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Attorney Docket No.: 110797-0019-502

Date: September 12, 2016

1. [x] This is a request for *ex parte* reexamination pursuant to 37 CFR 1.510 of patent number 8,457,228 issued 06-04-2013. The request is made by:
   [ ] patent owner. [x] third party requester.

2. [x] The name and address of the person requesting reexamination is:

   Samsung Electronics Co., Ltd.
   416 Maetan-3 Dong, Yeongtong-Gu, Suwon-City
   Gyeonggi-Do, Korea 443-742, South Korea

   Samsung Electronics America, Inc.
   85 Challenger Road
   Ridgefield Park, NJ 07660

3. Requester asserts [ ] small entity status (37 CFR 1.27) or [ ] certifies micro entity status (37 CFR 1.29).
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4. [ ] a. A check in the amount of $ ______ is enclosed to cover the reexamination fee, 37 CFR 1.20(c)(1);
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6. [x] A copy of the patent to be reexamined having a double column format on one side of a separate paper is enclosed. 37 CFR 1.510(b)(4).

7. [ ] CD-ROM or CD-R in duplicate, Computer Program (Appendix) or large table
   [ ] Landscape Table on CD

8. [ ] Nucleotide and/or Amino Acid Sequence Submission
   If applicable, items a. – c. are required.
   a. [ ] Computer Readable Form (CRF)
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      ii. [ ] paper
   c. [ ] Statements verifying identity of above copies

9. [ ] A copy of any disclaimer, certificate of correction or reexamination certificate issued in the patent is included.

10. [x] Reexamination of claim(s) 21 is requested.

11. [x] A copy of every patent or printed publication relied upon is submitted herewith including a listing thereof on Form PTO/SB/08, PTO-1449, or equivalent.

12. [ ] An English language translation of all necessary and pertinent non-English language patents and/or printed publications is included.

13. [x] The attached detailed request includes at least the following items:
   a. A statement identifying each substantial new question of patentability based on prior patents and printed publications. 37 CFR 1.510(b)(1).
   b. An identification of every claim for which reexamination is requested, and a detailed explanation of the pertinency and manner of applying the cited art to every claim for which reexamination is requested. 37 CFR 1.510(b)(2).

14. [ ] A proposed amendment is included (only where the patent owner is the requester). 37 CFR 1.510(e).

15. [x] It is certified that the statutory estoppel provisions of 35 U.S.C. 315(e)(1) or 35 U.S.C. 325(e)(1) do not prohibit requester from filing this *ex parte* reexamination request. 37 CFR 1.510(b)(6).

16. [x] a. It is certified that a copy of this request (if filed by other than the patent owner) has been served in its entirety on the patent owner as provided in 37 CFR 1.33(c).
   The name and address of the party served and the date of service are:

   Condo Roccia Koptiw LLP
   1800 JFK Boulevard, Suite 1700
   Philadelphia, PA 19103

   Date of Service: September 12, 2016 ; **or**

   [ ] b. A duplicate copy is enclosed since service on patent owner was not possible. An explanation of the efforts made to serve patent owner **is attached**. See MPEP 2220.

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18. [x] The patent is currently the subject of the following concurrent proceeding(s):

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J. Steven Baughman — Typed/Printed Name
47,414 — Registration No.

[ ] For Patent Owner Requester
[x] For Third Party Requester

1. *Rembrandt Wireless Techs., LP v. Samsung Elecs. Co.*, C.A. No. 2:13-cv-00213-JRG (E.D. Tex.)

2. *Rembrandt Wireless Techs., LP v. Samsung Elecs. Co.*, C.A. No. 2:16-cv-00170-JRG (E.D. Tex.)

3. *Rembrandt Wireless Techs., LP v. Samsung Elecs. Co.*, No. 2016-1729 (Fed. Cir.)

Exhibit L (Part 2)

