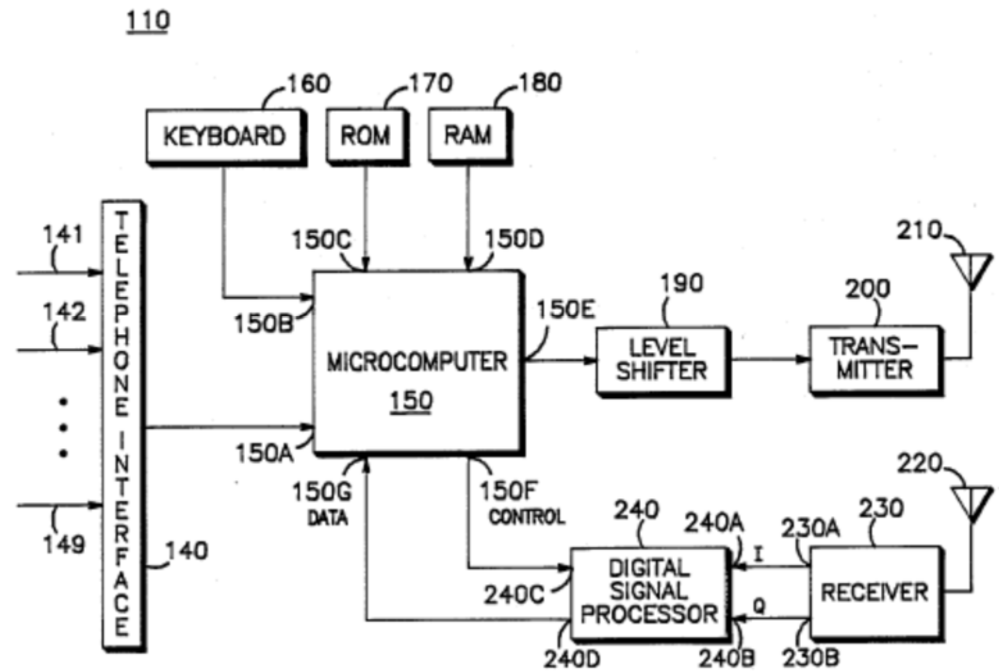
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 4* Figs. 5A-B, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 5A*

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 5B* “The transmission format is described in FIGS. 2A-2C, and will be described in detail below. The trans mission protocol of FIGS. 2A-2C enables the transmission of information which is modulated in a conventional FM modulation format, and further enables the transmission of message information which is modulated in a linear modulation format to enable high speed data transmission.” Col. 4:57-64.

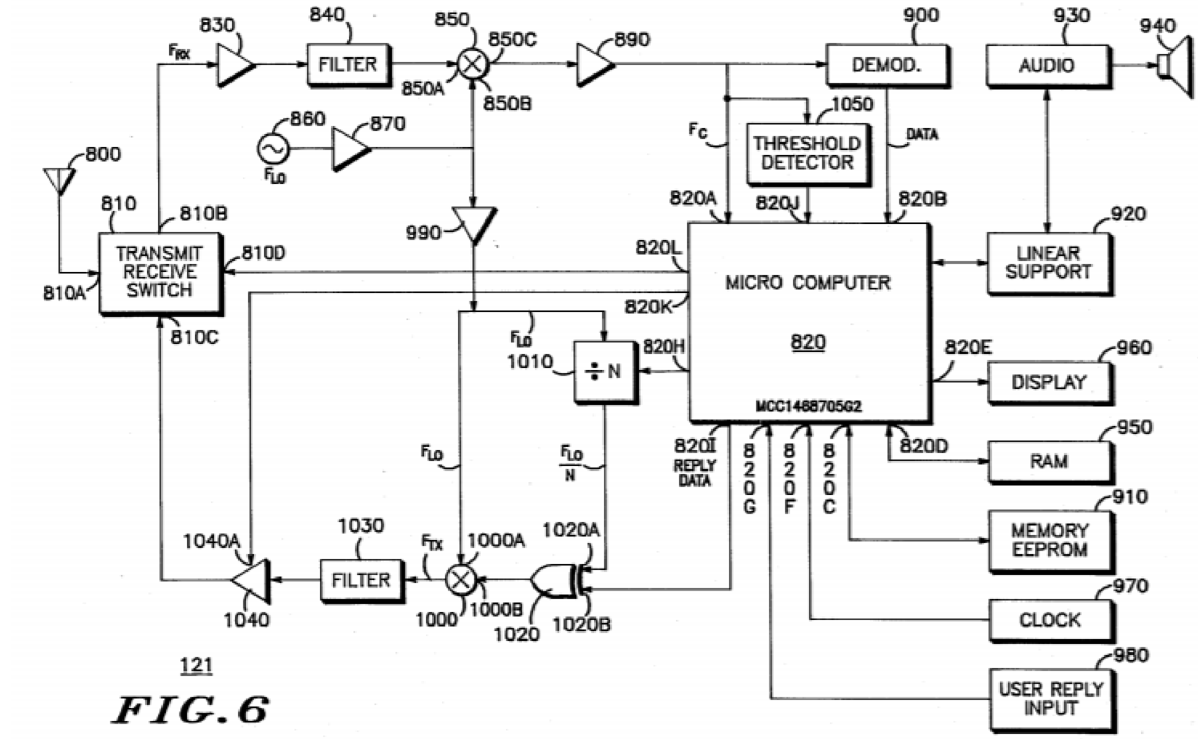
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		Alternatively, Motorola ’306 in view of the teachings of Motorola ’038 discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers. **For example, as discussed above, Motorola ’306 discloses a communication device. In addition, Motorola ’038 discloses a master transceiver (e.g., “central station 110”) configured to transmit a first message over a communication medium (e.g., “frequency subbands (subchannels)”).** “Paging system 100 includes a central station or paging terminal 110 which is capable of both transmitting outgoing paging signals and of receiving acknowledge back (ack-back) paging signals. . . . Each of ack-back pagers 121, 122 . . . P has the capability of receiving paging signals from central station 110 and of permitting the pager user to respond to such paging signals. That is, pagers 121, 122 . . . P permit the user to reply or acknowledge back to a page from central station 110.” Col. 2:58-66. “[T]he ackback receivers 121, 122 . . . P to synchronize to the paging signals transmitted by central station 110. Apparatus for synchronizing paging receivers to paging signals is well known to those skilled in the art and is included in ack-back pagers 121, 122 . . . P.” Col. 4:67-5:3. “Referring to FIG. 4E, in conjunction with 4C, it is seen that the message 1 transmitted during time period T4 at 370 is received by pager AB-1 at 380 as shown in FIG. 4E. Pager AB-1 receives message 1 at 380 and matches message 1 to address 1. That is, by means later described in more detail, pager AB-1 is programmed to determine that message 1 is the particular message of the group of M messages which is intended for pager AB-1. Subsequent to reception and display of message 1 at 380 as shown in FIG. 4E, the user of pager AB-1 indicates his or her response to message 1 during a time period T6 at 385. Time period T6 is not drawn to scale with respect to the other time periods discussed. Time period T6 is sufficiently long to permit indication of a response by the pager user. Subsequent to time period T6, pagers AB-1, AB-2 . . . AB-M simultaneously transmit acknowledge back signals on respective frequency subbands (subchannels) back to central station 110 as at 390 during a time period T5. Subsequent to the ack-back transmission at 390, pagers AB-1, AB-2 . . . AB-M are placed in the “sleep state” until awakened again by a preamble as at 340. In an alternative embodiment of the invention, ackback pagers AB-1 . . . AB-20 reply back automatically without action by the pager user. In such an embodiment, prior to being paged, the user preselects a reply already stored in the pager or keys into the pager a predetermined message which the pager uses as the ack back reply when it is later addressed by central station 110. For example, the ack-back pager user selects a “not available” response or otherwise keys into the pager a "not available" response when the pager user wishes to inform callers into central station 110 that the pager user is not taking any calls currently. Clearly, the reply data may be provided to the ack-back pagers in many different ways. In the case of a user selectable response already programmed into the pager, time period T6 can be arbitrarily short, that is just sufficiently long enough to permit transmission of such a selectable response whose length is predetermined and known to the microcomputer 150 in central station 110.” Col. 7:23-62. “Microcomputer output 150E is coupled via a level shifter 190 to the input of a transmitter 200. The output of

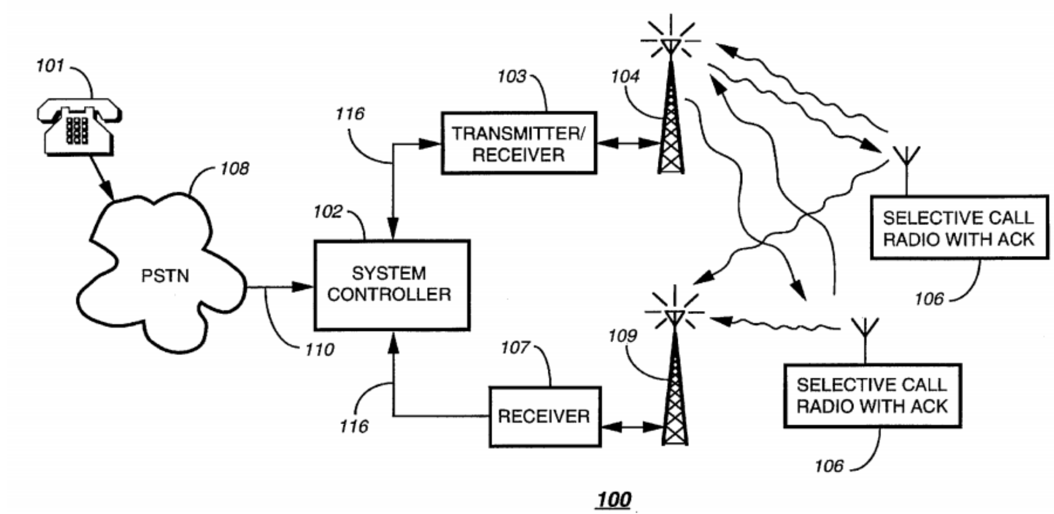
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		transmitter 200 is coupled to an antenna 210 having dimensions and characteristics appropriate to the particular paging frequency channel selected for the operation of central station 110.” Col. 3:39-41. “[C]entral station 110 includes a receive antenna 220 for receiving the ackback signals transmitted by ack-back pagers 121, 122-P. In actual practice, antenna 210 may also be employed as antenna 220.” Col. 3:56-59. FIG.2 

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		FIG. 3  “Accordingly, it is one object of the present invention is to provide a paging system in which the radio pager is capable of responding back to the paging terminal and the caller. Another object of the present invention is to provide a radio paging system in which a group of addressed pagers are capable of simultaneously transmitting ac knowledge back signals on a plurality of respective predetermined sub-band frequencies. In one embodiment of the invention, an acknowledge back pager is provided which has a unique address associated therewith. The pager includes a receiver for receiving paging signals from a central station. Such paging signals include a batch of M pager addresses transmitted in a sequential order during a first time frame, wherein M is the number of pager addresses in the batch. The pager further includes a decoder, coupled to the receiver, for detecting the presence of the pager's address within the batch of M addresses. An address order determining apparatus is coupled to the decoder for determining the order of the pager's ad dress within the batch of M addresses. The pager further includes a sub-band transmitter for transmitting an acknowledge back signal on a selected one of a plurality

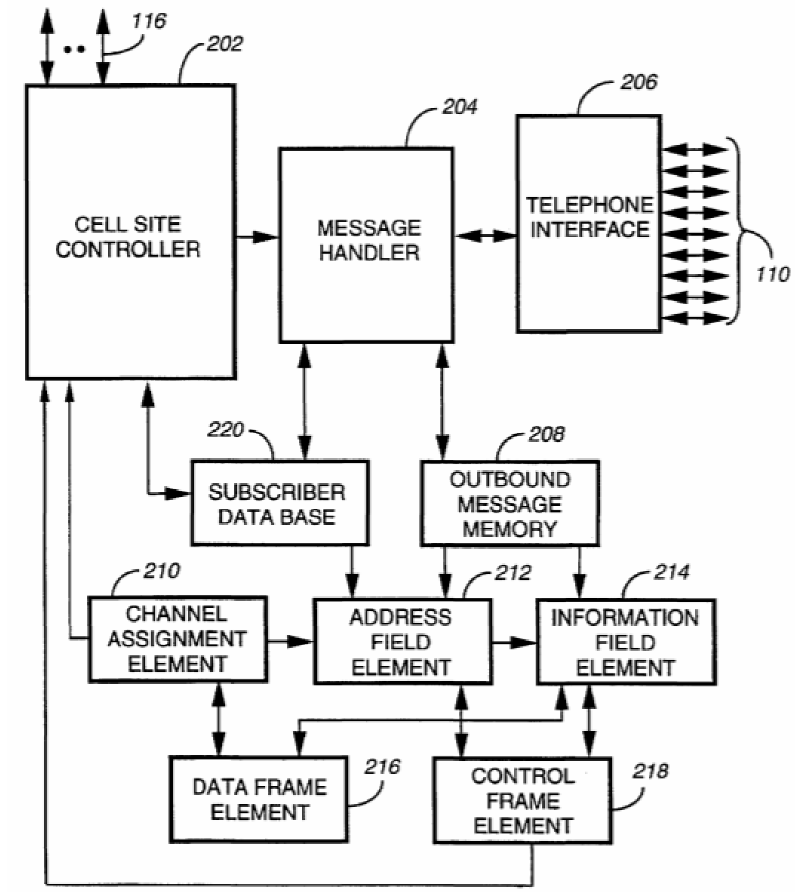
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		of M predetermined frequency sub-bands, the selected one of the sub-bands exhibiting a predetermined relationship to the order of the address of the pager within the batch of M addresses." Col. 1:44-2:3. *See also*, Col. 2:53-4:9. "Apparatus for synchronizing paging receivers to paging signals is well known to those skilled in the art and is included in ack-back pagers 121, 22. . . P." Col. 5:2-5. "FIG. 4D is a time vs. event diagram of the status of receiver 230 in central station 110. Subsequent to time period T4, receiver 230 at central station 110 is turned on to receive ack-back signals from the 20 pagers in the group of M during a time period T5" Col. 6:37-41. *See also*, Col. 7:2-8:60. "After it is determined that the transmission of the group of M messages is complete as per block 670, flow continues to block 690 at which central station 110 pauses to permit the ack-back pager users which have received messages to key an appropriate response into their ack-back pagers for transmission subsequently back to central station 110. For example, such ack-back pagers may include a keyboard or a switch that is toggled by the message recipient to signify a yes or a no. It will be appreciated that it will take significantly less time for a user to toggle one key to indicate a predetermined response, for example a yes or a "canned message' (for example, I will call you back), than it would take for a user to key in a response on a keyboard or keypad situated on the pager. However, such keyboard or keypad embodiments of the ack-back pager herein are considered to be within the scope of the invention in that they provide alternative ways of indicating the user's response to the ack-back pager. After pausing to permit the addressed pager users to key in their responses, central station 110 simultaneously receives M ack-back signals from a group of M addressed pagers as per block 700. These ack-back responses are then provided to the appropriate corresponding callers via telephone interface 140. Flow then continues back to block 510 to permit other paging messages to be input into central station 110. FIG. 6 is a block diagram of one of ack-back pagers 121, 122 . . . P., namely ack-back pager 121. In one embodiment of the invention, ack-back pagers 121, 122 . . . P transmit acknowledge back signals on the same radio frequency as that on which central station 110 transmits although this is not necessarily a requirement of the system. That is, other embodiments of the invention are contemplated wherein the ack-back pagers transmit ack-back signals at frequencies other than within the spectrum of the paging channel employed by central station 110." Col. 11:40-12:9. "Ack-back pager 121 includes a transmit/receive antenna 800 exhibiting an appropriate size and geometry to permit transmission and reception of radio frequency signals on the radio frequency paging channel on which central station 110 transmits and receives. Antenna 800 is coupled to a common port 10A of a transmit receive switch 810. Transmit/receive switch 810 includes a receive port 810B and a transmit port 810C in addition to the above mentioned antenna input port 810A." Col. 12:40-48. "For example, choice A when selected by the pager user could be a "Yes" response to the caller's message. Choice B

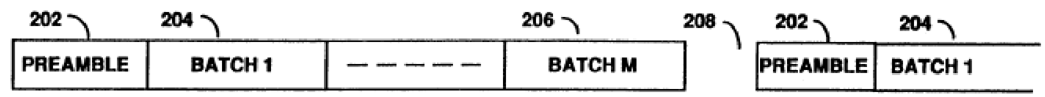
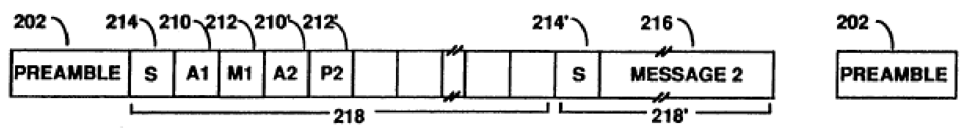
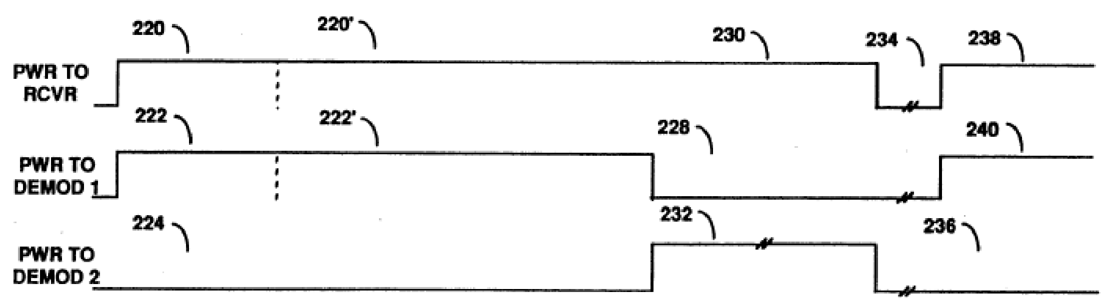
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		could be “No” response. Choice C is a “Maybe” response and Choice D is a “Cannot Reply Now” response.” Col. 14:4-9. “The reply data is then transmitted back to central station 110 by pager 121 during acknowledge back reply field 390 as shown in the acknowledge back protocol shown in FIG. 4E” Col. 14:22-25. “Each of the group of M pagers designated AB-1, AB-2 . . . AB-20, and in fact all of the pagers of the population of P acknowledge back pagers are capable of acknowledging back on any one of the M different frequency sub-bands. That is, the control program stored within memory 910 is capable of directing microcomputer 820 and associated frequency synthesis circuitry later described to transmit acknowledge back signals on a selected one of the M or 20 different sub bands.” Col. 14:59-68. “The receiver portion of pager 121 is turned on and becomes synchronized with respect to the paging signals transmitted on the paging channel by central station 110.” Col. 19:9-12. “Ack-back data is supplied to microcomputer 820 by the pager user as per block 1260. The ack-back pager waits as per block 1270 for an ack-backfield (time interval) before responding back to the central station 100 with the ack-back data provided by the pager user. It was discussed earlier that M different sub-bands are available in the pager of the invention for transmission of ack-back signals. Each ack-back pager within a group of M addressed pagers responds back to the central station 110 on a different respective sub-band based on the value of the ADRCOUNT variable determined above for such pager as per block 1280” Col. 20:21-33. *See also*, Claims 1, 5, 8, 12, 18-21. Fig. 6, reproduced below.

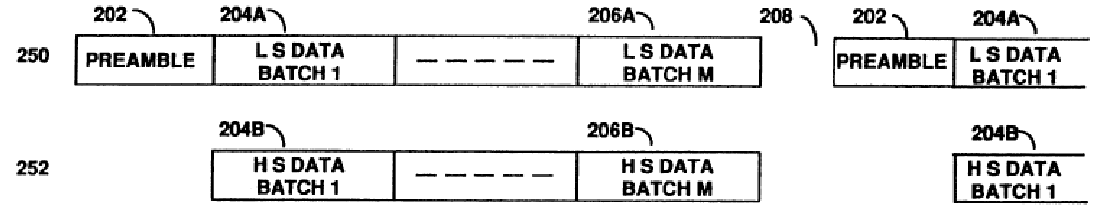
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 121 ***FIG. 6*** **Alternatively, Motorola '306 in view of the teachings of Motorola '038 and Motorola '568 discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers.** **For example, Motorola '568 discloses a master transceiver (e.g., "system controller 102") configured to transmit a first message over a communication medium (e.g., "radio frequency").** "The system controller 102 also functions to digitally encode and schedule outbound messages, which can include such information as digitized audio messages, alphanumeric messages, and response commands, for transmission by the radio frequency transmitter/receivers 103 to a plurality of selective call radios 106. The system controller 102 further functions to decode inbound messages, including unsolicited and response messages, received by the radio frequency transmitter/receivers 103 and the fixed system receivers 107 from the plurality of selective call radios 106. Examples of response messages are acknowledgments and designated response messages. Designated response messages are communicated in the inbound channel in portions named data units. An acknowledgment is a response

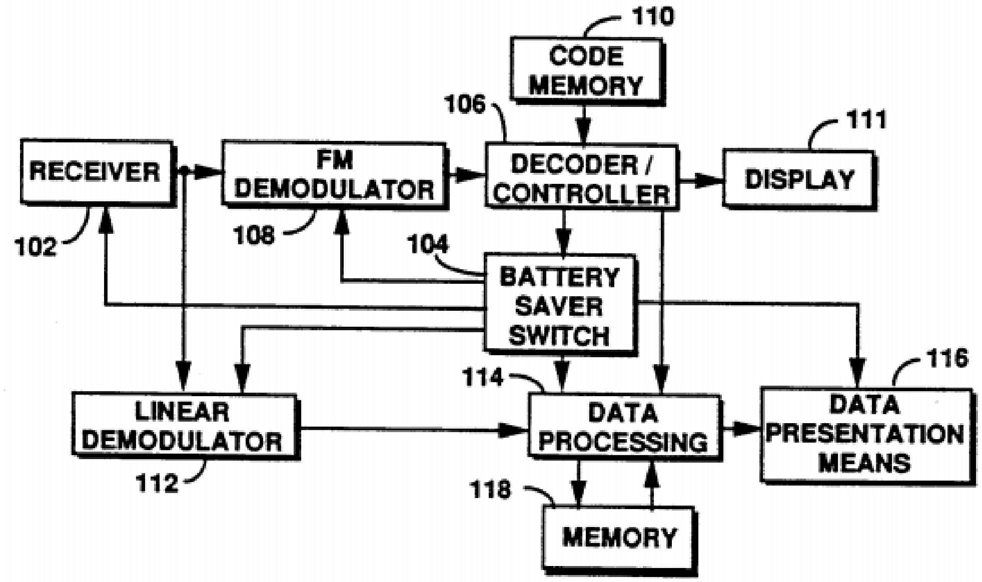
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		to an outbound message initiated at the system controller 102. An example of an outbound alphanumeric message intended for a selective call radio 106 is a page message entered from the telephone 101. The acknowledgment indicates successful reception of the outbound message.” Col. 4:41-60. “It should be noted that the system controller 102 is capable of operating in a distributed transmission control environment that allows mixing conventional cellular, simulcast, master/slave, or other coverage schemes involving a plurality of radio frequency transmitter/receivers 103, conventional antennas 104, 109, and fixed system receivers 107, for providing reliable radio signals within a geographic area as large as a nationwide network. Moreover, as one of ordinary skill in the art would recognize, the telephonic and selective call radio communication system functions may reside in separate system controllers 102 which operate either independently or in a networked fashion. It should also be noted that the radio frequency transmitter/receiver 103 may comprise the fixed system receiver 107 collocated with a conventional radio frequency transmitter.” Col. 5:26-41. “The message handler 204 schedules outbound messages and the selective call addresses associated therewith within a transmission cycle. The message handler 204 also determines response schedules for response messages which minimize contention of messages at transmitter/receivers 103 and fixed system receivers 107, and includes response timing information in outbound messages so that selective call radios 106 will respond according to the response schedule.” Col. 6:43-51. Fig. 1, reproduced below.  *FIG. 1* “Accordingly, in a third aspect of the present invention, a method is used in a system controller for generating a

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		radio signal transmitted on a first radio channel. The radio signal has short and long messages included in a plurality of control frames and data frames. Each of the short and long messages has an address signal and related message information." Col. 2:66-3:5. "Referring to FIG. 2, an electrical block diagram of the system controller 102 is shown, in accordance with the preferred embodiment of the present invention. The system controller 102 comprises a cell site controller 202, a message handler 204, an outbound message memory 208, a subscriber data base 220, a telephone interface 206, a channel assignment element 210, an address field element 212, an information field element 214, a data frame element 216, and a control frame element 218. The cell site controller 202 is coupled to the radio frequency transmitter/receivers 103 (FIG. 1) and fixed system receivers 107 (FIG. 1) by the links 116. The cell site controller 202 couples outbound messages including selective call addresses to the transmitter/receivers 103 and controls the transmitter/receivers 103 to transmit transmission cycles which include the outbound messages. The cell site controller 202 also processes inbound messages from the selective call radios 106. The inbound messages are received by the transmitter/receivers 103 and fixed system receivers 107, and are coupled to the cell site controller 202. The message handler 204, which routes and processes messages, is coupled to the telephone interface 206, the subscriber data base 220, and the outbound message memory 208. The telephone interface 206 handles the switched telephone network 108 (PSTN) (FIG. 1) physical connection, connecting and disconnecting telephone calls at the telephone links 110, and routing the audio signals between the telephone links 110 and the message handler 204." 6:1-28. Fig. 2, reproduced below.

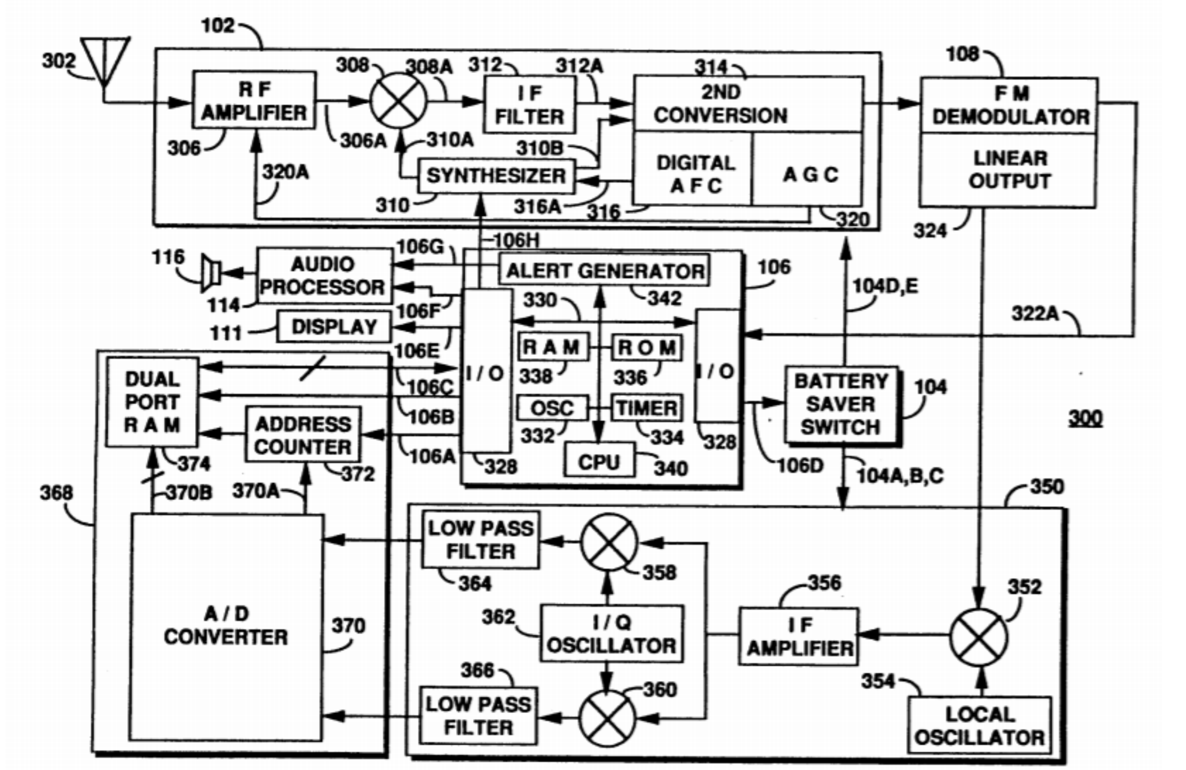
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 2*
1[b]	wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method,	**Motorola ’306 in view of the teachings of Motorola ’038 discloses wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers.**

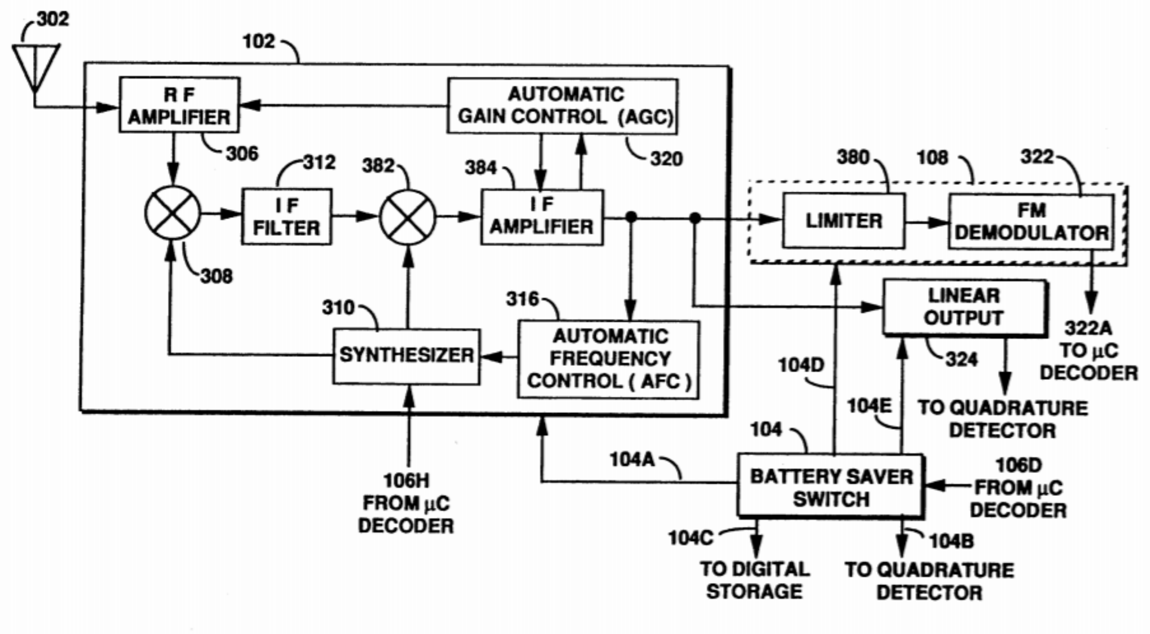
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
	wherein the second information comprises data intended for one of the one or more slave transceivers and	*See* 1[pre] discussion of paging systems as communication device disclosed by **Motorola ’306**; ack-back pagers, central station 110, messages and responses to them as master and slave communications, respectively, disclosed by **Motorola ’038**, and outbound and response messages as master and slave communications, respectively, disclosed by **Motorola ’568**; *see also* **For example, Motorola ’306 discloses a “first message” including “first information” (e.g., “address 210”) comprising address information (e.g., “address 210”).** Figs. 2A-D, reproduced below.  *FIG. 2A*  *FIG. 2B*  *FIG. 2C*

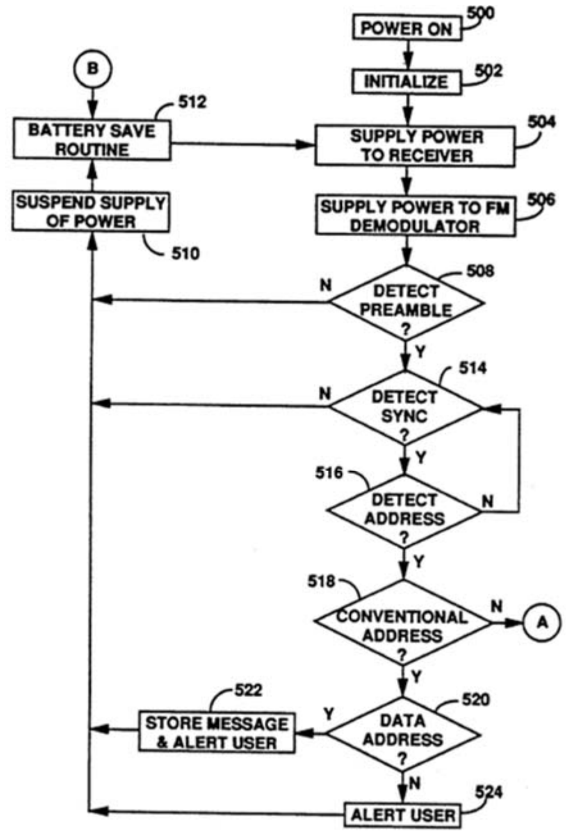
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 2D* “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmitted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of address and/or message information code words, which, as for example, is sixteen. As shown, the address 210 of a first receiver and the associated message 212 are transmitted, followed by the address 210' of a second receiver and the associated message 212', and so forth. Message 212' for the second receiver is not a normal message information code word, but is a predetermined "batch" pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'. As shown, batch 218' contains the high speed message information 216 which is modulated in a linear modulation format. Batch 218' begins with the synchronization code word 214' which is used to signal the start of the message information, as will be described below.” Col. 6:19-48. **Motorola ’306 discloses that both the “first” (e.g., “address 210”) and the “second information” (e.g., “message 212”) are modulated using the first modulation method (e.g., “frequency shift keyed FM”).** “Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine.” Col. 12:25-28. Fig. 1, reproduced below.

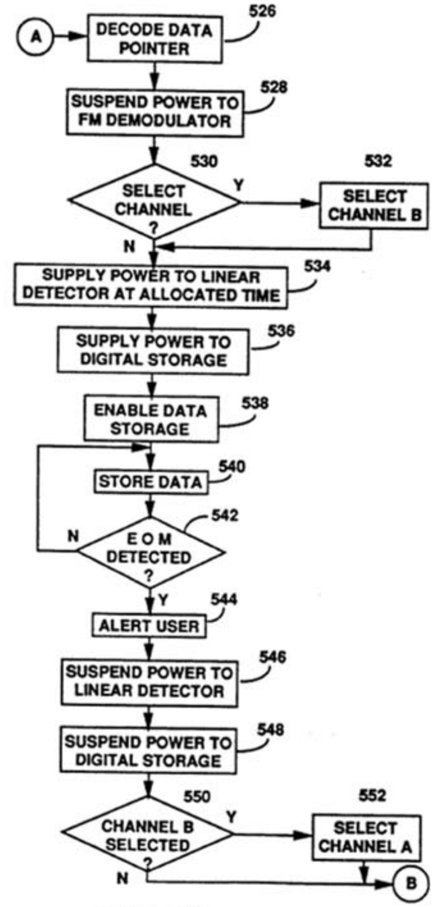
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 1* “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “The dual mode selective call receiver according to claim 1, wherein the first modulation format is frequency shift keyed FM modulation.” Claim 2. “While linear modulation techniques are available to provide the increased message transmission speeds, such modulation techniques generally are incompatible for use with existing receiver architectures, are incompatible with present day signaling protocols, and require significantly more current drain for operation than required for circuits receiving and demodulating existing signaling protocols transmitted using standard FM modulation techniques. There is a need to provide a receiver architecture which retains compatibility within existing FM modulated paging signaling protocols, thereby taking advantage of the battery saving capabilities of these existing paging signaling protocols. Furthermore, there is a need to provide a receiver architecture which includes linear demodulation for voice and high speed data capability, to provide the increased message throughput required for these ever expanding

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		services, without compromising the battery saving performance of the existing paging signaling protocols.” Col. 1:61-32. “The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:36-57. “Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions” Col. 7:13-17. “After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Col. 13:4-9. Fig. 3, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 3* Fig. 4, reproduced below.

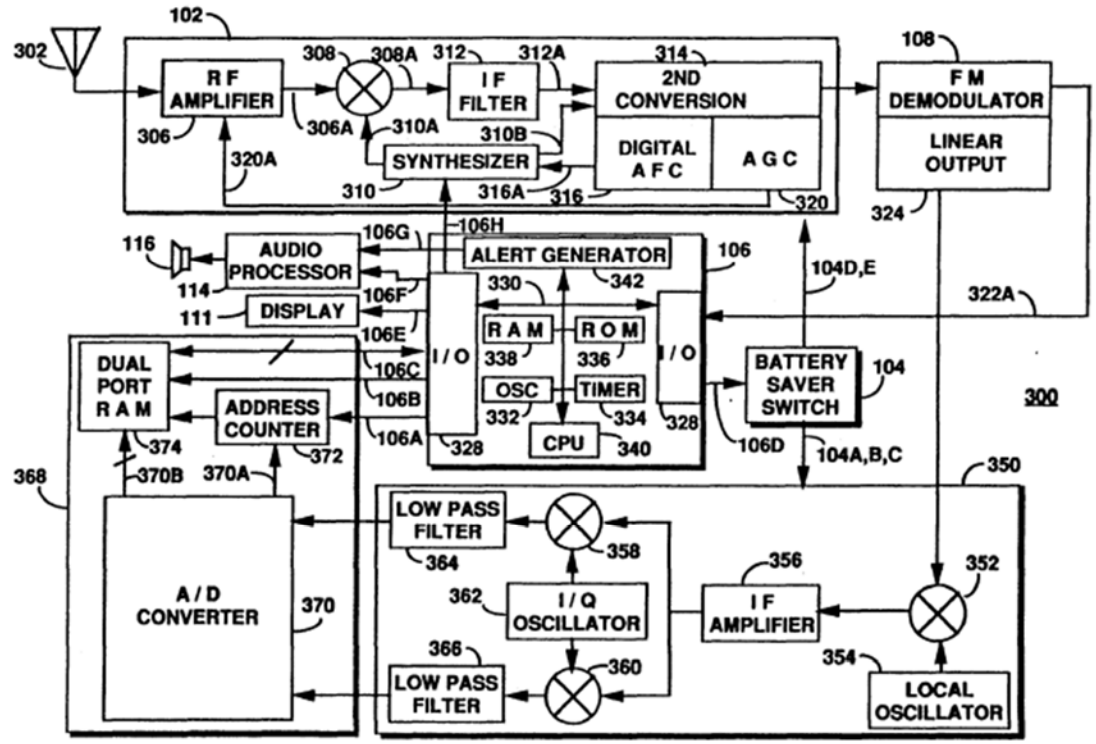
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 4* "As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art." Col. 5:49-60. "When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520,

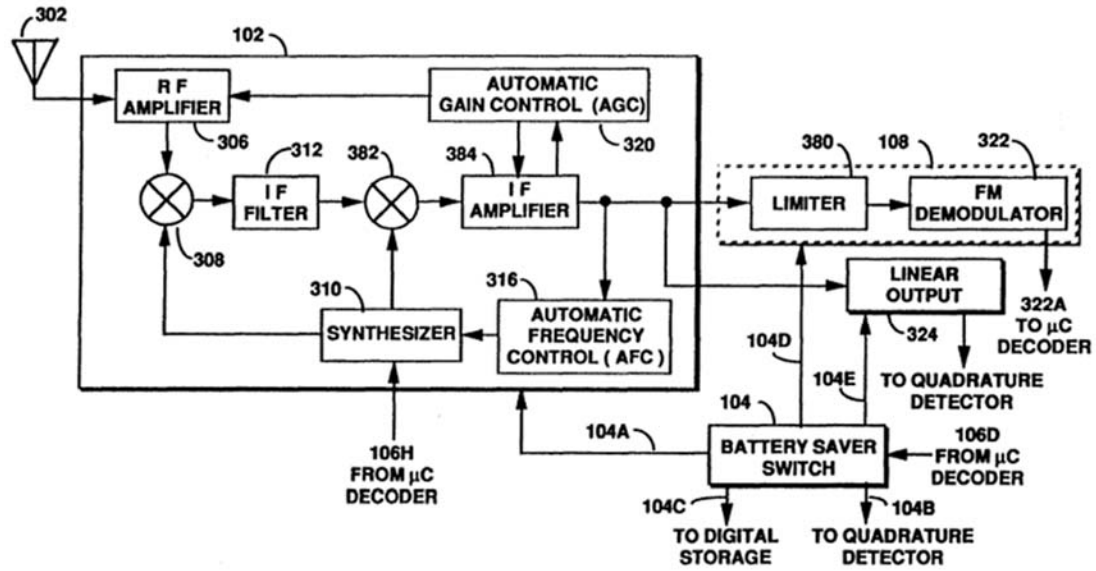
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		the user is alerted to indicate a page was received.” Col. 12:59-13:4. Figs. 5A-B.  *FIG. 5A*

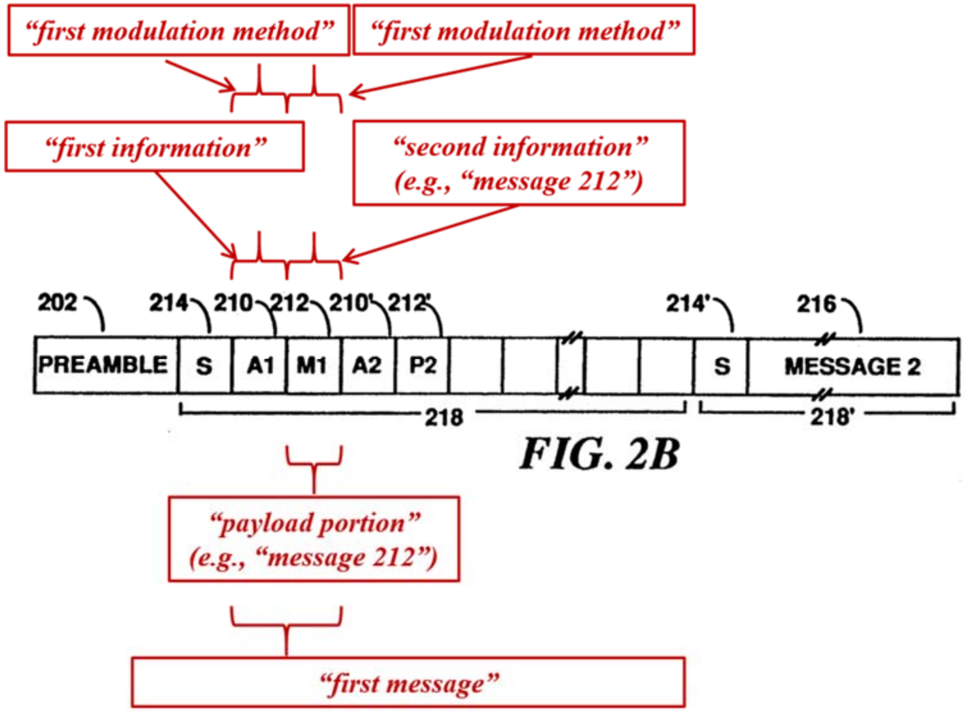
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 5B* “A code memory 110 is provided which couples to the decoder/controller 106, and which stores address information assigned to the dual mode communication receiver. When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below.” Col. 5:6-13. “A code memory 110 (not shown in FIG. 3) couples to microcomputer 106 through the I/O port 328. The code memory is preferably an EEPROM (Electrically Erasable Programmable Read Only Memory) which stores one or

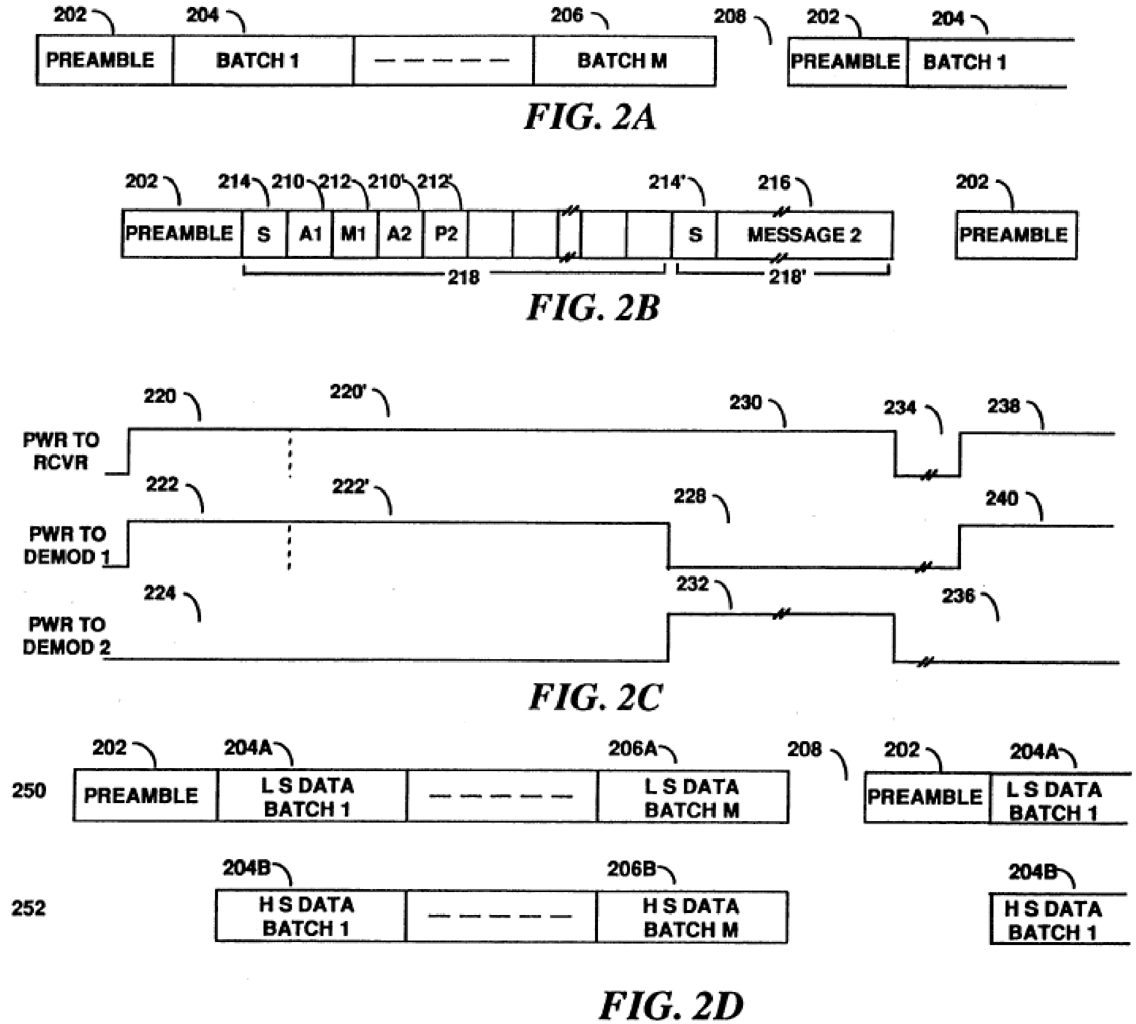
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		more predetermined addresses to which communication receiver 300 is responsive. Col. 9:50-56. “When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the recovered message information is received and stored in the microcomputer RAM 338, or in the digital storage section 368, as will be explained in further detail below, and an alerting signal 106G is generated by alert generator 342.” Col. 9:60-10:4. “SUMMARY OF THE INVENTION” Col. 2:13. “In a first embodiment of the present invention, a dual mode communication receiver comprises means for receiving information transmitted on a common channel in a first and second modulation format, a first means for detecting the information transmitted in the first modulation format on the common channel, and a second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Col. 2:14-22. “In a second embodiment of the present invention, a dual mode communication receiver comprises means for receiving information transmitted on a common channel in a first and second modulation format: first means for detecting the information transmitted in the first modulation format on the common channel and second means, responsive to the information detected in the first modulation format, for receiving the information transmitted in the second modulation format. A third means supplies power to the receiving means for enabling the receiving of the information transmitted in the first and second modulation formats, supplies power to the first means for enabling the detecting of the information transmitted in the first modulation format, and further in response to the information received and detected in the first modulation format, supplies power to the second means for enabling the detecting of the information transmitted in the second modulation format.” Col. 2:23-42. “In a third embodiment of the present invention, a dual mode communication receiver comprises a means for receiving information transmitted in a FM modulation format and a linear modulation format. A first means for detecting detects the information transmitted in the FM modulation format, and second means for detecting, responsive to the information detected in the FM modulation format, detects the information transmitted in the linear modulation format.” Col. 2:43-51. “In a fourth embodiment of the present invention, a dual mode communication receiver comprises a means for receiving information transmitted in a FM modulation format and a linear modulation format. A first means for detecting detects the information transmitted in the FM modulation format, and a second means for detecting, responsive to the information detected in the FM modulation format, detects the information transmitted in the linear modulation format. A third means supplies power to the receiving means for enabling the receiving of the information transmitted in the FM and linear modulation formats. The third means further supplies power to the first means for enabling the detecting of the information transmitted in the FM modulation format, and the third means further in response to the information detected in the FM modulation format, supplies power to the second means for

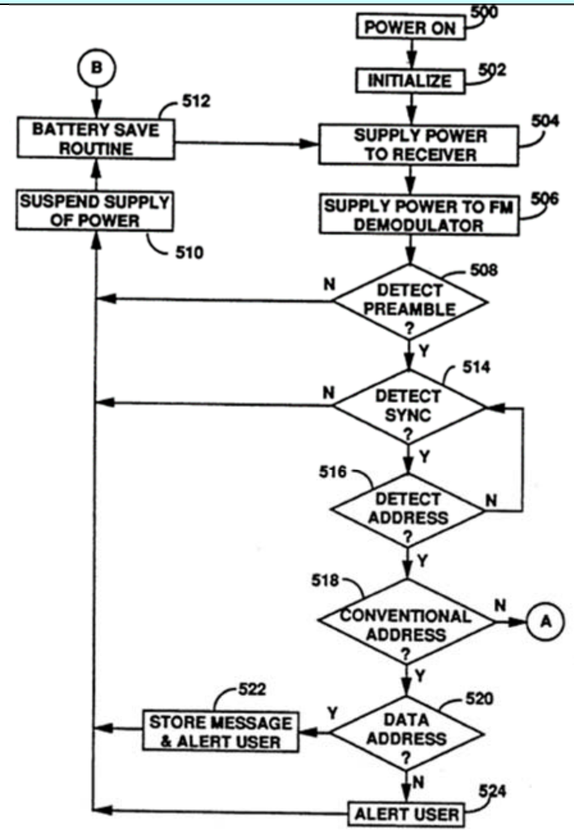
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		enabling the detecting of the information transmitted in the linear modulation format.” Col. 1:61-3:2. “The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:36-57. “As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format.” Col. 5:49-60. “Power is again supplied to the receiver section during time interval 238, and to the FM demodulator, during time interval 240, to again enable reception of the message information in the next sequence of message batch transmissions.” Col. 7:13-17. “After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Col. 13:4-9.

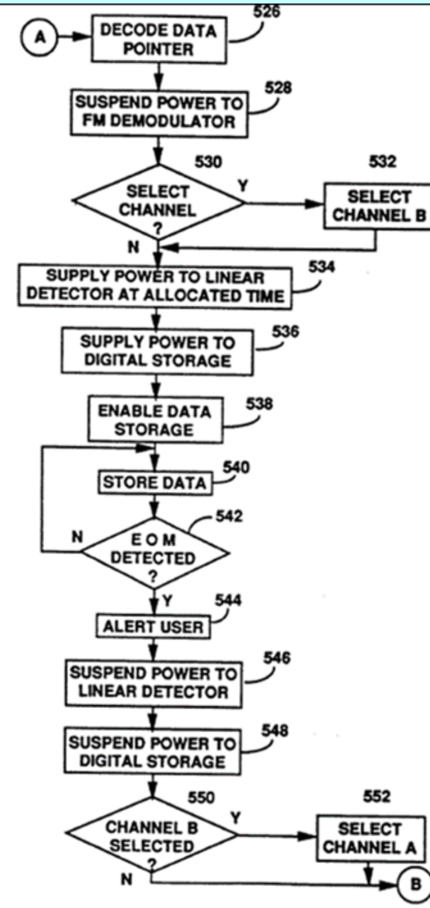
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 FIG. 3

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 4* Figure 2B, annotated:

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 2B*
1[c]	first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information; and	**Motorola '306 in view of the teachings of Motorola '038 discloses first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information.** *See* 1[pre] discussion of paging systems as communication device disclosed by **Motorola '306**; ack-back pagers, central station 110, messages and responses to them as master and slave communications, respectively, disclosed by **Motorola '038**, and outbound and response messages as master and slave communications, respectively, disclosed by **Motorola '568**; *see also* **For example, Motorola '306 first message address information (e.g., "address 210") indicating the intended destination of the second information (e.g., "message 212").** Figs. 2A-D.

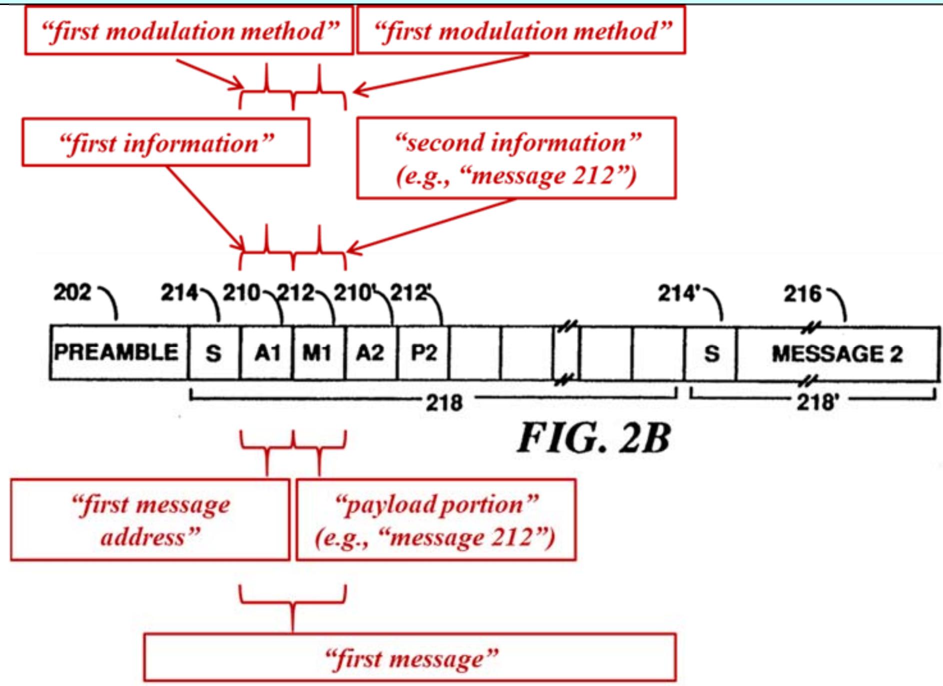
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 FIG. 2D Figs. 5A-B, reproduced below.

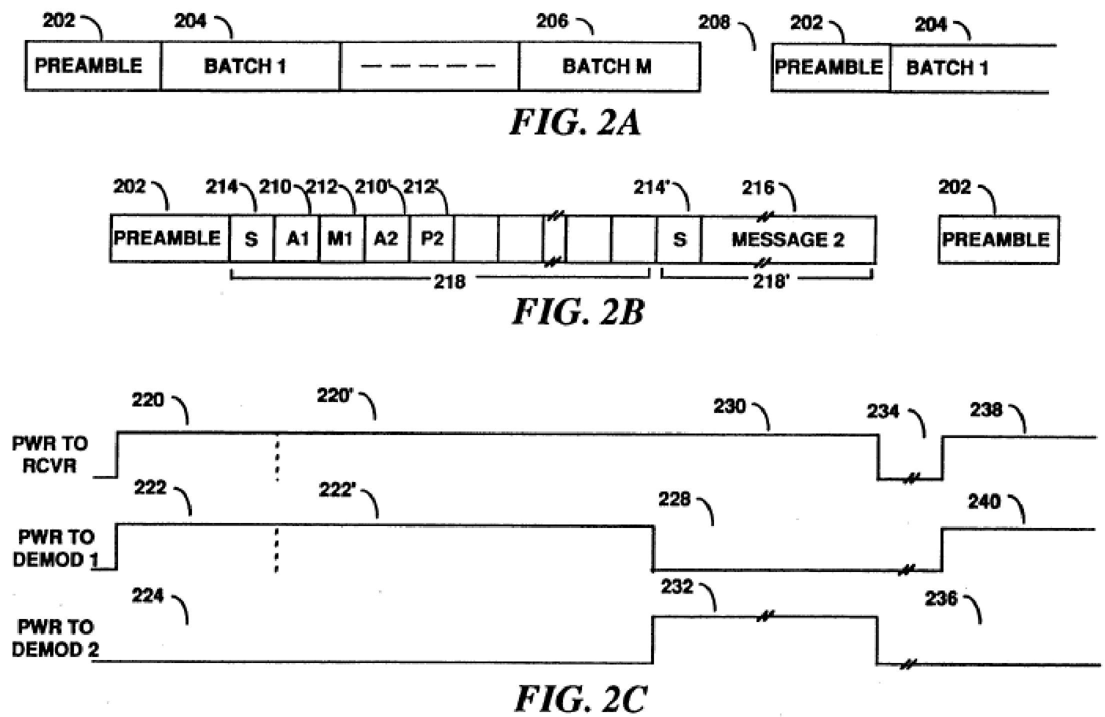
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 FIG. 5A

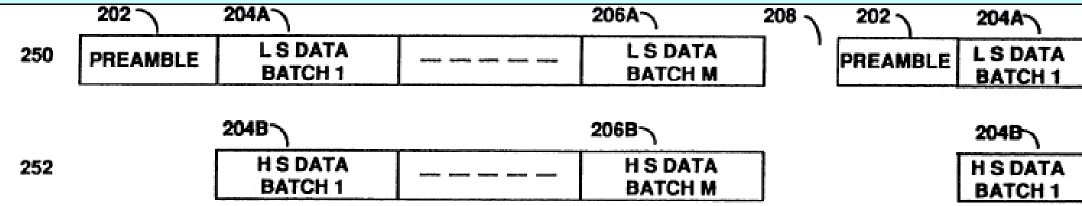
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 5B* "A code memory 110 is provided which couples to the decoder/controller 106, and which stores address information assigned to the dual mode communication receiver. When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below." Col. 5:6-13. "Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216." Col. 6:19-22.

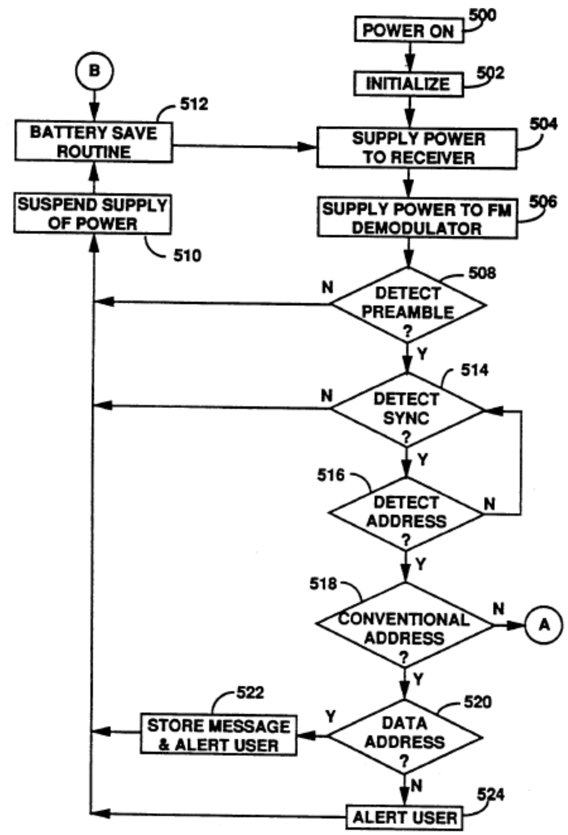
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		"A code memory 110 (not shown in FIG. 3) couples to microcomputer 106 through the I/O port 328. The code memory is preferably an EEPROM (Electrically Erasable Programmable Read Only Memory) which stores one or more predetermined addresses to which communication receiver 300 is responsive. Col. 9:50-56. "The microcomputer 106 also controls the supply of power to the receiver section, the linear demodulator and the digital storage during the transmission of linearly modulated message information. The microcomputer 326 also controls the supply of power to the the digital storage section during the processing of the stored high speed message information, and during the reading of the stored message. In summary, the battery saver switch 104 under the control of the microcomputer 106, supplies power only to those circuits which are currently utilized in the receiving or processing of information, thereby minimizing the energy consumption of the battery." Col. 12:7-19. "FIGS. 5A and 5B are flow charts describing the operation of the dual mode communication receiver of the present invention. Referring to FIG. SA, when the user turns power on to the receiver, at step 500, the microcomputer is initialized, at step 502, enabling the battery saving routine. Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine. The decoder monitors the information received on the channel, searching for a preamble signal, at step 508, or some other signal by which bit synchronization can be obtained." Col. 12:20-31. "When a preamble signal, or other signal is not detected within a predetermined search window time interval, at step 508, the microcomputer suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator. When preamble is detected, at step 508, and bit synchronization is obtained, in a manner well known in the art, the microcomputer begins the synchronization code word acquisition routine, at step 514. When the synchronization code word is not detected within a predetermined period of time, at step 514, the microcomputer is suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator." Col. 12:31-49. "When the synchronization code word is detected, at step 514, corresponding to the batch to which the receiver is assigned, the microcomputer monitors the received address and message information, in order that any addresses and messages directed to the receiver can be detected, at step 516." Col. 12:50-55. "As shown, the address 210 of a first receiver and the associated message 212 are trans mitted, followed by the address 210' of a second receiver and the associated message 212, and so forth. Message 212 for the second receiver is not a normal message information code word, but is a predetermined "batch' pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'." Col. 6:34-43. "When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code

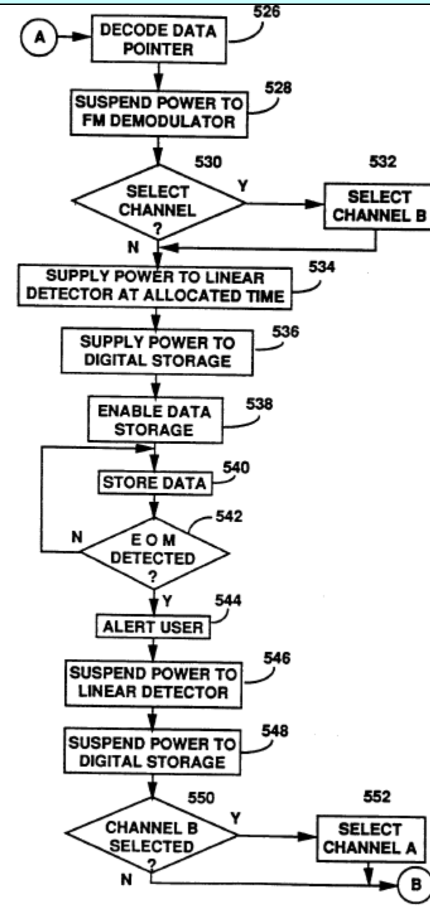
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received. After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Cols. 12:59-13:9. “When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received. After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Cols. 12:59-13:9. Figure 2B, annotated:

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 FIG. 2B
1[d]	said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave	**Motorola '306 in view of the teachings of Motorola '038 discloses said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers.** *See* 1[pre] discussion of paging systems as communication device disclosed by **Motorola '306**; ack-back pagers, central station 110, messages and responses to them as master and slave communications, respectively, disclosed by **Motorola '038**, and outbound and response messages as master and slave communications, respectively, disclosed by **Motorola '568**; *see also*

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
	transceiver of the one or more slave transceivers, and	**Motorola ’306 discloses transmitting a “second message” including “third information” (e.g., “address 210'”) modulated according to the “first modulation method” (e.g., “frequency shift keyed FM”).** Figs. 2A-D, reproduced below. 

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 ***FIG. 2D*** “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmitted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of address and/or message information code words, which, as for example, is sixteen. As shown, the address 210 of a first receiver and the associated message 212 are transmitted, followed by the address 210' of a second receiver and the associated message 212', and so forth. Message 212' for the second receiver is not a normal message information code word, but is a predetermined "batch" pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'. As shown, batch 218' contains the high speed message information 216 which is modulated in a linear modulation format. Batch 218' begins with the synchronization code word 214' which is used to signal the start of the message information, as will be described below.” Col. 6:19-48. “All information transmitted in a given batch is modulated in a common modulation format. As will be described in further detail below, one or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format.” Col. 5:67-6:4. “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. “2. The dual mode selective call receiver according to claim 1, wherein the first modulation format is frequency shift keyed FM modulation.” Claim 2. **Motorola ’306 discloses the “third information” (e.g., “address 210'”) “is indicative of an impending change**

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		in modulation to a second modulation method" (e.g., "QAM") and "fourth information" (e.g., "high speed data 216") intended for a single slave receiver transmitted after the third information according to the "second modulation method" (e.g., "QAM"). Fig. 5A, reproduced below.  *FIG. 5A* Fig. 5B, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 5B* "When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received.” Col. 12:59-13:4. “When the message information indicates a high speed data transmission is forthcoming, the supply of power to the FM demodulator is suspended, and power is supplied to the linear demodulator to enable the reception of the high speed data.” Col. 7:22-26. “Alternate modulation formats are available to provide improved throughput of message information. These alternate modulation formats include those modulation formats which are often termed linear modulation formats. Such linear modulation formats enable the modulation of the carrier signal whereby the message information is encoded in both the amplitude and the instantaneous phase angle of the carrier. Examples of linear modulation formats include, but are not limited to, quadrature amplitude modulation (QAM modulation), and spectrally efficient data modulation (SEDM modulation), such as described in U.S. Pat. No. 4,737,969 to Steel et al., entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention and which is hereby incorporated by reference herein. Other forms of linear modulation include those modulation formats which simultaneously modulate both the amplitude and the phase of the transmitted signal to encode the message information, and also shape the transmitted spectrum to provide adjacent channel protection.” Col. 3:63-4:17.[3] “When the information in the recovered data signal 322A matches any of the stored predetermined addresses, the subsequently received information is decoded to determine if additional information is directed to the receiver which is modulated in the FM modulation format, or if the additional information is modulated in the linear modulation format. When the additional information is transmitted in the FM modulation format, the recovered message information is received and stored in the microcomputer RAM 338, or in the digital storage section 368, as will be explained in further detail below, and an alerting signal 106G is generated by alert generator 342.” Col. 9:60-10:4. “When additional information is to be transmitted in the linear modulation format, the microcomputer 106 decodes the pointer information. The microcomputer 106 maintains the operation of monitoring and decoding information transmitted in the FM modulation format, until the end of the current batch, at which time the supply of power is suspended to the receiver until the next assigned batch, or until the batch identified by the pointer is reached, during which high speed data is transmitted. The microcomputer 106, through I/O port 328 generates a battery saving control signal 106D which couples to battery saver switch 104 to suspend the supply of power to the FM demodulator 108, and to supply power to the linear demodulator 112, including linear output section 324, the quadrature demodulator 350, and the digital storage section 368, as will be described in detail below.” Col. 10:10-26.

[3] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		Claim 5: “5. The dual mode communication receiver according to claim 3, wherein the linear modulation format is QAM modulation.” “Analog signaling protocols, such as two tone and five tone signaling protocols, and analog voice messages were modulated using either phase or angle modulation formats, or a direct frequency modulation format in FM modulated carrier systems which are prevalent in the industry today. Other signaling protocols, such as digital signaling protocols, have typically utilized a frequency shift keying (FSK) modulation format for both the address and message transmissions.” Col. 3:40-48. “A code memory 110 is provided which couples to the decoder/controller 106, and which stores address information assigned to the dual mode communication receiver. When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below. In the first instance, the battery saving switch 104, under the control of the decoder/controller 106 will maintain the supply of power to the FM demodulator 108 to enable further demodulation of message information received in the FM modulation format.” Col. 5:6-18. “However, unlike the prior art receivers, power to the FM demodulator 108 is suspended by battery saver switch 104, under the control of the decoder/controller 106, and power is then supplied to the linear demodulator 112, to enable the demodulation of information received in the second modulation format. The information received in the second modulation format is received by receiver 102, which then couples the received information to the linear demodulator 112. The demodulated message information is coupled from the output of the linear demodulator 112, to the input of a data processing unit 114.” Col. 5:26-37. “As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art.” Col. 5:49-60. “A code memory 110 (not shown in FIG. 3) couples to microcomputer 106 through the I/O port 328. The code memory is preferably an EEPROM (Electrically Erasable Programmable Read Only Memory) which stores one or more predetermined addresses to which communication receiver 300 is responsive.” Col. 9:50-56. “Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine.” Col. 12:25-28. “When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540.” Col. 13:10-28. “The transmission protocol of FIGS. 2A-2C enables the transmission of information which is modulated in a conventional FM modulation format, and further enables the transmission of message information which is modulated in a linear modulation format to enable high speed data transmission.” Col. 4:58-64. “FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein. All information transmitted in a given batch is modulated in a common modulation format. As will be described in further detail below, one or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format.” Col. 5:47-6:4. “FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially supplied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby conserving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220’, and to the FM demodulator during time interval 222’, in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator.” Col. Col. 6:56-7:13. “In summary, power is regularly supplied to the receiver and to the FM demodulator to enable reception of an

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		address and message information using a signaling protocol which provides battery saving capability to the receiver.” Col. 7:18-22. “When the message information is transmitted in the FM modulation format, the second IF signal is coupled to the FM demodulator section 108, as will be explained in detail below. The FM demodulator section 108 demodulates the second IF signal in a manner well known to one of skill in the art, to provide a recovered data signal 108A which is a stream of binary information corresponding to the received address and message information transmitted in the FM modulation format.” Col. 9:6-14. “FIG. 4 is an electrical block diagram showing details of the battery saving features of the dual mode communication receiver of the present invention. The microcomputer 106 controls the battery saving operation of the communication receiver through battery saver controls signals 106D coupled to the battery saver switch 104. The battery saver switch 104 enables power to be selectively supplied to the receiver section 102 via receiver supply line 104A, to the quadrature detector 350 via quadrature detector supply line 104B, to the digital storage section 368 via digital storage supply line 104C, to the FM demodulator section 108 which includes a data limiter 380 coupled to an FM demodulator 322 via FM demodulator supply line 104D, and to the linear output section 324 via linear output supply line 104E.” Col. 11:48-63. “The microcomputer 106 also controls the supply of power to the receiver section, the linear demodulator and the digital storage during the transmission of linearly modulated message information. The microcomputer 326 also controls the supply of power to the the digital storage section during the processing of the stored high speed message information, and during the reading of the stored message. In summary, the battery saver switch 104 under the control of the microcomputer 106, supplies power only to those circuits which are currently utilized in the receiving or processing of information, thereby minimizing the energy consumption of the battery.” Col. 12:7-19. “FIGS. 5A and 5B are flow charts describing the operation of the dual mode communication receiver of the present invention. Referring to FIG. SA, when the user turns power on to the receiver, at step 500, the microcomputer is initialized, at step 502, enabling the battery saving routine. Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine. The decoder monitors the information received on the channel, searching for a preamble signal, at step 508, or some other signal by which bit synchronization can be obtained. When a preamble signal, or other signal is not detected within a predetermined search window time interval, at step 508, the microcomputer suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator.” Col. 12:20-38. “When preamble is detected, at step 508, and bit synchronization is obtained, in a manner well known in the art, the microcomputer begins the synchronization code word acquisition routine, at step 514. When the synchronization code word is not detected within a predetermined period of time, at step 514, the microcomputer is suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		demodulator.” Col. 12:39-49. “When the synchronization code word is detected, at step 514, corresponding to the batch to which the receiver is assigned, the microcomputer monitors the received address and message information, in order that any addresses and messages directed to the receiver can be detected, at step 516.” Col. 12:7-55. “When high speed message information is being received, the digital storage section samples and stores the high speed message information in real time, after which the stored message information is processed by the microcomputer decoder to prepare the information for display.” Col. 13:57-62. “A dual mode communication receiver, comprising: means for receiving information transmitted on a common channel in a first and second modulation format; first means for detecting the information transmitted in the first modulation format on the common channel; and second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format.” Claim 1. “The dual mode communication receiver according to claim 1, wherein the second modulation format is a linear modulation format.” Claim 3. “The dual mode communication receiver according to claim 3, wherein the linear modulation format is spectrally efficient digital modulation.” Claim 4. “A dual mode communication receiver comprising: means for receiving information transmitted on a common channel in a first and second modulation format: first means for detecting the information transmitted in the first modulation format on the common channel; second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format; and third means, for supplying power to said receiving means for enabling the receiving of the information transmitted in the first and second modulation format said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the first modulation format; said third means further in response to the information detected in the first modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the second modulation format.” Claim 23. “A dual mode communication receiver, comprising:

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		means for receiving information transmitted in a FM modulation format and a linear modulation format; first means for detecting the information transmitted in the FM modulation format; and second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format.” Claim 28. “The dual mode communication receiver according to claim 28, wherein the FM modulation format utilizes frequency shift keying.” Claim 29. “The dual mode communication receiver according to claim 28, wherein the linear modulation format is spectrally efficient digital modulation.” Claim 30. “The dual mode communication receiver according to claim 28, wherein the linear modulation format is QAM modulation.” Claim 31. “A dual mode communication receiver comprising: means for receiving information transmitted in a FM modulation format and a linear modulation format: first means for detecting the information transmitted in the FM modulation format; second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format; and third means, for supplying power to said receiving means for enabling the receiving of the information transmitted in the FM and linear modulation formats, said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the FM modulation format; said third means further in response to the information detected in the FM modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the linear modulation format.” Claim 35.

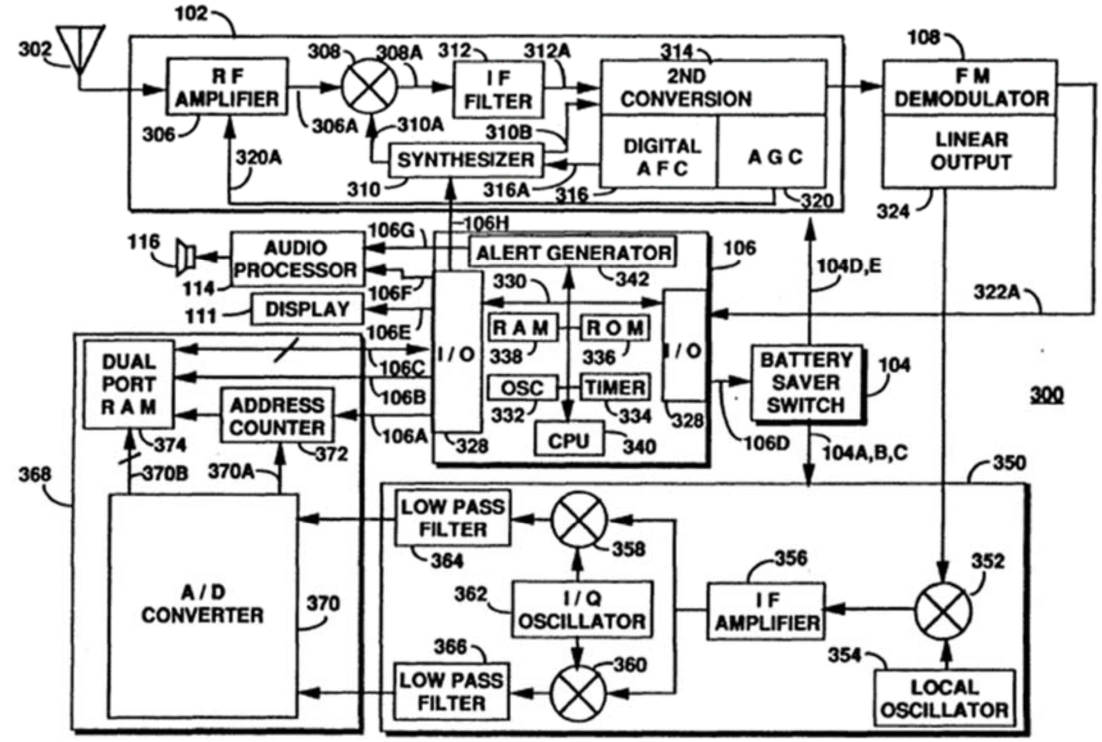
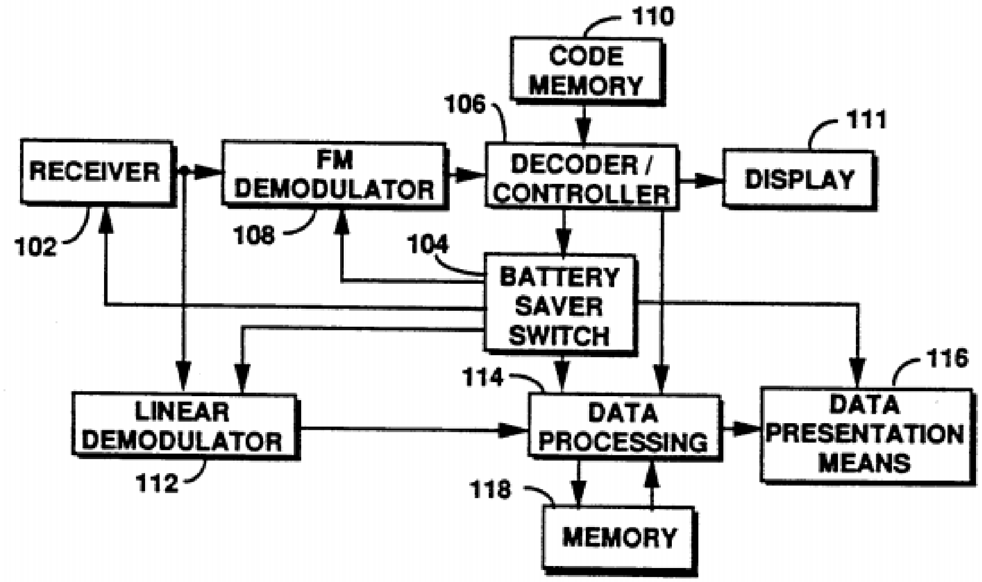
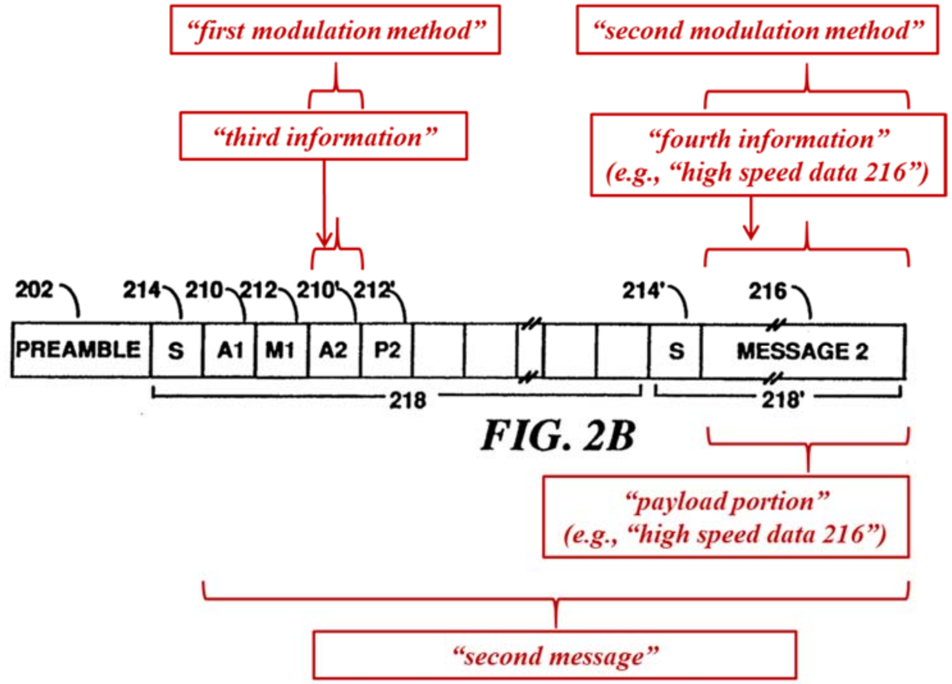
<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,457,228
(“the ’228 patent”)</th><th>The Motorola ’306 patent</th></tr>
<tr><td></td><td></td><td>

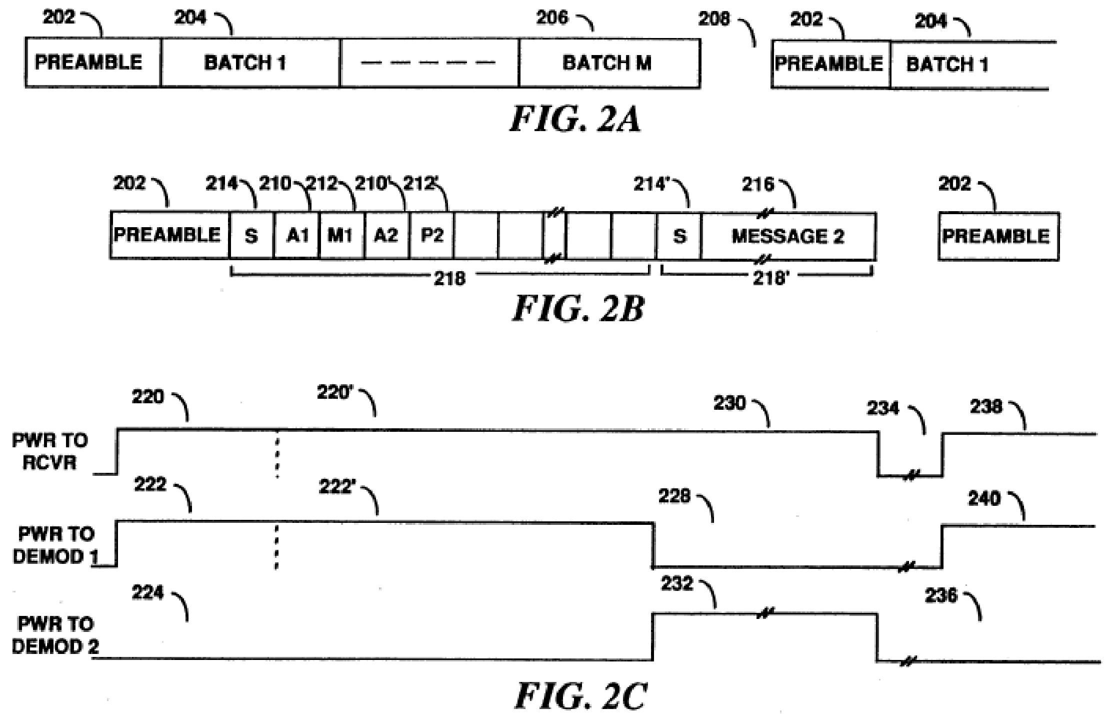
FIG. 3

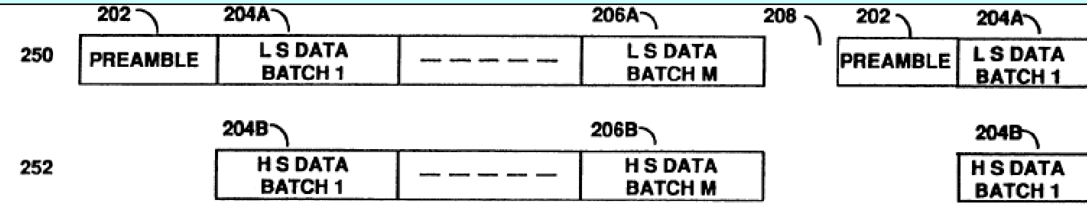
Fig. 1, reproduced below.</td></tr>
</table>

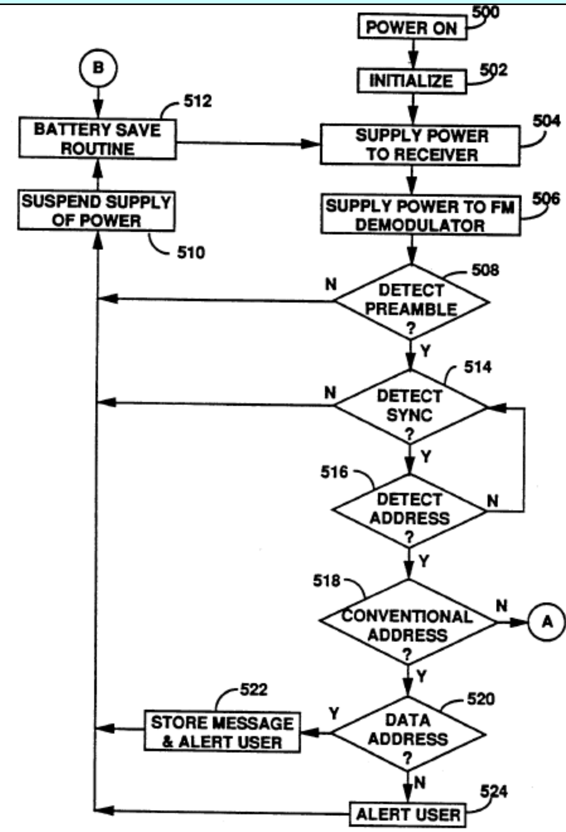
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 1* “Because of the limitations of FM modulation for high speed message transmission, other forms of modulation, such as linear modulation techniques are required to provide for transmission at the higher data rates.” Col. 1:57-61. “Following the preamble 202 trans mission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216. The synchronization code word 214 is modulated in the modulation format appropriate for the type of data being transmit ted in the batch, and enables synchronization with the transmitted information. In the example shown in FIG. 2B, the synchronization code word 214 is modulated in the FM modulation format, followed by addresses 210 and messages 212 which are also modulated in the FM modulation format. Each transmission batch is coded using a coded synchronization code word and allows for the transmission of a predetermined number of ad dress and/or message information code words, which, as for example, is sixteen. As shown, the address 210 of a first receiver and the associated message 212 are trans mitted, followed by the address 210' of a second receiver and the associated message 212, and so forth. Message 212 for the second receiver is not a normal message information code word, but is a predetermined “batch” pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218".” Col. 6:19-43.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		“The dual mode communication receiver of the present invention, enables the transmission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by providing a second receiving means which is responsive to the information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information.” Col. 4:36-57. “The alerting signal 106G is coupled to the audio processing circuit 344 which drives a transducer 346, delivering an audible alert. Other forms of sensible alerting, such as a tactile or vibrating alert, can also be provided to alert the user as well.” Col. 10:4-9. “After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Col. 13:4-9. “When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B. When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/ A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540. When an end of message (EOM) character is received, or after a predetermined number of message bits have been received, at step 540, the user is alerted that a message has been received, at step 544. The microcomputer suspends the supply of power to the linear demodulator, at step 546. Power is maintained to the digital storage section during which time the received high speed data is processed. Upon the completion of the processing of the high speed message information, the supply of power is then suspended to the digital storage section, at step 548. The microcomputer determines if a second channel was selected for receiving the high speed message information at step 550. When a second channel was selected, at step 550, the microcomputer reselects the first channel at step 552. When the first channel was selected at steps 550 or 552, the microcomputer returns to the normal battery saving routine, at step 512 of FIG. 5A.” Col. 13:4-45. “5. The dual mode communication receiver according to claim 3, wherein the linear modulation. format is QAM

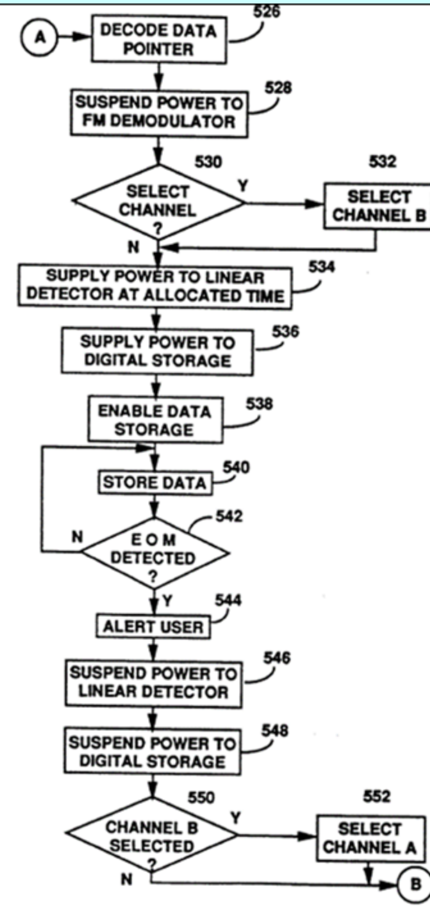
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		modulation." Claim 5. Figure 2B, annotated:  **Motorola '306 in view of Motorola '038 discloses that address information indicates an impending change from the first to the second modulation method, as occurs, for example, when the transceiver transmits an FM-modulated message to a receiver, and then addresses that same transceiver to transmit a high speed message.**
1[e]	second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and	**Motorola '306 in view of the teachings of Motorola '038 discloses second message address information (e.g., "address 210'") that is indicative of the single slave transceiver being an intended destination of the fourth information.** *See* 1[pre] discussion of paging systems as communication device disclosed by **Motorola '306**; ack-back pagers, central station 110, messages and responses to them as master and slave communications, respectively, disclosed by **Motorola '038**, and outbound and response messages as master and slave communications, respectively, disclosed

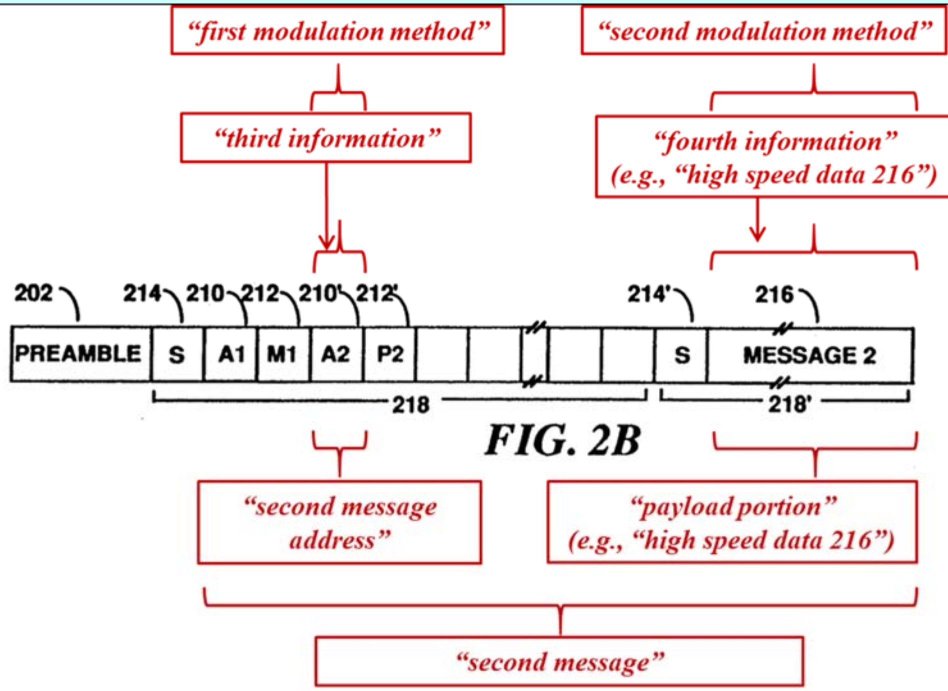
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		by **Motorola '568**; *See also* 1[d] discussion of "frequency shift keyed FM" as the first modulation method, and "linear modulation format," such as "QAM," as the second modulation method disclosed by **Motorola '306**; *see also* Figs. 2A-D, reproduced below.  FIG. 2A FIG. 2B FIG. 2C

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 2D* Fig. 5A, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 ***FIG. 5A*** “A code memory 110 is provided which couples to the decoder/controller 106, and which stores address information assigned to the dual mode communication receiver. When an address is detected in the demodulated information which corresponds to the predetermined address information assigned to the communication receiver, one of two operations will occur, which will be described in greater detail below.” Col. 5:6-13. “Following the preamble 202 transmission, each batch comprises a synchronization code word 214, followed by address 210 and message 212 information, or by high speed data 216.” Col. 6:19-22.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		“A code memory 110 (not shown in FIG. 3) couples to microcomputer 106 through the I/O port 328. The code memory is preferably an EEPROM (Electrically Erasable Programmable Read Only Memory) which stores one or more predetermined addresses to which communication receiver 300 is responsive. Col. 9:50-56. “The microcomputer 106 also controls the supply of power to the receiver section, the linear demodulator and the digital storage during the transmission of linearly modulated message information. The microcomputer 326 also controls the supply of power to the the digital storage section during the processing of the stored high speed message information, and during the reading of the stored message. In summary, the battery saver switch 104 under the control of the microcomputer 106, supplies power only to those circuits which are currently utilized in the receiving or processing of information, thereby minimizing the energy consumption of the battery.” Col. 12:7-19. “FIGS. 5A and 5B are flow charts describing the operation of the dual mode communication receiver of the present invention. Referring to FIG. SA, when the user turns power on to the receiver, at step 500, the microcomputer is initialized, at step 502, enabling the battery saving routine. Power is supplied to the receiver, at step 504, and is also supplied to the FM demodulator section, at step 506 to begin the preamble search and acquisition routine. The decoder monitors the information received on the channel, searching for a preamble signal, at step 508, or some other signal by which bit synchronization can be obtained.” Col. 12:20-31. “When a preamble signal, or other signal is not detected within a predetermined search window time interval, at step 508, the microcomputer suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator. When preamble is detected, at step 508, and bit synchronization is obtained, in a manner well known in the art, the microcomputer begins the synchronization code word acquisition routine, at step 514. When the synchronization code word is not detected within a predetermined period of time, at step 514, the microcomputer is suspends the supply of power to the receiver and to the FM demodulator, at step 510, and returns to the battery saving routine, at step 512, until the next time interval during which power is again supplied to the receiver and to the FM demodulator.” Col. 12:31-38. “When the synchronization code word is detected, at step 514, corresponding to the batch to which the receiver is assigned, the microcomputer monitors the received address and message information, in order that any addresses and messages directed to the receiver can be detected, at step 516.” Col. 12:50-55. Fig. 5B, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 5B* “As shown, the address 210 of a first receiver and the associated message 212 are trans mitted, followed by the address 210' of a second receiver and the associated message 212, and so forth. Message 212 for the second receiver is not a normal message information code word, but is a predetermined "batch' pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218".” Col. 6:34-43. Figure 2B, annotated:

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 FIG. 2B
1[f]	wherein the second modulation method results in a higher data rate than the first modulation method.	**Motorola '306 in view of the teachings of Motorola '038 discloses wherein the second modulation method results in a higher data rate than the first modulation method.** *See* 1[d] discussion of "frequency shift keyed FM" as the first modulation method, and "linear modulation format," such as "QAM," as the second modulation method disclosed by **Motorola '306**; *see also* "Because of the limitations of FM modulation for high speed message transmission, other forms of modulation, such as linear modulation techniques are required to provide for transmission at the higher data rates." Col. 1:57-61. "There is a need to provide a receiver architecture which retains compatibility within existing FM modulated paging signaling protocols, thereby taking advantage of the battery saving capabilities of these existing paging signaling protocols. Furthermore, there is a need to provide a receiver architecture which includes linear demodulation for voice and high speed data capability, to provide the increased message throughput required for these ever expanding services, without compromising the battery saving performance of the existing paging signaling protocols." Col. 2:1-11. "Analog signaling protocols, such as two tone and five tone signaling protocols, and analog voice messages were

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		modulated using either phase or angle modulation formats, or a direct frequency modulation format in FM modulated carrier systems which are prevalent in the industry today. Other signaling protocols, such as digital signaling protocols, have typically utilized a frequency shift keying (FSK) modulation format for both the address and message transmissions.” Col. 3:40-48. “Alternate modulation formats are available to provide improved throughput of message information. These alternate modulation formats include those modulation formats which are often termed linear modulation formats. Such linear modulation formats enable the modulation of the carrier signal whereby the message information is encoded in both the amplitude and the instantaneous phase angle of the carrier. Examples of linear modulation formats include, but are not limited to, quadrature amplitude modulation (QAM modulation), and spectrally efficient data modulation (SEDM modulation), such as described in U.S. Pat. No. 4,737,969 to Steel et al., entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention and which is hereby incorporated by reference herein. Other forms of linear modulation include those modulation formats which simultaneously modulate both the amplitude and the phase of the transmitted signal to encode the message information, and also shape the transmitted spectrum to provide adjacent channel protection. An example of such modulation format is the QPSK signaling format. While such linear modulation formats are available for the transmission of message information at very high data rates, well in excess of that which can be provided by convention frequency modulation formats, such linear modulation formats are generally incompatible for use with the established paging signaling protocols which have been developed to provide both excellent receiver sensitivities and battery saving performance.” Col. 3:63-4:25.[4] “Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format.” Col. 5:53-58. “FIG. 1 is an electrical block diagram of a dual mode communication receiver of the present invention which overcomes the problems described, and which is compatible for use on existing paging systems, using existing paging signaling protocols. The dual mode communication receiver of the present invention, enables the trans mission of data at very high data bit rates, such as eight kilobits per second and higher. The dual mode communication receiver of the present invention is compatible with the existing paging signaling protocols to provide excellent battery saving performance characteristics, and to maintain the receiver sensitivity characteristics of the prior art communication receivers using the conventional paging signaling protocols. The dual mode communication receiver of the present invention is capable of the operation described above by providing a first receiving means for receiving and detecting information transmitted in a first modulation format, such as in the conventional FM modulated format, and by pro viding a second receiving means which is responsive to the

[4] The disclosure of the patent incorporated by reference is incorporated herein as if the disclosure were fully set forth.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		information detected by the first receiving means in the first modulation format for receiving and detecting information transmitted in a second modulation format, such as in one of the linear modulation formats which enables the high speed transmission of message information. The transmission format is described in FIGS. 2A-2C, and will be described in detail below.” Col. 4:32-58. “This invention relates to the field of communication receivers, and more particularly to a selective call communication receiver providing high speed data and voice communication with battery saving capability.” Col. 1:10-13. “When an address is detected, at step 516, the microcomputer evaluates the next received code word, at step 518 to determine if the message information being transmitted is low speed or high speed message information. When the information transmitted is low speed message information, the microcomputer recalls information from the code memory identifying the received address as either a data address, or a tone only address, at step 520. When the address is a data address, at step 520, the message information following the address is stored, at step 522, and the user is alerted to indicate a message was received. When the address is identified as a tone only address, at step 520, the user is alerted to indicate a page was received.” Col. 12:59-13:4. “When the information received in the first modulation format indicates a high speed data message is to be received in the second modulation format, at step 518, the microcomputer decodes the data pointer, at step 526 of FIG. 5B.” Col. 13:10-14. “A dual mode receiver has been described which is capable of receiving addresses and messages which are transmitted in an FM modulation format, and further which is capable of receiving high speed data messages which are transmitted in a linear modulation format on either the same or a different radio frequency channel.” Col. 13:46-51. Claim 2: “2. The dual mode selective call receiver according to claim 1, wherein the first modulation format is frequency shift keyed FM modulation.” Claim 5: “5. The dual mode communication receiver according to claim 3, wherein the linear modulation format is QAM modulation.” “The transmission protocol of FIGS. 2A-2C enables the transmission of information which is modulated in a conventional FM modulation format, and further enables the transmission of message information which is modulated in a linear modulation format to enable high speed data transmission.” Col. 4:58-64. “Message 212' for the second receiver is not a normal message information code word, but is a predetermined "batch" pointer, directing the receiver to the transmission batch in which the high speed message information directed to the receiver is to be transmitted, which as shown is in the next transmission batch 218'. As shown, batch 218' contains the high speed message information 216 which is modulated in a linear modulation format.” Col. 6:38-45.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		"Furthermore, there is a need to provide a receiver architecture which includes linear demodulation for voice and high speed data capability, to provide the increased message throughput required for these ever expanding services, without compromising the battery saving performance of the existing paging signaling protocols." Col. 2:6-11. "FIGS. 2A and 2B are timing diagrams describing the signaling format for the dual mode communication receiver of the present invention. As shown in FIG. 2A, when a message transmission is initiated on the channel, a preamble 202, modulated in the FM modulation format, is transmitted on the channel, followed by a plurality of message batches 204-206. Each of the message batches 204-206 has a predetermined transmission time interval, and enables the transmission of address and message information which is modulated in the FM modulation format, or for high speed data, which is modulated in a linear modulation format. The modulation of address and message information in the FM modulation format is well known in the art. The modulation of data in a linear modulation format, such as the SEDM modulation format, is described in U.S. Pat. No. 4,737,969 to Steel et al, entitled "Spectrally Efficient Digital Modulation Method and Apparatus" which is assigned to the assignee of the present invention, and which is incorporated by reference herein. All information transmitted in a given batch is modulated in a common modulation format. As will be described in further detail below, one or more batches of information are modulated in the FM modulation format and can be interleaved with one or more batches of information which are modulated in a linear modulation format." Col. 5:47-6:4. "FIG. 2C is a timing diagram describing the battery saver operation for the dual mode communication receiver of the present invention. Power is initially supplied to the receiver section, during time interval 220, and to the FM demodulator, during time interval 222, to enable receiving the preamble and synchronization code word information modulated in the FM modulation format. The supply of power to the linear demodulator is inhibited during time interval 224, thereby conserving power within the receiver. After having detected the preamble and synchronization code word, the supply of power to the receiver is maintained during time interval 220', and to the FM demodulator during time interval 222', in order to receive any additional address and message information transmitted in the first transmission batch. The supply of power to the receiver section is maintained during time interval 230 since the next transmission batch includes the high speed data directed to the receiver. However, the supply of power to the FM demodulator is suspended during time interval 228, and power is supplied to the linear demodulator, during time interval 232. After receiving the high speed data information during time interval 232, the supply of power is suspended during time interval 234 to the receiver section, and during time interval 236 to the linear demodulator." Col. Col. 6:56-7:13. "A dual mode communication receiver, comprising: means for receiving information transmitted on a common channel in a first and second modulation format; first means for detecting the information transmitted in the first modulation format on the common channel; and second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format." Claim 1.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		“The dual mode communication receiver according to claim 1, wherein the second modulation format is a linear modulation format.” Claim 3. “The dual mode communication receiver according to claim 3, wherein the linear modulation format is spectrally efficient digital modulation.” Claim 4. “A dual mode communication receiver comprising: means for receiving information transmitted on a common channel in a first and second modulation format: first means for detecting the information transmitted in the first modulation format on the common channel; second means, responsive to the information detected in the first modulation format, for detecting the information transmitted in the second modulation format; and third means, for supplying power to said receiving means for enabling the receiving of the information transmitted in the first and second modulation format said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the first modulation format; said third means further in response to the information detected in the first modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the second modulation format.” Claim 23. “A dual mode communication receiver, comprising: means for receiving information transmitted in a FM modulation format and a linear modulation format; first means for detecting the information transmitted in the FM modulation format; and second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format.” Claim 28. “The dual mode communication receiver according to claim 28, wherein the FM modulation format utilizes frequency shift keying.” Claim 29. “The dual mode communication receiver according to claim 28, wherein the linear modulation format is spectrally efficient digital modulation.” Claim 30. “The dual mode communication receiver according to claim 28, wherein the linear modulation format is QAM modulation.” Claim 31. “A dual mode communication receiver comprising: means for receiving information transmitted in a FM modulation format and a linear modulation format:

<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,457,228
(“the ’228 patent”)</th><th>The Motorola ’306 patent</th></tr>
<tr><td></td><td></td><td>

first means for detecting the information transmitted in the FM modulation format;

second means, responsive to the information detected in the FM modulation format, for detecting the information transmitted in the linear modulation format; and

third means, for supplying power to said receiving means for enabling the receiving of the information

transmitted in the FM and linear modulation formats,

said third means, further for supplying power to said first means for enabling the detecting of the information transmitted in the FM modulation format;

said third means further in response to the information detected in the FM modulation format, supplies power to said second means for enabling the detecting of the information transmitted in the linear modulation format.” Claim 35.

Figs. 2A-D, reproduced below.

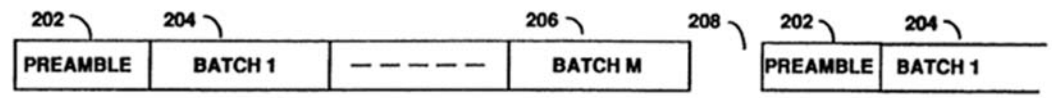


FIG. 2A

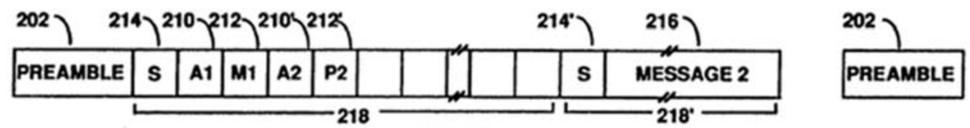


FIG. 2B

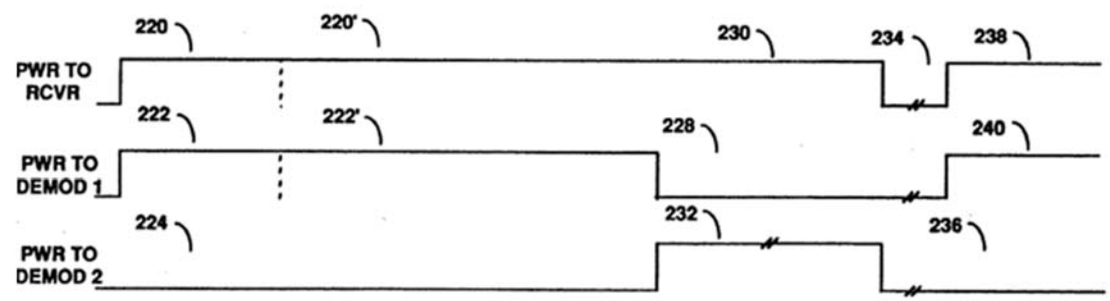
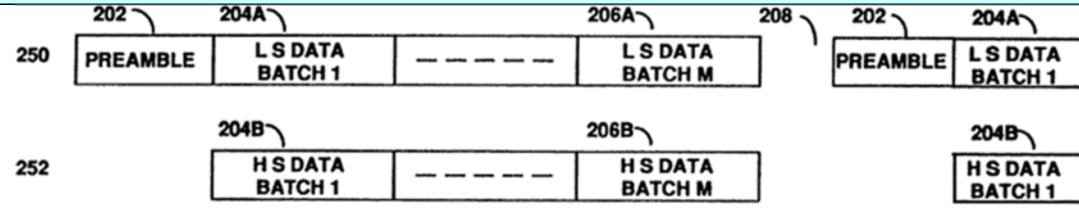
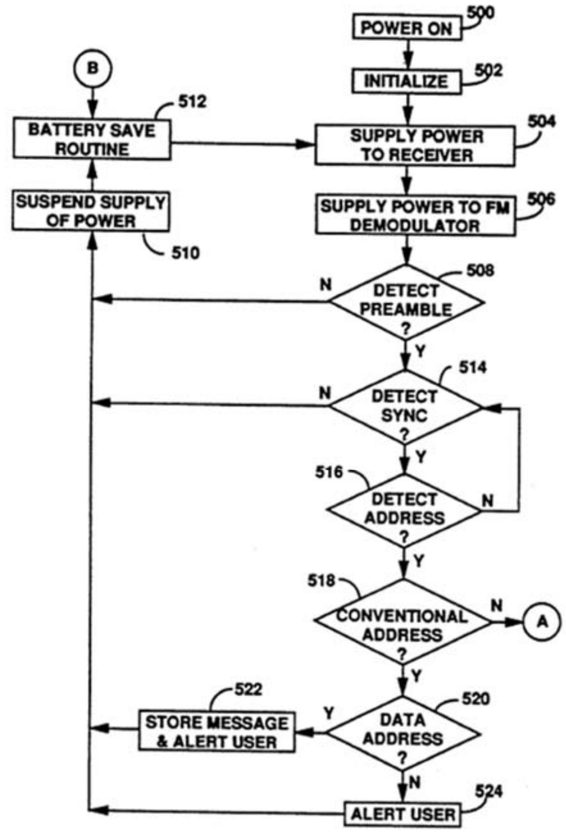
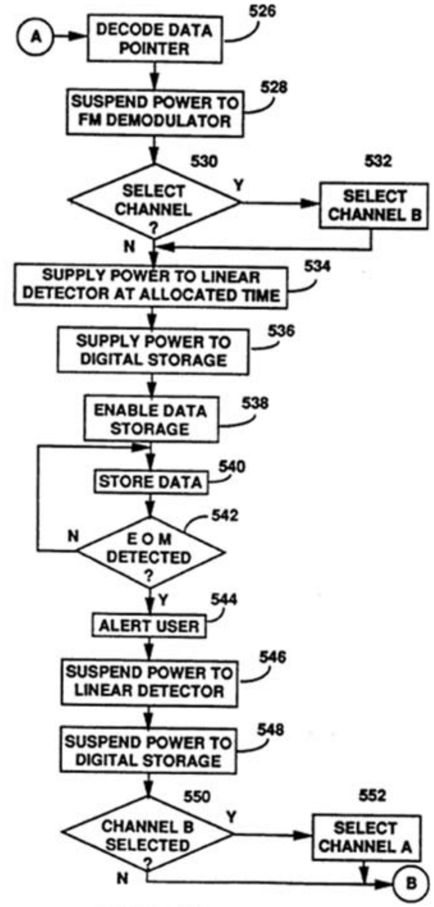


FIG. 2C

</td></tr>
</table>

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 2D* Figs. 5A-B, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Motorola '306 patent
		 *FIG. 5A*

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		 *FIG. 5B* “The existing signaling protocols, such as the POCSAG signaling protocol at 512 and 1200 bits per second, or the Golay Sequential Code protocol at 600 bits per second, were developed to provide superior performance in wide area communication systems, such as those systems providing simulcast message transmission. However, as previously described, there is a limit at which transmission of information at high data bit rates using an FM modulation format becomes impractical, due largely to problems encountered in equalizing simulcast transmission systems for such transmissions, and due to the frequency spectrum required to utilize conventional frequency

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
		modulation formats to provide such higher speed data communications.” Col. 3:48-63. “After having received and processed the message, at steps 522, or 524, the microcomputer returns to the battery saving routine, suspending the supply of power to the receiver, at step 510, when no other information is to be received in the current batch.” Col. 13:4-9. “When the end of the current batch is detected, the supply of power to the FM demodulator is suspended, at step 528. The microcomputer determines if the high speed message information is transmitted on the second channel, at step 530. When the high speed message is transmitted on a second channel, the second channel is selected at step 532. When a second channel is not selected at step 530, or is selected at step 532, power is next supplied to the linear demodulator during the batch indicated by the pointer, at step 534, and to the digital storage section, at step 536. The microcomputer provides an enable signal to the address counter and to the D/ A converter, at step 538, which enables the high speed sampling and storage of the received data, at step 540. When an end of message (EOM) character is received, or after a predetermined number of message bits have been received, at step 540, the user is alerted that a message has been received, at step 544. The microcomputer suspends the supply of power to the linear demodulator, at step 546. Power is maintained to the digital storage section during which time the received high speed data is processed. Upon the completion of the processing of the high speed message information, the supply of power is then suspended to the digital storage section, at step 548. The microcomputer determines if a second channel was selected for receiving the high speed message information at step 550. When a second channel was selected, at step 550, the microcomputer reselects the first channel at step 552. When the first channel was selected at steps 550 or 552, the microcomputer returns to the normal battery saving routine, at step 512 of FIG. 5A.” Col. 13:14-45. “19. The dual mode communication receiver according to claim 14 wherein the message information detected in the second modulation format is high speed data information.” Claim 19. “20. The dual mode communication receiver according to claim 19 wherein the high speed data information is transmitted at a data rate in excess of 1200 bits per second.” Claim 20. “21. The dual mode communication receiver according to claim 14 wherein the message information detected in the second modulation format is voice information.” Claim 21. “22. The dual mode communication receiver according to claim 21 wherein the voice information is digitized at a rate of at least 8 kilobits per second.” Claim 22.
1[g]		

	Claim 21 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
21	The master communication device as in claim 1,	**Motorola ’306 in view of the teachings of Motorola ’038 discloses the master communication device as in**

	Claim 21 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Motorola ’306 patent
	wherein the first information that is included in the first message comprises the first message address data.	**claim 1, wherein the first information that is included in the first message comprises the first message address data.** *See* 1[pre] discussion of paging systems as communication device disclosed by **Motorola ’306**; ack-back pagers, central station 110, messages and responses to them as master and slave communications, respectively, disclosed by **Motorola ’038**, and outbound and response messages as master and slave communications, respectively, disclosed by **Motorola ’568**; *See also* 1[b] discussion of address 210 as first information; *See also* 1[c] discussion of address 210 as first message address data.

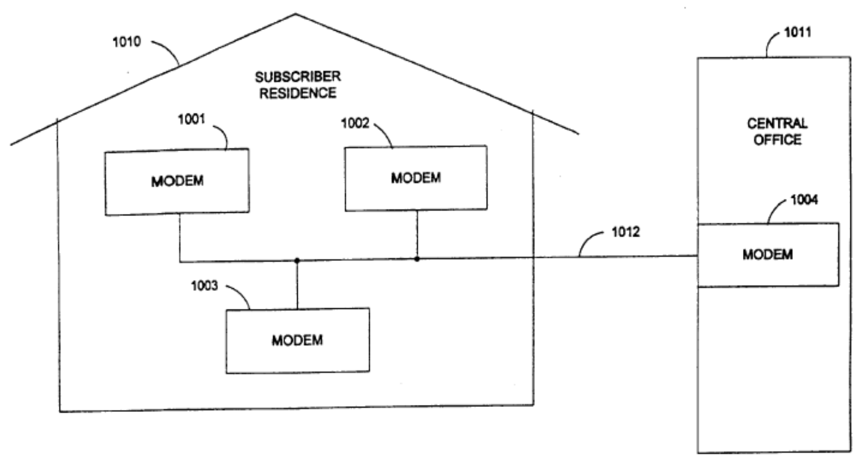
EXHIBIT H

EXHIBIT H

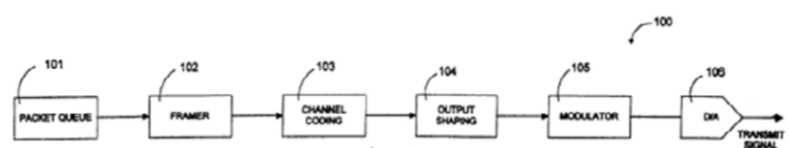
Comparison of the Asserted Claims of the ’580 Patent to U.S. Patent No. 6,075,814 (“the Broadcom ’814 patent” or “Broadcom ’814”)

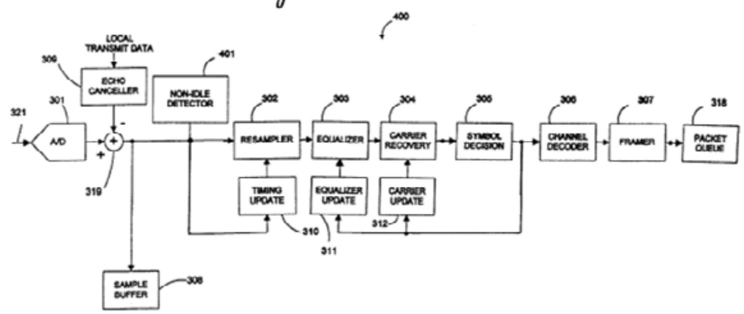
As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,023,580 (“the ’580 patent”) are invalid under 35 U.S.C. § 103(a) as obvious over Broadcom ’814 in view of the teachings of U.S. Patent No. 5,583,922 (“Radish ’922”), and/or the teachings of the Admitted Prior Art (“APA”). One of ordinary skill in the art, as of the priority date of the ’580 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

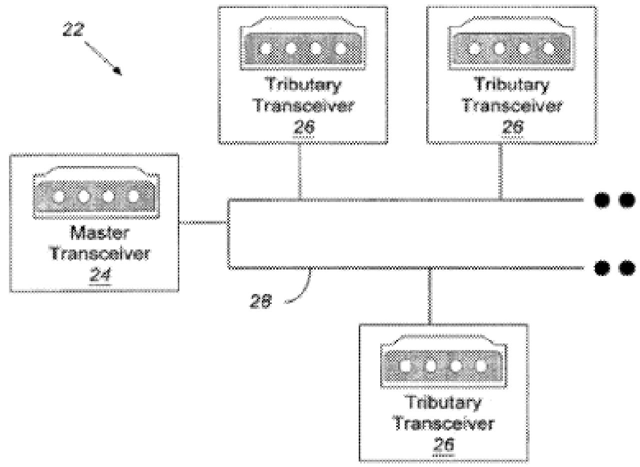
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
1[pre]	A communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, the device comprising:	**Broadcom ’814 in view of the knowledge of a person of ordinary skill in the art (“POSITA”) and/or in view of the teachings of the APA discloses a communication device capable of communicating according to a master slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, Broadcom ’814 discloses a communication device (*e.g.*, “modems … connected to the same communication channel using time-division multiplexing”/“time division multiple access (TDMA) techniques”/“periodic poll”). A POSITA would have understood from Broadcom ’814’s teachings that the system described may be implemented in a master/slave relationship with the master communication device capable of transmitting communications to and receiving communications from a slave (e.g., “modem”).** “In multi-drop operation, multiple modems connected [sic] are connected to the same communication channel using time-division multiplexing. For example, in accordance with multi-drop operation, a subscriber can operably couple more than one modem to a single telephone line. FIG. 7 is a schematic diagram of a multi-drop configuration which includes modems 1001-1003 in the subscriber’s residence 1010, and modem 1004 in the telephone company central office 1011. Modems 1001-1004 are coupled by a twisted pair telephone line 1012. Each of modems 1001-1004 include a transmitter circuit and a receiver circuit which operate in accordance with the previously described burst-mode protocol.”). Col. 19:1-13. “As a result, any of the transmitter circuits of modems 1001-1004 can establish a session on telephone line 1012 as follows.” Col. 19:18-20. “In an alternative embodiment, multi-drop access is provided by implementing well known time division multiple access (TDMA) techniques in which every transmitter circuit is assigned a fixed time slot during which to transmit packet information. The advantage of this scheme is ease of implementation.” Col. 19:43-48. Fig. 7, reproduced below.

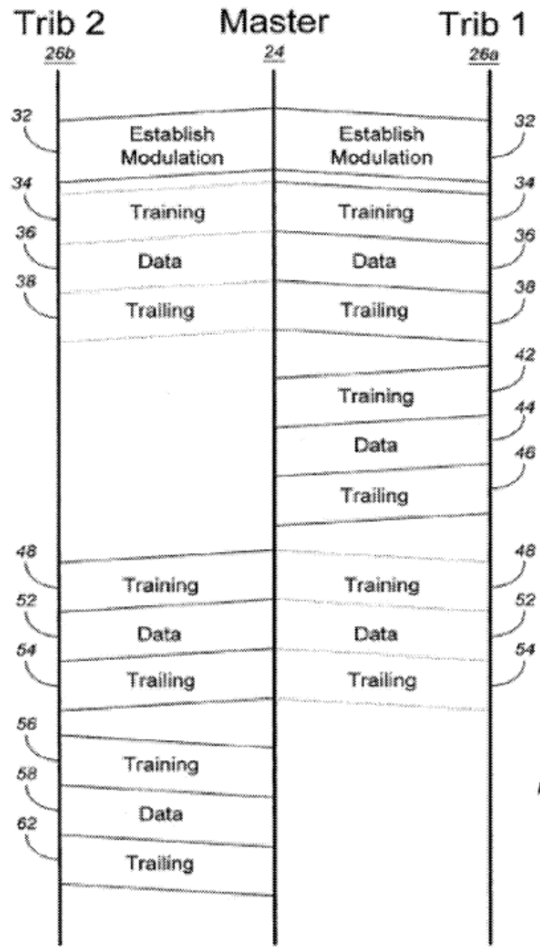
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		Fig. 7 “As previously described, the preamble can also contain error control information that will be used by the main body of the packet. Using this scheme, the same modem can accommodate both “expensive’ error control schemes such as might be required for Video applications, as well as "inexpensive' error control sschemes which might be used for traditional packet traffic. Another portion of the error control information can be used to ‘request an acknowledgement’ from the receiver circuit.. If the received packet is acceptable, then the receiver circuit will cause an acknowledge (ack) signal to be transmitted to the modem residing at the source address. If the received packet is not acceptable, then the receiver circuit will cause a no acknowledge (nack) signal to be transmitted to the modem residing at the source address. Col. 20:64-21:11. “For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 20:1-7. “The associated transmitter circuit can then initiate a session by transmitting a non-idle state signal long enough to ensure that non-idle detector 401 detects the subsequent DATA state.” Col. 15:18-22. **Broadcom ’814 in view of the knowledge of a POSITA further discloses a “slave communication” (e.g., response to a “timing signal” or “poll”) from a slave to a master occurs “in response to a**

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		master communication from the master to the slave" (e.g., "timing signal" or "poll" sent by the master). "Alternatively, receiver circuit 400 can periodically enable the non-idle detector 401 during predetermined time intervals which can be used by the remote transmitter circuit to signal the transmission of a packet. A periodic poll or some other timing signal would be used to maintain synchronization of these time intervals between receiver circuit 400 and the remote transmitter circuit." Col. 15:26-32. "FIG. 1 is a block diagram of a transmitter circuit 100 of a conventional modem. Transmitter circuit 100 includes packet queue 101, framer 102, channel coding circuit 103, output shaper 104, modulator 105 and digital-to-analog (D/A) converter 106. In accordance with conventional modem protocols, transmitter circuit 100 transforms source data received by packet queue 101 into a continuous time analog transmit signal, which is provided at the output terminal of D/A converter 106. More specifically, within transmitter circuit 100, the source data is grouped into packets and stored in packet queue 101. These packets are not synchronous with respect to the modem bit clock, but arrive at packet queue 101 at random times. Framer 102 receives the packets from packet queue 101, and in response, composes a continuous bit stream which is synchronous with respect to the modem bit clock. To create such a synchronous bit stream in response to the asynchronous packets, framer 102 generates idle information (i.e., nulls or a marking tone) when no packets are available, and generates packet data when packets are available. The packet data and idle information are delineated in such a way that a receiver circuit of a modem (see, e.g., FIG. 2) can determine where the packet boundaries lie. The synchronous bit stream generated by framer 102 is then coded by channel coding circuit 103. Channel coding circuit 103 is used to compensate for noise and distortion in the communication channel. Channel coding circuit 103 provides redundant information (e.g., convolutional encoding) to allow for error correction. Channel coding circuit 103 further performs a scrambling function, as well as mapping the coded bit stream onto symbol values. The stream of symbol values generated by channel coding circuit 103 is provided to output shaper 104. Output shaper 104 digitally filters the stream of symbol values received from channel coding circuit 103. Output shaper circuit 104 limits the frequency bandwidth of these symbol values within a predetermined range and may also be adjusted to help compensate for channel distortion. The filtered sample stream provided by output shaper 104 is provided to modulator 105, which modulates a carrier signal by the filtered sample stream. The output of modulator 105 is provided to D/A converter 106, which generates an analog TRANSMIT signal for transmission on the communication channel (i.e., telephone line). Transmitter circuit 100 exhibits three distinct disadvantages. First, because transmitter circuit 100 transmits constantly (either packet data or idle information), a modem can be functionally connected to only one telephone line at any given time. Moreover, only a small percentage of the total information

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		carrying capacity of the communication channel is used to transmit data, while a large percentage of this capacity is used to transmit idle information. Additionally, transmitter circuit 100 is unsuited to multi-drop operation on a single communication channel. The first disadvantage mentioned above is particularly deleterious where a number of xDSL modems are collected together in a central office to provide data communications to a number of remote locations. In this case, each remote location requires a dedicated XDSL modem in the central office.” Col. 1:29-2:21. “The present invention also includes a method for operating a plurality of modems on a single telephone line (i.e., multi-drop operation). This method includes the steps of (1) modulating packets of digital information by the modems, wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and (4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time. In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Col. 5:32-58. “For example, although the present modems have been described in terms of codecs and DSP chips, it is understood that the modems in accordance with the present invention can be implemented entirely by software within a conventional X86 or X86 with MMX processor.” Col. 23:28-33. Fig. 1, reproduced below.  Fig. 1 (PRIOR ART)

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		Fig. 4, reproduced below. Fig. 4  “In accordance with another embodiment of the present invention, the transmitter and receiver circuits provide for direct Support of packet traffic, as opposed to continuous bit Streams, using low-level modem protocols. The protocol which facilitates this packet traffic will hereinafter be referred to as a burst-mode protocol. In the burst-mode protocol, the transmitter circuit does not transmit idle information as previously described in connection with transmitter circuit 100 (FIG. 1). Instead, the transmitter circuit transmits a predetermined non-idle State Signal to indicate that packet data is about to be transmitted, and then transmits the packet data. If the transmitter circuit is not transmitting the predetermined non-idle State Signal or packet data, the transmitter circuit does not transmit any signals on the communication channel. Stated another way, the transmitter circuit does not transmit idle information. The transmitter circuit only Sends information when there is meaningful packet data available to be sent.” Col. 13:48-65. *See also* Col. 18:66-19:53. **Alternatively, Broadcom ’814 in view of the teachings of the APA discloses a communication device capable of communicating according to a master slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.**

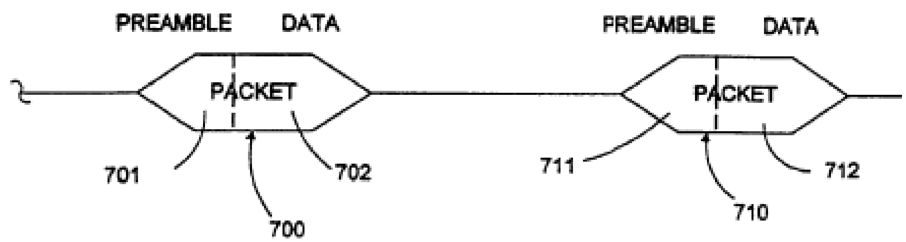
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		 FIG. 1 Prior Art ’580 at Fig. 1.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		 FIG. 2 '580 at Fig. 2. "With reference to FIG. 1, a prior art multipoint communication system 22 is shown to comprise a master modem or transceiver 24, which communicates with a plurality of tributary modems (tribs) or transceivers 26-26 over communication medium 28. Note that all tribs 26-26 are identical in that they share a common modulation method with the master transceiver 24. Thus, before any communication

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		can begin in multipoint system 22, the master transceiver and the tribs 26-26 must agree on a common modulation method. If a common modulation method is found, the master transceiver 24 and a single trib 26 will then exchange sequences of signals that are particular subsets of all signals that can be communicated via the agreed upon common modulation method. These sequences are commonly referred to as training signals and can be used for the following purposes: 1) to confirm that the common modulation method is available, 2) to establish received signal level compensation, 3) to establish time recovery and/or carrier recovery, 4) to permit channel equalization and/or echo cancellation, 5) to exchange parameters for optimizing performance and/or to select optional features, and 6) to confirm agreement with regard to the foregoing purposes prior to entering into data communication mode between the users. In a multipoint system, the address of the trib with which the master is establishing communication is also transmitted during the training interval. At the end of a data session a communicating pair of modems will typically exchange a sequence of signals known as trailing signals for the purpose of reliably stopping the session and confirming that the session has been stopped. In a multipoint system, failure to detect the end of a session will delay or disrupt a subsequent session. Referring now to FIG. 2, an exemplary multipoint communication session is illustrated through use of a ladder diagram. This system uses polled multipoint communication protocol. That is, a master controls the initiation of its own transmission to the tribs and permits transmission from a trib only when that trib has been selected. At the beginning of the session, the master transceiver 24 establishes a common modulation as indicated by sequence 32 that is used by both the master 24 and the tribs 26a, 26b for communication. Once the modulation scheme is established among the modems in the multipoint system, The master transceiver 24 transmits a training sequence 34 that includes the address of the trib that the master seeks to communicate with. In this case, the training sequence 34 includes the address of trib 26a. As a result, trib 26b ignores training sequence 34. After completion of the training sequence 34, master transceiver 24 transmits data 36 to trib 26a followed by trailing sequence 38, which signifies the end of the communication session. Similarly, with reference to FIG. 8, the sequence 170 illustrates a Type A modulation training signal, followed by a Type A modulation data signal. Note that trib 26b ignores data 36 and trailing sequence 38 as it was not requested for communication during training sequence 34. At the end of trailing sequence 38, trib 26a transmits training sequence 42 to initiate a communication session with master transceiver 24. Because master transceiver 24 selected trib 26a for communication as part of training sequence 34, trib 26a is the only modem that will return a transmission. Thus, trib 26a transmits data 44 destined for master transceiver 24 followed by trailing sequence 46 to terminate the communication session. The foregoing procedure is repeated except master transceiver identifies trib 26b in training sequence 48. In this case, trib 26a ignores the training sequence 48 and the subsequent transmission of data 52 and trailing sequence 54 because it does not recognize its address in training sequence 48. Master transceiver

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		24 transmits data 52 to trib 26b followed by trailing sequence 54 to terminate the communication session. Similarly, with reference to FIG. 8, sequence 172 illustrates a Type A modulation signal, with notification of a changes to Type B, followed by a Type B modulation data signal. To send information back to master transceiver 24, trib 26b transmits training sequence 56 to establish a communication session. Master transceiver 24 is conditioned to expect data only from trib 26b because trib 26b was selected as part of training sequence 48. Trib 26b transmits data 58 to master transceiver 24 terminated by trailing sequence 62.” ‘580 at 3:40-4:50.[1]
1[a]	a transceiver, in the role of the master according to the master/slave relationship,	**Broadcom ’814 in view of the knowledge of a POSITA and/or in view of the teachings of the APA discloses a transceiver, in the role of the master according to the master/slave relationship.** *See* 1[pre] discussion of master and slave transceivers.
1[b]	for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,	**Broadcom ’814 in view of the teachings of Radish ’922 discloses for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** **For example, Broadcom ’814 in view of the teachings of Radish ’922 discloses sending transmissions modulated using a “first modulation method” (e.g., “FSK”) and a “second modulation method” (e.g., “QAM”) of a different “type” than the “first modulation method.”** **For example, Broadcom ’814 discloses sending transmissions modulated using a “first modulation method” (e.g., “first modem protocol,” first “modulation format”) and a “second modulation method” (e.g., “different modem protocol,” “different … modulation format[]”).** “The present invention also includes a method for operating a plurality of modems on a single telephone line (i.e., multi-drop operation). This method includes the steps of (1) modulating packets of digital information by the modems wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and

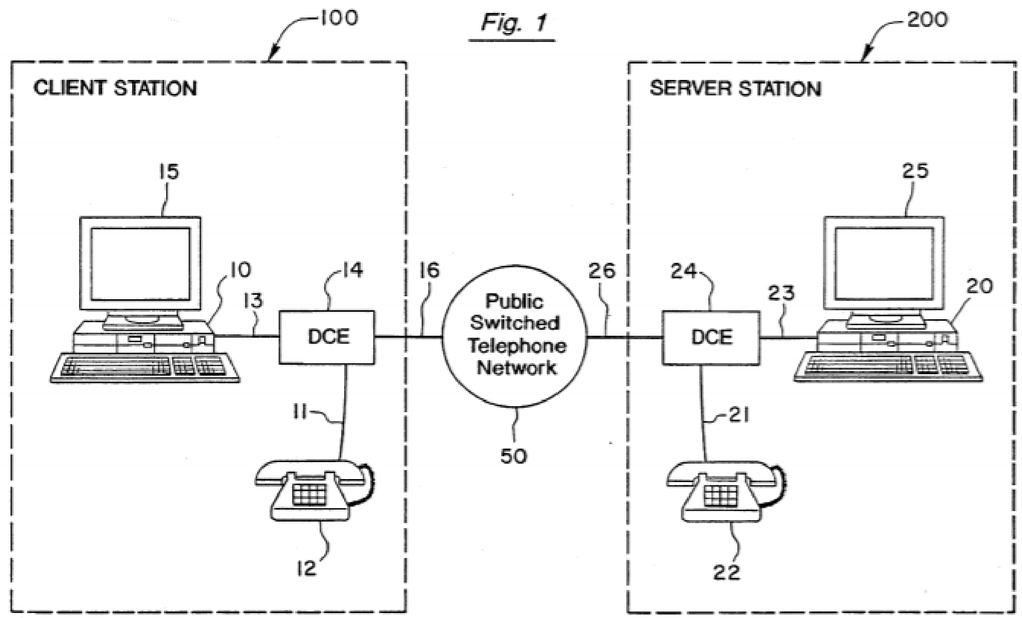
[1] The ’580 patent confirms that a polled protocol is a master/slave protocol. Rembrandt’s represented to the patent office during prosecution that the master/slave language added to the claims and specification was supported by and did not add new matter to the discussion of polled multipoint communication between a master and tributary transceivers. ‘580 patent at 4:6-9; ‘580 Prosecution History at 140. *See also* IPR2014-00518, Pap. 47 at 15 (“In [a polling] protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network.”); ‘580 Prosecution History at 404; IPR2014-00518.

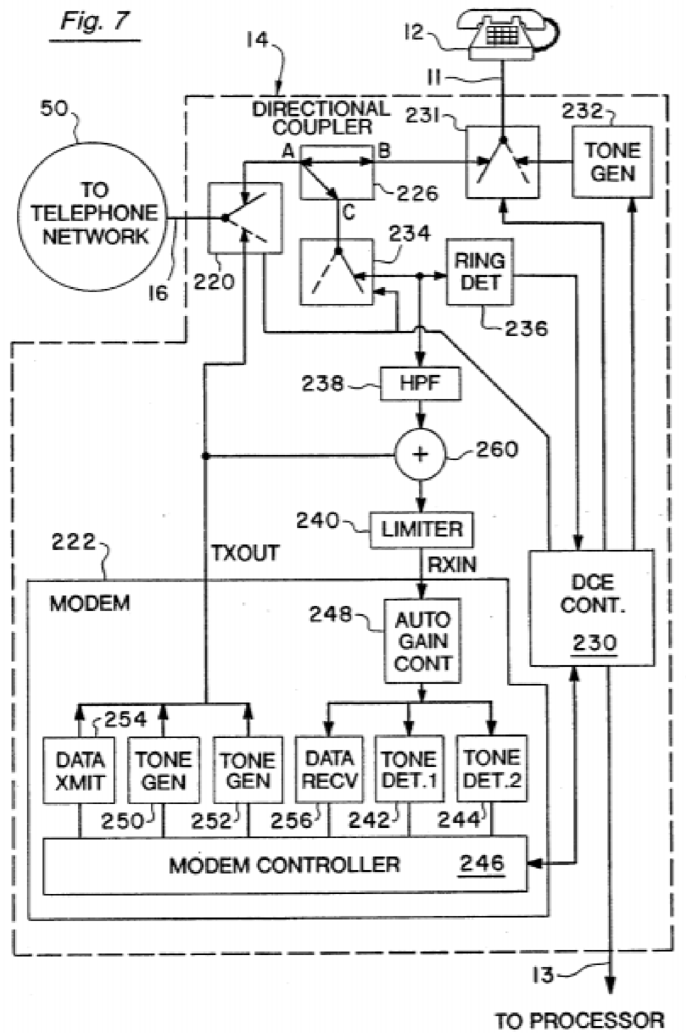
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		(4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time. In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocols associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration." Col. 5:32-58. "In accordance with another embodiment of the invention, a burst mode protocol is provided for operating a modem on a telephone line. The burst mode protocol involves modulating packets of digital information by a transmitter circuit of the modem, wherein the packets of digital information are converted into analog signal bursts of discrete duration." Col. 4:30-35. Fig. 8, reproduced below.  Fig. 8 "For example, consider a quadrature amplitude modulation (QAM) modem." Col. 10:67-11:1. "The concept of idle detection and idle symbol prediction can be applied to other modulation types in addition to QAM. One example of an alternative modulation type is carrier-less amplitude and phase (CAP) modulation. Another example is pulse amplitude modulation (PAM). PAM can be geometrically

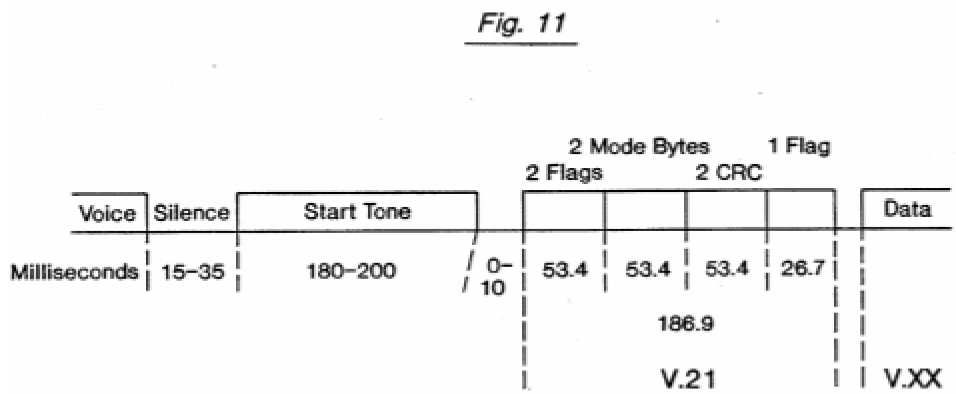
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		viewed as a one dimensional constellation, where the areas described for in QAM example convert to line lengths in PAM.” Col. 12:46-53. “In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet. The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate. The transmitter circuit of modem 1001 then transmits the main body 702 of the packet 700 at this higher rate. The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701. Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber’s residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700. Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712.

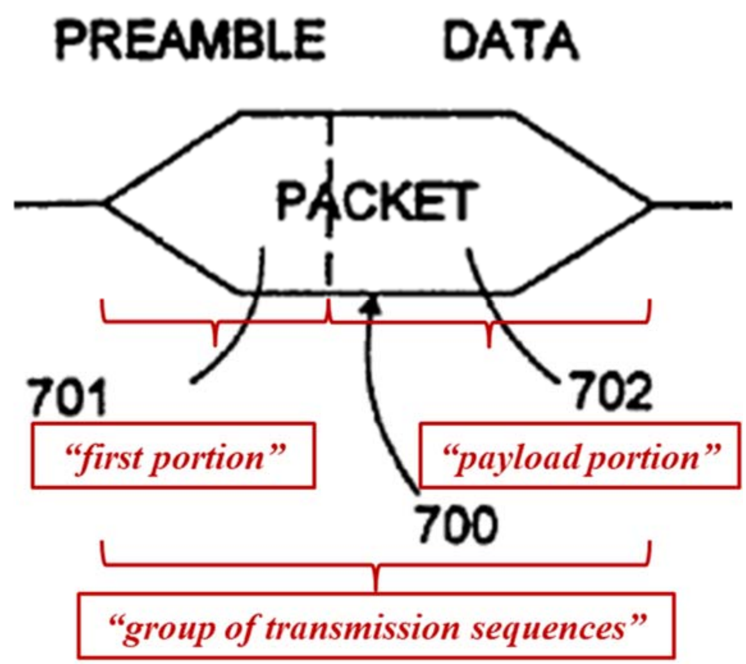
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		The previously described rate adaptive protocol allows both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a "smart toaster" or similar appliance. The previously described rate adaptive protocol allows a multi-line network access circuit to take advantage of reduced processing required for receiving packets that have a lower data rate in their main body. For example, an operator may offer subscribers lower rates in exchange for limiting packet traffic to lower data rates during certain times or under certain classes of service." 19:54-20:53. "In addition, although the present invention has been described in connection with selected modulation techniques (i.e., QAM and MCM) it is understood that other modulation techniques, such as carrier-less amplitude and phase (CAP) modulation, can be used." Col. 23:37-41. **For example, Radish '922 discloses sending transmissions modulated using a "first modulation method" (*e.g.*, "burst rate," which is "V.21 300 bps FSK") and a "second modulation method" (*e.g.*, "priority rate," which is "V.29 9600 bps QAM") of a different "type" than the "first modulation method."** "As discussed in the previous section, three transmission rates are used to convey data during VoiceView data mode: priority rate, recovery rate, and burst rate. Three default modulation schemes corresponding to these rates are: V.21 300 bps FSK, V.27ter 4800 bps DPSK, and V.29 9600 bps QAM" Col. 21:49-54. "The custom data mode identifier is an HDLC frame transmitted using V.21300 bps modulation. The (001100), (010100), and (011100) tone combinations indicate the default VoiceView data mode transmission rates. These tones correspond to the CCITT V.21 300 bps, CCITT V.27ter 4800 bps, and CCITT V.29 9600 bps modulation schemes, respectively. The highest transmission rate is referred to as the Priority rate and is normally used to transmit data between DCEs. The medium speed rate is called the Recovery rate and is used to retransmit data that cannot be successfully transmitted at the Priority rate. The slowest rate is called the Burst rate and is used to send small packets of data, including acknowledgments, between DCEs." Col. 20:4-16. "Burst rate should always use V.21 300 bps because of its robustness and lack of a training sequence." Col. 20:19-21. "Overview. Turning to FIG. 1, a schematic block diagram is provided showing two stations 100, 200 communicating over a telephone line 16, 26 via the public switched tele phone network 50. Each station includes a conventional telephone set 12, 22 for voice communications. Data circuit-terminating equipment (DCE) 14, 24 is inserted between the telephone 12, 22 and the telephone network 50 to selectively couple the telephones 12, 22 for voice communications, and to selectively provide data

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		communications in any of a variety of data formats, protocols, and/or transmission rates.” Col. 6:57-66. “In the preferred embodiment, the data receive block 256 can be configured by the DCE controller 230 and modem controller 246 to selectively operate at any of a number of different data modes (e.g., VoiceView, facsimile, modem file transfer, etc.) and data transmission rates (e.g., V.21 300 bps FSK, V.27ter 4800 bps DPSK, or V.29 9600 bps QAM).” Col. 17:10-15. “This start signal also indicates the format and transmission rate (the “mode”) in which the data will be transmitted.” Col. 7:34-36. “The subsequent data block format is also used by the answering DCE when transmitting any HDLC frames while in VoiceView data mode. All data blocks containing a single HDLC Supervisory or Unnumbered frame must be sent efficiently and reliably since these frames cannot be retransmitted if an error occurs. Therefore these data frames are transmitted using the subsequent data block format at the burst transmission rate (V.21 300 bps FSK). This format is referred to as the "response data block” format and is used to exchange data in certain circumstances outside of Voice View data mode, as follows:” Col. 22:26-36. “FIG. 11 shows an alternative embodiment of the start sequence in which the mode tones have been replaced with a V.21 HDLC frame. The two mode bytes identify the mode of the data to be transferred. The first mode byte has the form of 000001XX through 111111XX (i.e., it cannot be 000000XX). This allows support of 64,512 modes. However, the two mode bytes should be coded to avoid sequences of five or more consecutive ones to avoid bit stuffing. Client data blocks transmitted with V.21 modulation begin with three HDLC flags, an address byte, a control byte, and a number of data bytes and conclude with two CRC bytes and one or more HDLC flags. The address and control bytes have a double meaning in that they identify the transfer is at V.21 and the HDLC frame type. Alternatively, subsequent data blocks transmitted with non-V.21 modulation are preceded by a V.21 header containing three HDLC flags followed by two mode bytes, two CRC bytes, and a number of HDLC flags.” Col. 20:38-55. Fig. 1, reproduced below.

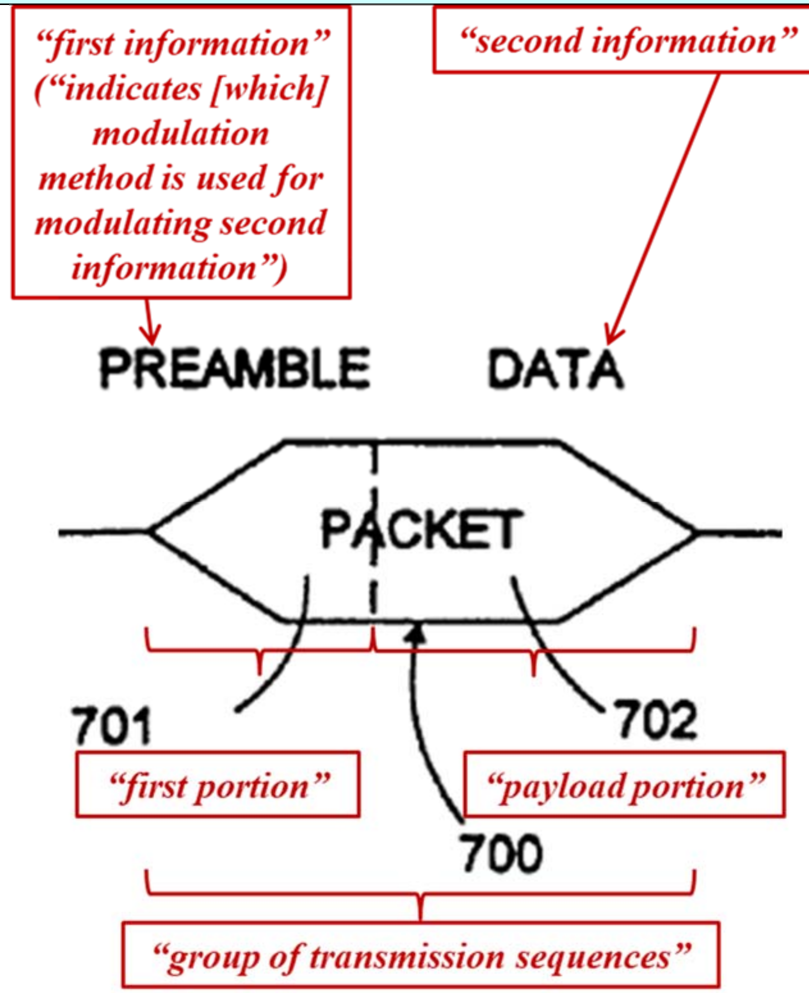
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		 Fig. 7, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		 Fig. 11, reproduced below.

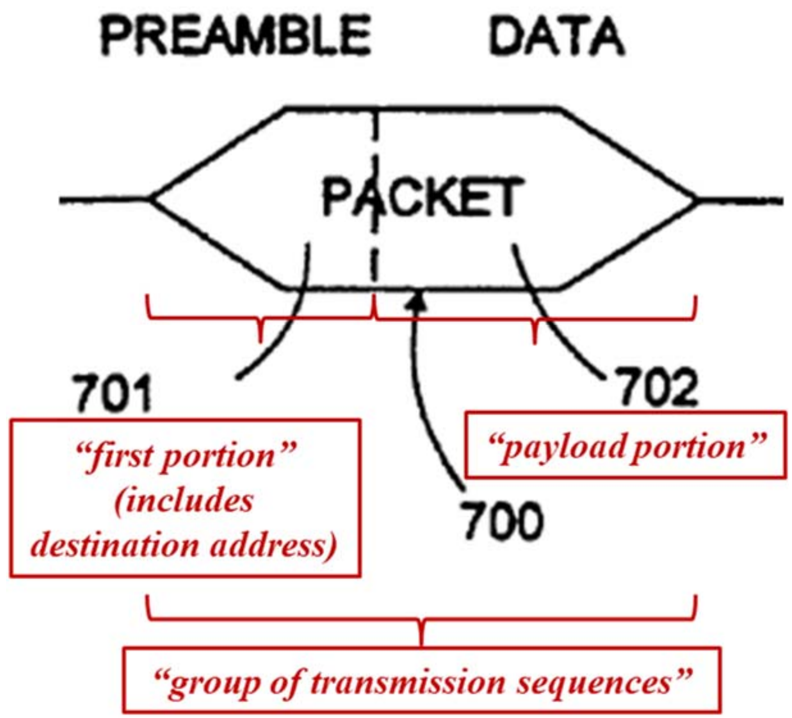
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		
1[c]	wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion	**Broadcom '814 discloses wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion** **For example, Broadcom '814 discloses transmitting a "first portion" (*e.g.*, "preamble") and a "payload portion" (*e.g.*, "main body") within a group of transmission sequences (*e.g.*, a "packet").** Fig. 8, annotated below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		 “FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 19:57-20:7. “In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem

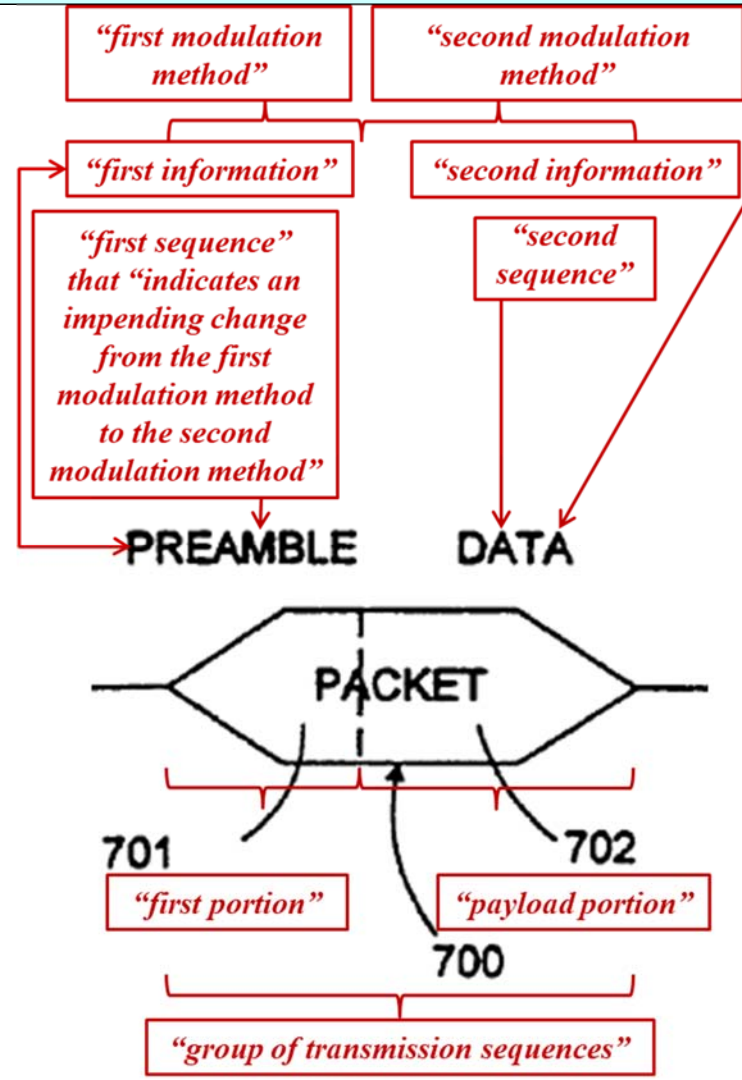
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		protocol.” Col. 5:45-48. “FIG. 7 is a schematic diagram of a multi-drop configuration which includes modems in a subscriber's residence and a modem in the telephone company central office, FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment;” Col. 6:46-51.
1[d]	wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,	**Broadcom ’814 discloses wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion.** **Broadcom ’814 discloses that the first information (*e.g.*, “information which identifies:…(2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used)”) indicates whether the communication device is transmitting a group of sequences (*e.g.*, “packet”) having second information (*e.g.*, “data”) in the payload portion (*e.g.*, “main body”) that is modulated using the first modulation method (*e.g.*, “first modem protocol,” first “modulation format”) or modulated using the second modulation method (*e.g.*, “different modem protocol,” “different … modulation format[]”).** Fig. 8, annotated below.

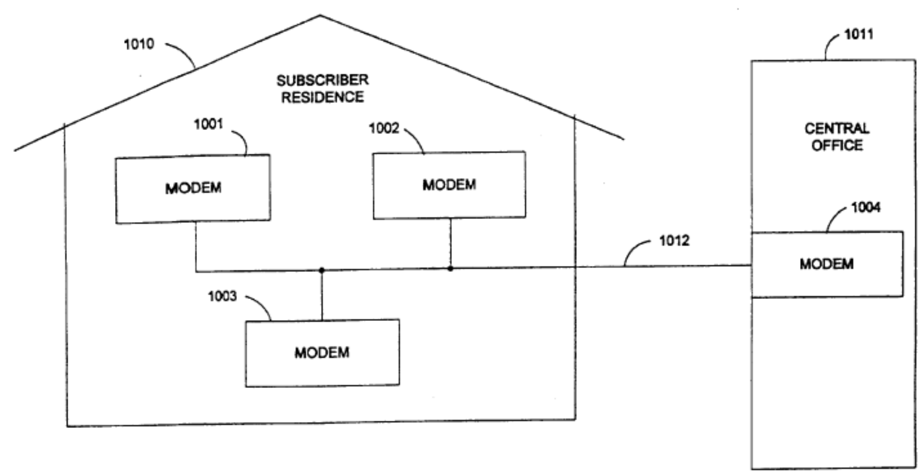
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		 “FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 19:57-20:7. “Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble.” Col. 5:47-55. “In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate. The transmitter circuit of modem 1001 then transmits the main body 702 of the packet 700 at this higher rate. The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701. Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber’s residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700. Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712.” Col. 20:11-39. See also 1[b] for disclosure of two types of modulation (e.g., “burst rate”, “V.21 300 bps FSK” and “priority rate”, “V.29 9600 bps QAM”) by Radish ’922.
1[e]	wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion, and	**Broadcom ’814 discloses wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion.** **For example, Broadcom ’814 discloses that the at least one group of transmissions sequences (*e.g.*,**

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		“packet”) is intended for a destination by an address (*e.g.*, “destination address”) of the payload portion (*e.g.*, “main body”). Fig. 8, annotated below.  “For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 20:1-7. “When the preamble in a burst-mode packet includes the destination address of the packet, the receiver circuits can monitor the destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits.” Col.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		20:54-59. “The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701.” Col. 20:19-22.
1[f]	wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method, and	**Broadcom ’814 in view of the teachings of Radish ’922 discloses wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method.** **For example, Broadcom ’814 discloses a “first sequence” (*e.g.*, “line code (i.e., the modem protocol being used)”) in the first portion and modulated according to the “first modulation method” (*e.g.*, “first modem protocol,” first “modulation format”).** Fig. 8, annotated below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		 Fig. 7, reproduced below.

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		 Fig. 7 “Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Col. 5:45-58. “This method includes the steps of (1) modulating packets of digital information by the modems, wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and (4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time.”) Col. 5:35-44. “In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This Packet 700 includes a preamble 701 and a main body 702.” Col. 19:60-64.

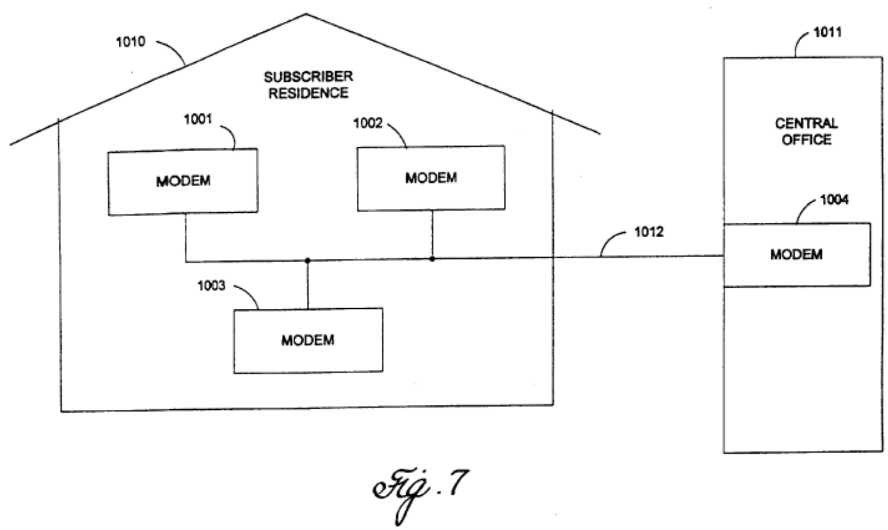
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		“As a result, any of the transmitter circuits of modems 1001-1004 can establish a session on telephone line 1012 as follows.” Col. 19:18-20. “In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet. The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate. The transmitter circuit of modem 1001 then transmits the main body 702 of the packet 700 at this higher rate. The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701. Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber’s residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700. Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712. The previously described rate adaptive protocol allows both simple devices (which communicate at a

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a "smart toaster" or similar appliance. The previously described rate adaptive protocol allows a multi-line network access circuit to take advantage of reduced processing required for receiving packets that have a lower data rate in their main body. For example, an operator may offer subscribers lower rates in exchange for limiting packet traffic to lower data rates during certain times or under certain classes of service." 19:54-20:53. **Broadcom '814 discloses that the "first sequence" (*e.g.*, "line code (i.e., the modem protocol being used)") "indicates an impending change from the first modulation method to the second modulation method" (e.g., from the "first modem protocol," first "modulation format" to the "different modem protocol," "different … modulation format[]").** "In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet." Col. 19:54-20:7. **Radish '922 discloses a first modulation method (e.g., "FSK") that is a different type than the second modulation method (e.g., "QAM").** *See also* 1[b] discussion of two types of modulation, where a second modulation method (*e.g.*, "priority rate", "V.29 9600 bps QAM") is of a different type than a first modulation method (*e.g.*, "burst rate", "V.21 300 bps FSK").
1[g]	the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.	**Broadcom '814 discloses the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.** **For example, Broadcom '814 discloses that the at least one group of transmission sequences (*e.g.*, "packet") includes the second information (*e.g.*, "data") that comprises a second sequence (*e.g.*, "data") that is modulated according to the second modulation method (*e.g.*, "different modem**

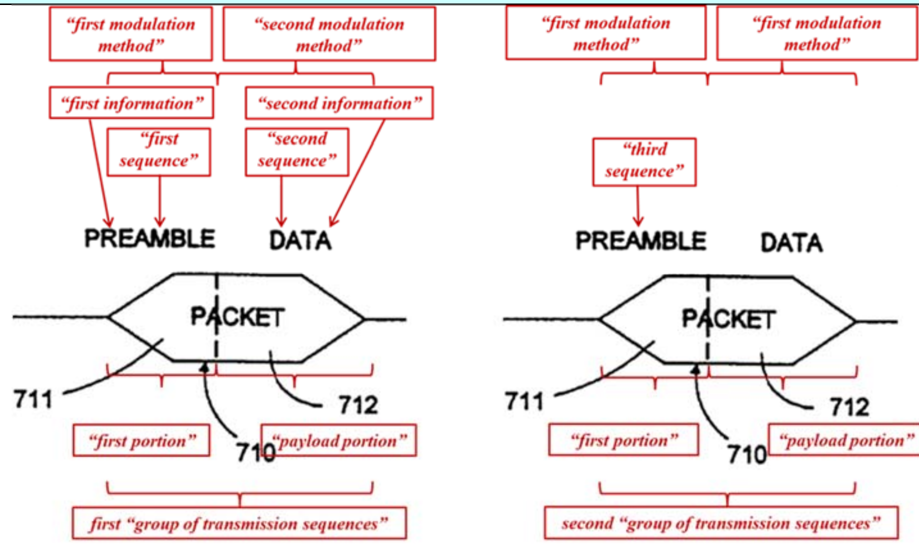
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ’814 patent
		protocol,” “different … modulation format[]”), where the second sequence (*e.g.*, “data” in “main body”) is transmitted after the first sequence (*e.g.*, “line code” in “preamble”). *See* 1[f] discussion of first sequence (*e.g.*, first “packet”) and second sequence (*e.g.*, second “packet”). **Radish ’922 discloses the first modulation method (*e.g.*, “FSK”) and the second modulation method (*e.g.*, “QAM”).** *See* 1[b] discussion of first modulation method (*e.g.*, “burst rate”, “V.21 300 bps FSK”) and second modulation method (*e.g.*, “priority rate”, “V.29 9600 bps QAM”).

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ‘814 patent
[2]	The device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	**Broadcom ‘814 in view of the teachings of Radish ’922 and/or in view of the teachings of the APA discloses the device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method** *See* Claim 1; *see also* **For example, Broadcom ’814 discloses a transceiver (*e.g.*, “modem”) configured to send transmissions to another device (*e.g.*, “modem”) where communication switches between modulation methods.** *See* 1[pre] discussion of master/slave techniques, 1[b] discussion of “first modulation method” (*e.g.*, FSK) and “second modulation method” (*e.g.*, QAM). **Broadcom ’814 further discloses that the transceiver is configured to send a third sequence (*e.g.*, part of another “packet”) modulated using a first modulation method (*e.g.*, “first modem protocol,” first “modulation format”) after the second sequence (*e.g.*, “data”), modulated according to the second modulation method (*e.g.*, “different modem protocol,” “different … modulation format[]”), of the group of transmission sequences (*e.g.*, first “packet”). For Broadcom ’814 discloses that the transceiver is configured to send the third sequence (*e.g.*, “line code (i.e., the modem protocol being used)” of another “packet”) transmitted in the first modulation method (*e.g.*, “first modem protocol,” first “modulation format”) and indicates that the communication from the transceiver has reverted from the second modulation method (*e.g.*, “different modem protocol,” “different …**

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		modulation format[]") to the first modulation method (*e.g.*, "first modem protocol," first "modulation format"). "The present invention also includes a method for operating a plurality of modems on a single telephone line (i.e., multi-drop operation). This method includes the steps of (1) modulating packets of digital information by the modems wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and (4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time. In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration." Col. 5:32-58. "In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.." Col. 19:54-20:7. Fig. 7, reproduced below.

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		 Fig. 8, annotated below.

<table>
<tr><th></th><th>Claim 2 of U.S. Patent No. 8,023,580
(“the ’580 patent”)</th><th>The Broadcom ‘814 patent</th></tr>
<tr><td></td><td></td><td>



“FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702.” Col. 19:57-64.

“Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber’s residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700.” Col. 20:23-33.

“The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate. The transmitter circuit of modem 1001 then transmits the main body 702 of the packet 700 at this higher rate. The receiver circuit identified by the destination address of

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	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	The Broadcom '814 patent
		preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701. … Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712. The previously described rate adaptive protocol allows both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a "smart toaster" or similar appliance. The previously described rate adaptive protocol allows a multi-line network access circuit to take advantage of reduced processing required for receiving packets that have a lower data rate in their main body. For example, an operator may offer subscribers lower rates in exchange for limiting packet traffic to lower data rates during certain times or under certain classes of service." Col. 20:8-53. *See also* Col. 19:18-64. **For example, Radish '922 discloses that communication from the transceiver has reverted from the second modulation method (*e.g.*, "QAM") to the first modulation method (*e.g.*, "FSK").** Radish '922 discloses "adaptive selection of data modulation schemes," which includes retransmitting data blocks at lower rates/modulation schemes when initial transmissions have been unsuccessful. "The VoiceView data mode uses an adaptive selection of data modulation schemes. The DCE first transmits a starting data block using the priority transmission rate to transport the data. If the starting data block is transmitted and no response is received from the answering DCE before the acknowledgment timer expires, the originating DCE aborts data mode, notifies its DTE with an ERROR result code, and immediately returns to voice mode. if an acknowledgment is received before the timer expires, indicating that only some of the data was received correctly, the DCE initiates retransmission of the data. However, this time the data is sent using the subsequent data block format. If a UA frame was received, the entire window of data frames is retransmitted using the priority transmission rate. If an RR has been received, only those unacknowledged frames are retransmitted at the priority data rate. After the first retransmission, if no response is encountered before the time out or only some of the frames are successfully acknowledged, the DCE retransmits the remaining unacknowledged frames in a subsequent data block one last time using the recovery transmission rate (or burst rate if recovery rate was used the first two times). If the timer again expires, the DCE aborts data mode, immediately returns to voice mode, and notifies the DTE.

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ‘814 patent
		If the first data block is successfully delivered to the far-end DCE, the remainder of the data message is transmitted by the sending DCE using one or more subsequent data blocks. All the frames in a data block must be acknowledged before new frames are transmitted in a new block. If a data block or portion thereof cannot be successfully transmitted at the priority transmission rate during a data mode transaction but is successfully retransmitted at the recovery transmission rate, the DCE automatically sends all remaining information data blocks during that data mode transaction using the recovery rate. This strategy minimizes transmission time of data on telephone connections with marginal transmission quality by avoiding subsequent transmissions at the priority rate that are likely to fail. This mode of operation is reset when returning to voice mode so that the next data mode transaction (i.e., a new data mode start sequence) will attempt transmission at the priority rate again. If data frames (I frames) are transmitted in both directions during VoiceView data mode, there is no requirement that both directions must use the same transmission rates. The information may be transmitted in one direction at a different transmission rate from the other depending on line quality and DCE capabilities. The use of a mode tone to start the data block transmission allows the selection of varying data rates. In general, all I frames transmitted by a VoiceView DCE are transmitted as follows: (a) The first transmission of either a starting or subsequent data block uses the priority transmission rate (default 9600 bps). (b) The first retransmission of some or all unacknowledged frames in the data block is transmitted at the priority transmission rate. (c) The second and final retransmission of unacknowledged frames in the data block uses the recovery transmission rate (default 4800 bps).” Col. 26:10-67. For example, when transmissions at the “priority rate” (QAM) fail, data is retransmitted at the “recovery rate” (DPSK), and when subsequent transmissions at the “recovery rate” fail, data is retransmitted at the “burst rate” (FSK). “As discussed in the previous section, three transmission rates are used to convey data during VoiceView data mode: priority rate, recovery rate, and burst rate. Three default modulation schemes corresponding to these rates are: V.21 300 bps FSK, V.27ter 4800 bps DPSK, and V.29 9600 bps QAM” Col. 21:49-54. “The highest transmission rate is referred to as the Priority rate and is normally used to transmit data between DCEs. The medium speed rate is called the Recovery rate and is used to retransmit data that cannot be successfully transmitted at the Priority rate. The slowest rate is called the Burst rate and is used to send small packets of data, including acknowledgments, between DCEs. Modulation schemes other than the above-specified defaults may be used in VoiceView data mode for the Priority and Recovery rates. Burst rate should always use V.21 300 bps because of its robustness and lack

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ‘814 patent
		of a training sequence.” Col. 20:9-21.

	Claim 58 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ‘814 patent
58[pre]	A communication device capable of communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave, the device comprising:	*See* 1[pre].
58[a]	a transceiver, in the role of the master according to the master/slave relationship,	*See* 1[a].
58[b]	capable of transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method, and	*See* 1[b].
58[c]	wherein the transceiver is configured to transmit messages with: a first sequence, in the first modulation method, that indicates at least which of the first modulation method and the second modulation method is used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method,	*See* 1[a] for discussion of “transceiver”, 1[c] for discussion of “group of transmission sequences”, 1[d] for “first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,” and 1[f] for “first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method.”
58[d]	and wherein the at least one message is addressed for an intended destination of the second sequence, and	*See* 1[e].
58[e]	the second sequence, modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the	*See* 1[a] for discussion of “transceiver”, 1[c] for discussion of “group of transmission sequences”, 1[d] for “first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,” and 1[f] for “first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second

	Claim 58 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ‘814 patent
	second sequence is transmitted after the first sequence.	modulation method.”

	Claim 59 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	The Broadcom ‘814 patent
59	The device of claim 58, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	*See* Claims 1, 2, and 58.

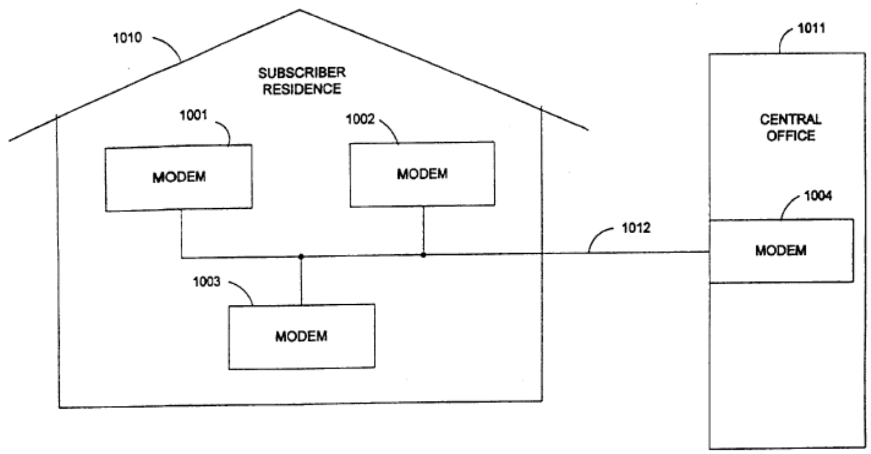
EXHIBIT I

EXHIBIT I

Comparison of the Asserted Claims of the ’228 Patent to U.S. Patent No. 6,075,814 (“the Broadcom ’814 patent” or “Broadcom ’814”)

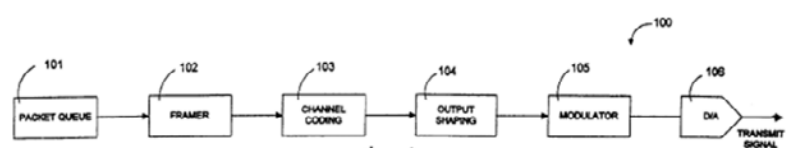
As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,457,228 (“the ’228 patent”) are invalid under 35 U.S.C. § 103(a) as obvious over Broadcom ’814 in view of the teachings of U.S. Patent No. 5,583,922 (“Radish ’922”), and/or the teachings of the Admitted Prior Art (“APA”). One of ordinary skill in the art, as of the priority date of the ’228 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	**The Broadcom ’814 patent**
1[pre]	A master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device comprising:	**Broadcom ’814 in view of the knowledge of a person of ordinary skill in the art (“POSITA”) and/or in view of the teachings of the APA discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device.** **For example, Broadcom ’814 discloses a communication device (*e.g.*, “modems … connected to the same communication channel using time-division multiplexing”/“time division multiple access (TDMA) techniques”/”periodic poll”). A POSITA would have understood from Broadcom ’814’s teachings that the system described may be implemented in a master/slave relationship with the master communication device capable of transmitting communications to and receiving communications from a slave device (e.g., “modem”).** Fig. 7, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		 Fig. 7 "In multi-drop operation, multiple modems connected [sic] are connected to the same communication channel using time-division multiplexing. For example, in accordance with multi-drop operation, a subscriber can operably couple more than one modem to a single telephone line. FIG. 7 is a schematic diagram of a multi-drop configuration which includes modems 1001-1003 in the subscriber's residence 1010, and modem 1004 in the telephone company central office 1011. Modems 1001-1004 are coupled by a twisted pair telephone line 1012. Each of modems 1001-1004 include a transmitter circuit and a receiver circuit which operate in accordance with the previously described burst-mode protocol." Col. 19:1-13. "As a result, any of the transmitter circuits of modems 1001-1004 can establish a session on telephone line 1012 as follows." Col. 19:18-20. "In an alternative embodiment, multi-drop access is provided by implementing well known time division multiple access (TDMA) techniques in which every transmitter circuit is assigned a fixed time slot during which to transmit packet information. The advantage of this scheme is ease of implementation." Col. 19:43-48. "As previously described, the preamble can also contain error control information that will be used by the main body of the packet. Using this scheme, the same modem can

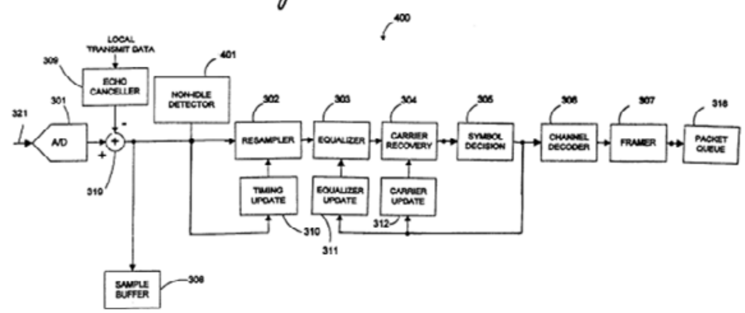
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		accommodate both “expensive’ error control schemes such as might be required for Video applications, as well as "inexpensive' error control schemes which might be used for traditional packet traffic. Another portion of the error control information can be used to ‘request an acknowledgement’ from the receiver circuit.. If the received packet is acceptable, then the receiver circuit will cause an acknowledge (ack) signal to be transmitted to the modem residing at the source address. If the received packet is not acceptable, then the receiver circuit will cause a no acknowledge (nack) signal to be transmitted to the modem residing at the source address. Col. 20:64-21:11. “For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 20:1-7. “The associated transmitter circuit can then initiate a session by transmitting a non-idle state signal long enough to ensure that non-idle detector 401 detects the subsequent DATA state.” Col. 15:18-22. “FIG. 1 is a block diagram of a transmitter circuit 100 of a conventional modem. Transmitter circuit 100 includes packet queue 101, framer 102, channel coding circuit 103, output shaper 104, modulator 105 and digital-to-analog (D/A) converter 106. In accordance with conventional modem protocols, transmitter circuit 100 transforms source data received by packet queue 101 into a continuous time analog transmit signal, which is provided at the output terminal of D/A converter 106. More specifically, within transmitter circuit 100, the source data is grouped into packets and stored in packet queue 101. These packets are not synchronous with respect to the modem bit clock, but arrive at packet queue 101 at random times. Framer 102 receives the packets from packet queue 101, and in response, composes a continuous bit stream which is synchronous with respect to the modem bit clock. To create such a synchronous bit stream in response to the asynchronous packets, framer 102 generates idle information (i.e., nulls or a marking tone) when no packets are available, and generates packet data when packets are available. The packet data and idle information are delineated in such a way that a receiver circuit of a modem (see, e.g., FIG. 2) can determine where the packet boundaries lie. The synchronous bit stream generated by framer 102 is then coded by channel coding circuit 103. Channel coding circuit 103 is used to compensate for noise and distortion

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		in the communication channel. Channel coding circuit 103 provides redundant information (e.g., convolutional encoding) to allow for error correction. Channel coding circuit 103 further performs a scrambling function, as well as mapping the coded bit stream onto symbol values. The stream of symbol values generated by channel coding circuit 103 is provided to output shaper 104. Output shaper 104 digitally filters the stream of symbol values received from channel coding circuit 103. Output shaper circuit 104 limits the frequency bandwidth of these symbol values within a predetermined range and may also be adjusted to help compensate for channel distortion. The filtered sample stream provided by output shaper 104 is provided to modulator 105, which modulates a carrier signal by the filtered sample stream. The output of modulator 105 is provided to D/A converter 106, which generates an analog TRANSMIT signal for transmission on the communication channel (i.e., telephone line). Transmitter circuit 100 exhibits three distinct disadvantages. First, because transmitter circuit 100 transmits constantly (either packet data or idle information), a modem can be functionally connected to only one telephone line at any given time. Moreover, only a small percentage of the total information carrying capacity of the communication channel is used to transmit data, while a large percentage of this capacity is used to transmit idle information. Additionally, transmitter circuit 100 is unsuited to multi-drop operation on a single communication channel. The first disadvantage mentioned above is particularly deleterious where a number of xDSL modems are collected together in a central office to provide data communications to a number of remote locations. In this case, each remote location requires a dedicated XDSL modem in the central office.” Col. 1:29-2:21. “The present invention also includes a method for operating a plurality of modems on a single telephone line (i.e., multi-drop operation). This method includes the steps of (1) modulating packets of digital information by the modems, wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and (4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time. In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Col. 5:32-58. “FIG. 4 is a block diagram of a receiver circuit 400 in accordance with the burst-mode protocol. Many of the elements of receiver circuit 400 are similar to elements previously described in connection with receiver circuit 300 (FIG.3). Thus, similar elements in FIGS. 3 and 4 are labeled with similar reference numbers. Thus, receiver circuit 400 includes A/D converter 301, resampler 302, equalizer 303, carrier recovery circuit 304, symbol decision circuit 305, channel decoder 306, framer/idle detector 307, sample buffer 308, echo canceler 309, timing update circuit 310, equalizer update circuit 311, carrier update circuit 312 and packet queue 318. In addition, receiver circuit 400 includes a non-idle detector circuit 401, which is coupled to receive the output signal provided by Summing node 319.” Col. 13:66-14:12. “For example, although the present modems have been described in terms of codecs and DSP chips, it is understood that the modems in accordance with the present invention can be implemented entirely by software within a conventional X86 or X86 with MMX processor.” Col. 23:28-33. Fig. 1, reproduced below.  Fig. 1 (PRIOR ART) Fig. 4, reproduced below.

<table>
<tr><th></th><th>Claim 1 of U.S. Patent No. 8,457,228
(“the ’228 patent”)</th><th>The Broadcom ’814 patent</th></tr>
<tr><td></td><td></td><td>

Fig. 4



Broadcom ’814 in view of the knowledge of a POSITA further discloses a “slave communication” (e.g., response to a “timing signal” or “poll”) from a slave to a master occurs “in response to a master communication from the master communication device to the slave device” (e.g., “timing signal” or “poll” sent by the master).

“Alternatively, receiver circuit 400 can periodically enable the non-idle detector 401 during predetermined time intervals which can be used by the remote transmitter circuit to signal the transmission of a packet. A periodic poll or some other timing signal would be used to maintain synchronization of these time intervals between receiver circuit 400 and the remote transmitter circuit.” Col. 15:26-32.

“In accordance with another embodiment of the present invention, the transmitter and receiver circuits provide for direct Support of packet traffic, as opposed to continuous bit Streams, using low-level modem protocols. The protocol which facilitates this packet traffic will hereinafter be referred to as a burst-mode protocol. In the burst-mode protocol, the transmitter circuit does not transmit idle information as previously described in connection with transmitter circuit 100 (FIG. 1). Instead, the transmitter circuit transmits a predetermined non-idle State Signal to indicate that packet data is about to be transmitted, and then transmits the packet data. If the transmitter circuit is not transmitting the predetermined non-idle State Signal or packet data, the transmitter circuit does not transmit any signals on the communication channel. Stated another way, the transmitter circuit does not transmit idle information. The transmitter circuit only Sends information when there is meaningful packet data available to be sent.” Col. 13:48-65.

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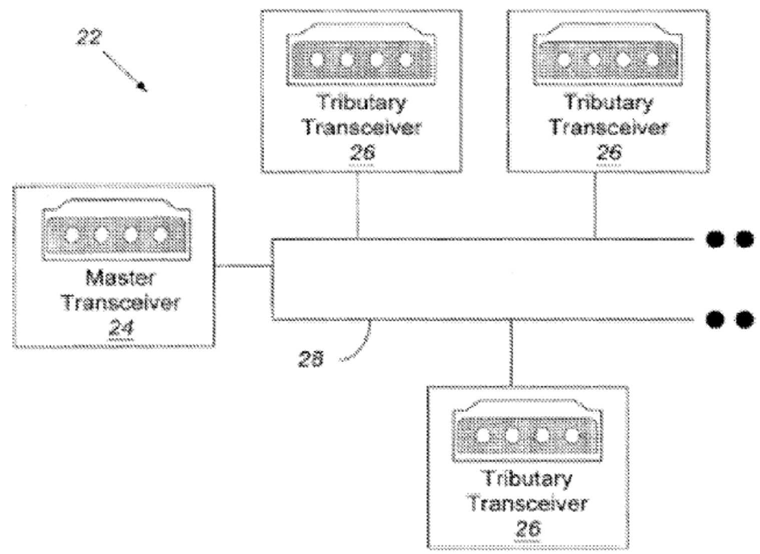
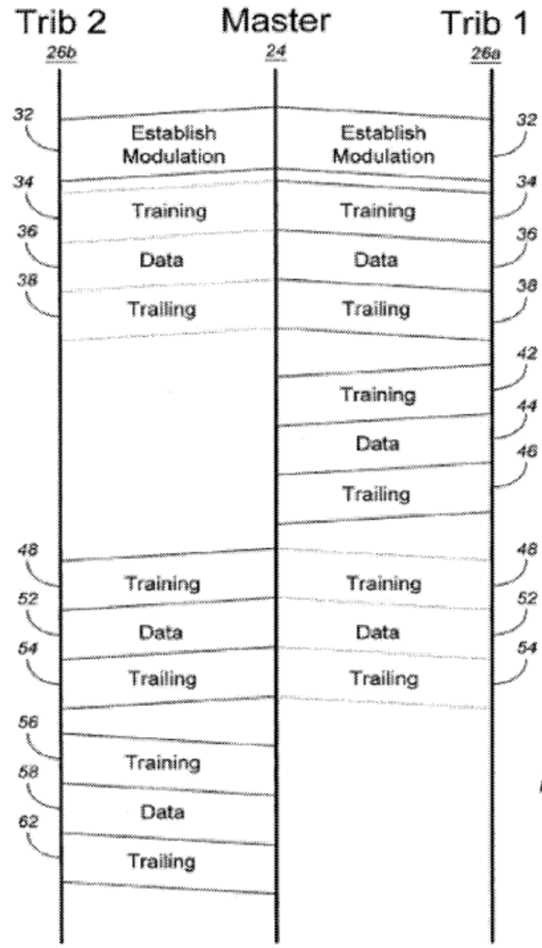
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		See also Col. 18:66-19:53. **Alternatively, Broadcom '814 in view of the teachings of the APA discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave device to a master communication device occurs in response to a master communication from the master communication device to the slave device.**  *FIG. 1* **Prior Art** '228 at Fig. 1.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		 FIG. 2 ‘228 at FIG 2. “With reference to *FIG. 1, a prior art multipoint communication system 22 is shown to comprise a master modem or transceiver 24, which communicates with a plurality of tributary modems (tribs) or transceivers 26-26 over communication medium 28.* Note that all tribs 26-26 are identical in that they share a common modulation method

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		with the master transceiver 24. Thus, before any communication can begin in multipoint system 22, the master transceiver and the tribs 26-26 must agree on a common modulation method. If a common modulation method is found, the master transceiver 24 and a single trib 26 will then exchange sequences of signals that are particular subsets of all signals that can be communicated via the agreed upon common modulation method. These sequences are commonly referred to as training signals and can be used for the following purposes: 1) to confirm that the common modulation method is available, 2) to establish received signal level compensation, 3) to establish time recovery and/or carrier recovery, 4) to permit channel equalization and/or echo cancellation, 5) to exchange parameters for optimizing performance and/or to select optional features, and 6) to confirm agreement with regard to the foregoing purposes prior to entering into data communication mode between the users. In a multipoint system, the address of the trib with which the master is establishing communication is also transmitted during the training interval. At the end of a data session a communicating pair of modems will typically exchange a sequence of signals known as trailing signals for the purpose of reliably stopping the session and confirming that the session has been stopped. In a multipoint system, failure to detect the end of a session will delay or disrupt a subsequent session. Referring now to FIG. 2, an exemplary multipoint communication session is illustrated through use of a ladder diagram. This system uses polled multipoint communication protocol. That is, a master controls the initiation of its own transmission to the tribs and permits transmission from a trib only when that trib has been selected. At the beginning of the session, the master transceiver 24 establishes a common modulation as indicated by sequence 32 that is used by both the master 24 and the tribs 26a, 26b for communication. Once the modulation scheme is established among the modems in the multipoint system, The master transceiver 24 transmits a training sequence 34 that includes the address of the trib that the master seeks to communicate with. In this case, the training sequence 34 includes the address of trib 26a. As a result, trib 26b ignores training sequence 34. After completion of the training sequence 34, master transceiver 24 transmits data 36 to trib 26a followed by trailing sequence 38, which signifies the end of the communication session. Similarly, with reference to FIG. 8, the sequence 170 illustrates a Type A modulation training signal, followed by a Type A modulation data signal. Note that trib 26b ignores data 36 and trailing sequence 38 as it was not requested for communication during training sequence 34. At the end of trailing sequence 38, trib 26a transmits training sequence 42 to initiate a communication session with master transceiver 24. Because master transceiver 24

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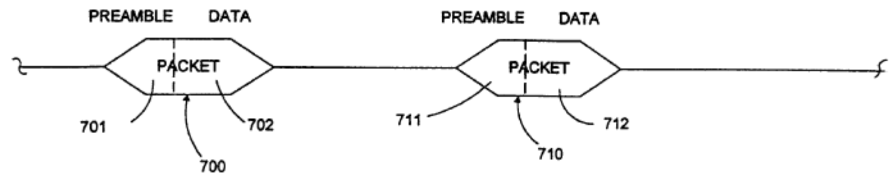
		selected trib 26a for communication as part of training sequence 34, trib 26a is the only modem that will return a transmission. Thus, trib 26a transmits data 44 destined for master transceiver 24 followed by trailing sequence 46 to terminate the communication session. The foregoing procedure is repeated except master transceiver identifies trib 26b in training sequence 48. In this case, trib 26a ignores the training sequence 48 and the subsequent transmission of data 52 and trailing sequence 54 because it does not recognize its address in training sequence 48. Master transceiver 24 transmits data 52 to trib 26b followed by trailing sequence 54 to terminate the communication session. Similarly, with reference to FIG. 8, sequence 172 illustrates a Type A modulation signal, with notification of a changes to Types B, followed by a Types B modulation data signal. To send information back to master transceiver 24, trib 26b transmits training sequence 56 to establish a communication session. Master transceiver 24 is conditioned to expect data only from trib 26b because trib 26b was selected as part of training sequence 48. Trib 26b transmits data 58 to master transceiver 24 terminated by trailing sequence 62.” ‘228 at 3:64-5:7.[1]
1[a]	a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers,	**Broadcom ’814 in view of the knowledge of a POSITA and/or in view of the teachings of the APA discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers.** *See* 1[pre] discussion of TDMA and polling techniques and a modem in the role of a master communication device according to the master/slave relationship; *see also* **For example, Broadcom ’814 further discloses transmitting a first message (*e.g.*, “packet”) over a communication medium (*e.g.*, “communication channel,” “telephone line”).**

[1] A polled protocol is a master/slave protocol, as confirmed by the ‘228 patent and Rembrandt’s representations that the master/slave language added to the claims and specification of the ‘580 patent was supported by and did not add new matter to the discussion of polled multipoint communication between a master and tributary transceivers. ‘228 patent at 4:30-33; ‘580 Prosecution History at 140. *See also* IPR2014-00892, Pap. 46 at 16 (“In [a polling] protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network.”); ‘228 Prosecution History at 352; IPR2014-00892.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		Fig. 8, reproduced below.  *Fig. 8* "The present invention relates to the reduction of the required amount of signal processing in a modulator/demodulator (modem) which is transferring packet-based data or other information which is intermittent in nature on a communication channel." Col. 1:9-13. "In accordance with another embodiment of the invention, a burst mode protocol is provided for operating a modem on a telephone line. The burst mode protocol involves modulating packets of digital information by a transmitter circuit of the modem, wherein the packets of digital information are converted into analog signal bursts of discrete duration. These analog signal bursts are transmitted from the transmitter circuit to the telephone line." Col. 4:29-37. "The present invention also includes a method for operating a plurality of modems on a single telephone line (i.e., multi-drop operation). This method includes the steps of (1) modulating packets of digital information by the modems, wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and (4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time. In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocols associated with

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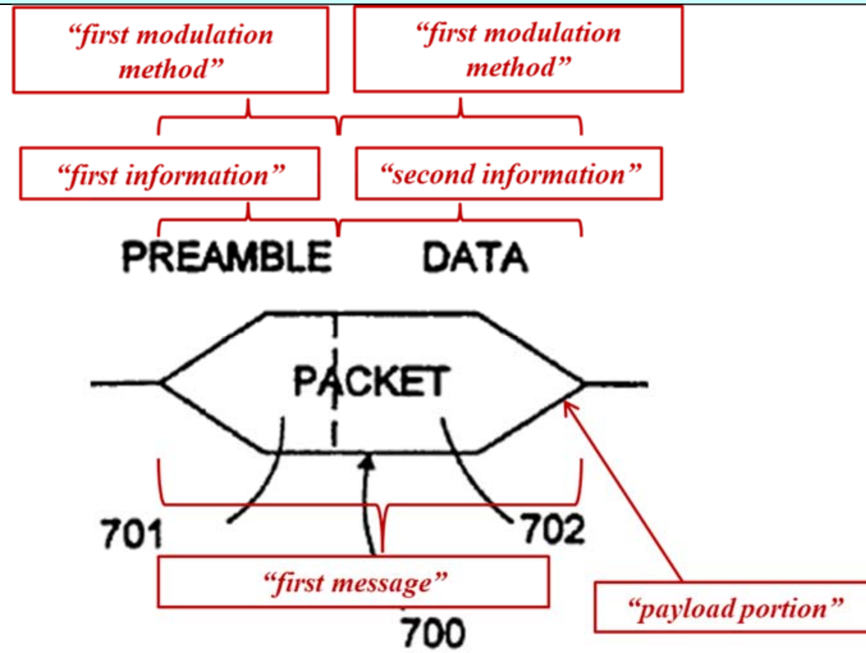
		each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Col. 5:32-58. “Moreover, although the present invention has been described in connection with communication channels which are telephone lines, it is understood that other types of communication channels can be used to implement the present invention.” Col. 23:33-37. “Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration.” Col. 5:45-58.
1[b]	wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers and	**Broadcom ’814 in view of the teachings of Radish ’922 and the knowledge of a POSITA and/or the teachings of the APA discloses wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers.** *See* 1[pre] discussion of TDMA and polling techniques and a modem in the role of a master communication device according to the master/slave relationship; *see also* **For example, Broadcom ’814 discloses a “first message” (*e.g.*, “packet”) including “first information” (*e.g.*, “preamble”). Broadcom ’814 also discloses the “first message” (*e.g.*, “packet”) including “second information” (*e.g.*, “a corresponding main body”), including a “payload portion” (*e.g.*, “data”), intended for one of the one or more slave transceivers.** Fig. 8, annotated below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		 “FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment.” Col. 19:57-60. “In accordance with another embodiment of the invention, a burst mode protocol is provided for operating a modem on a telephone line. The burst mode protocol involves modulating packets of digital information by a transmitter circuit of the modem, wherein the packets of digital information are converted into analog signal bursts of discrete duration.” Col. 4:30-35. “For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 20:1-7. “When the preamble in a burst-mode packet includes the destination address of the

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		packet, the receiver circuits can monitor the destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits.” Col. 20:54-59. “The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701.” Col. 20:19-22. “For example, consider a quadrature amplitude modulation (QAM) modem.” Col. 10:67-11:1. “The concept of idle detection and idle symbol prediction can be applied to other modulation types in addition to QAM. One example of an alternative modulation type is carrier-less amplitude and phase (CAP) modulation. Another example is pulse amplitude modulation (PAM). PAM can be geometrically viewed as a one dimensional constellation, where the areas described for in QAM example convert to line lengths in PAM.” Col. 12:46-53. “In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet. The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		includes data which is being transmitted at a higher data rate. The transmitter circuit of modem 1001 then transmits the main body 702 of the packet 700 at this higher rate. The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701. Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber’s residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700. Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712. The previously described rate adaptive protocol allows both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a “smart toaster” or similar appliance. The previously described rate adaptive protocol allows a multi-line network access circuit to take advantage of reduced processing required for receiving packets that have a lower data rate in their main body. For example, an operator may offer subscribers lower rates in exchange for limiting packet traffic to lower data rates during certain times or under certain classes of service.” 19:54-20:53. “In addition, although the present invention has been described in connection with selected modulation techniques (i.e., QAM and MCM) it is understood that other modulation techniques, such as carrier-less amplitude and phase (CAP) modulation, can be used.” Col. 23:37-41. **Broadcom ’814 also discloses that both the “first” and the “second information”**

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		are modulated using the "first modulation method" (*e.g.*, "first modem protocol," first "modulation format"). "The present invention also includes a method for operating a plurality of modems on a single telephone line (i.e., multi-drop operation). This method includes the steps of (1) modulating packets of digital information by the modems wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and (4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time. In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration." Col. 5:32-58. **Radish '922 discloses a transceiver for sending a first message wherein the first message comprises: first information modulated according to a first modulation method (e.g., "FSK"), second information, including a payload portion, modulated according to the first modulation method (e.g., "FSK").** For example, Radish '922 discloses transmissions modulated using a "first modulation method" (e.g., "burst rate," which is "V.21 300 bps FSK"). "As discussed in the previous section, three transmission rates are used to convey data during VoiceView data mode: priority rate, recovery rate, and burst rate. Three default modulation schemes corresponding to these rates are: V.21 300 bps FSK, V.27ter 4800 bps DPSK, and V.29 9600 bps QAM" Col. 21:49-54. "The custom data mode identifier is an HDLC frame transmitted using V.21300 bps modulation. The (001100), (010100), and (011100) tone combinations indicate the default VoiceView data mode transmission rates. These tones correspond to the CCITT V.21 300 bps, CCITT V.27ter 4800 bps, and CCITT V.29 9600 bps

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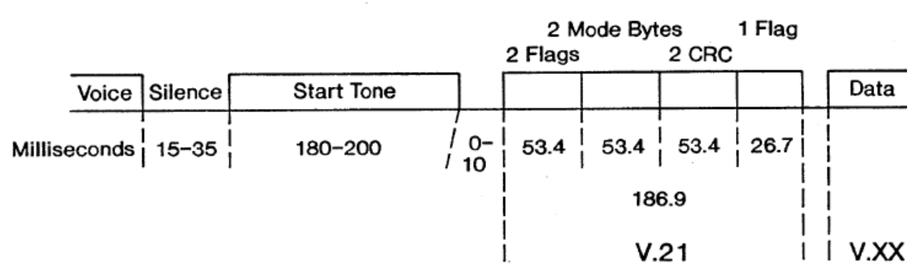
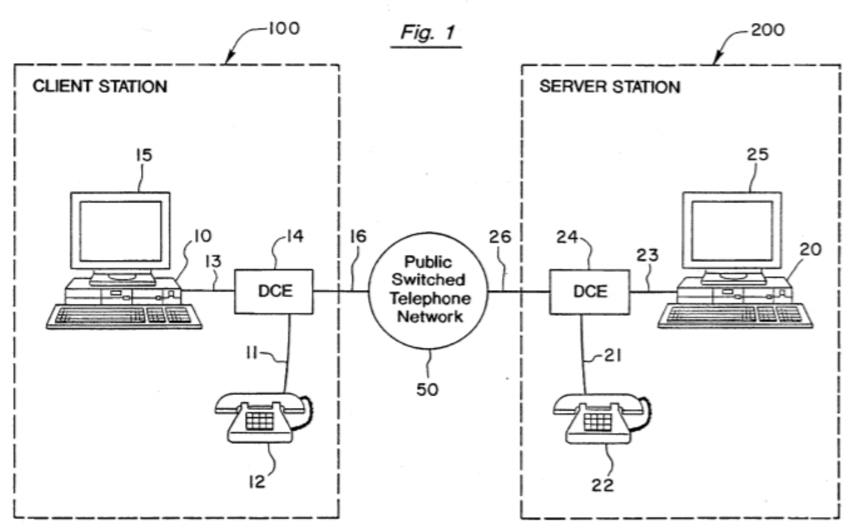
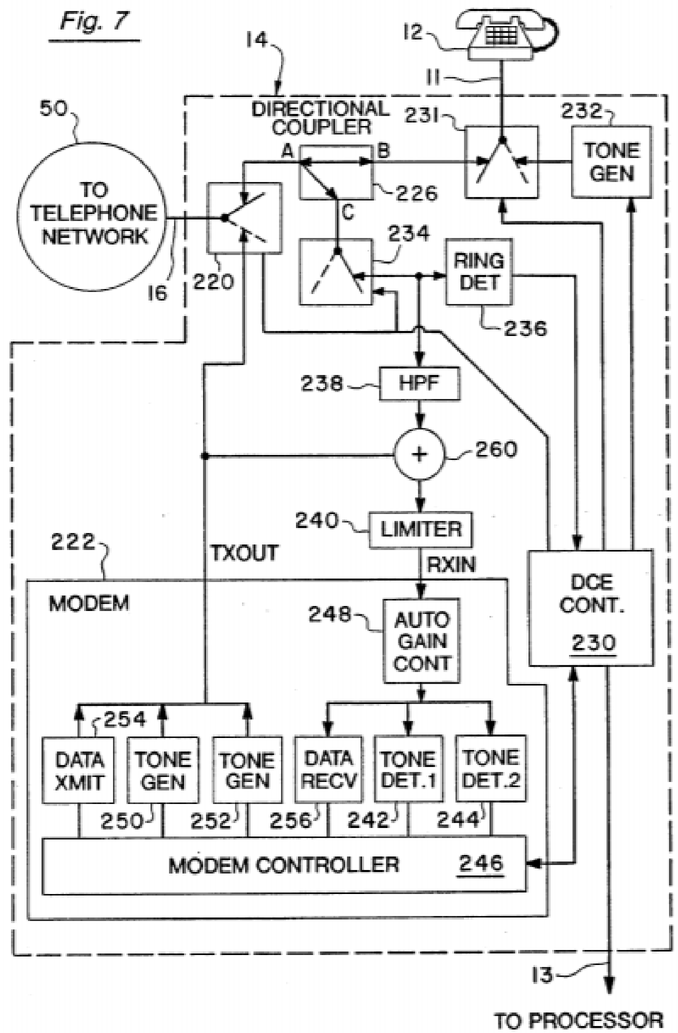
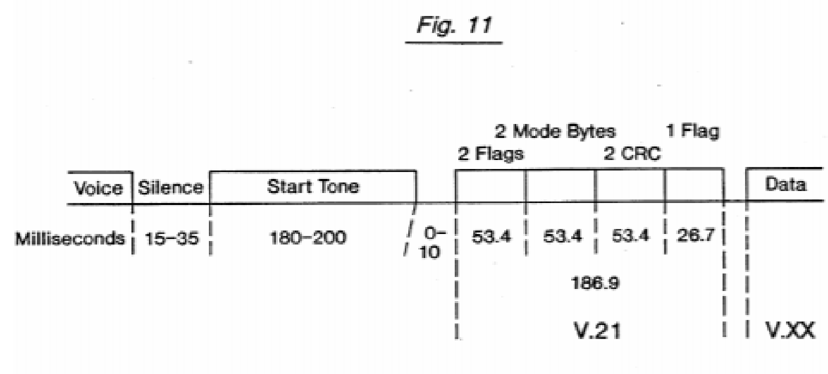
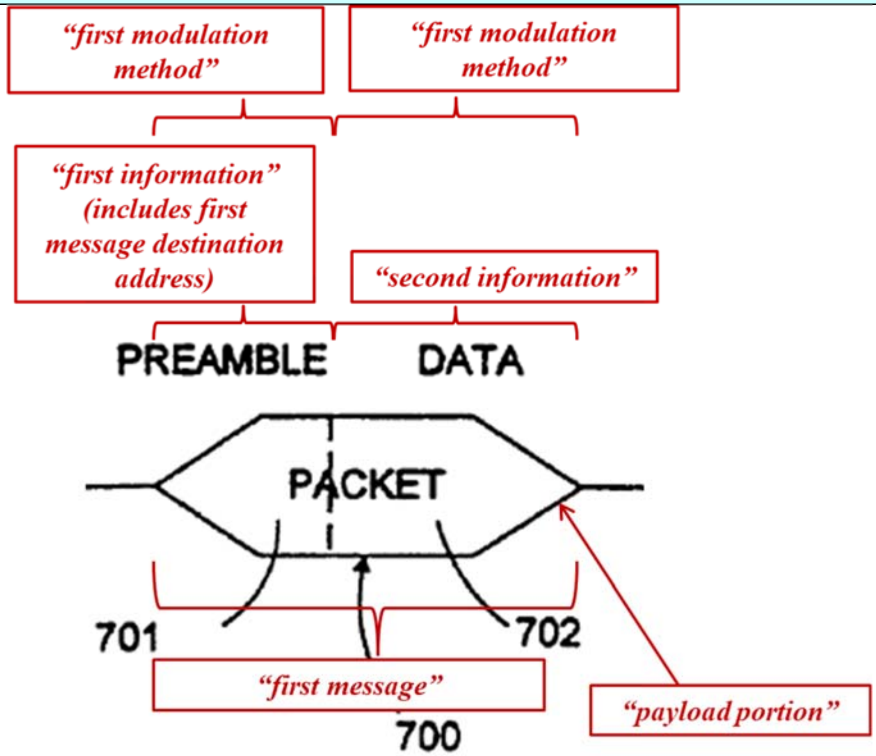
		modulation schemes, respectively. The highest transmission rate is referred to as the Priority rate and is normally used to transmit data between DCEs. The medium speed rate is called the Recovery rate and is used to retransmit data that cannot be successfully transmitted at the Priority rate. The slowest rate is called the Burst rate and is used to send small packets of data, including acknowledgments, between DCEs." Col. 20:4-16. "Burst rate should always use V.21 300 bps because of its robustness and lack of a training sequence." Col. 20:19-21. "All data blocks containing a single HDLC Supervisory or Unnumbered frame must be sent efficiently and reliably since these frames cannot be retransmitted if an error occurs. Therefore these data frames are transmitted using the subsequent data block format at the burst transmission rate (V.21 300 bps FSK)." Col. 22:26-36. "Data circuit-terminating equipment (DCE) 14, 24 is inserted between the telephone 12, 22 and the telephone network 50 to selectively couple the telephones 12, 22 for voice communications, and to selectively provide data communications in any of a variety of data formats, protocols, and/or transmission rates." Col. 6:57-66. "In the preferred embodiment, the data receive block 256 can be configured by the DCE controller 230 and modem controller 246 to selectively operate at any of a number of different data modes (e.g., VoiceView, facsimile, modem file transfer, etc.) and data transmission rates (e.g., V.21 300 bps FSK, V.27ter 4800 bps DPSK, or V.29 9600 bps QAM)." Col. 17:10-15. Fig. 11, reproduced below. *Fig. 11* 

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		“FIG. 11 shows an alternative embodiment of the start sequence in which the mode tones have been replaced with a V.21 HDLC frame. The two mode bytes identify the mode of the data to be transferred. The first mode byte has the form of 000001XX through 111111XX (i.e., it cannot be 000000XX). This allows support of 64,512 modes. How ever, the two mode bytes should be coded to avoid sequences of five or more consecutive ones to avoid bit stuffing. Client data blocks transmitted with V.21 modulation begin with three HDLC flags, an address byte, a control byte, and a number of data bytes and conclude with two CRC bytes and one or more HDLC flags. The address and control bytes have a double meaning in that they identify the transfer is at V.21 and the HDLC frame type. Alternatively, subsequent data blocks transmitted with non-V.21 modulation are preceded by a ***V.21 header*** containing three HDLC flags followed by two mode bytes, two CRC bytes, and a number of HDLC flags.” Col. 20:38-55. “This start signal also indicates the format and transmission rate (the “mode”) in which the data will be transmitted.” Col. 7:34-36. Fig. 1, reproduced below.  Fig. 7, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		 Fig. 11, reproduced below.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		
1[c]	first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information; and	**Broadcom ’814 discloses first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information.** *See* 1[pre] discussion of TDMA and polling techniques and a modem in the role of a master communication device according to the master/slave relationship; *see also* **For example, Broadcom ’418 discloses first message address information (*e.g.*, “address”) indicating the intended destination of the second information (*e.g.*, “a corresponding main body” of a “packet”).** Fig. 8, annotated below.

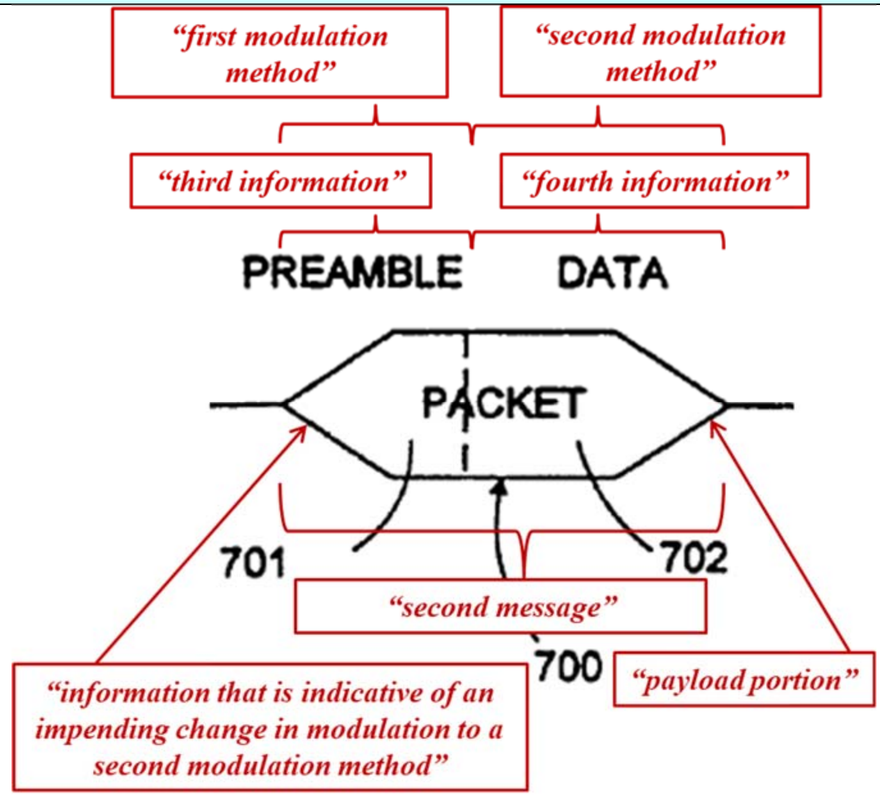
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		 "For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) *packet* source and *destination addresses*, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet." Col. 20:1-7. "When the preamble in a burst-mode packet includes the destination address of the packet, the receiver circuits can monitor the destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits." Col. 20:54-59. "The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701." Col.

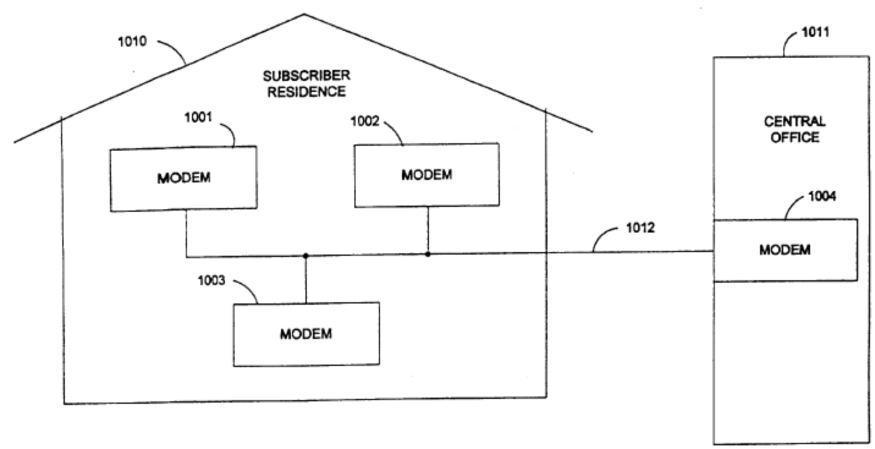
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		20:19-22. "In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet. The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate." Col. 19:54-20:17. "Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber's residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700. Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		body 712. The previously described rate adaptive protocol allows both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a "smart toaster" or similar appliance. The previously described rate adaptive protocol allows a multi-line network access circuit to take advantage of reduced processing required for receiving packets that have a lower data rate in their main body. For example, an operator may offer subscribers lower rates in exchange for limiting packet traffic to lower data rates during certain times or under certain classes of service." Col. 20:23-53. "In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first modem protocol." Col. 5:45-48.
1[d]	said master transceiver configured to transmit a second message[2] over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers, and	**Broadcom '814 in view of the teachings of Radish '922 and the knowledge of a POSITA and/or the teachings of the APA discloses said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers.** *See* 1[pre] discussion of TDMA and polling techniques and a modem in the role of a master communication device according to the master/slave relationship; *see also*

[2] The use of "first message" and "second message" in the claim does not, as Rembrandt acknowledged during prosecution, "imply an order of claim elements (*e.g.*, an ordering of transmissions)". ['228 file history] at 125. To the extent Rembrandt improperly argues that the "first" and "second" identifiers for messages imply an order of claim elements, Broadcom '814 and Radish '922 disclose such limitations.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		Broadcom ’814 discloses the master transceiver is configured to transmit a “second message” (*e.g.*, “packet”) including “third information” (*e.g.*, “preamble”) modulated according to the “first modulation method” (e.g., “first modem protocol,” first “modulation format”). Broadcom ’814 discloses the “third information” (*e.g.*, “preamble”) comprises information (*e.g.*, “line code”) that “is indicative of an impending change in modulation to a second modulation method” (*e.g.*, “different modem protocol,” “different … modulation format[]”) and the “fourth information,” (*e.g.*, “main body”) intended for a transceiver, transmitted according to the second modulation method, transmitted after the third information. Fig. 8, annotated below.

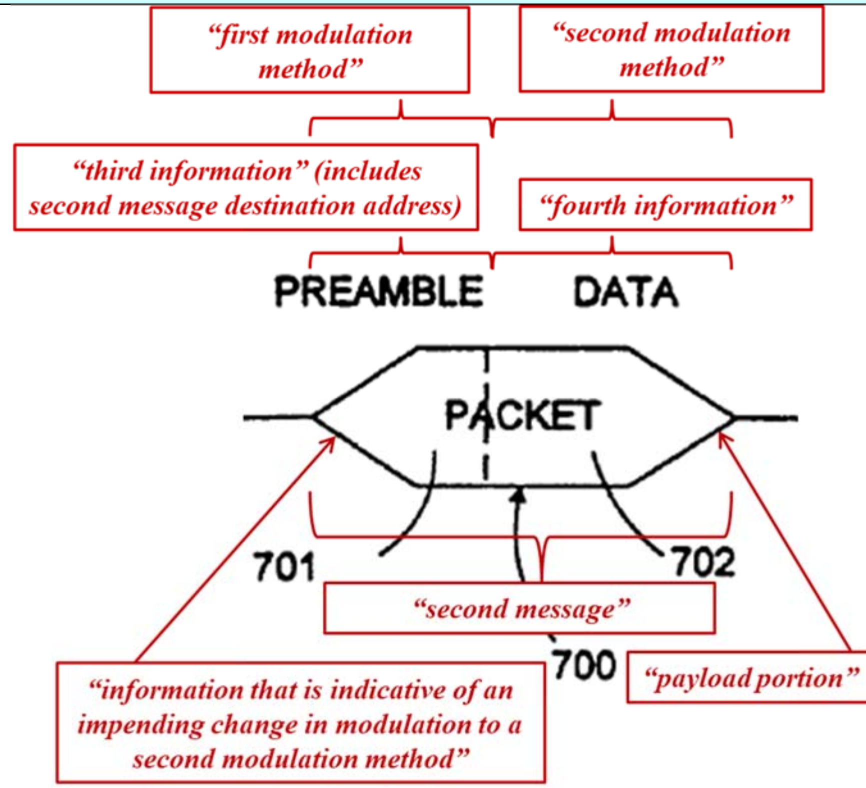
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		 "The present invention also includes a method for operating a plurality of modems on a single telephone line (i.e., multi-drop operation). This method includes the steps of (1) modulating packets of digital information by the modems, wherein the packets of digital information are converted into analog signal bursts of discrete duration, (2) transmitting the analog signal bursts from the modems to the telephone line, (3) providing no signal from the modems to the telephone line between the analog signal bursts, and (4) arbitrating the transmitting of the analog signal bursts from the modems to the telephone line such that only one modem is transmitting analog signal bursts to the telephone line at any given time. In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body. Each preamble is transmitted in accordance with a predetermined first

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble. This variation enables devices having different operating capabilities (e.g., personal computers and smart appliances) to be operably coupled to the same telephone line in a multi-drop configuration." Col. 5:32-58. Fig. 7, reproduced below.  Fig. 7 "Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber's residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700." Col. 20:23-33.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		“FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 19:57-20:7. “The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble.” Col. 5:53-55. “As a result, any of the transmitter circuits of modems 1001-1004 can establish a session on telephone line 1012 as follows.” Col. 19:18-20. “In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet. The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate. The transmitter circuit of modem 1001 then transmits the main body 702 of the packet 700 at this higher rate. The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701. Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber’s residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700. Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712. The previously described rate adaptive protocol allows both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a “smart toaster” or similar appliance. The previously described rate adaptive protocol allows a multi-line network access circuit to take advantage of reduced processing required for receiving packets that have a lower data rate in their main body. For example, an operator may offer subscribers lower rates in exchange for limiting packet traffic to lower data rates during certain times or under certain classes of service.” 19:54-20:53. **Radish ’922 discloses the first modulation method (*e.g.* “FSK”) being of a different type than the second modulation method (*e.g.*, “QAM”).**

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		See 1[b] discussing FSK and QAM; *see also* “As discussed in the previous section, three transmission rates are used to convey data during VoiceView data mode: priority rate, recovery rate, and burst rate. Three default modulation schemes corresponding to these rates are: V.21 300 bps FSK, V.27ter 4800 bps DPSK, and V.29 9600 bps QAM” Col. 21:49-54. “In the preferred embodiment, the data receive block 256 can be configured by the DCE controller 230 and modem controller 246 to selectively operate at any of a number of different data modes (e.g., VoiceView, facsimile, modem file transfer, etc.) and data transmission rates (e.g., V.21 300 bps FSK, V.27ter 4800 bps DPSK, or V.29 9600 bps QAM).” Col. 17:10-15. “The custom data mode identifier is an HDLC frame transmitted using V.21300 bps modulation. The (001100), (010100), and (011100) tone combinations indicate the default VoiceView data mode transmission rates. These tones correspond to the CCITT V.21 300 bps, CCITT V.27ter 4800 bps, and CCITT V.29 9600 bps modulation schemes, respectively. The highest transmission rate is referred to as the Priority rate and is normally used to transmit data between DCEs. The medium speed rate is called the Recovery rate and is used to retransmit data that cannot be successfully transmitted at the Priority rate. The slowest rate is called the Burst rate and is used to send small packets of data, including acknowledgments, between DCEs.” Col. 20:4-16.
1[e]	second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and	**Broadcom ’814 discloses second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information.** *See* 1[pre] discussion of TDMA and polling techniques and a modem in the role of a master communication device according to the master/slave relationship. *See also* 1[b], 1[d] discussion of FSK as a first modulation method and QAM as a second modulation method; *see also* **For example, Broadcom ’814 discloses second message address information (*e.g.*, “destination address”).** Fig. 8, annotated below.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		 "FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		length and (7) a timing value for the expected reception slot of a subsequent packet. The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate.” Col. 19:57-20:17. “Returning to FIG. 8, packet 710 is representative of a packet sent by a second transmitter circuit. In the described example, packet 710 is transmitted by modem 1004 in the central office 1011 to one or more of the modems 1001-1003 in the subscriber’s residence 1010. Packet 710 includes preamble 711 and main body 712. Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700. Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712. The previously described rate adaptive protocol allows both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a “smart toaster” or similar appliance. The previously described rate adaptive protocol allows a multi-line network access circuit to take advantage of reduced processing required for receiving packets that have a lower data rate in their main body. For example, an operator may offer subscribers lower rates in exchange for limiting packet traffic to lower data rates during certain times or under certain classes of service.” Col. 20:23-53.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
		“In one variation of the multi-drop method, each of the analog signal bursts includes a preamble and a corresponding main body.” Col. 5:45-47. “For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Col. 20:1-7. “When the preamble in a burst-mode packet includes the destination address of the packet, the receiver circuits can monitor the destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits.” Col. 20:54-59. “The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701.” Col. 20:19-22.
1[f]	wherein the second modulation method results in a higher data rate than the first modulation method.	**Broadcom ’814 discloses wherein the second modulation method results in a higher data rate than the first modulation method.** *See* 1[b], 1[d] discussion of FSK as a first modulation method and QAM as a second modulation method; *see also* “Each preamble is transmitted in accordance with a predetermined first modem protocol. However, the main bodies can be transmitted in accordance with different modem protocols which are different than the first modem protocol. For example, the different modem protocols may implement different data rates, modulation formats and/or protocol versions. The modem protocol associated with each of the main bodies is identified by information included in the corresponding preamble.” Col. 5:45-58. “Preamble 711 includes information which is transmitted at the same rate as the information of preamble 701. However, preamble 711 indicates that the main body 712 is transmitted at a second data rate, which is different from the data rate of the main body 702 of packet 700.” Col. 20:23-33. “The receiver circuits of the modems 1002-1004 coupled to the telephone line 1012 detect the information present in the preamble 701 and establish synchronization at the beginning of the packet 700. In the described embodiment, all preambles are transmitted at a relatively low, common transmission rate. The preamble 701 contains information which identifies the data rate of the main body 702 of the

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent
		packet. For example, the preamble 701 may indicate that the main body 702 of the packet 700 includes data which is being transmitted at a higher data rate. The transmitter circuit of modem 1001 then transmits the main body 702 of the packet 700 at this higher rate. The receiver circuit identified by the destination address of preamble 701 receives the main body 702 of the packet 700 at the rate identified in the preamble 701." Col. 20:8-22. "In accordance with another aspect of the present invention, the burst-mode protocol enables multiple transmitter circuits to transfer data at different rates in a rate adaptive manner. FIG. 8 is a schematic representation of packet information which is transmitted by transmitter circuits in accordance with the burst-mode protocol of the present embodiment. In the described example, it is assumed that packet 700 is transmitted by the transmitter circuit of modem 1001. This packet 700 can be transmitted to any one or more of the other modems 1002-1004. Packet 700 includes a preamble 701 and a main body 702. Packet 700 is transmitted using a gated modulation or gated carrier signal. Preamble 701, which is approximately 20 to 100 symbols in length, includes information identifying the nature of the packet 700. For example, preamble 701 can include information which identifies: (1) a version or type field for the preamble, (2) packet source and destination addresses, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet." Col. 19:54-20:7. "Because the receiver circuits are informed of these different data rates prior to receiving main body 702 and main body 712, the receiver circuits are able to adjust for these different data rates. More specifically, preamble 711 can be used to select a different set of update coefficients for use within the receiver circuit to process main body 712. The previously described rate adaptive protocol allows both simple devices (which communicate at a relatively low speed) and complex devices (which communicate at a relatively high speed) to be operably coupled to a single telephone line at the same time. For example, modem 1001 can be located in a personal computer, while modem 1002 can be located in a "smart toaster" or similar appliance." Col. 20:34-46.

	Claim 21 of U.S. Patent No. 8,457,228 ("the '228 patent")	The Broadcom '814 patent

	Claim 21 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	The Broadcom ’814 patent
21	The master communication device as in claim 1, wherein the first information that is included in the first message comprises the first message address data.	*See* 1[pre] discussion of TDMA and polling techniques and a modem in the role of a master communication device according to the master/slave relationship. *See also* 1[b] discussion of “preamble” as a first information including a “packet” as a first message. *See also* 1[c] discussion of “destination address” as first message address data.

EXHIBIT J

EXHIBIT J

Comparison of Claims 2 and 59 of the '580 Patent to U.S. Patent No. 5,706,428 ("Lucent")

As demonstrated in the claim charts below, claims 2 and 59[1] of U.S. Patent No. 8,023,580 ("the '580 patent") are invalid (a) under one or more sections of 35 U.S.C. § 103(a) as obvious over Lucent standing alone and as set forth herein, and/or in view of the teachings of the Admitted Prior Art or Kamerman, A., Throughput Density Constraints for Wireless LANs Based on DSSS, IEEE 4th International Symposium on Spread Spectrum Techniques and Applications Proceedings, Mainz, Germany, Sept. 22-25, 1996, pp. 1344-1350 vol.3 ("Kamerman"). One of ordinary skill in the art, as of the priority date of the '580 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Lucent
2	The device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	**Lucent discloses the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method** For example, Lucent discloses: "Therefore, according to the present invention, there is provided a method of operating a wireless local area network station adapted to transmit and receive messages at a plurality of data rates, wherein said messages include an initial portion and a data portion, including the steps of: transmitting the initial portion of a message to be transmitted by a station at a first predetermined

[1] I understand that the PTAB has already found each independent claim from which the asserted claims depend unpatentable as obvious over APA and Lucent. *See* IPR2014-00518, Pap. 47 at 21; IPR2014-00892, Pap. 46 at 23. Thus, I understand the independent claims from which the asserted claims depend have been dedicated to the public, and Rembrandt is not permitted to recapture those elements that are now in the public domain.

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Lucent
		one of a first plurality of data rates…" Lucent, Col. 1:33-40. A subsequent transmission of SIGNAL 206 and SERVICE 208 fields would be a "third sequence." <u>"The Third Sequence Is Transmitted In The First Modulation Method:"</u> "With regard to the message 200, FIG. 4, it should be understood that the preamble 216 and header 218 are always transmitted at the 1 Mbps rate using DBPSK modulation." Lucent, col. 3:56-58. <u>"Indicates That Communication From The Master To The Slave Has Reverted To The First Modulation Method:"</u> "All transmitted messages start with a preamble and header at the 1 Mbps rate. The header includes fields identifying the data rate for the data portion of the message, and a length field. For a 2 Mbps transmission the length field identifies the number of bytes in the data field. For a 5 or 8 Mbps the length field identifies the number of bytes in the data field which, if transmitted at 2 Mbps, would take the same transmission time of the data field, and is thus a fraction 2/5 or 2/8 of the actual number of the bytes." Lucent, Abstract. "Referring first to FIG. 1, there is shown a preferred embodiment of a wireless LAN (local area network) 10 in which the present invention is implemented. The LAN 10 includes an access point 12, which serves as base station, and is connected to a cable 14 which may be part of a backbone LAN (not shown), connected to other devices and/or networks with which stations in the LAN 10 may communicate. The access point 12 has antennas 16 and 17 for transmitting and receiving messages over a wireless communication channel." Lucent, Col. 2:6-15.

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Lucent
		"With regard to the message 200, FIG. 4, it should be understood that the preamble 216 and header 218 are always transmitted at the 1 Mbps rate using DBPSK modulation. The subsequent DATA field 214, however, may be transmitted at a selected one of the four possible rates 1, 2, 5 or 8 Mbps, using the modulation and coding discussed hereinabove." Lucent, Col. 3:56-62. "The SIGNAL field 206 has a first predetermined value if the DATA field 214 is transmitted at the 1 Mbps rate and a second predetermined value if the DATA field 214 is transmitted at the 2, 5 or 8 Mbps rates. The SERVICE field 208 has a first predetermined value (typically all zero bits) for the 1 and 2 Mbps rates, a second predetermined value for the 5 Mbps rate and a third predetermined value for the 8 Mbps rate." Lucent, Col. 4:4-11. "Returning to block 508, if an ACK message is not received correctly and within the predetermined time interval, then the flowchart proceeds to block 522 where the SC count value is reset to zero and the data rate is decremented (if the minimum data rate is not already being used)…." Lucent, Col. 7:41-51, *see also* Fig. 7. "If a station 22 doesn't receive the expected ACK message in return correctly and in due time, it will retransmit the original message packet at a lower data rate." Lucent, Col. 8:6-9. To the extent that Plaintiff alleges that Lucent does not explicitly disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art. For example, a person of ordinary skill in the art would have recognized that claim 2 is an obvious variant of claim 1—which was found unpatentable over Lucent in view of the APA—and

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Lucent
		that it would have been obvious, at least in view of Lucent's disclosure of a transceiver that can transmit multiple sequences using a plurality of data rates to transmit additional sequences using higher data rates or lower data rates as appropriate. For example, as described above, Lucent specifies that such a reversion from a higher data rate to a lower data rate would occur if ACK messages are not received correctly. In addition, Lucent already discloses that the SIGNAL 206 and SERVICE 208 fields in Lucent indicate which modulation method will be used to transmit data in any subsequent DATA field 214. **Alternatively, Lucent in view of the Admitted Prior Art discloses the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.** The APA teaches transmission of multiple sequences. '580 Patent (APA), Fig. 2, s*ee also* '580 Patent (APA), Col. 4:4-50. **Alternatively, Lucent in view of the teachings of Kamerman discloses the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.** For example, Kamerman discloses an automatic rate selection scheme for reverting (e.g., falling back) from a "second modulation method" (e.g., QAM) corresponding to a higher data rate to a "first modulation method" (e.g., BPSK) corresponding to a lower data rate (e.g., 1 Mbit/s) after unacknowledged packet

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Lucent
		transmissions, for instance, where there is a high load in neighbor cells causing cochannel interference. "Then there is looked to automatic rate control to keep the cochannel interference at a tolerable level." Kamerman at 6. "IEEE 802.11 DS specifies bit rates of 1 and 2 Mbps. The allowable SNR and CSIR values for reliable transmission of data packets are dependent on the bit rate." Kamerman at 11. "IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: after unacknowledged packet transmissions the rate falls back, and after a number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up." Kamerman at 11. "At lower load in the neighbor cells the highest bit rate can be used more often. At higher load the transmissions from the accesspoint to stations at the outer part of the cells, will be done often at fallback rates due to mutilation of transmissions by interference. In practice the network load for LANs at nowadays client-server applications is very bursty, with sometimes transmission bursts over an individual links and low activity during the major part of the time. Therefore the higher bit rate can be used during the most of the time, and at high load in the neighbor cells (as will evoked by test applications) there will be switched to fall back rates in the outer part of the cell." Kamerman at 11. "The application of proprietary bit rates of 3 and 4 Mbps in

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Lucent
		addition to the basic 1 and 2 Mbps, can be combined with an automatic rate selection. This automatic rate selection gives fall forward at reliable connections and fall back at strong cochannel interference." Kamerman at 12.

	Claim 59 of U.S. Patent No. 8,023,580 ("the '580 patent")	Lucent
59	The device of claim 58, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	*See* Claim 58.

EXHIBIT K

EXHIBIT K

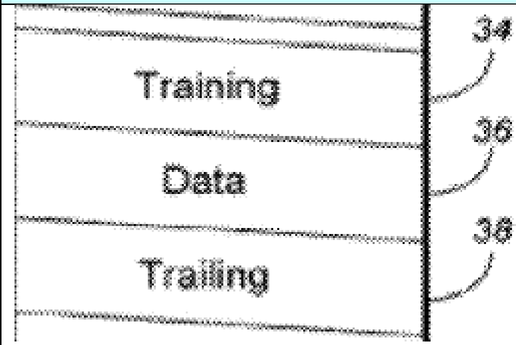
Comparison of Claim 21 of the '228 Patent to U.S. Patent No. 5,706,428 ("Lucent")

As demonstrated in the claim charts below, claim 21[1] of U.S. Patent No. 8,457,228 ("the '228 patent") is invalid (a) under one or more sections of 35 U.S.C. § 103(a) as obvious over Lucent standing alone and as set forth herein, and/or in view of the teachings of the Admitted Prior Art or U.S. Patent No. 5,537,398 ("Siwiak '398"). One of ordinary skill in the art, as of the priority date of the '228 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 21 of U.S. Patent No. 8,457,228 ("the '228 patent")	Lucent
21	The master communication device as in claim 1, wherein the first information that is included in the first message comprises the first message address data.	**Lucent discloses the first information that is included in the first message comprises the first message address data.** "Referring first to FIG. 1, there is shown a preferred embodiment of a wireless LAN (local area network) 10 in which the present invention is implemented. The LAN 10 includes an access point 12, which serves as base station, and is connected to a cable 14 which may be part of a backbone LAN (not shown), connected to other devices and/or networks with which stations in the LAN 10 may communicate. The access point 12 has antennas 16 and 17 for transmitting and receiving messages over a wireless communication channel. The network 10 includes mobile stations 18, referred to individually as mobile stations 18-1, 18-2, and having antennas 20 and 21, referred to individually as antennas 20-1, 20-2 and 21-1, 21-2. The mobile stations 18 are capable of transmitting and receiving messages selectively at a data rate of 1 Mbps (Megabit per second) or 2 Mbps, using DSSS (direct sequence spread spectrum) coding." Lucent, Col. 2:6-22.

[1] I understand that the PTAB has already found each independent claim from which the asserted claims depend unpatentable as obvious over APA and Lucent. *See* IPR2014-00518, Pap. 47 at 21; IPR2014-00892, Pap. 46 at 23. Thus, I understand the independent claims from which the asserted claims depend have been dedicated to the public, and Rembrandt is not permitted to recapture those elements that are now in the public domain.

	Claim 21 of U.S. Patent No. 8,457,228 ("the '228 patent")	Lucent
		"Also included in the LAN 10 are further mobile stations 22, referred to individually as stations 22-1 and 22-2, and having antennas 24 and 25, referred to individually as antennas 24-1, 24-2 and 25-1, 25-2." Lucent, Col. 2:34-37. **Alternatively, Lucent in view of the Admitted Prior Art discloses the first information that is included in the first message comprises the first message address data.** "FIG. 1 is a block diagram of a prior art multipoint communication system including a master transceiver and a plurality of tributary transceivers." '228 Patent (APA), Figs. 1, 2; col. 3:30-33. With reference to FIG. 1, a prior art multipoint communication system 22 is shown to comprise a master modem or transceiver 24, which communicates with a plurality of tributary modems (tribs) or transceivers 26-26 over communication medium 28." '228 Patent (APA), col. 3:64-4:1. "These sequences are commonly referred to as training signals… In a multipoint system, the address of the trib with which the master is establishing communication is also transmitted during the training interval." '228 Patent (APA), col. 4:10-21. "The master transceiver 24 transmits a training sequence 34 that includes the address of the trib that the master seeks to communicate with. In this case, the training sequence 34 includes the address of trib 26a. As a result, trib 26b ignores training sequence 34. After completion of the training sequence 34, master transceiver 24 transmits data 36 to trib 26a followed by trailing sequence 38, which signifies the end of the communication session." '228 Patent (APA), col. 4:28-50. '228 Patent (APA), Fig. 2 (reproduced below).

	Claim 21 of U.S. Patent No. 8,457,228 ("the '228 patent")	Lucent
		 **Alternatively, Lucent in view of the teachings of Siwiak '398 discloses the first information that is included in the first message comprises the first message address data.** For example, Siwiak '398 discloses: "Each of the plurality of data communication receivers includes receiver circuitry for receiving and demodulating the radio frequency signal transmitted in the first modulation format; means for decoding the selective call address information and the message characterization information transmitted in the first modulation format; receiver circuitry, responsive to the message characterization information transmitted during the first transmission portion, for receiving and demodulating the radio frequency signal transmitted in the second modulation format; and means for decoding the message data transmitted in the second modulation format. The address uniquely identifies the data communication receiver (or a group of data communication receivers) to which the message is directed, and the message characterization information identifies an information service, among other things." Col. 2:42-57. "As shown in FIG. 2, when a message transmission is initiated on the channel, the first transmission portion 102, modulated in the well-known FM format, is transmitted on the channel. The first transmission portion 102

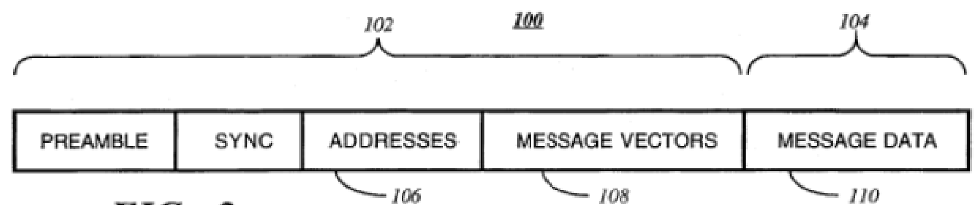
	Claim 21 of U.S. Patent No. 8,457,228 ("the '228 patent")	Lucent
		includes a preamble and synchronization bits, followed by the pager address in the address block 106 and message vectors 108 which contain the information as to the modulation format of the message data 110 in the second transmission portion 104." Col. 4:31-39. Fig. 2 (reproduced below).  FIG. 2

EXHIBIT L

EXHIBIT L

Comparison of the Asserted Claims to U.S. Patent No. 5,982,807 ("Snell")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,023,580 ("the '580 patent") are invalid under 35 U.S.C. § 103(a) as obvious over Snell in view of U.S. Patent No. 6,075,814 ("Yamano"), Kamerman, A., *Throughput Density Constraints for Wireless LANs Based on DSSS*, *IEEE 4th International Symposium on Spread Spectrum Techniques and Applications Proceedings*, Mainz, Germany, Sept. 22-25, 1996, pp. 1344-1350 vol.3 ("Kamerman"), Applicant's Admitted Prior Art, and/or the knowledge of a person of ordinary skill in the art. One of ordinary skill in the art, as of the priority date of the '580 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

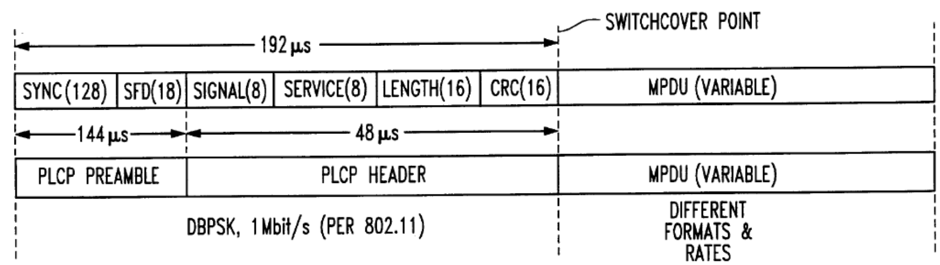
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	**Snell**
1[pre]	A communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, the device comprising:	**Snell discloses a communication device capable of communicating according to a master slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** *See, e.g.*, Snell at 1:34-46, 1:47-50, 1:55-57, 2:27-30, 4:42-47, 5:18-21; Harris AN9614 at 3. For example, Snell discloses: "In a typical WLAN, *an access point provided by a transceiver*, that is, a combination transmitter and receiver, connects to the wired network from a fixed location. Accordingly, the access transceiver receives, buffers, and transmits data between the WLAN and the wired network. *A single access transceiver can support a small group of collocated users within a range of less than about one hundred to several hundred feet. The end users connect to the WLAN through transceivers* which are typically implemented as PC cards in a notebook computer, or ISA or PCI cards for desktop computers. Of course the transceiver may be integrated with any device, such as a hand-held computer." Snell at 1:34-46. "Like the HSP3824 baseband processor, the high data rate baseband processor 40 of the invention contains all of the functions necessary for a

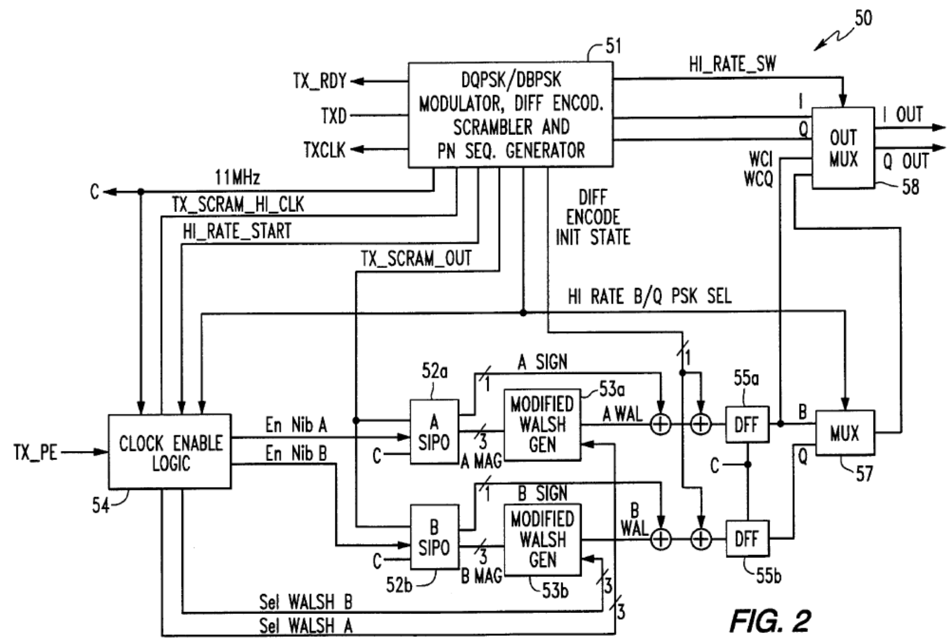
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	Snell
		full or half duplex packet baseband *transceiver*.” Snell at 5:18-21. “The PRISM 1 chip set provides all the functions necessary for full or half duplex, direct sequence spread spectrum, *packet communications* at the 2.4 to 2.5 GHz ISM radio band.” Snell at 1:55-57. “It is another object of the invention to provide *a spread spectrum transceiver* and associated method to permit operation at higher data rates and which may switch on-the-fly between different data rates and/or formats.”). Snell at 2:27-30 “The assignee of the present invention has developed and manufactured a set of integrated circuits for a WLAN under the mark PRISM 1 which is compatible with the proposed IEEE 802.11 standard.”). Snell at 1:47-50 “Referring to FIG. 1, a *wireless transceiver 30* in accordance with the invention is first described. The *transceiver 30 may be readily used for WLAN applications* in the 2.4 GHZ ISM band in accordance with the proposed IEEE 802.11 standard. Those of skill in the art will readily recognize other applications for the transceiver 30 as well.” Snell at 4:42-47. Snell incorporates by reference Harris AN9614,[1] which discloses that the communications between transceivers can operate according to a polled (i.e., master/slave) protocol.[2] *See, e.g.*, Harris AN9614 at 3.

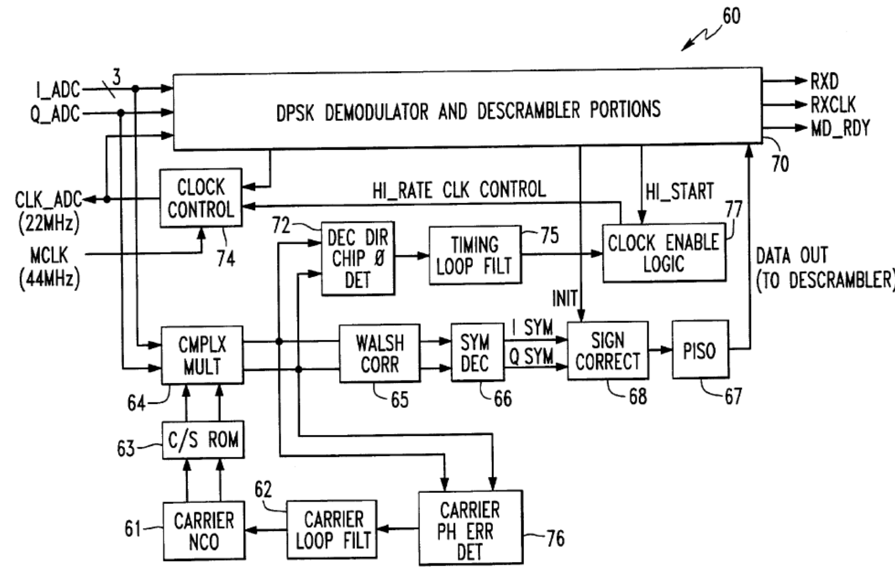
[1] Snell expressly incorporates by reference “the entire disclosure” of Harris AN9614 (Snell at Col. 5:2-7 (“[A]s further described in the Harris PRISM 1 chip set literature, such as the application note No. AN9614, March 1996, the entire disclosure of which is incorporated herein by reference.”).

[2] A polled protocol is a master/slave protocol, as confirmed by the ‘580 patent and Rembrandt’s representations that the master/slave language added to the claims and specification was supported by and did not add new matter to the discussion of polled multipoint communication between a master and tributary transceivers. ‘580 patent at 4:6-9; ‘580 Prosecution History at 140. *See also* IPR2014-00518, Pap. 47 at 15 (“In [a polling] protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network.”); ‘580 Prosecution History at 404; IPR2014-00518.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		"[T]he controller can keep adequate time to operate either a polled or a time allocated scheme. In these modes, the radio is powered off most of the time and only awakens when communications is expected. This station would be awakened periodically to listen for a beacon transmission. The beacon serves to reset the timing and to alert the radio to traffic. If traffic is waiting, the radio is instructed when to listen and for how long. In a polled scheme, the remote radio can respond to the poll with its traffic if it has any. With these techniques, the average power consumption of the radio can be reduced by more than an order of magnitude while meeting all data transfer objectives." Harris AN9614 at 3.
1[a]	a transceiver, in the role of the master according to the master/slave relationship,	**Snell discloses a transceiver, in the role of the master according to the master/slave relationship.** *See* Element 1.preamble.
1[b]	for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,	**Snell in view of Kamerman discloses for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** *See, e.g.*, Snell at Abstract, 1:58-61, 2:56-59, 2:61-3:5, 6:64-66, 7:6-8, Figs. 2, 3, 5; Harris 4064.4 at 14-16. **Snell discloses BPSK as the first modulation method:** For example: "The modulator preferably comprises means for operating *in one of a bi-phase PSK (BPSK) modulation mode* at a first data rate defining a first format, and *a quadrature PSK (QPSK) mode* at a second data rate defining a second format." Snell at 2:56-59. "In particular, the HSP3824 baseband processor manufactured by Harris Corporation *employs quadrature or bi-phase phase shift keying (QPSK or*

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		BPSK) modulation schemes." Snell at 1:58-61. "The modulator and demodulator are each preferably operable *in one of a bi-phase PSK (BPSK) mode* at a first data rate and *a quadrature PSK (QPSK) mode* at a second data rate. These formats may also be switched on-the-fly in the demodulator." Snell at Abstract "Moreover, a WLAN application, for example, may require a change between *BPSK and QPSK* during operation, that is, on-the-fly." Snell at Col. 2:15-17 "*The PLCP preamble and PLCP header are* always at 1 Mbit/s, *Diff encoded*, scrambled and spread with an 11 chip barker." Snell at 6:64-66. "The modulator may also preferably include header modulator means for modulating data packets to include *a header at a predetermined modulation and a third data rate defining a third format*…. *The third format is preferably differential BPSK*." Snell at 2:61-3:5. "The reference phase for the first symbol of the *MPDU* is the output phase of the last symbol of the header *for Diff Encoding*." Snell at 7:6-8.  FIG. 3 Snell at Fig. 3.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		 FIG. 2 Snell at Fig.

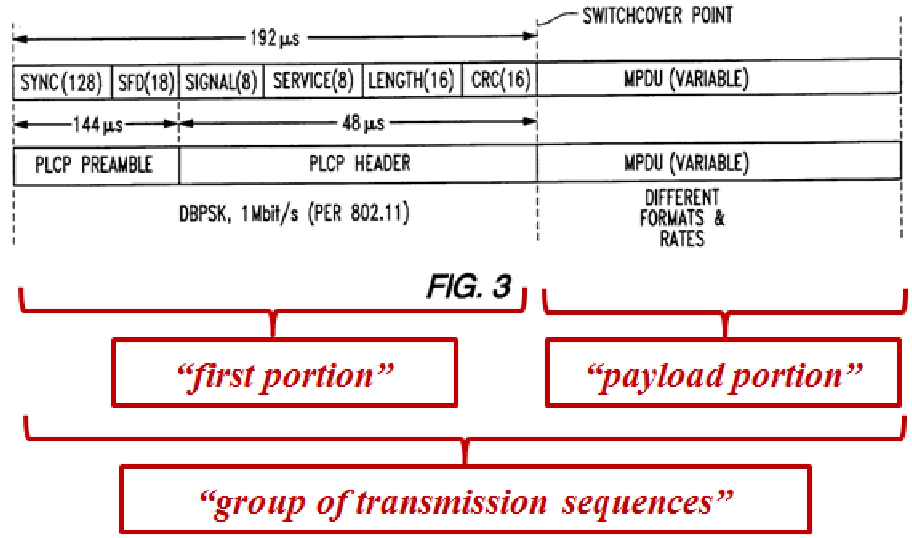
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		 FIG. 5 2. Snell at Fig. 5. Snell incorporates by reference Harris 4064.4,[3] which discloses: "The preamble and header are always transmitted as *DBPSK* waveforms while the data packets can be configured to be *either DBPSK or DQPSK*." Harris 4064.4 at 14. "The HSP3824 transmitter is designed as a Direct Sequence Spread

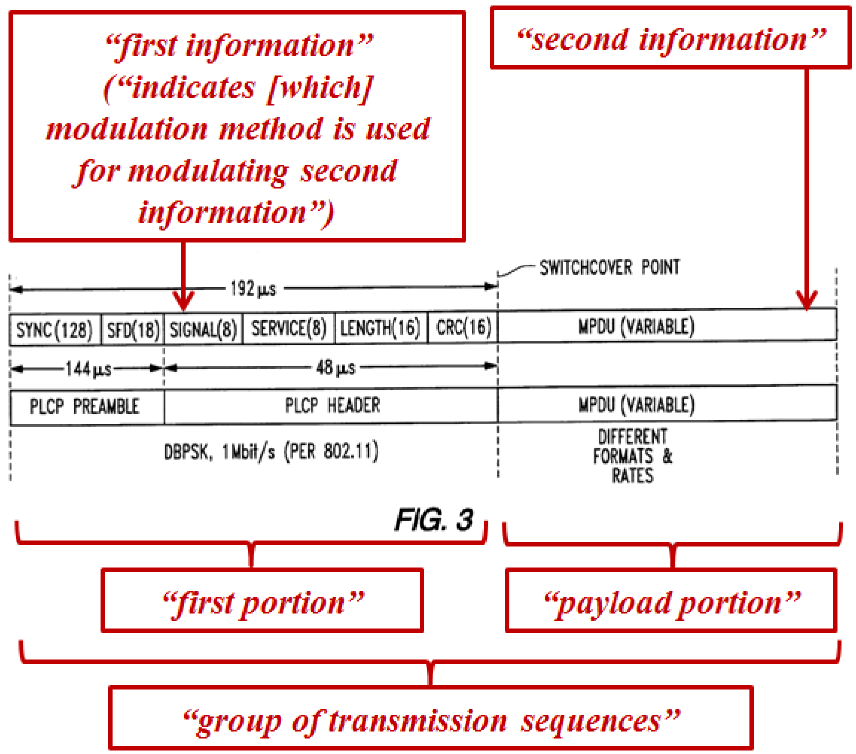
[3] Snell expressly incorporates by reference "the entire disclosure" of Harris 4064.4 (Snell at Col. 5:13-17 ("This prior baseband processor [HSP3824] is described in detail in a publication entitled "Direct Sequence Spread Spectrum Processor, March 1996, file number 4604.4, and the entire disclosure of which is incorporated herein by reference.").

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		Spectrum *DBPSK/DQPSK modulator*." Harris 4064.4 at 14. "The modulator is capable of switching rate automatically in the case where the preamble and header information are DBPSK modulated, and the data is DQPSK modulated." Harris 4064.4 at 14. *See also, e.g.*, Harris 4064.4 at 15 ("The preamble is always transmitted as a *DBPSK* waveform with a programmable length of up to 256 symbols long."); Harris 4064.4 at 15 ("Signal Field (8 Bits) - This field indicates whether the data packet that follows the header is modulated as *DBPSK or DQPSK*. In mode 3 the HSP3824 receiver *looks at the signal field to determine whether it needs to switch from DBPSK demodulation into DQPSK demodulation* at the end of the always DBPSK preamble and header fields."); Harris 4064.4 at 16 ("Mode 3 - In this mode the preamble is programmable up to 256 bits (all 1's). The header in this mode is using all available fields. In mode 3 the signal field defines the modulation type of the data packet (DBPSK or DQPSK) so the receiver does not need to be preprogrammed to anticipate one or the other. In this mode the device checks the Signal field for the data packet modulation and it switches to DQPSK if it is defined as such in the signal field. Note that the preamble and header are always DBPSK the modulation definition applies only for the data packet."). **Kamerman discloses QAM as the second modulation method:** "IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: after unacknowledged packet transmissions the rate falls back, and after a

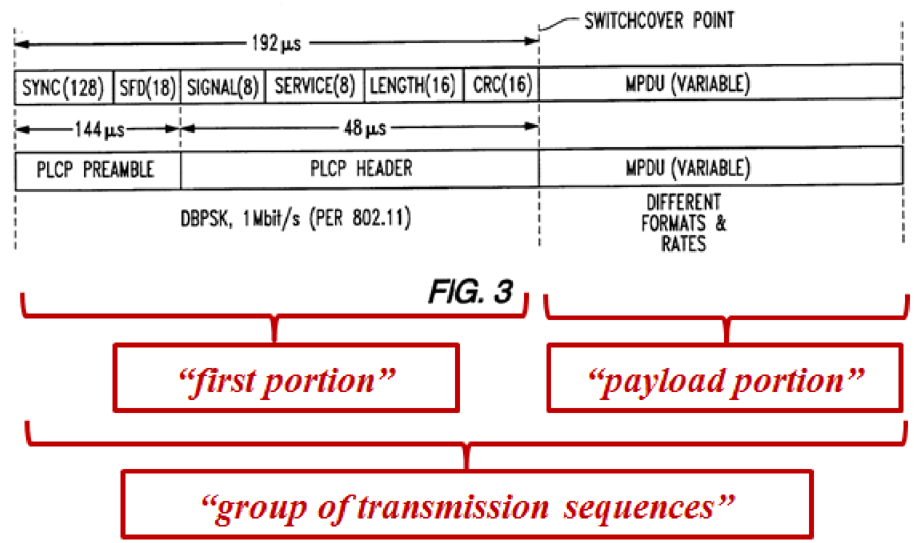
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up." Kamerman at 11.[4]
1[c]	wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion	**Snell discloses wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion** . *See, e.g.*, Snell at 6:35-36, 6:64-66, 7:5-14, Fig. 3. For example, Snell discloses transmitting a group of transmission sequences structured with a "first portion" including the PLCP preamble and PLCP header and a "payload portion" including the MPDU data (as depicted in Figure 3 below)

[4] *See also, e.g.*, Electronic Communications Systems – Fundamentals Through Advanced, Wayne Tomasi, Prentice-Hall, Inc., 1988, p. 490 ("Essentially, there are three digital modulation techniques that are commonly used in digital radio systems: *frequency shift keying* (FSK), *phase shift keying* (PSK), and *quadrature amplitude modulation* (QAM)."); Deep space telecommunications systems engineering, PN Sargeaunt - IEE Proceedings F-Communications, Radar, 1985 (referring to "the PSK family of modulation methods); US 5,966,055 at 3:36-40 (referring to "the family of PSK (phase shift keyed) modulations"); WO 2009/091,128 (referring separately to "Phase Shift Key (PSK)-family" and "Quadrature Amplitude Modulation (QAM)-family").

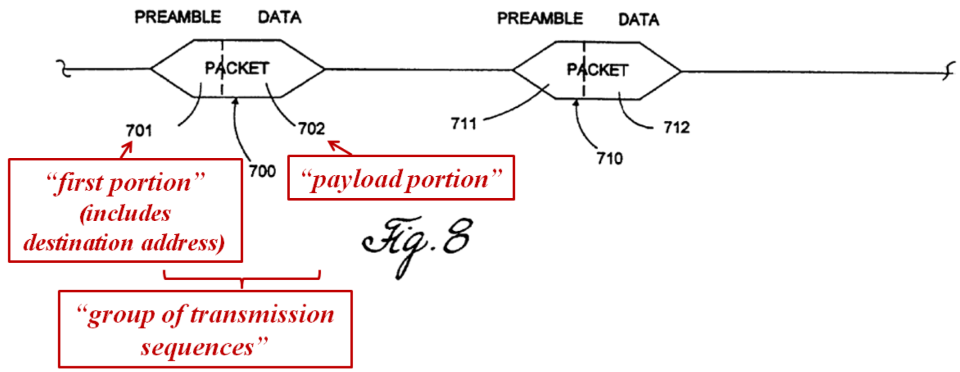
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		 Snell at Fig. 3 (annotated). "The *header* may always be BPSK." Snell at 6:35-36. "*The PLCP preamble and PLCP header* are always at 1 Mbit/s, Diff encoded, scrambled and spread with an 11 chip barker." Snell at 6:64-66. "*MPDU* is serially provided by Interface 80 and *is the variable data* scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU. *The variable data* may be modulated and demodulated in different formats than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14.
1[d]	wherein first information in the first portion	**Snell discloses wherein first information in the first portion indicates**

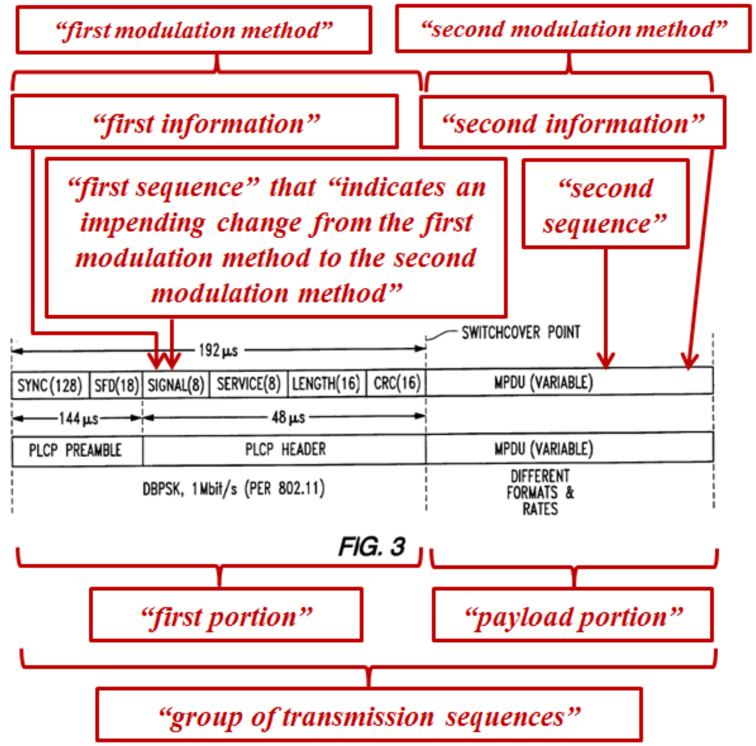
	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	Snell
	indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,	**at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion.** *See, e.g.,* 6:35-36, 6:52-59, 6:64-66, 7:1-2, 7:5-14; Harris 4064.4 at 15-16, Fig. 10. For example, Snell discloses:  Snell at Fig. 3 (annotated). “The *header* may always be BPSK.” Snell at 6:35-36. “*The PLCP preamble and PLCP header* are always at 1 Mbit/s, Diff

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		encoded, scrambled and spread with an 11 chip barker." Snell at 6:64-66. "Now relating to the *PLCP header* 91, *the SIGNAL* is: 0Ah 1 Mbit/s BPSK, 14h 2 Mbit/S QPSK, 37h 5.5 Mbit/s BPSK, and 6Eh 11 Mbit/s QPSK. " Snell at 6:52-59. "SIGNAL is indicated by 2 control bits and then formatted as described." Snell at 7:1-2. "*MPDU* is serially provided by Interface 80 and *is the variable data* scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU. *The variable data may be modulated and demodulated in different formats* than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14. Snell incorporates by reference Harris 4064.4, which discloses: "*Signal Field (8 Bits) - This field indicates whether the data packet that follows the header is modulated as DBPSK or DQPSK*. In mode 3 the HSP3824 receiver looks at the signal field to determine whether it needs to switch from DBPSK demodulation into DQPSK demodulation at the end of the always DBPSK preamble and header fields." Harris 4064.4 at 15. "In mode 3 *the signal field defines the modulation type of the data packet (DBPSK or DQPSK)* so the receiver does not need to be preprogrammed to anticipate one or the other. In this mode the device checks the Signal

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		field for the data packet modulation and it switches to DQPSK if it is defined as such in the signal field. Note that the preamble and header are always DBPSK the modulation definition applies only for the data packet." Harris 4064.4 at 16. *See also, e.g.*, Harris 4064.4 at FIGURE 10.
1[e]	wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion, and	**Snell in view of Yamano discloses wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion.** *See, e.g.*, 6:35-36, 6:64-66, 7:5-14, Fig. 3; Harris 4064.4 at 14; Yamano at 19:63-64, 20:1-7, 20:54-59, Fig. 8. **For example, Snell discloses:**  Snell at Fig. 3 (annotated).

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		"The *header* may always be BPSK." Snell at 6:35-36. "The *PLCP preamble and PLCP header* are always at 1 Mbit/s, Diff encoded, scrambled and spread with an 11 chip barker." Snell at 6:64-66. "*MPDU* is serially provided by Interface 80 and *is the variable data* scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU. *The variable data* may be modulated and demodulated in different formats than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14. Snell incorporates by reference Harris 4064.4, which discloses: "The *preamble and header* are always transmitted as DBPSK waveforms while the *data packets* can be configured to be either DBPSK or DQPSK." Harris 4064.4 at 14. **For example, Yamano discloses:** "*Packet 700* includes a *preamble 701* and a *main body 702*." Yamano at 19:63-64. "For example, *preamble 701* can include information which identifies: (1) a version or type field for the preamble, (2) *packet source and destination addresses*, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet." Yamano at 20:1-7 (emphasis added).

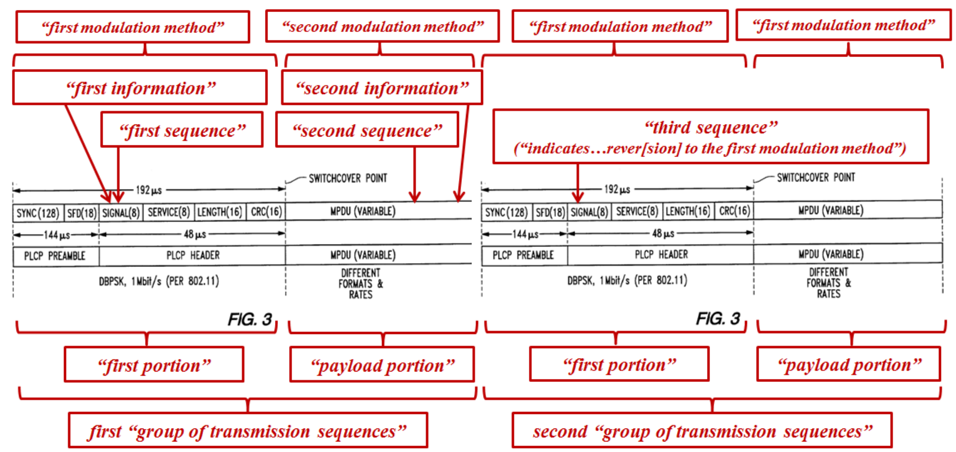
	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		 Yamano at Figure 8 (annotated). "When the preamble in a burst-mode packet *includes the destination address of the packet*, the receiver circuits can monitor the destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits." Yamano at 20:54-59.
1[f]	wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method, and	**Snell discloses wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method.** *See, e.g.*, Snell at 2:61-3:5, 6:35-36, 6:52-59, 6:64-66, 7:1-2, 7:5-14, Figs. 2, 3, 5; Harris 4064.4 at 15-16, Fig. 10. For example, Snell discloses:

	Claim 1 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	Snell
		 Snell at Fig. 3 (annotated). “The *header may always be BPSK*.” Snell at 6:35-36. “Now relating to the *PLCP header* 91, *the SIGNAL* is: 0Ah 1 Mbit/s BPSK, 14h 2 Mbit/S QPSK, 37h 5.5 Mbit/s BPSK, and 6Eh 11 Mbit/s QPSK. ”

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		Snell at 6:52-59. "SIGNAL is indicated by 2 control bits and then formatted as described." Snell at 7:1-2. "*MPDU* is serially provided by Interface 80 and *is the variable data* scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU. *The variable data may be modulated and demodulated in different formats* than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14. "*The PLCP preamble and PLCP header* are always at 1 Mbit/s, *Diff encoded*, scrambled and spread with an 11 chip barker." Snell at 6:64-66. "The modulator may also preferably include header modulator means for modulating data packets to include *a header at a predetermined modulation and a third data rate defining a third format*…. *The third format is preferably differential BPSK*." Snell at 2:61-3:5. "MPDU is serially provided by Interface 80 and is the variable data scrambled for normal operation. *The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding*." Snell at 7:5-8. *See also, e.g.*, Snell at Figs. 2, 3, 5. Snell incorporates by reference Harris 4064.4, which discloses: "*Signal Field (8 Bits) - This field indicates whether the data packet that follows the header is modulated as DBPSK or DQPSK*. In mode 3 the HSP3824 receiver *looks at the signal field to determine whether it needs to switch from DBPSK demodulation into DQPSK demodulation at the end of the always DBPSK preamble and header fields*." Harris 4064.4 at 15.

	Claim 1 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		"In mode 3 *the signal field defines the modulation type of the data packet (DBPSK or DQPSK)* so the receiver does not need to be preprogrammed to anticipate one or the other. In this mode the device *checks the Signal field for the data packet modulation and it switches to DQPSK if it is defined as such in the signal field.* Note that *the preamble and header are always DBPSK the modulation definition applies only for the data packet.*" Harris 4064.4 at 16. *See also, e.g.*, Harris 4064.4 at FIGURE 10.
1[g]	the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.	**Snell discloses the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.** *See* Element 1.F.

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
2	The device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	**Snell discloses device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.** *See, e.g.*, Snell at 1:55-57, 2:27-30, 2:61-63, 6:35-36, 6:52-59, 6:64-66, 7:1-2, 7:5-14, Fig. 3; Harris 4064.4 at 15-16, Fig. 10.; Kamerman at 6, 11, 12. For example, Snell discloses: "The modulator may also preferably include header modulator means for modulating *data packets*." Snell at 2:61-63. "The PRISM 1 chip set provides all the functions necessary for full or half

	Claim 2 of U.S. Patent No. 8,023,580 (“the ’580 patent”)	Snell
		duplex, direct sequence spread spectrum, *packet communications* at the 2.4 to 2.5 GHz ISM radio band.” Snell at 1:55-57. “It is another object of the invention to provide a spread spectrum transceiver and associated method to permit operation at higher data rates and *which may switch on-the-fly between different data rates and/or formats*.” Snell at 2:27-30. “The variable data may be modulated and demodulated in different formats than the header portion to thereby increase the data rate, and *while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly*.” Snell at 7:10-14. *See also* Element 1.D.  Snell at Fig. 3 (annotated). **Alternatively, Snell in view of the teachings of Kamerman discloses wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication**

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		from the master to the slave has reverted to the first modulation method. Kamerman discloses reverting from a second modulation method to a first modulation method. *See, e.g.*, Kamerman at 6, 11, 12. For example, Kamerman discloses: "Then there is looked to *automatic rate control* to keep the cochannel interference at a tolerable level." Kamerman at 6. "IEEE 802.11 DS specifies bit rates of 1 and 2 Mbps. The allowable SNR and CSIR values for reliable transmission of data packets are dependent on the bit rate." Kamerman at 11. "IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: *after unacknowledged packet transmissions the rate falls back,* and after a number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up." Kamerman at 11. "*At lower load in the neighbor cells the highest bit rate can be used more often. At higher load the transmissions from the accesspoint to stations at the outer part of the cells, will be done often at fallback rates due to mutilation of transmissions by interference.* In practice the network load for LANs at nowadays client-server applications is very bursty, with sometimes transmission bursts over an individual links and low activity during the major part of the time. *Therefore the higher bit rate can be used during the most of the time, and at high load in the neighbor cells (as will evoked by test applications) there will be switched to fall back*

	Claim 2 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
		rates in the outer part of the cell." Kamerman at 11. "The application of proprietary bit rates of 3 and 4 Mbps in addition to the basic 1 and 2 Mbps, can be combined with an automatic rate selection. This automatic rate selection gives fall forward at reliable connections and *fall back at strong cochannel interference*." Kamerman at 12.

	Claim 58[5] of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
[58.pre]	A communication device capable of communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave, the device comprising:	*See* [1.pre].
[58.A]	a transceiver, in the role of the master according to the master/slave relationship,	*See* [1.A].
[58.B]	capable of transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method, and	*See* [1.B].
[58.C]	wherein the transceiver is configured to transmit messages with: a first sequence, in the first modulation method, that indicates at least which of the first modulation method and the second modulation method is	*See* [1.A], [1.C], [1.D], and [1.F].

[5] It is my understanding that each element of claim 58 has already been found within the prior art. To the extent Rembrandt is now permitted to argue that the elements of claim 58 are not within the prior art, Snell alone or in combination with other prior art discloses the elements of claim 58.

	Claim 58[5] of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
	used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method,	
[58.D]	and wherein the at least one message is addressed for an intended destination of the second sequence, and	*See* [1.E].
[58.E]	the second sequence, modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the second sequence is transmitted after the first sequence.	*See* [1.F] and [1.G].

	Claim 59 of U.S. Patent No. 8,023,580 ("the '580 patent")	Snell
59	The device of claim 58, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	*See* Claims 1, 2, and 58.

EXHIBIT M

EXHIBIT M

Comparison of the Asserted Claims to U.S. Patent No. 5,706,428 ("Snell")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,457,228 ("the '228 patent") are invalid under 35 U.S.C. § 103(a) as obvious over Snell in view of U.S. Patent No. 6,075,814 ("Yamano"), Kamerman, A., *Throughput Density Constraints for Wireless LANs Based on DSSS*, *IEEE 4th International Symposium on Spread Spectrum Techniques and Applications Proceedings*, Mainz, Germany, Sept. 22-25, 1996, pp. 1344-1350 vol.3 ("Kamerman"), Applicant's Admitted Prior Art, and/or the knowledge of a person of ordinary skill in the art. One of ordinary skill in the art, as of the priority date of the '580 patent, would have known to combine the teachings of the prior art disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	**Snell**
1[pre]	A master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device comprising:	**Snell discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device.** *See, e.g.*, Snell at 1:34-46, 1:47-50, 1:55-57, 2:27-30, 4:42-47, 5:18-21; Harris AN9614 at 3. For example, Snell discloses: "In a typical WLAN, *an access point provided by a transceiver*, that is, a combination transmitter and receiver, connects to the wired network from a fixed location. Accordingly, the access transceiver receives, buffers, and transmits data between the WLAN and the wired network. *A single access transceiver can support a small group of collocated users within a range of less than about one hundred to several hundred feet. The end users connect to the WLAN through transceivers* which are typically implemented as PC cards in a notebook computer, or ISA or PCI cards for desktop computers. Of course the transceiver may be integrated with any device, such as a hand-held computer." Snell at 1:34-46.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		"Like the HSP3824 baseband processor, the high data rate baseband processor 40 of the invention contains all of the functions necessary for a full or half duplex packet baseband *transceiver*." Snell at 5:18-21. "The PRISM 1 chip set provides all the functions necessary for full or half duplex, direct sequence spread spectrum, *packet communications* at the 2.4 to 2.5 GHz ISM radio band." Snell at 1:55-57. "It is another object of the invention to provide *a spread spectrum transceiver* and associated method to permit operation at higher data rates and which may switch on-the-fly between different data rates and/or formats." Snell at 2:27-30 "The assignee of the present invention has developed and manufactured a set of integrated circuits for a WLAN under the mark PRISM 1 which is compatible with the proposed IEEE 802.11 standard." Snell at 1:47-50 "Referring to FIG. 1, a *wireless transceiver 30* in accordance with the invention is first described. The *transceiver 30 may be readily used for WLAN applications* in the 2.4 GHZ ISM band in accordance with the proposed IEEE 802.11 standard. Those of skill in the art will readily recognize other applications for the transceiver 30 as well." Snell at 4:42-47. Snell incorporates by reference Harris AN9614,[1] which discloses that the communications between transceivers can operate according to a polled (*i.e.*, master/slave) protocol, which is a master/slave communication system.[2] *See e.g.*, Harris AN9614 at 3.

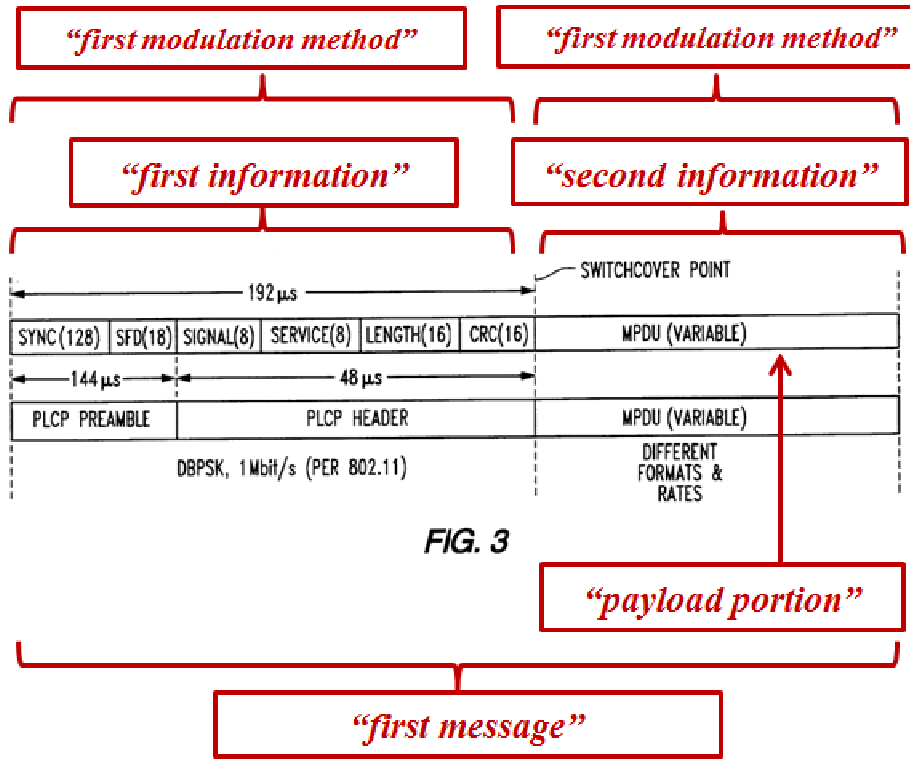
[1] Snell expressly incorporates by reference "the entire disclosure" of Harris AN9614 (Snell at 5:2-7 ("[A]s further described in the Harris PRISM 1 chip set literature, such as the application note No. AN9614, March 1996, the entire disclosure of which is incorporated herein by reference.")).

[2] A polled protocol is a master/slave protocol, as confirmed by the '228 patent and Rembrandt's representations that the master/slave language added to the claims and specification of the '580 patent was supported by and did not add new matter to the discussion of polled multipoint communication between a master

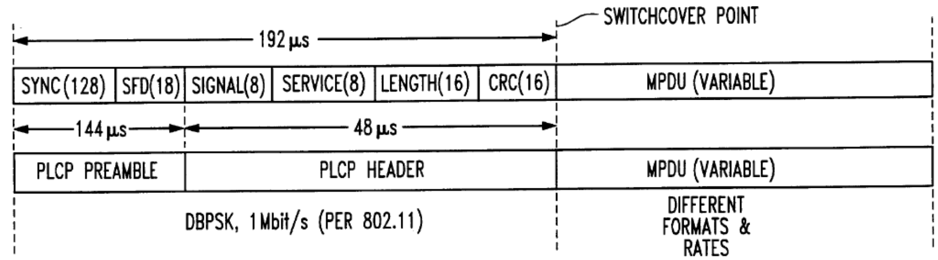
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		"[T]he controller can keep adequate time to operate either a polled or a time allocated scheme. In these modes, the radio is powered off most of the time and only awakens when communications is expected. This station would be awakened periodically to listen for a beacon transmission. The beacon serves to reset the timing and to alert the radio to traffic. If traffic is waiting, the radio is instructed when to listen and for how long. In a polled scheme, the remote radio can respond to the poll with its traffic if it has any. With these techniques, the average power consumption of the radio can be reduced by more than an order of magnitude while meeting all data transfer objectives." Harris AN9614 at 3.
1[a]	a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers,	**Snell discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers.** *See* Element 1.preamble.
1[b]	wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers and	**Snell discloses wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers.** *See, e.g.*, Snell at Abstract, 1:34-46, 1:47-50, 1:55-57, 1:58-61, 2:27-30, 2:56-59, 2:61-3:5, 4:42-47, 5:18-2, 6:35-36, 6:52-59, 6:64-66, 7:1-2, 7:5-14, 7:6-8, Figs. 2, 3; Harris AN9614 at 3; Harris 4064.4 at 14, 15, 16, Fig. 10. For example, Snell discloses: "In a typical WLAN, *an access point provided by a transceiver*, that is, a

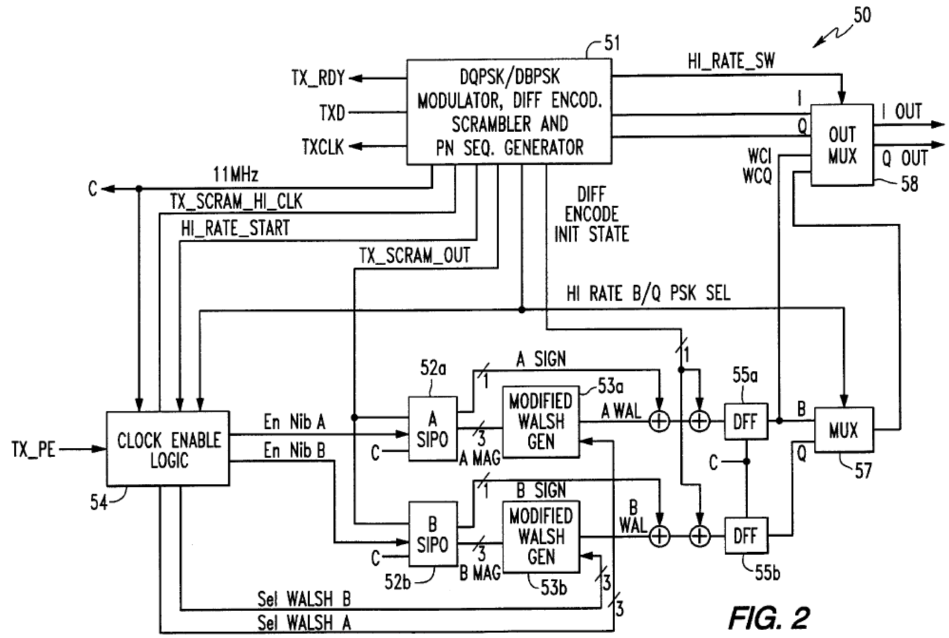
and tributary transceivers. '228 patent at 4:30-34; '580 Prosecution History at 140. *See also* IPR2014-00892, Pap. 46 at 16 ("In [a polling] protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network."); '228 Prosecution History at 352; IPR2014-00892.

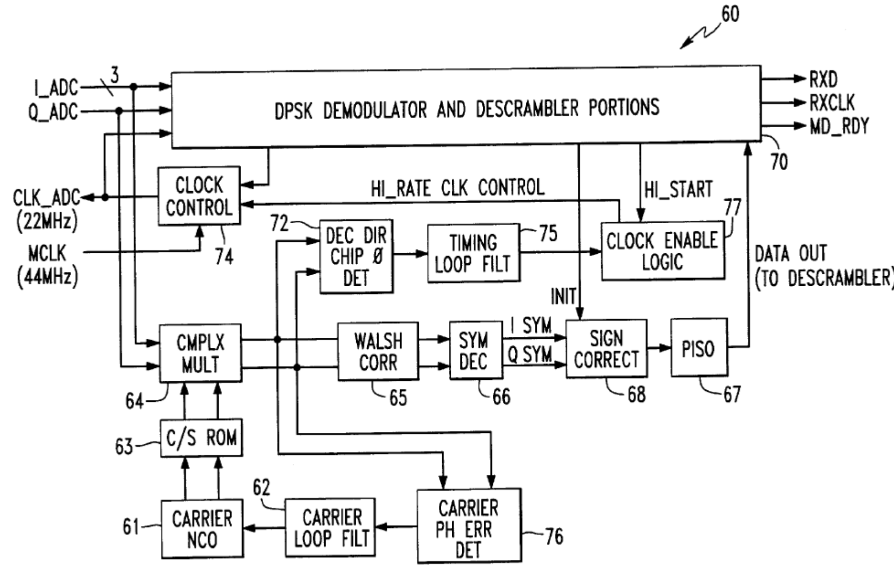
	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
		combination transmitter and receiver, connects to the wired network from a fixed location. Accordingly, the access transceiver receives, buffers, and transmits data between the WLAN and the wired network. *A single access transceiver can support a small group of collocated users within a range of less than about one hundred to several hundred feet. The end users connect to the WLAN through transceivers* which are typically implemented as PC cards in a notebook computer, or ISA or PCI cards for desktop computers. Of course the transceiver may be integrated with any device, such as a hand-held computer.” Snell at 1:34-46. “The PRISM 1 chip set provides all the functions necessary for full or half duplex, direct sequence spread spectrum, *packet communications* at the 2.4 to 2.5 GHz ISM radio band.” Snell at 1:55-57.

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		 Snell at Fig. 3 (annotated). "The *header may always be BPSK*." Snell at 6:35-36. Snell discloses that the "SIGNAL" in the PLCP header indicates (*e.g.*, using "OAh") the modulation type (*e.g.*, BPSK) used for modulating the MPDU data portion. "Now relating to the PLCP header 91, the SIGNAL is:

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		<table><tr><td>0Ah</td><td>1 Mbit/s BPSK,</td></tr><tr><td>14h</td><td>2 Mbit/S QPSK,</td></tr><tr><td>37h</td><td>5.5 Mbit/s BPSK, and</td></tr><tr><td>6Eh</td><td>11 Mbit/s QPSK.</td></tr></table> " Snell at 6:52-59. "SIGNAL is indicated by 2 control bits and then formatted as described." Snell at 7:1-2. "MPDU is serially provided by Interface 80 and is the variable data scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU. The variable data may be modulated and demodulated in different formats than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14. "The modulator preferably comprises means for *operating in one of a bi-phase PSK (BPSK) modulation mode at a first data rate defining a first format,* and a quadrature PSK (QPSK) mode at a second data rate defining a second format." Snell at 2:56-59. "In particular, the HSP3824 baseband processor manufactured by Harris Corporation *employs quadrature or bi-phase phase shift keying (QPSK or BPSK) modulation schemes*." Snell at 1:58-61. The modulator and demodulator are each preferably operable *in one of a bi-phase PSK (BPSK) mode* at a first data rate and *a quadrature PSK (QPSK) mode* at a second data rate. These formats may also be switched on-the-fly in the demodulator. Snell at Abstract Moreover, a WLAN application, for example, may require a change

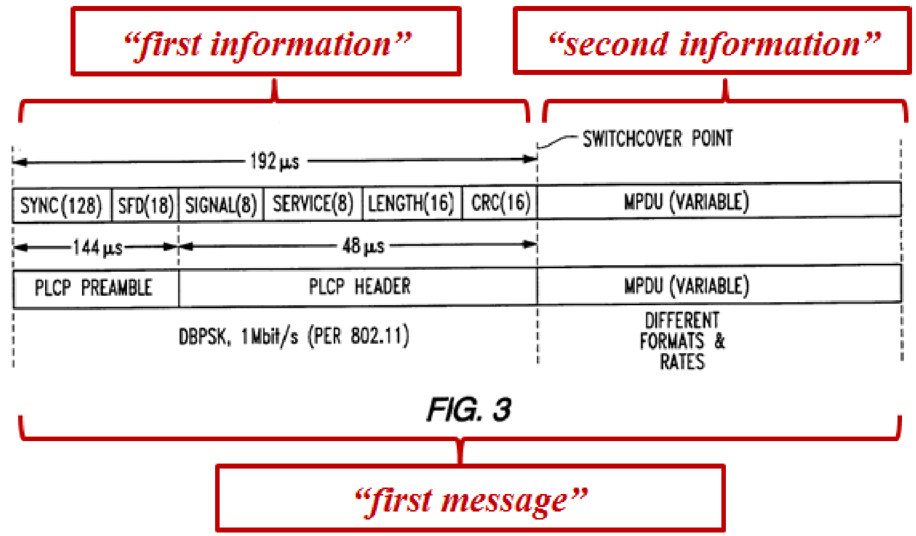
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		between *BPSK and QPSK* during operation, that is, on-the-fly." Snell at Col. 2:15-17 (" "*The PLCP preamble and PLCP header are always* at 1 Mbit/s, *Diff encoded*, scrambled and spread with an 11 chip barker." Snell at Col. 6:64-66. "The modulator may also preferably include header modulator means for modulating data packets to include *a header at a predetermined modulation and a third data rate defining a third format*…. *The third format is preferably differential BPSK*." Snell at Col. 2:61-3:5. "The reference phase for the first symbol of the *MPDU* is the output phase of the last symbol of the header *for Diff Encoding*." Snell at Col. 7:6-8.  *FIG. 3* Snell at Fig. 3.

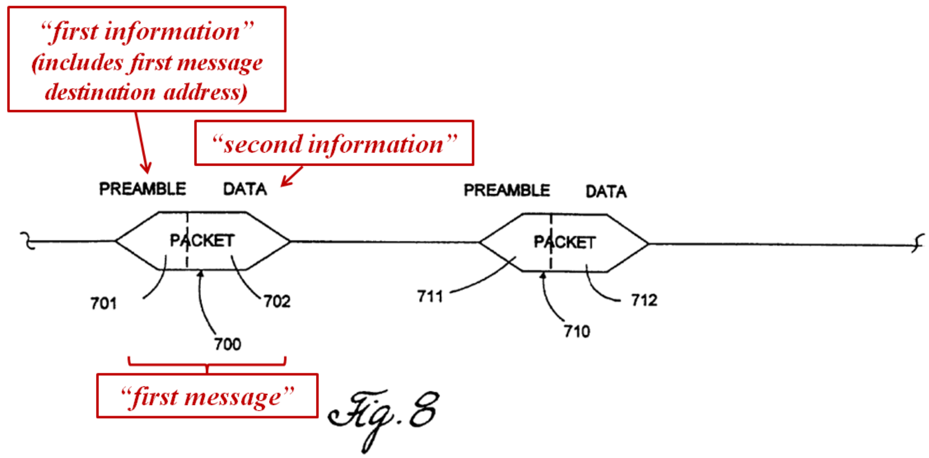
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		 FIG. 2 Snell at Fig.

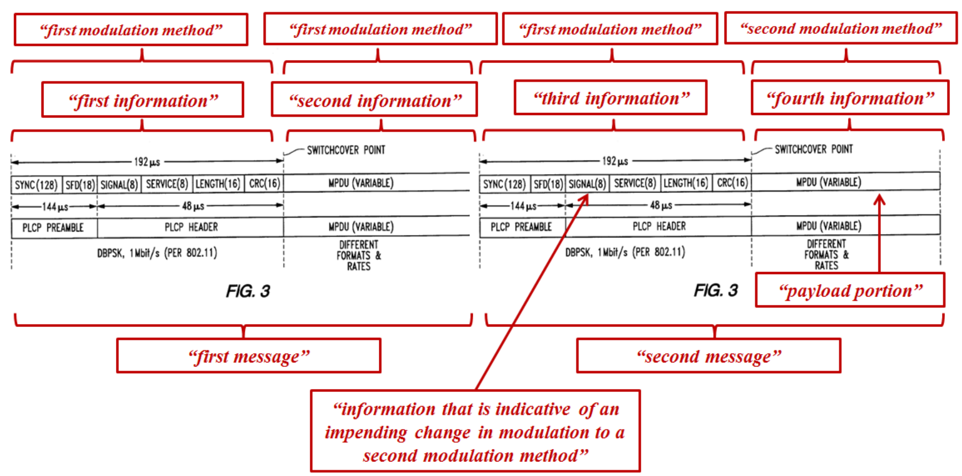
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		 FIG. 5 2. Snell at Fig. 5. Snell incorporates by reference Harris 4064.4,[3] which discloses: "*The preamble and header are always transmitted as DBPSK* waveforms while the *data packets can be configured to be either DBPSK* or DQPSK." Harris 4064.4 at 14. "The *preamble is always transmitted as a DBPSK* waveform with a programmable length of up to 256 symbols long." Harris 4064.4 at 15. "*Signal Field (8 Bits) - This field indicates whether the data packet that*

[3] Snell expressly incorporates by reference "the entire disclosure" of Harris 4064.4 (Snell at 5:8-17, 5:31-33).

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
		follows the header is modulated as DBPSK or DQPSK. In mode 3 the HSP3824 receiver looks at the signal field to determine whether it needs to switch from DBPSK demodulation into DQPSK demodulation at the end of the always DBPSK preamble and header fields.” Harris 4064.4 at 15. “Mode 3 - In this mode the preamble is programmable up to 256 bits (all 1’s). The header in this mode is using all available fields. *In mode 3 the signal field defines the modulation type of the data packet (DBPSK* or DQPSK) so the receiver does not need to be preprogrammed to anticipate one or the other. In this mode the device checks the Signal field for the data packet modulation and it switches to DQPSK if it is defined as such in the signal field. *Note that the preamble and header are always DBPSK* the modulation definition applies only for the data packet.” Harris 4064.4 at 16. *See also, e.g.*, Harris 4064.4 at 14 (“The HSP3824 transmitter is designed as a Direct Sequence Spread Spectrum DBPSK/DQPSK modulator.”), Harris 4064.4 at 14 (“The modulator is capable of switching rate automatically in the case where the preamble and header information are DBPSK modulated, and the data is DQPSK modulated.”), Harris 4064.4 at FIGURE 10.
1[c]	first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information; and	**Snell in view of Yamano discloses first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information.** *See, e.g.*, Snell at 6:35-36, 6:64-66, 7:5-10, Fig. 3; Harris 4064.4 at 14; Yamano at 19:63-64, 20:1-7, 20:54-59, Fig. 8. For example, Snell discloses:

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		 Snell at Fig. 3 (annotated). "The *header* may always be BPSK." Snell at 6:35-36. "The *PLCP preamble and PLCP header* are always at 1 Mbit/s, Diff encoded, scrambled and spread with an 11 chip barker." Snell at 6:64-66. "*MPDU* is serially provided by Interface 80 and *is the variable data* scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU." Snell at 7:5-10. Snell incorporates by reference Harris 4064.4, which discloses: "The *preamble and header* are always transmitted as DBPSK waveforms while the *data packets* can be configured to be either DBPSK or DQPSK." Harris 4064.4 at 14.

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
		For example, Yamano discloses: “*Packet 700* includes a *preamble 701* and a *main body 702*.” Yamano at 19:63-64. “For example, *preamble 701* can include information which identifies: (1) a version or type field for the preamble, (2) *packet source and destination addresses*, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet.” Yamano at 20:1-7.  Yamano at Fig. 8 (annotated). “When the preamble in a burst-mode packet *includes the destination address of the packet*, the receiver circuits can monitor the destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits.” Yamano at 20:54-59.
1[d]	said master transceiver configured to transmit a	**Snell in view of Yamano discloses said master transceiver configured**

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
	second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers, and	**to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers.** *See, e.g.*, Snell at 1:34-46, 1:47-50, 1:55-57, 2:27-30, 2:61-3:5, 4:42-47, 5:18-2, 6:35-36, 6:52-59, 6:64-66, 7:1-2, 7:5-14, Figs. 2, 3, 5; Harris AN9614 at 3; Harris 4064.4 at 14-16, Fig. 10;. For example, Snell discloses: 

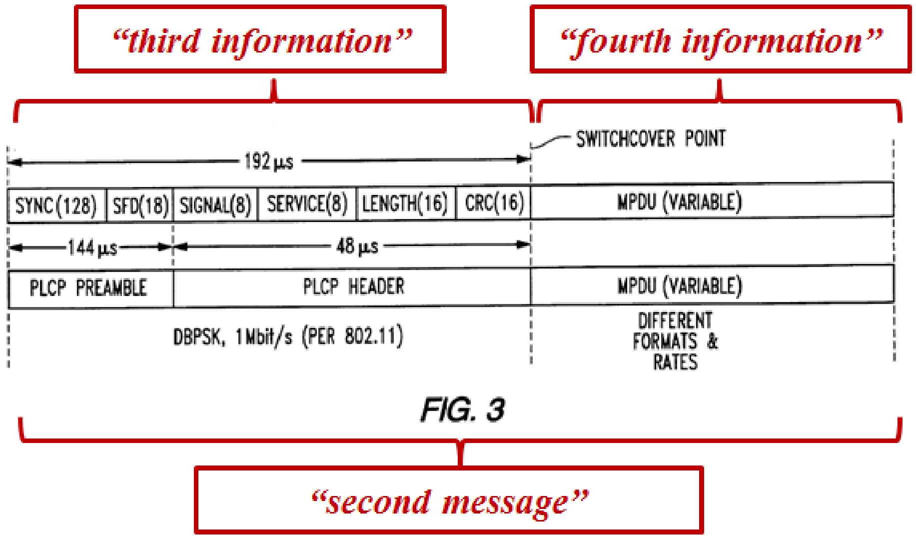
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		Snell at Fig. 3. (annotated). "The modulator may also preferably include header modulator means for modulating *data packets*." Snell at 2:61-63. "The PRISM 1 chip set provides all the functions necessary for full or half duplex, direct sequence spread spectrum, *packet communications* at the 2.4 to 2.5 GHz ISM radio band." Snell at 1:55-57. "It is another object of the invention to provide a spread spectrum transceiver and associated method to permit operation at higher data rates and *which may switch on-the-fly between different data rates and/or formats*." Snell at 2:27-30. "*The variable data may be modulated and demodulated in different formats than the header portion* to thereby increase the data rate, and *while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly*." Snell at 7:10-14. "The *header* may always be *BPSK*." Snell at 6:35-36. **Snell's BPSK is the claimed first modulation method.** "Now relating to the *PLCP header* 91, *the SIGNAL* is: 0Ah 1 Mbit/s BPSK, 14h 2 Mbit/S QPSK, 37h 5.5 Mbit/s BPSK, and 6Eh 11 Mbit/s QPSK. " Snell at 6:52-59. "SIGNAL is indicated by 2 control bits and then formatted as described." Snell at 7:1-2. "*MPDU* is serially provided by Interface 80 and *is the variable data*

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be followed by the first bit of the MPDU. *The variable data may be modulated and demodulated in different formats* than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14. "*The PLCP preamble and PLCP header are always* at 1 Mbit/s, *Diff encoded*, scrambled and spread with an 11 chip barker." Snell at 6:64-66. "The modulator may also preferably include header modulator means for modulating data packets to include *a header at a predetermined modulation and a third data rate defining a third format…. The third format is preferably differential BPSK*." Snell at 2:61-3:5. "The reference phase for the first symbol of the *MPDU* is the output phase of the last symbol of the header *for Diff Encoding*." Snell at 7:6-8. *See also, e.g.*, Snell at Figs. 2, 3, 5. Snell incorporates by reference Harris 4064.4, which discloses: "*The preamble and header are always transmitted as DBPSK* waveforms while the *data packets can be configured to be either DBPSK or DQPSK*." Harris 4064.4 at 14. "The *preamble is always transmitted as a DBPSK* waveform with a programmable length of up to 256 symbols long." Harris 4064.4 at 15. "*Signal Field (8 Bits) - This field indicates whether the data packet that follows the header is modulated as DBPSK or DQPSK.* In mode 3 the HSP3824 receiver looks at the signal field to determine whether it needs to switch from DBPSK demodulation into DQPSK demodulation at the end of the always DBPSK preamble and header fields." Harris 4064.4 at

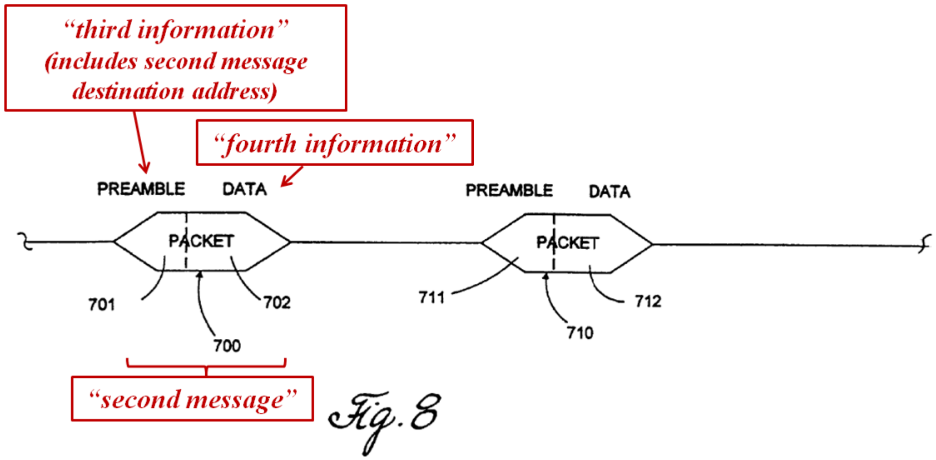
	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		15. "Mode 3 - In this mode the preamble is programmable up to 256 bits (all 1's). The header in this mode is using all available fields. *In mode 3 the signal field defines the modulation type of the data packet (DBPSK* or *DQPSK*) so the receiver does not need to be preprogrammed to anticipate one or the other. In this mode the device checks the Signal field for the data packet modulation and it switches to DQPSK if it is defined as such in the signal field. *Note that the preamble and header are always DBPSK* the modulation definition applies only for the data packet." Harris 4064.4 at 16. *See also, e.g.*, Harris 4064.4 at 14 ("The HSP3824 transmitter is designed as a Direct Sequence Spread Spectrum *DBPSK/DQPSK* modulator."), Harris 4064.4 at 14 ("The modulator is capable of switching rate automatically in the case where the preamble and header information are DBPSK modulated, and the data is *DQPSK* modulated."), Harris 4064.4 at FIGURE 10. **Kamerman discloses a second modulation as QAM.** For example, Kamerman discloses: "IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: after unacknowledged packet transmissions the rate falls back, and after a

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up." Kamerman at 11.[4]
1[e]	second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and	**Snell in view of Yamano discloses second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information.** *See, e.g.*, Snell at 1:55-57, 2:61-63, 6:35-36, 6:64-66, 7:5-14, Fig. 3; Harris 4064.4 at 14; Yamano at 19:63-64, 20:1-7, 20:54-59, Fig. 8. For example, Snell discloses:

[4] *See also, e.g.*, Electronic Communications Systems – Fundamentals Through Advanced, Wayne Tomasi, Prentice-Hall, Inc., 1988, p. 490 ("Essentially, there are three digital modulation techniques that are commonly used in digital radio systems: *frequency shift keying* (FSK), *phase shift keying* (PSK), and *quadrature amplitude modulation* (QAM)."); Deep space telecommunications systems engineering, PN Sargeaunt - IEE Proceedings F-Communications, Radar, 1985 (referring to "the PSK family of modulation methods); US 5,966,055 at 3:36-40 (referring to "the family of PSK (phase shift keyed) modulations"); WO 2009/091,128 (referring separately to "Phase Shift Key (PSK)-family" and "Quadrature Amplitude Modulation (QAM)-family").

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
		 Snell at Fig. 3 (annotated). “The modulator may also preferably include header modulator means for modulating *data packets*.” Snell at 2:61-63. “The PRISM 1 chip set provides all the functions necessary for full or half duplex, direct sequence spread spectrum, *packet communications* at the 2.4 to 2.5 GHz ISM radio band.” Snell at 1:55-57. “The *header* may always be BPSK.” Snell at 6:35-36. “The *PLCP preamble and PLCP header* are always at 1 Mbit/s, Diff encoded, scrambled and spread with an 11 chip barker.” Snell at 6:64-66. “*MPDU* is serially provided by Interface 80 and *is the variable data* scrambled for normal operation. The reference phase for the first symbol of the MPDU is the output phase of the last symbol of the header for Diff Encoding. The last symbol of the header into the scrambler 51 must be

	Claim 1 of U.S. Patent No. 8,457,228 ("the '228 patent")	Snell
		followed by the first bit of the MPDU. *The variable data* may be modulated and demodulated in different formats than the header portion to thereby increase the data rate, and while a switchover as indicated by the switchover point in FIG. 3, occurs on-the-fly." Snell at 7:5-14. Snell incorporates by reference Harris 4064.4, which discloses: "The *preamble and header* are always transmitted as DBPSK waveforms while the *data packets* can be configured to be either DBPSK or DQPSK." Harris 4064.4 at 14. For example, Yamano discloses: "*Packet 700* includes a *preamble 701* and a *main body 702*." Yamano at 19:63-64. "For example, *preamble 701* can include information which identifies: (1) a version or type field for the preamble, (2) *packet source and destination addresses*, (3) the line code (i.e., the modem protocol being used), (4) the data rate, (5) error control parameters, (6) packet length and (7) a timing value for the expected reception slot of a subsequent packet." Yamano at 20:1-7 (emphasis added).

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
		 Yamano at Figure 8 (annotated). “When the preamble in a burst-mode packet *includes the destination address of the packet*, the receiver circuits can monitor the destination address of the packet, and in response, filter packets which do not need to be demodulated, thereby reducing the processing requirements of the receiver circuits.” Yamano at 20:54-59.
1[f]	wherein the second modulation method results in a higher data rate than the first modulation method.	**Snell in view of Yamano discloses wherein the second modulation method results in a higher data rate than the first modulation method.** See element 1[d] for Snell’s disclose of BPSK as the first modulation method and Kamerman’s disclosure of QAM as the second modulation method. QAM results in a higher data rate than BPSK. *See* Kamerman at 11 (“IEEE 802.11 DS specifies BPSK and QPSK, in addition there could be applied proprietary modes with M-PSK and QAM schemes that provide higher bit rates by encoding more bits per symbol. . . . An automatic rate

	Claim 1 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
		selection scheme based on the reliability of the individual uplink and downlink could be applied. The basic rate adaptation scheme could be: after unacknowledged packet transmissions the rate falls back, and after a number (e.g. 10) of successive correctly acknowledged packet transmissions the bit rate goes up.”).

	Claim 21 of U.S. Patent No. 8,457,228 (“the ’228 patent”)	Snell
21	The master communication device as in claim 1, wherein the first information that is included in the first message comprises the first message address data.	**Snell in view of Yamano discloses master communication device as in claim 1, wherein the first information that is included in the first message comprises the first message address data.** *See* claim 1, Element 1.C.

EXHIBIT N

EXHIBIT N

Comparison of Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,023,580 ("the '580 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Reunamaki and (b) under 35 U.S.C. § 103(a) as obvious over Reunamaki standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibits A-L, X, and Z-1, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '580 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

'580 Claim	**Claim Element**	**U.S. Patent No. 7,295,546 ("REUNAMAKI")**
1.pre.	A communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, the device comprising:	**To the extent this preamble is considered a limitation of the claim, Reunamaki discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, Reunamaki discloses**: "A Bluetooth system provides a communication channel between two electronic devices via a short-range radio link." Col. 1:13-14. "It is a primary object of the present invention to improve correlation properties near ideal symbol time in Bluetooth medium rate packets." Col. 2:52-54. "Bluetooth network arrangements can be either point-to-point or point-to-multipoint to provide connection links among a plurality of electronic devices. Two to eight devices can be operatively connected into a piconet, wherein, at a given period, one of the devices serves as the master while the others are the slaves." Col. 1:30-35. **To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of Bluetooth Core Specification Version 1.1 ("BT 1.1").** BT 1.1 discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave. Specifically, BT 1.1 discloses: "2 PHYSICAL CHANNEL 2.1 CHANNEL DEFINITION The channel is represented by a pseudo-random hopping sequence hopping through the 79 or 23 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s. All Bluetooth units participating

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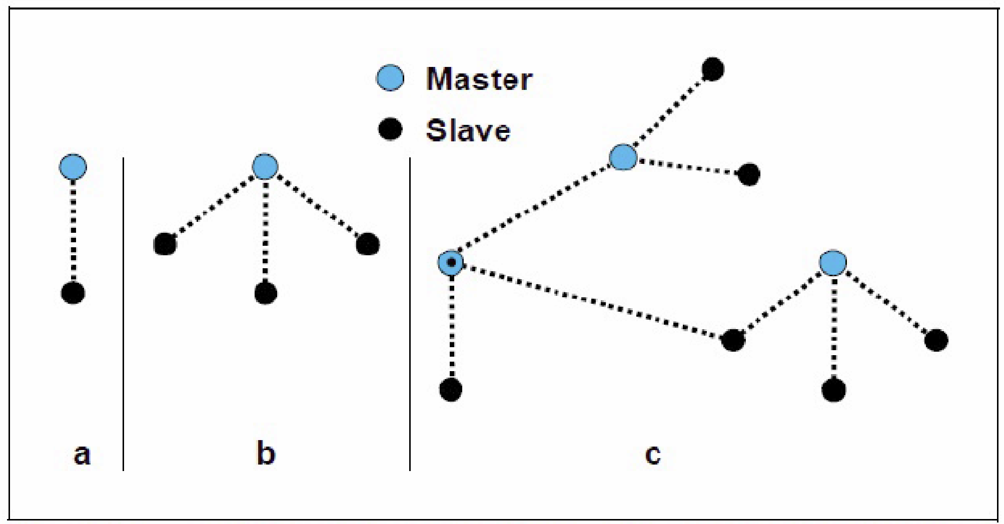
Comparison of Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'580 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		in the piconet are time- and hop-synchronized to the channel." p. 43. "The channel in the piconet is characterized entirely by the master of the piconet. The Bluetooth device address (BD_ADDR) of the master determines the FH hopping sequence and the channel access code; the system clock of the master determines the phase in the hopping sequence and sets the timing. In addition, the master controls the traffic on the channel by a polling scheme. By definition, the master is represented by the Bluetooth unit that initiates the connection (to one or more slave units). . . . Note that the names 'master' and 'slave' only refer to the protocol on the channel: the Bluetooth units themselves are identical; that is, any unit can become a master of a piconet. Once a piconet has been established, master-slave roles can be exchanged." p. 92. "Polling in active mode The master always has full control over the piconet. Due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves." p. 119; Fig. 1.2. Fig. 1.2, reproduced below; *see also* pp. 41-42 (describing the formation of a point-to- multipoint network); 90 (describing multi-slave operation); Fig. 9.7.  *Figure 1.2: Piconets with a single slave operation (a), a multi-slave operation (b) and a scatternet operation (c).* Given the disclosures of **Reunamaki** and **BT 1.1**, a person of ordinary skill in the art would have

Comparison of Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'580 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		been motivated to modify and/or combine **Reunamaki** and **BT 1.1**.
1.a.	a transceiver, in the role of the master according to the master/slave relationship,	**Reunamaki discloses a transceiver, which takes the role of master in a master/slave relationship.** For example, Reunamaki discloses: "In the time slots, master and slave devices can transmit packets. Packets transmitted by the master or the slave device may extend up to five time slots. The RF hop frequency remains fixed for the duration of packet transmission." Col. 2:2-5. To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of the other references identified in Exhibit X.
1.b.	for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,	**Reunamaki discloses a transceiver for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** For example, Reunamaki discloses: "A robust PSK scheme has been chosen to simplify the hardware integration of medium rate in the Bluetooth radios, addressing the low cost aspect. Narrow-band modulation, with RF channels of 1 MHz (3 dB bandwidth), has been chosen to be similar to the 1 MHz channel of the current Bluetooth 1.1 Specification. Depending on propagation conditions, n/4-DQPSK (Differential QPSK) or 8 DPSK can be applied with corresponding asymmetric ACL user data rates of up to 1.45 Mbps or 2.18 Mbps. For all of the medium rate packet types, the user data rate is effectively 2* or 3* of the basic rate equivalents. Basic rate is 1 Ms/s. Link adaptation can be applied to provide a link more resilient to errors at the expense of reduced user rate." Col. 4:28-40. "Regarding modulation and bit rate, medium rate has the same symbol rate as basic rate. The payload modulation is either n/4-DQPSK or 8 DPSK corresponding to the gross bit rate of 2 Mbps or 3 Mbps." Col. 4:56-59. "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." Col. 6:35-37.
1.c.	wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a	**Reunamaki discloses that each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion.**

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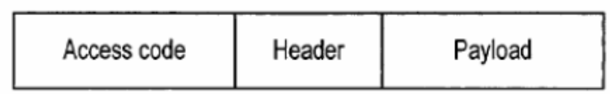
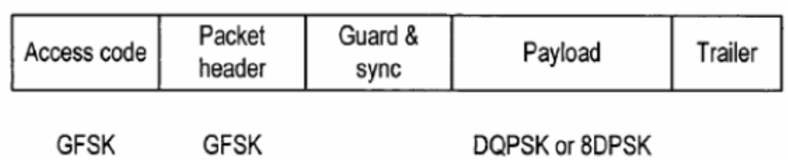
Comparison of Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'580 Claim	Claim Element	<u>U.S. Patent No. 7,295,546 ("REUNAMAKI")</u>
	payload portion	For example, Reunamaki discloses: "In the time slots, master and slave devices can transmit packets. . . . Every packet consists of an access code, a header and a payload, as shown in FIG. 1." Col. 2:2:15. "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. The packet is similar to a basic rate packet. The maximum modulo-lengths (modulo the 625 psec slot grid) are no greater than the longest basic rate packet plus two microseconds (DM3+two symbols). The access code and the packet header are identical in format and modulation so that the acquisition and packet identification are the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header. The guard time allows for settling and switching in the hardware during the transition from one modulation scheme to the other. Following the guard time is PSK-modulated synchronization that is used to complete acquisition prior to demodulating the n/4-DQPSK or 8 DPSK of the payload." Cols. 4:60-5:8. Figs. 1 and 3, reproduced below.  FIG. 1 (prior art)  FIG. 3

Comparison of Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'580 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
1.d.	wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,	**Reunamaki discloses that first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion.**[1] For example, Reunamaki discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme). The packet types contained in Segment 1 of TABLE II (NULL, POLL, FHS and DM1) are always transmitted at 1 Mbps. Segments 2, 3 and 4 may be transmitted either at 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP (link management protocol) commands. LMP messages are always sent using the DM1 packet type in 1 Mbps mode—even when medium rate is used for the other ACL packet types." Col. 6:35-44. "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to. Modes for ACL and SCO are also selected independently. For ACL links, the medium rate mode is explicitly selected via LMP using the packet_type_table (PTT) parameter. For SCO links, the medium rate mode is used only with eSCO links. The medium rate mode is selected when the eSCO link is established via LMP command. The AUX1 packet will always be transmitted at 1 Mbps." Col. 7:1-10. "Medium rate is enabled on ACL links by the selection of a packet type table (PTT) that defines the parameters of each packet type code. There are separate PTTs for ACL links over each physical (unicast, multicast or broadcast) connection. A PTT is effectively an index or pointer to the desired column in TABLE II. The packet type options utilize combinations of the 1, 2 and 3 Mbps packet types. The SCO links medium rate is selected when the link is established." Col. 9:2-9; *see also* Table II (detailing meaning of TYPE field for each link type); Table III (showing relationship between packet type and modulation rate); and Table IV (same); and Col. 8:18-53 (describing establishing links for basic or medium rate communication).
1.e.	wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion, and	**Reunamaki discloses that at least one group of transmission sequences is addressed for an intended destination of the payload portion.** For example, Reunamaki discloses: "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. . . . The access code and the packet header are identical in format and modulation [to those of a basic rate packet] so that the acquisition and packet identification are the same as basic rate." Col.

[1] Under Plaintiffs' infringement theory indicating the address and type of a Bluetooth packet also implies the modulation method. Defendant assumes this is true for purposes of these contentions.

'580 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		4:60-37. "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to." Col. 7:1-3. "[I]t is important to monitor the link on both the master side and the slave side to avoid possible collisions when the AM_ADDR is reassigned to another slave." Col. 9:35-37. To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1. **In particular, Reunamaki in view of BT 1.1 discloses wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion. Specifically, BT 1.1 discloses**: "The AM ADDR represents a member address and is used to distinguish between the active members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM ADDR of this slave; that is, the AM ADDR of the slave is used in both master-to-slave packets and in the slave- to-master packets." p. 51. Given the disclosures of Reunamaki and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Reunamaki and BT 1.1.
1.f.	wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method, and	**Reunamaki discloses the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method.** For example, Reunamaki discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." Col. 6:35-37; *also see* 1.c. The AM_ADDR and TYPE fields in the packet header indicate the modulation method that will be used to transmit the payload. When the header is modulated according to GFSK and the payload according to PSK, the modulation method changes from the header to the payload. The header therefore indicates the impending change. To the extent that Plaintiff alleges **that Reunamaki does not explicitly disclose this claim element,**

'580 Claim	**Claim Element**	**U.S. Patent No. 7,295,546 ("REUNAMAKI")**
		this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of the other references identified in Exhibit X.
1.g.	the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.	**Reunamaki discloses that the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.** **For example, Reunamaki discloses**: "Regarding modulation and bit rate, medium rate has the same symbol rate as basic rate. The payload modulation is either π/4-DQPSK or 8 DPSK corresponding to the gross bit rate of 2 Mbps or 3 Mbps." Col. 4:56-59; *see also* Fig. 3 (reproduced above); 1.a; and 1.c.
2.	The device of claim 1, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	**Reunamaki discloses a transceiver that transmits a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.** For example, Reunamaki discloses: "In the time slots, master and slave devices can transmit packets. Packets transmitted by the master or the slave device may extend up to five time slots. The RF hop frequency remains fixed for the duration of packet transmission." Col. 2:2-5. "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme). The packet types contained in Segment 1 of TABLE II (NULL, POLL, FHS and DM1) are always transmitted at 1 Mbps. Segments 2, 3 and 4 may be transmitted either at 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP (link management protocol) commands. LMP messages are always sent using the DM1 packet type in 1 Mbps mode—even when medium rate is used for the other ACL packet types." Col. 6:35-44. "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to. Modes for ACL and SCO are also selected independently. For ACL links, the medium rate mode is explicitly selected via LMP using the packet_type_table (PTT) parameter. For SCO links, the medium rate mode is used only with eSCO links. The medium rate mode is selected when the eSCO link is established via LMP command. The AUX1 packet will always be transmitted at 1 Mbps." Col. 7:1-10. "Medium rate is enabled on ACL links by the selection of a packet type table (PTT) that defines the parameters of each packet type code. There are separate PTTs for ACL links over each physical (unicast, multicast or broadcast) connection. A PTT is effectively an index or pointer to the desired

Comparison of Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'580 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		column in TABLE II. The packet type options utilize combinations of the 1, 2 and 3 Mbps packet types. The SCO links medium rate is selected when the link is established." Col. 9:2-9; *see also* Table II (detailing meaning of TYPE field for each link type); Table III (showing relationship between packet type and modulation rate); and Table IV (same); and Col. 8:18-53 (describing establishing links for basic or medium rate communication). "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. . . . The access code and the packet header are identical in format and modulation [to those of a basic rate packet] so that the acquisition and packet identification are the same as basic rate." Col. 4:60-37. "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to." Col. 7:1-3. "[I]t is important to monitor the link on both the master side and the slave side to avoid possible collisions when the AM_ADDR is reassigned to another slave." Col. 9:35-37.
58.pre.	A communication device capable of communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave, the device comprising:	**To the extent this preamble is considered a limitation of the claim, Reunamaki discloses a communication device capable of communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave.** See Element 1.pre, incorporated herein.
58.a.	a transceiver, in the role of the master according to the master/slave relationship,	**Reunamaki discloses a transceiver, in the role of the master according to the master/ slave relationship**. See Element 1.a, incorporated herein.
58.b.	capable of transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method, and	**Reunamaki discloses transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** See Element 1.b, incorporated herein.
58.c.	wherein the transceiver is configured to transmit messages with: a first sequence, in	**Reunamaki discloses that the transceiver is configured to transmit messages with: a first sequence, in the first modulation method, that indicates at least which of the first modulation**

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Comparison of Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'580 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
	the first modulation method, that indicates at least which of the first modulation method and the second modulation method is used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method,	**method and the second modulation method is used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method.** See Elements 1.c, 1.d, and 1.f, incorporated herein.
58.d.	and wherein the at least one message is addressed for an intended destination of the second sequence, and	**Reunamaki discloses that at least one message is addressed for an intended destination of the second sequence.** See Element 1.e, incorporated herein.
58.e.	the second sequence, modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the second sequence is transmitted after the first sequence.	**Reunamaki discloses that the second sequence is modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the second sequence is transmitted after the first sequence.** See Element 1.g, incorporated herein.
59.	The device of claim 58, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	Defendant incorporates by reference its contentions relating to claim 58, as if fully set forth herein. **Reunamaki discloses that the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.** See Claims 1 and 2, incorporated herein.

EXHIBIT O

EXHIBIT O

Comparison of the Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

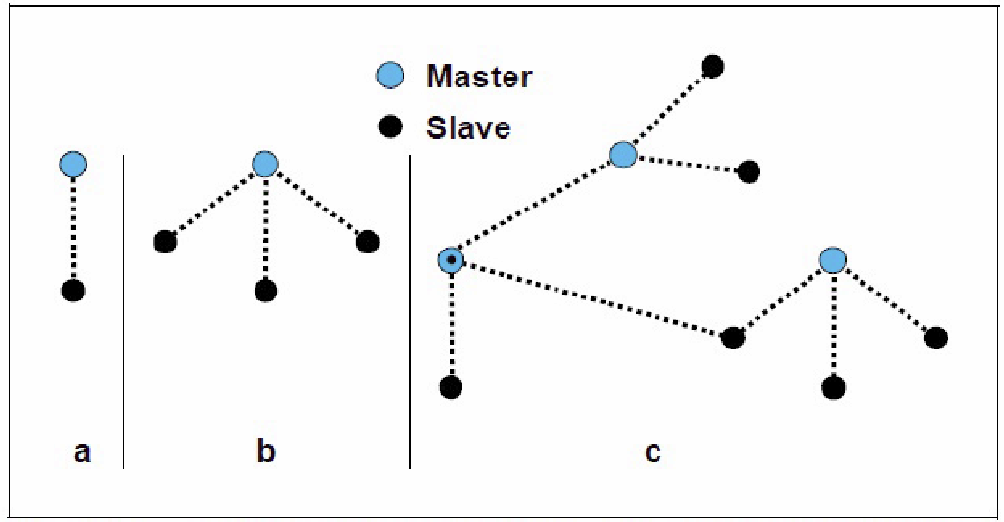
As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,457,228 ("the '228 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Reunamaki and (b) under 35 U.S.C. § 103(a) as obvious over Reunamaki standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibits A, M-W, Y, and Z-2, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '228 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

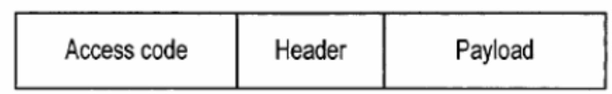
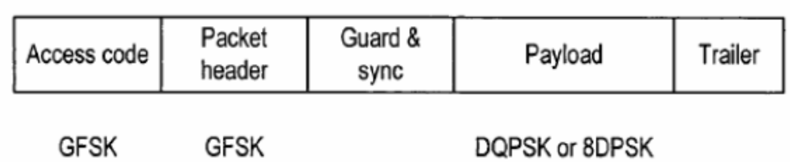
'228 Claim	**Claim Element**	**U.S. Patent No. 7,295,546 ("REUNAMAKI")**
1.pre.	A master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device comprising:	**To the extent this preamble is considered a limitation of the claim, Reunamaki discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device.** **For example, Reunamaki discloses**: "A Bluetooth system provides a communication channel between two electronic devices via a short-range radio link." Col. 1:13-14. "It is a primary object of the present invention to improve correlation properties near ideal symbol time in Bluetooth medium rate packets." Col. 2:52-54. "Bluetooth network arrangements can be either point-to-point or point-to-multipoint to provide connection links among a plurality of electronic devices. Two to eight devices can be operatively connected into a piconet, wherein, at a given period, one of the devices serves as the master while the others are the slaves." Col. 1:30-35. To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of Bluetooth Core Specification Version 1.1 ("BT 1.1"). **Reunamaki in view of BT 1.1 discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device. Specifically, BT 1.1 discloses**: "2 PHYSICAL CHANNEL 2.1 CHANNEL DEFINITION The channel is represented by a pseudo-random hopping sequence hopping through the 79 or 23 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into

EXHIBIT O

Comparison of the Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s. All Bluetooth units participating in the piconet are time- and hop-synchronized to the channel." p. 43. "The channel in the piconet is characterized entirely by the master of the piconet. The Bluetooth device address (BD_ADDR) of the master determines the FH hopping sequence and the channel access code; the system clock of the master determines the phase in the hopping sequence and sets the timing. In addition, the master controls the traffic on the channel by a polling scheme. By definition, the master is represented by the Bluetooth unit that initiates the connection (to one or more slave units). . . . Note that the names 'master' and 'slave' only refer to the protocol on the channel: the Bluetooth units themselves are identical; that is, any unit can become a master of a piconet. Once a piconet has been established, master-slave roles can be exchanged." p. 92. "Polling in active mode The master always has full control over the piconet. Due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves." p. 119; Fig. 1.2. Fig. 1.2, reproduced below; *see also* pp. 41-42 (describing the formation of a point-to- multipoint network); 90 (describing multi-slave operation); Fig. 9.7.

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		 *Figure 1.2: Piconets with a single slave operation (a), a multi-slave operation (b) and a scatternet operation (c).* Given the disclosures of Reunamaki and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Reunamaki and BT 1.1.
1.a.	a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers,	**Reunamaki discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers**. Reunamaki discloses a transceiver, which takes the role of master in a master/slave relationship. For example, Reunamaki discloses: "In the time slots, master and slave devices can transmit packets. Packets transmitted by the master or the slave device may extend up to five time slots. The RF hop frequency remains fixed for the duration of packet transmission." Col. 2:2-5; *see also* 1.pre.
1.b.	wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method,	**Reunamaki discloses that the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers.**

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
	wherein the second information comprises data intended for one of the one or more slave transceivers and	For example, Reunamaki discloses: "In the time slots, master and slave devices can transmit packets. . . . Every packet consists of an access code, a header and a payload, as shown in FIG. 1." Col. 2:2:15. "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. The packet is similar to a basic rate packet. The maximum modulo-lengths (modulo the 625 psec slot grid) are no greater than the longest basic rate packet plus two microseconds (DM3+two symbols). The access code and the packet header are identical in format and modulation so that the acquisition and packet identification are the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header. The guard time allows for settling and switching in the hardware during the transition from one modulation scheme to the other. Following the guard time is PSK-modulated synchronization that is used to complete acquisition prior to demodulating the n/4-DQPSK or 8 DPSK of the payload." Cols. 4:60-5:8. Figs. 1 and 3, reproduced below.  FIG. 1 (prior art)  FIG. 3 "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." Col. 6:35-37; *see also* Fig. 3, reproduced

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		above; and 1.a. "The medium rate mode provides a straightforward extension of the Bluetooth specification by adding additional packet types. Medium rate provides a two-fold, and optionally, a three-fold increase in the data rate during the payload portion of certain packet types." Col. 4:22-26. "Medium rate is an optional feature that can be used to complement the basic rate operation of a piconet, as specified in the Bluetooth 1.1 Specification or in combination with the new Radio1 Improvements." Col. 4:48-51. "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme). The packet types contained in Segment 1 of TABLE II (NULL, POLL, FHS and DM1) are always transmitted at 1 Mbps. . . . LMP messages are always sent using the DM1 packet type in 1 Mbps mode—even when medium rate is used for the other ACL packet types." Col. 6:35-44. "A Bluetooth system provides a communication channel between two electronic devices via a short-range radio link The Bluetooth radio link is intended to be a cable replacement between portable and/or fixed electronic devices." Col. 1:8-18. "In the time slots, master and slave devices can transmit packets. Packets transmitted by the master or the slave device may extend up to five time slots. The RF hop frequency remains fixed for the duration of packet transmission. A master device and a slave device can be linked together by an Asynchronous Connection-Less (ACL) link for a packet-switched connection or by a Synchronous Connection Oriented (SCO) link for a circuit-switched connection." Col. 2:2-10. "Medium rate provides further options to create 64 kbps full duplex links to carry the CVSD encoded audio. The 2-EVx and 3- EVx packet types have payload segments with 2* or 3* the data content. This allows the use of packet intervals (Tesco) that are 2 or 3 times those of basic rate eSCO links. The power consumption to support a given link is also reduced because of the 2* or 3* lower packet rate over the air link. The penalty is that loss of a packet causes loss of more data and hence a longer real-time segment of the audio." Col. 9:50-59; *see also* Table II (listing available packet types, including data packets). To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1. **For example, Reunamaki in view of BT 1.1 discloses wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second**

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		information comprises data intended for one of the one or more slave transceivers. Specifically, BT 1.1 discloses: "3.1 MODULATION CHARACTERISTICS The Modulation is GFSK (Gaussian Frequency Shift Keying) with a BT=0.5." p. 22; *see also* Fig. 4.1. "2. Payload body[:] The payload body includes the user host information and determines the effective user throughput. The length of the payload body is indicated in the length field of the payload header." p. 64; *see also* pp. 54-61 (describing different types of packets used to transmit user data). Given the disclosures of Reunamaki and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Reunamaki and BT 1.1.
1.c.	first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information; and	**Reunamaki discloses first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information.** **For example, Reunamaki discloses**: "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. . . . The access code and the packet header are identical in format and modulation [to those of a basic rate packet] so that the acquisition and packet identification are the same as basic rate." Col. 4:60-67. "The selection of the packet type column in TABLE II is carried out independently for every base AM ADDR a device is listening to." Col. 7:1-3. "[I]t is important to monitor the link on both the master side and the slave side to avoid possible collisions when the AM_ADDR is reassigned to another slave." Col. 9:35-37. To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1. **For example, Reunamaki in view of BT 1.1 discloses first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information. Specifically, BT 1.1 discloses**: "The AM ADDR represents a member address and is used to distinguish between the active members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM ADDR of

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		this slave; that is, the AM ADDR of the slave is used in both master-to-slave packets and in the slave- to-master packets." p. 51. Given the disclosures of Reunamaki and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Reunamaki and BT 1.1.
1.d.	said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers, and	**Reunamaki discloses that the master transceiver is configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers**. *See* 1.pre, 1.a, 1.b. For example, Reunamaki discloses: "Whether or not a device is capable of supporting medium rate is indicated in the LMP_features message. A medium rate capable device may support the 2 Mbps mode only or both 2 Mbps and 3 Mbps. The master can enable the use of medium rate on ACL and/or extended SCO (eSCO) links separately for each of the medium rate capable slaves in the piconet." Col. 4:41-47. "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme). The packet types contained in Segment 1 of TABLE II (NULL, POLL, FHS and DM1) are always transmitted at 1 Mbps. Segments 2, 3 and 4 may be transmitted either at 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP (link management protocol) commands. LMP messages are always sent using the DM1 packet type in 1 Mbps mode—even when medium rate is used for the other ACL packet types." Col. 6:35-44. "The selection of the packet type column in TABLE II is carried out independently for every base AM_ADDR a device is listening to. Modes for ACL and SCO are also selected independently. For ACL links, the medium rate mode is explicitly selected via LMP using the packet_type_table (PTT) parameter. For SCO links, the medium rate mode is used only with eSCO links. The medium rate mode is selected when the eSCO link is established via LMP command. The AUX1 packet will always be transmitted at 1 Mbps." Col. 7:1-10. "Medium rate is enabled on ACL links by the selection of a packet type table (PTT) that defines the

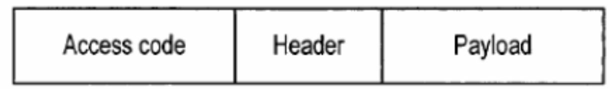
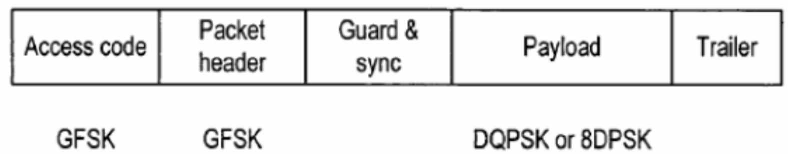
'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		parameters of each packet type code. There are separate PTTs for ACL links over each physical (unicast, multicast or broadcast) connection. A PTT is effectively an index or pointer to the desired column in TABLE II. The packet type options utilize combinations of the 1, 2 and 3 Mbps packet types. The SCO links medium rate is selected when the link is established." Col. 9:2-9; *see also* Table II (detailing meaning of TYPE field for each link type); Table III (showing relationship between packet type and modulation rate); Table IV (same); and Col. 8:18-53 (describing establishing links for basic or medium rate communication). "A robust PSK scheme has been chosen to simplify the hardware integration of medium rate in the Bluetooth radios, addressing the low cost aspect. Narrow-band modulation, with RF channels of 1 MHz (3 dB bandwidth), has been chosen to be similar to the 1 MHz channel of the current Bluetooth 1.1 Specification. Depending on propagation conditions, n/4- DQPSK (Differential QPSK) or 8 DPSK can be applied with corresponding asymmetric ACL user data rates of up to 1.45 Mbps or 2.18 Mbps. For all of the medium rate packet types, the user data rate is effectively 2* or 3* of the basic rate equivalents. Basic rate is 1 Ms/s. Link adaptation can be applied to provide a link more resilient to errors at the expense of reduced user rate." Col. 4:28-40. "Regarding modulation and bit rate, medium rate has the same symbol rate as basic rate. The payload modulation is either n/4- DQPSK or 8 DPSK corresponding to the gross bit rate of 2 Mbps or 3 Mbps." Col. 4:56-59; *see also* Fig. 3 (reproduced above).
1.e.	second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and	**Reunamaki discloses second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information.** For example, Reunamaki discloses: "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. . . . The access code and the packet header are identical in format and modulation [to those of a basic rate packet] so that the acquisition and packet identification are the same as basic rate." Col. 4:60-67. "The selection of the packet type column in TABLE II is carried out independently for every base AM ADDR a device is listening to." Col. 7:1-3. "[I]t is important to monitor the link on both the master side and the slave side to avoid possible collisions when the AM_ADDR is reassigned to another slave." Col. 9:35-37. To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1.

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		For example, Reunamaki in view of BT 1.1 discloses second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information. Specifically, BT 1.1 discloses: "The AM ADDR represents a member address and is used to distinguish between the active members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM ADDR of this slave; that is, the AM ADDR of the slave is used in both master-to-slave packets and in the slave- to-master packets." p. 51. Given the disclosures of Reunamaki and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Reunamaki and BT 1.1.
1.f.	wherein the second modulation method results in a higher data rate than the first modulation method.	**Reunamaki discloses that the second modulation method results in a higher data rate than the first modulation method.** For example, Reunamaki discloses: "The medium rate mode provides a straightforward extension of the Bluetooth specification by adding additional packet types. Medium rate provides a two-fold, and optionally, a three-fold increase in the data rate during the payload portion of certain packet types." Col. 4:22-26. "Regarding modulation and bit rate, medium rate has the same symbol rate as basic rate. The payload modulation is either n/4- DQPSK or 8 DPSK corresponding to the gross bit rate of 2 Mbps or 3 Mbps." Col. 4:56-59. "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." Col. 6:35-37.
21.	The master communication device as in claim 1, wherein the first information that is included in the first message comprises the first message address data.	**Reunamaki discloses that the first information that is included in the first message comprises the first message address data.** For example, Reunamaki discloses that: "In the time slots, master and slave devices can transmit packets. . . . Every packet consists of an access code, a header and a payload, as shown in FIG. 1." Col. 2:2:15. "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. The packet is similar to a basic rate packet. The maximum modulo-lengths (modulo the 625 psec slot grid) are no greater than the longest basic rate packet plus two microseconds (DM3+two

EXHIBIT O

Comparison of the Asserted Claims to U.S. Patent No. 7,295,546 ("Reunamaki")

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		symbols). The access code and the packet header are identical in format and modulation so that the acquisition and packet identification are the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header. The guard time allows for settling and switching in the hardware during the transition from one modulation scheme to the other. Following the guard time is PSK-modulated synchronization that is used to complete acquisition prior to demodulating the n/4-DQPSK or 8 DPSK of the payload." Cols. 4:60-5:8. "A Bluetooth system provides a communication channel between two electronic devices via a short-range radio link The Bluetooth radio link is intended to be a cable replacement between portable and/or fixed electronic devices." Col. 1:8-18. "In the time slots, master and slave devices can transmit packets. Packets transmitted by the master or the slave device may extend up to five time slots. The RF hop frequency remains fixed for the duration of packet transmission. A master device and a slave device can be linked together by an Asynchronous Connection-Less (ACL) link for a packet-switched connection or by a Synchronous Connection Oriented (SCO) link for a circuit-switched connection." Col. 2:2-10. "Medium rate provides further options to create 64 kbps full duplex links to carry the CVSD encoded audio. The 2-EVx and 3- EVx packet types have payload segments with 2* or 3* the data content. This allows the use of packet intervals (Tesco) that are 2 or 3 times those of basic rate eSCO links. The power consumption to support a given link is also reduced because of the 2* or 3* lower packet rate over the air link. The penalty is that loss of a packet causes loss of more data and hence a longer real-time segment of the audio." Col. 9:50-59; *see also* Table II (listing available packet types, including data packets). Figs. 1 and 3, reproduced below.

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		 FIG. 1 (prior art)  FIG. 3 "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." Col. 6:35-37; *see also* Fig. 3, reproduced above; and 1.a. "The medium rate mode provides a straightforward extension of the Bluetooth specification by adding additional packet types. Medium rate provides a two-fold, and optionally, a three-fold increase in the data rate during the payload portion of certain packet types." Col. 4:22-26. "Medium rate is an optional feature that can be used to complement the basic rate operation of a piconet, as specified in the Bluetooth 1.1 Specification or in combination with the new Radio1 Improvements." Col. 4:48-51. "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme). The packet types contained in Segment 1 of TABLE II (NULL, POLL, FHS and DM1) are always transmitted at 1 Mbps. . . . LMP messages are always sent using the DM1 packet type in 1 Mbps mode—even when medium rate is used for the other ACL packet types." Col. 6:35-44. "The general format of the medium rate packet, according to the present invention, is shown in FIG. 3. . . . The access code and the packet header are identical in format and modulation [to those of a

'228 Claim	Claim Element	U.S. Patent No. 7,295,546 ("REUNAMAKI")
		basic rate packet] so that the acquisition and packet identification are the same as basic rate." Col. 4:60-67. "The selection of the packet type column in TABLE II is carried out independently for every base AM ADDR a device is listening to." Col. 7:1-3. "[I]t is important to monitor the link on both the master side and the slave side to avoid possible collisions when the AM_ADDR is reassigned to another slave." Col. 9:35-37. To the extent that Plaintiff alleges that Reunamaki does not explicitly disclose this claim element, this limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1. **For example, Reunamaki in view of BT 1.1 discloses wherein the first information that is included in the first message comprises the first message address data. Specifically, BT 1.1 discloses**: "3.1 MODULATION CHARACTERISTICS The Modulation is GFSK (Gaussian Frequency Shift Keying) with a BT=0.5." p. 22; *see also* Fig. 4.1. "The AM ADDR represents a member address and is used to distinguish between the active members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM ADDR of this slave; that is, the AM ADDR of the slave is used in both master-to-slave packets and in the slave- to-master packets." p. 51. "2. Payload body[:] The payload body includes the user host information and determines the effective user throughput. The length of the payload body is indicated in the length field of the payload header." p. 64; *see also* pp. 54-61 (describing different types of packets used to transmit user data). Given the disclosures of Reunamaki and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Reunamaki and BT 1.1.

EXHIBIT P

EXHIBIT P

Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,023,580 ("the '580 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Medium Rate and (b) under 35 U.S.C. § 103(a) as obvious over Medium Rate standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibits A-L, X, and Z-1, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '580 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
1.pre.	A communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave, the device comprising:	**To the extent this preamble is considered a limitation of the claim, Medium Rate discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave.** **For example, Medium Rate discloses**: "Whether or not a device is capable of supporting Medium Rate is indicated in the *LMP_features* message. A Medium Rate capable device may support the 2Mbps mode only or both 2Mbps and 3Mbps. The master can enable the use of Medium Rate on ACL and/or SCO links separately for each of the Medium Rate capable slaves in the piconet." p. 7. **To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of Bluetooth Core Specification Version 1.1 ("BT 1.1").** BT 1.1 discloses a communication device capable of communicating according to a master/slave relationship in which a slave communication from a slave to a master occurs in response to a master communication from the master to the slave. Specifically, BT 1.1 discloses: "The Bluetooth transceiver is operating in the 2.4 GHz ISM band. This specification defines the requirements for a Bluetooth transceiver operating in this unlicensed band." p. 19. "2 PHYSICAL CHANNEL 2.1 CHANNEL DEFINITION The channel is represented by a pseudo-random hopping sequence hopping through the 79 or 23 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		different RF hop frequencies. The nominal hop rate is 1600 hops/s. All Bluetooth units participating in the piconet are time- and hop-synchronized to the channel." p. 43. "The channel in the piconet is characterized entirely by the master of the piconet. The Bluetooth device address (BD_ADDR) of the master determines the FH hopping sequence and the channel access code; the system clock of the master determines the phase in the hopping sequence and sets the timing. In addition, the master controls the traffic on the channel by a polling scheme. By definition, the master is represented by the Bluetooth unit that initiates the connection (to one or more slave units). . . . Note that the names 'master' and 'slave' only refer to the protocol on the channel: the Bluetooth units themselves are identical; that is, any unit can become a master of a piconet. Once a piconet has been established, master-slave roles can be exchanged." p. 92. "Polling in active mode the master always has full control over the piconet. Due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves." p. 119; Fig. 1.2. Fig. 1.2, reproduced below; *see also* pp. 41-42 (describing the formation of a point-to- multipoint network); 90 (describing multi-slave operation); Fig. 9.7.

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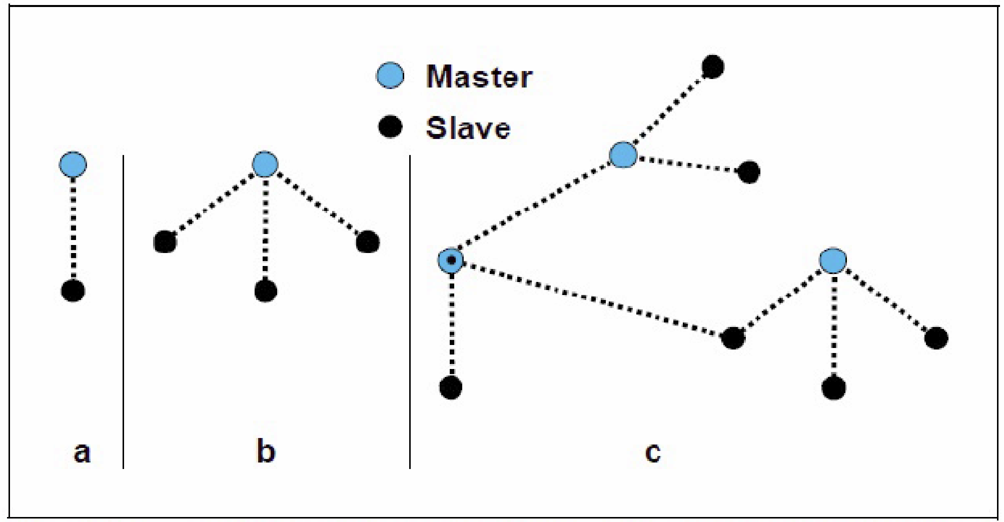
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		 *Figure 1.2: Piconets with a single slave operation (a), a multi-slave operation (b) and a scatternet operation (c).* **Medium Rate** incorporates **BT 1.1** by reference. Even if it was not, given the disclosures of **Medium Rate** and **BT 1.1**, a person of ordinary skill in the art would have been motivated to modify and/or combine **Medium Rate** with **BT 1.1**.
1.a.	a transceiver, in the role of the master according to the master/slave relationship,	**Medium Rate discloses a transceiver, which takes the role of master in a master/slave relationship. *See* 1.pre.** For example, Medium Rate discloses: "Whether or not a device is capable of supporting Medium Rate is indicated in the *LMP_features* message. A Medium Rate capable device may support the 2Mbps mode only or both 2Mbps and 3Mbps. The master can enable the use of Medium Rate on ACL and/or SCO links separately for each of the Medium Rate capable slaves in the piconet." p. 7. To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		it would have been obvious in view of BT 1.1. **In addition, Medium Rate in view of BT 1.1 discloses a transceiver, in the role of the master according to the master/slave relationship. Specifically, BT 1.1 discloses**: "On the channel, information is exchanged through packets. Each packet is transmitted on a different hop frequency. A packet nominally covers a single slot, but can be extended to cover up to five slots." p. 41; *see also* pp. 19, 41-43, 90, 92, 119, Fig. 1.2, Fig. 9.7. Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.b.	for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,	**Medium Rate discloses sending transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." p. 11; *see also* pp. 8-10, 12, Fig. 1. "The payload modulation is either /4-DQPSK or 8DPSK corresponding to the gross bit rates of 2 Mbps or 3 Mbps.* * * Following the guard time is a PSK-modulated synchronization sequence that is used to complete acquisition prior to demodulating the /4-DQPSK or 8DPSK of the payload." p. 8. For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11. "The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium rate mode is selected when the SCO link is established via LMP command." *Id*.; *see also* Fig. 1 (reproduced above).

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Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or BT 1.1. **In addition, Medium Rate in view of BT 1.1 discloses for sending at least transmissions modulated using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method. Specifically, BT 1.1 discloses**: "3.1 MODULATION CHARACTERISTICS The Modulation is GFSK (Gaussian Frequency Shift Keying) with a BT=0.5." p. 22. Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.c.	wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion	**Medium Rate discloses that each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion.** For example, Medium Rate discloses: "The general format of the Medium Rate packet is shown in Figure 1. These are very similar to the basic rate packets. The maximum modulo- lengths (modulo the 625 usec slot grid) are no greater than the longest basic rate packet (DM3)1). The access code and packet header are identical in format and modulation so that the acquisition and packet identification is the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header." pp. 8-14; *see also* Fig. 1, reproduced below.

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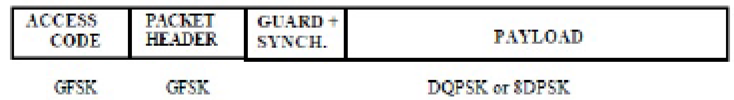
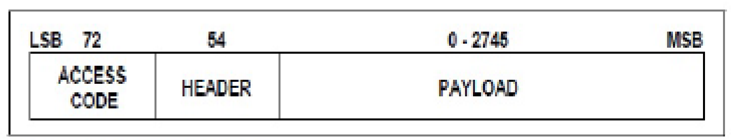
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		 *Figure 1: medium rate packet format* **To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or BT 1.1.** In addition, Medium Rate in view of BT 1.1 discloses wherein each transmission comprises a group of transmission sequences, wherein each group of transmission sequences is structured with at least a first portion and a payload portion. Specifically, BT 1.1 discloses: "On the channel, information is exchanged through packets. Each packet is transmitted on a different hop frequency. A packet nominally covers a single slot, but can be extended to cover up to five slots." p. 41; *see also* p. 47 (describing the contents of a packet). Fig. 4.1, reproduced below, illustrates a basic packet format as specified in **BT 1.1**.  *Figure 4.1: Standard packet format.* Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.d.	wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion,	**Medium Rate discloses that first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion.** For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11.

Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		"The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium rate mode is selected when the SCO link is established via LMP command." *Id*.; *see also* Fig. 1 (reproduced above); Table 4-1 (reproduced below):

Segment	TYPE code $b_3b_2b_1b_0$	Slots	SCO link (1 Mbps)	SCO link (2/3 Mbps)	ACL link (1 Mbps) [ptt=0]	ACL link (2/3 Mbps) [ptt =1]
1	0000	1	NULL	NULL	NULL	NULL
	0001	1	POLL	POLL	POLL	POLL
	0010	1	FHS	FHS	FHS	FHS
	0011	1	DM1	DM1	DM1	DM1
2	0100	1	Undefined	Undefined	DH1	**2-DH1**
	0101	1	HV1	**Reserved**	Undefined	Undefined
	0110	1	HV2	**2-HV3**	Undefined	Undefined
	0111	1	HV3	**3-HV3**	Undefined	Undefined
	1000	1	DV	Undefined	Undefined	**3-DH1**
	1001	1	Undefined	Undefined	AUX1	AUX1
3	1010	3	Undefined	Undefined	DM3	**2-DH3**
	1011	3	Undefined	Undefined	DH3	**3-DH3**
	1100	3	**HV4**	**2-HV5**	Undefined	Undefined
	1101	3	**HV5**	**3-HV5**	Undefined	Undefined
4	1110	5	Undefined	Undefined	DM5	**2-DH5**
	1111	5	Undefined	Undefined	DH5	**3-DH5**

Table 4-1 – Replacement for Table 4.2

To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or

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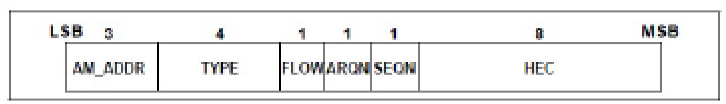
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		BT 1.1. **In addition, Medium Rate in view of BT 1.1 discloses wherein first information in the first portion indicates at least which of the first modulation method and the second modulation method is used for modulating second information in the payload portion. Specifically, BT 1.1 discloses**: "The header contains link control (LC) information and consists of 6 fields: • AM ADDR: 3- bit active member address • TYPE: 4-bit type code • FLOW: 1-bit flow control • ARQN: 1-bit acknowledge indication • SEQN: 1-bit sequence number • HEC: 8-bit header error check . . . The 4-bit TYPE code specifies which packet type is used." p. 51; *see also* pp. 51, 568, 572 (describing the operation of the TYPE field for ACL and SCO connections). Fig. 4.5, reproduced below.  *Figure 4.5: Header format.* Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.e.	wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion, and	**Medium Rate discloses that at least one group of transmission sequences is addressed for an intended destination of the payload portion.** For example, Medium Rate discloses: "When the slave has multiple logical links based on AM ADDRs using the header extension option, the master must choose the associated AM ADDRs such that the base AM ADDR (along with the

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Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		TYPE field) uniquely defines whether the packet is in Medium Rate or not." pp. 8-14. **To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1.** In addition, Medium Rate in view of BT 1.1 discloses wherein at least one group of transmission sequences is addressed for an intended destination of the payload portion. Specifically, BT 1.1 discloses: "The AM ADDR represents a member address and is used to distinguish between the active participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM ADDR of this slave; that is, the AM ADDR of the slave is used in both master-to-slave packets and in the slave-to-master packets." p. 51; *see also* Fig. 4.5, reproduced above. Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.f.	wherein for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method, and	**Medium Rate discloses that for the at least one group of transmission sequences: the first information for said at least one group of transmission sequences comprises a first sequence, in the first portion and modulated according to the first modulation method, wherein the first sequence indicates an impending change from the first modulation method to the second modulation method.** For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." p. 11; *see also* Fig. 1 (reproduced above). "When the slave has multiple logical links based on AM ADDRs using the header extension option, the master must choose the associated AM ADDRs such that the base AM ADDR (along with the TYPE field) uniquely defines whether the packet is in **Medium Rate** or not." pp. 8-14; *see also* Table 4-1, reproduced above. To the extent that Plaintiff alleges that **Medium Rate** does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or

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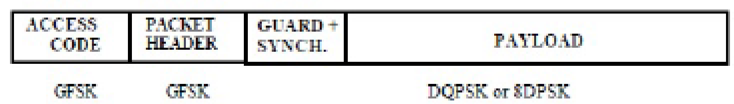
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	Claim Element	<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>
		it would have been obvious in view of the references cited herein and/or the other references identified in Exhibit X. **Medium Rate** incorporates **BT 1.1** by reference. Even if it was not, given the disclosures of **Medium Rate** and **BT 1.1**, a person of ordinary skill in the art would have been motivated to modify and/or combine **Medium Rate** with **BT 1.1**.
1.g.	the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.	**Medium Rate discloses the second information for said at least one group of transmission sequences comprises a second sequence that is modulated according to the second modulation method, wherein the second sequence is transmitted after the first sequence.** **For example, Medium Rate discloses**: "The payload modulation is either/4- DQPSK or 8DPSK corresponding to the gross bit rates of 2 Mbps or 3 Mbps. * * * Following the guard time is a PSK-modulated synchronization sequence that is used to complete acquisition prior to demodulating the /4-DQPSK or 8DPSK of the payload." p. 8; *see also* pp. 8-14 (describing format); and Fig. 1 (reproduced below).  *Figure 1: medium rate packet format* To the extent that Plaintiff alleges that **Medium Rate** does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of the references cited herein and/or the other references identified in Exhibit X. **Medium Rate** incorporates **BT 1.1** by reference. Even if it was not, given the disclosures of **Medium Rate** and **BT 1.1**, a person of ordinary skill in the art would have been motivated to modify and/or combine **Medium Rate** with **BT 1.1**.
2.	The device of claim 1, wherein the transceiver is configured to transmit a third	**Medium Rate discloses that the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and**

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
	sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	**indicates that communication from the master to the slave has reverted to the first modulation method.** For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11. "The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium rate mode is selected when the SCO link is established via LMP command." *Id*.; *see also* Fig. 1 (reproduced above); Table 4-1 (reproduced below):

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		(continued below)

Segment	TYPE code $b_3b_2b_1b_0$	Slots	SCO link (1 Mbps)	SCO link (2/3 Mbps)	ACL link (1 Mbps) [ptt=0]	ACL link (2/3 Mbps) [ptt =1]
1	0000	1	NULL	NULL	NULL	NULL
	0001	1	POLL	POLL	POLL	POLL
	0010	1	FHS	FHS	FHS	FHS
	0011	1	DM1	DM1	DM1	DM1
2	0100	1	Undefined	Undefined	DH1	**2-DH1**
	0101	1	HV1	**Reserved**	Undefined	Undefined
	0110	1	HV2	**2-HV3**	Undefined	Undefined
	0111	1	HV3	**3-HV3**	Undefined	Undefined
	1000	1	DV	Undefined	Undefined	**3-DH1**
	1001	1	Undefined	Undefined	AUX1	AUX1
3	1010	3	Undefined	Undefined	DM3	**2-DH3**
	1011	3	Undefined	Undefined	DH3	**3-DH3**
	1100	3	**HV4**	**2-HV5**	Undefined	Undefined
	1101	3	**HV5**	**3-HV5**	Undefined	Undefined
4	1110	5	Undefined	Undefined	DM5	**2-DH5**
	1111	5	Undefined	Undefined	DH5	**3-DH5**

Table 4-1 – Replacement for Table 4.2

"The general format of the Medium Rate packet is shown in Figure 1. These are very similar to the basic rate packets. The maximum modulo- lengths (modulo the 625 usec slot grid) are no greater than the longest basic rate packet (DM3)1). The access code and packet header are identical in format and modulation so that the acquisition and packet identification is the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header." pp. 8-14; *see also* Fig. 1, reproduced above.

To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or

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Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		BT 1.1. **In addition, Medium Rate in view of BT 1.1 discloses wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method. Specifically, BT 1.1 discloses**: "On the channel, information is exchanged through packets." p. 41. Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
58.pre.	A communication device capable of communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave, the device comprising:	**To the extent this preamble is considered a limitation of the claim, Medium Rate discloses a communication device capable of communicating according to a master/slave relationship in which a slave message from a slave to a master occurs in response to a master message from the master to the slave.** See Element 1.pre, incorporated herein.
58.a.	a transceiver, in the role of the master according to the master/slave relationship,	**Medium Rate discloses a transceiver, in the role of the master according to the master/ slave relationship.** See Element 1.a, incorporated herein.
58.b.	capable of transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method, and	**Medium Rate discloses transmitting using at least two types of modulation methods, wherein the at least two types of modulation methods comprise a first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method.** See Element 1.b, incorporated herein.
58.c.	wherein the transceiver is configured to transmit messages with: a first sequence, in	**Medium Rate discloses that the transceiver is configured to transmit messages with: a first sequence, in the first modulation method, that indicates at least which of the first modulation**

Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'580 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
	the first modulation method, that indicates at least which of the first modulation method and the second modulation method is used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method,	**method and the second modulation method is used for modulating a second sequence, wherein, in at least one message, the first sequence indicates an impending change from the first modulation method to the second modulation method.** See Elements 1.c, 1.d, and 1.f, incorporated herein.
58.d.	and wherein the at least one message is addressed for an intended destination of the second sequence, and	**Medium Rate discloses that at least one message is addressed for an intended destination of the second sequence.** Defendant incorporates by reference its contentions relating to Element 1.e, as if fully set forth herein.
58.e.	the second sequence, modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the second sequence is transmitted after the first sequence.	**Medium Rate discloses that the second sequence is modulated in accordance with the modulation method indicated by the first sequence and, in the at least one message, modulated using the second modulation method, wherein the second sequence is transmitted after the first sequence.** See Element 1.g, incorporated herein.
59.	The device of claim 58, wherein the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.	Defendant incorporates by reference its contentions relating to claim 58, as if fully set forth herein. **Medium Rate discloses that the transceiver is configured to transmit a third sequence after the second sequence, wherein the third sequence is transmitted in the first modulation method and indicates that communication from the master to the slave has reverted to the first modulation method.** See Claims 1 and 2, incorporated herein.

EXHIBIT Q

EXHIBIT Q

Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

As demonstrated in the claim charts below, the claims of U.S. Patent No. 8,457,228 ("the '228 patent") are invalid (a) under one or more sections of 35 U.S.C. § 102 as anticipated by Medium Rate and (b) under 35 U.S.C. § 103(a) as obvious over Medium Rate standing alone and as set forth herein, and/or combined with the knowledge of a person of ordinary skill in the art, Applicant's Admitted Prior Art, and/or the additional prior art references discussed in Exhibits A, M-W, Y, and Z-2, the contents of which are hereby incorporated by reference into this chart. One of ordinary skill in the art, as of the priority date of the '228 patent, would have known to combine the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

'228 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
1.pre.	A master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device, the master communication device comprising:	**To the extent this preamble is considered a limitation of the claim, Medium Rate discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device.** For example, Medium Rate discloses: "Whether or not a device is capable of supporting Medium Rate is indicated in the *LMP_features* message. A Medium Rate capable device may support the 2Mbps mode only or both 2Mbps and 3Mbps. The master can enable the use of Medium Rate on ACL and/or SCO links separately for each of the Medium Rate capable slaves in the piconet." p. 7. To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of Bluetooth Core Specification Version 1.1 ("BT 1.1"). **In addition, Medium Rate in view of Bluetooth Core Specification Version 1.1 ("BT 1.1") discloses a master communication device configured to communicate with one or more slave transceivers according to a master/slave relationship in which a slave communication from a slave device to the master communication device occurs in response to a master communication from the master communication device to the slave device. Specifically, BT 1.1 discloses:** "The Bluetooth transceiver is operating in the 2.4 GHz ISM band. This specification defines the requirements for a Bluetooth transceiver operating in this unlicensed band." p. 19. "2 PHYSICAL CHANNEL 2.1 CHANNEL DEFINITION The channel is represented by a pseudo-random hopping sequence hopping through the 79 or 23 RF channels. The hopping sequence is

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Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s. All Bluetooth units participating in the piconet are time- and hop-synchronized to the channel." p. 43. "The channel in the piconet is characterized entirely by the master of the piconet. The Bluetooth device address (BD_ADDR) of the master determines the FH hopping sequence and the channel access code; the system clock of the master determines the phase in the hopping sequence and sets the timing. In addition, the master controls the traffic on the channel by a polling scheme. By definition, the master is represented by the Bluetooth unit that initiates the connection (to one or more slave units). . . . Note that the names 'master' and 'slave' only refer to the protocol on the channel: the Bluetooth units themselves are identical; that is, any unit can become a master of a piconet. Once a piconet has been established, master-slave roles can be exchanged." p. 92. "Polling in active mode The master always has full control over the piconet. Due to the stringent TDD scheme, slaves can only communicate with the master and not to other slaves." p. 119; Fig. 1.2. Fig. 1.2, reproduced below; *see also* pp. 41-42 (describing the formation of a point-to- multipoint network); 90 (describing multi-slave operation); Fig. 9.7.

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Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

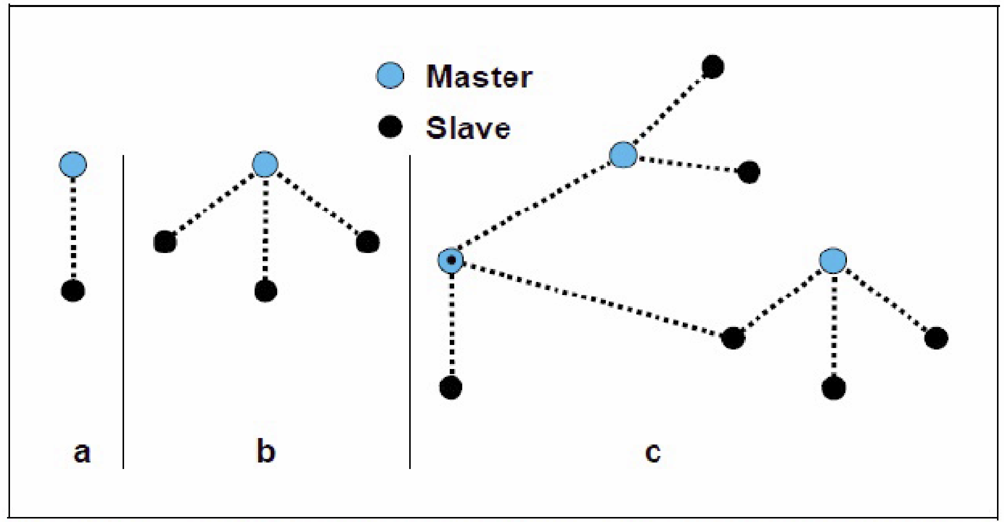
<table>
<tr><th>'228 Claim</th><th>Claim Element</th><th><u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u></th></tr>
<tr><td></td><td></td><td>

Figure 1.2: Piconets with a single slave operation (a), a multi-slave operation (b) and a scatternet operation (c).

Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.</td></tr>
<tr><td>1.a.</td><td>a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers,</td><td>Medium Rate discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers.

Medium Rate discloses a transceiver, which takes the role of master in a master/slave relationship. See 1.pre.

For example, Medium Rate discloses:

"Whether or not a device is capable of supporting Medium Rate is indicated in the LMP_features message. A Medium Rate capable device may support the 2Mbps mode only or both 2Mbps and 3Mbps. The master can enable the use of Medium Rate on ACL and/or SCO links separately for each of the Medium Rate capable slaves in the piconet." p. 7; see also p. 9.</td></tr>
</table>

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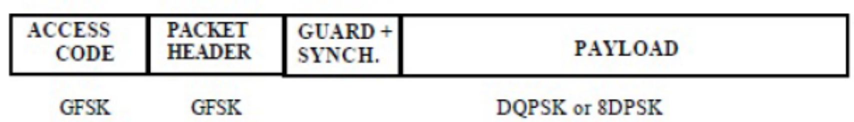
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view BT 1.1. **In addition, Medium Rate in view of BT 1.1 discloses a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers. Specifically, BT 1.1 discloses:** "On the channel, information is exchanged through packets. Each packet is transmitted on a different hop frequency. A packet nominally covers a single slot, but can be extended to cover up to five slots." p. 41. Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.b.	wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers and	**Medium Rate discloses that the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers.** For example, Medium Rate discloses: "The general format of the Medium Rate packet is shown in Figure 1. These are very similar to the basic rate packets. The maximum modulo-lengths (modulo the 625 usec slot grid) are no greater than the longest basic rate packet (DM3)1). The access code and packet header are identical in format and modulation so that the acquisition and packet identification is the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header." pp. 8-14; *see also* Fig. 1, reproduced below.  *Figure 1: medium rate packet format*

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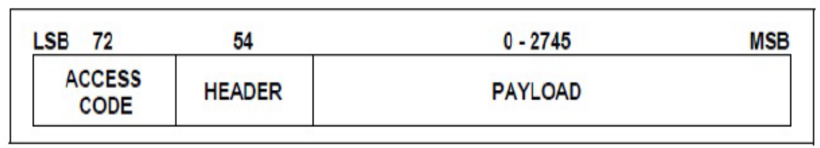
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		"The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." p. 10; *see also* Fig. 1, reproduced above. To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1 **In addition, Medium Rate in view of BT 1.1 discloses wherein the first message comprises: first information modulated according to a first modulation method, second information, including a payload portion, modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers. Specifically, BT 1.1 discloses:** Fig. 4.1, reproduced below; *see also* p. 47 (describing the contents of a packet).  *Figure 4.1: Standard packet format.* "3.1 MODULATION CHARACTERISTICS The Modulation is GFSK (Gaussian Frequency Shift Keying) with a BT=0.5." p. 22. "2. Payload body[:] The payload body includes the user host information and determines the effective user throughput. The length of the payload body is indicated in the length field of the payload header." p. 64; *see also* pp. 54-61 (describing different types of packets used to transmit user data). Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.c.	first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information; and	**Medium Rate discloses that first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information.** For example, Medium Rate discloses:

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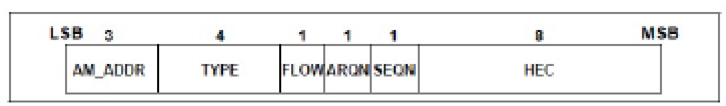
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		"When the slave has multiple logical links based on AM ADDRs using the header extension option, the master must choose the associated AM ADDRs such that the base AM ADDR (along with the TYPE field) uniquely defines whether the packet is in Medium Rate or not." pp. 8-14. To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of BT 1.1. **In addition, Medium Rate in view of BT 1.1 discloses first message address information that is indicative of the one of the one or more slave transceivers being an intended destination of the second information. Specifically, BT 1.1 discloses:** "The header contains link control (LC) information and consists of 6 fields: • AM ADDR: 3- bit active member address • TYPE: 4-bit type code • FLOW: 1-bit flow control • ARQN: 1-bit acknowledge indication • SEQN: 1-bit sequence number • HEC: 8-bit header error check . . . The AM_ADDR represents a member address and is used to distinguish between the active members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM_ADDR of this slave; that is, the AM_ADDR of the slave is used in both master-to-slave packets and in the slave-tomaster packets." p. 51; *see also* Fig. 4.5, reproduced below.  *Figure 4.5: Header format.* Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or

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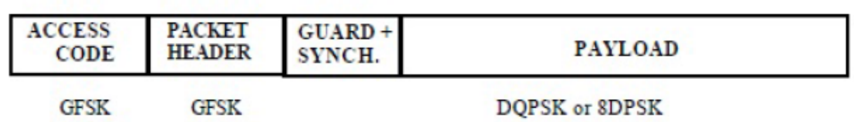
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		combine Medium Rate with BT 1.1.
1.d.	said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers, and	**Medium Rate discloses that the master transceiver is configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers.** For example, Medium Rate discloses: "The general format of the Medium Rate packet is shown in Figure 1. These are very similar to the basic rate packets. The maximum modulo-lengths (modulo the 625 usec slot grid) are no greater than the longest basic rate packet (DM3)1). The access code and packet header are identical in format and modulation so that the acquisition and packet identification is the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header." pp. 8-14; *see also* Fig. 1, reproduced below.  *Figure 1: medium rate packet format* "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." p. 10; *see also* Fig. 1, reproduced above. For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11. "The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3

Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	Claim Element	<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>
		Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium rate mode is selected when the SCO link is established via LMP command." *Id*.; *see also* Fig. 1 (reproduced above). Medium Rate Table 4-1 (*see* p. 11) is reproduced below:

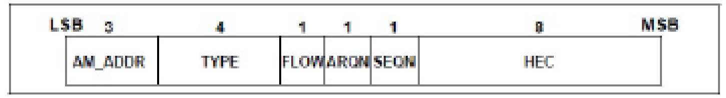
Segment	TYPE code $b_3b_2b_1b_0$	Slots	SCO link (1 Mbps)	SCO link (2/3 Mbps)	ACL link (1 Mbps) [ptt=0]	ACL link (2/3 Mbps) [ptt =1]
1	0000	1	NULL	NULL	NULL	NULL
	0001	1	POLL	POLL	POLL	POLL
	0010	1	FHS	FHS	FHS	FHS
	0011	1	DM1	DM1	DM1	DM1
2	0100	1	Undefined	Undefined	DH1	**2-DH1**
	0101	1	HV1	**Reserved**	Undefined	Undefined
	0110	1	HV2	**2-HV3**	Undefined	Undefined
	0111	1	HV3	**3-HV3**	Undefined	Undefined
	1000	1	DV	Undefined	Undefined	**3-DH1**
	1001	1	Undefined	Undefined	AUX1	AUX1
3	1010	3	Undefined	Undefined	DM3	**2-DH3**
	1011	3	Undefined	Undefined	DH3	**3-DH3**
	1100	3	**HV4**	**2-HV5**	Undefined	Undefined
	1101	3	**HV5**	**3-HV5**	Undefined	Undefined
4	1110	5	Undefined	Undefined	DM5	**2-DH5**
	1111	5	Undefined	Undefined	DH5	**3-DH5**

Table 4-1 – Replacement for Table 4.2

"The payload modulation is either/4- DQPSK or 8DPSK corresponding to the gross bit rates of 2 Mbps or 3 Mbps. * * * Following the guard time is a PSK-modulated synchronization sequence that is used to complete acquisition prior to demodulating the /4-DQPSK or 8DPSK of the payload." p.

Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		8; *see also* pp. 9-14 (describing format); and Fig. 1, reproduced above. To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of the references cited herein and/or the other references identified in Exhibit Y. **In addition, Medium Rate in view of BT 1.1 discloses said master transceiver configured to transmit a second message over the communication medium from the master transceiver to the one or more slave transceivers wherein the second message comprises: third information modulated according to the first modulation method, wherein the third information comprises information that is indicative of an impending change in modulation to a second modulation method, and fourth information, including a payload portion, transmitted after transmission of the third information, the fourth information being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the fourth information comprises data intended for a single slave transceiver of the one or more slave transceivers. Specifically, BT 1.1 discloses:** "3.1 MODULATION CHARACTERISTICS The Modulation is GFSK (Gaussian Frequency Shift Keying) with a BT=0.5." p. 22. "The header contains link control (LC) information and consists of 6 fields: • AM ADDR: 3- bit active member address • TYPE: 4-bit type code • FLOW: 1-bit flow control • ARQN: 1-bit acknowledge indication • SEQN: 1-bit sequence number • HEC: 8-bit header error check . . . The 4-bit TYPE code specifies which packet type is used." p. 51; *see also* pp. 568, 572 (describing the operation of the TYPE field for ACL and SCO connections); Fig. 4.5, reproduced below.

'228 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		 *Figure 4.5: Header format.* "2. Payload body[:] The payload body includes the user host information and determines the effective user throughput. The length of the payload body is indicated in the length field of the payload header." p. 64; *see also* pp. 54-61 (describing different types of packets used to transmit user data). Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.e.	second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and	**Medium Rate discloses second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information.** For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11. "The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium rate mode is selected when the SCO link is established via LMP command." *Id*.; *see also* Fig. 1 (reproduced above). To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of the references cited herein and/or the other references identified in Exhibit Y. **In addition, Medium Rate in view of BT 1.1 discloses second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information. Specifically, BT 1.1 discloses:** "The header contains link control (LC) information and consists of 6 fields:

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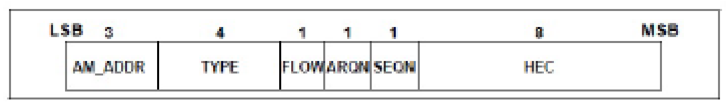
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		• AM ADDR: 3- bit active member address • TYPE: 4-bit type code • FLOW: 1-bit flow control • ARQN: 1-bit acknowledge indication • SEQN: 1-bit sequence number • HEC: 8-bit header error check . . . The AM_ADDR represents a member address and is used to distinguish between the active members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM_ADDR of this slave; that is, the AM_ADDR of the slave is used in both master-to-slave packets and in the slave-tomaster packets." p. 51; *see also* Fig. 4.5, reproduced below.  *Figure 4.5: Header format* Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.
1.f.	wherein the second modulation method results in a higher data rate than the first modulation method.	**Medium Rate discloses that the second modulation method results in a higher data rate than the first modulation method.** For example, Medium Rate discloses: "The payload modulation is either /4-DQPSK or 8DPSK corresponding to the gross bit rates of 2 Mbps or 3 Mbps." p. 8.
21.	The master communication device as in claim 1, wherein the first information that is included in the first message comprises	**Medium Rate discloses that the first information that is included in the first message comprises the first message address data.**

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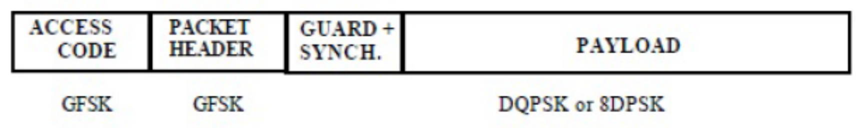
Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
	the first message address data.	For example, Medium Rate discloses: "The general format of the Medium Rate packet is shown in Figure 1. These are very similar to the basic rate packets. The maximum modulo-lengths (modulo the 625 usec slot grid) are no greater than the longest basic rate packet (DM3)1). The access code and packet header are identical in format and modulation so that the acquisition and packet identification is the same as basic rate. The main difference in the formats when compared to the basic rate packets is the addition of the guard time and synchronization sequence following the packet header." pp. 8-14; *see also* Fig. 1, reproduced below.  *Figure 1: medium rate packet format* For example, Medium Rate discloses: "The access code and packet header (including optional extended packet header) are always transmitted at 1 Mbps (GFSK modulation scheme)." *Id*. at p. 11. "The packet types contained in Segement 1 of the table (NULL, POLL, FHS and DM1) are always transmitted in 1 Mbps." *Id*. "Segments 2, 3, and 4 may be transmitted in either 1 Mbps, 2 Mbps or 3 Mbps over the air rates as configured through LMP commands." *Id*. "The selection of the packet type column in Table 4-1… is done independently for every base AM_ADDR a device is listening to." *Id*. "Also modes for ACL and SCO are selected independently." *Id*. "For ACL links the medium rate mode is explicitly selected via LMP using the *packet_type_table* (ptt) parameter." *Id*. "For SCO lins, the medium rate mode is selected when the SCO link is established via LMP command." *Id*.; *see also* Fig. 1 (reproduced above). To the extent that Plaintiff alleges that Medium Rate does not disclose this claim element, the limitation would have been obvious based on the knowledge of one of ordinary skill in the art and/or it would have been obvious in view of the references cited herein and/or the other references identified in Exhibit Y. **In addition, Medium Rate in view of BT 1.1 discloses wherein the first information that is included in the first message comprises the first message address data. Specifically, BT 1.1 discloses:**

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Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

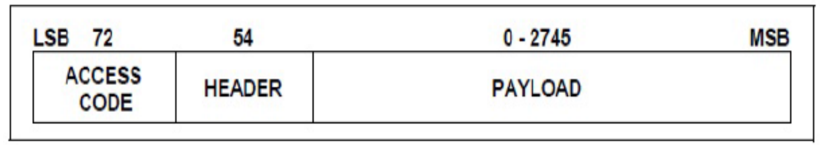
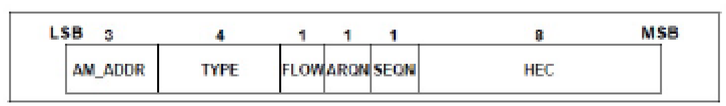
'228 Claim	**Claim Element**	**<u>Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")</u>**
		Fig. 4.1, reproduced below; *see also* p. 47 (describing the contents of a packet).  *Figure 4.1: Standard packet format.* "The header contains link control (LC) information and consists of 6 fields: • AM ADDR: 3- bit active member address • TYPE: 4-bit type code • FLOW: 1-bit flow control • ARQN: 1-bit acknowledge indication • SEQN: 1-bit sequence number • HEC: 8-bit header error check . . . The AM_ADDR represents a member address and is used to distinguish between the active members participating on the piconet. In a piconet, one or more slaves are connected to a single master. To identify each slave separately, each slave is assigned a temporary 3-bit address to be used when it is active. Packets exchanged between the master and the slave all carry the AM_ADDR of this slave; that is, the AM_ADDR of the slave is used in both master-to-slave packets and in the slave-tomaster packets." p. 51; *see also* Fig. 4.5, reproduced below.  *Figure 4.5: Header format.* "2. Payload body[:] The payload body includes the user host information and determines the effective user throughput. The length of the payload body is indicated in the length field of the payload header." p. 64; *see also* pp. 54-61 (describing different types of packets used to transmit user data).

EXHIBIT Q

Comparison of Asserted Claims to Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")

'228 Claim	Claim Element	Medium Rate Baseband Specification proposal for version 0.7, Version 0.66, 2002-07-05, Arto Palin ("Medium Rate")
		Medium Rate incorporates BT 1.1 by reference. Even if it was not, given the disclosures of Medium Rate and BT 1.1, a person of ordinary skill in the art would have been motivated to modify and/or combine Medium Rate with BT 1.1.