8/8

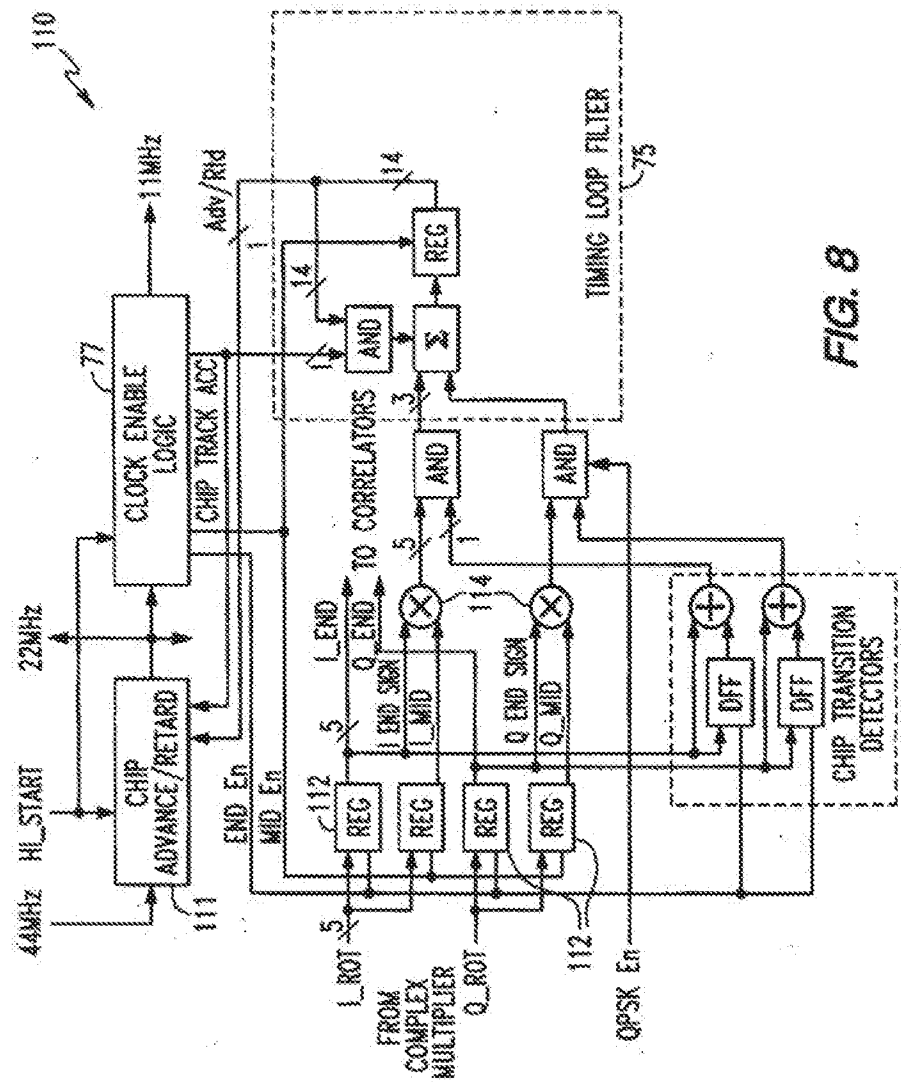

FIG. 8

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APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT		DATE MAILED
08/819,846	03/17/97	061	GHAYOUR, M	2734	06/03/99

First Named Applicant: SNELL, 35 USC 154(b) term ext. = 0 Days.

TITLE OF INVENTION: HIGH DATA RATE SPREAD SPECTRUM TRANSCEIVER AND ASSOCIATED METHODS

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
SE-1301-WR/H	375-200,000	T83	UTILITY	NO	$1210.00	09/03/99

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File History Content Report

The following content is missing from the original file history record obtained from the United States Patent and Trademark Office. No additional information is available.

Document Date - 1999-11-09

Document Title - USPTO Grant

Author: Bob Pearson

Introduction

The draft text [1] of the high speed extension of the IEEE802.11 Standard specifies Complementary Code Keying (CCK) as the modulation scheme for 5.5 and 11Mbps data rates in the 2.4GHz band. The new high rate specification is expected to be ratified later this year and radios that implement CCK have already been FCC certified. Two digital signal processing baseband processor (BBP) chips now available from Intersil contain all the functions necessary to implement CCK modulation as specified by the high rate draft 802.11 standard. These baseband processor ICs, the HFA3860B and the HFA3861A achieve Ethernet like data rates in wireless LAN systems operating in the 2.4GHz ISM band. This application note will explain the CCK modulation scheme and describe a HFA3861A based radio architecture that the design engineer can use to implement a high data rate packet based transceiver utilizing CCK modulation.

Complementary Sequences

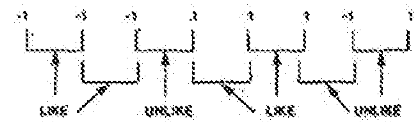
The subject of CCK modulation is somewhat esoteric in that it is not found in very many textbooks on digital communications. Hence the need for this application note. CCK has its roots in information theory on the subject of complementary sequences. One of the first known works on the subject was published in 1951 by Marcel J.E. Golay [2]. Golay was concerned with the problem of imaging polychromatic radiation as a spread spectrum in an application of a spectrometer. Golay's paper describes how the properties of a complementary sequence were used to control a series of open and closed slits in a multislit spectrometer. Besides being useful in the spectrometer application, Golay found the complementary sequence to be mathematically appealing and published a later paper [4] in which he described the properties of binary complementary sequences and how to synthesize them. Other authors have published papers on binary and polyphase codes with good correlation properties [4-7]. So exactly what is a complementary sequence and what are some of its important properties? We start with the definition of a binary complementary sequence or code. A binary complementary code is a subset of the more general class of codes known as polyphase codes. The IEEE 802.11 CCK codes are polyphase complementary codes.

The following definition for binary complementary codes is borrowed intact from R. Sivaswamy's "Multiphase Complementary Codes" [5]:

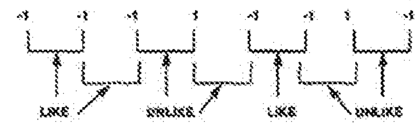
> Complementary codes, also referred to as binary complementary sequences or series, comprise a pair of equal finite length sequences having the property that the number of pairs of like elements with any given separation in one series is equal to the number of pairs of unlike elements with the same separation in the other.

The symmetry described in the above definition is not intuitively obvious but is easily demonstrated by an example. We borrow a pair of complementary sequences from Golay [4]:

SEQUENCE 1



SEQUENCE 2



Sequence 1 has 4 pairs of like elements with a separation of 1 and 3 pairs of unlike elements with a separation of 1; whereas Sequence 2 has 4 pairs of unlike elements with a separation of 1 and 3 pairs of like elements. Table 1 summarizes the results of the element pairing for separations of 1, 2 and 3.

TABLE 1. RESULTS OF ELEMENT PAIRING FOR SEQUENCES 1 AND 2

PAIR SEPARATION	SEQUENCE 1		SEQUENCE 2	
	LIKE	UNLIKE	LIKE	UNLIKE
1	4	3	3	4
2	4	3	3	4
3	1	5	5	1

We have seen that complementary codes possess a deep seated symmetry. So how does that property make them useful in digital communications? It turns out that complementary codes are characterized by the property that their periodic autocorrelative vector sum is zero everywhere except at the zero shift. This is the property that makes complementary codes useful in digital communications systems. Given a pair of complementary sequences with a and b_i elements, where $i = 1, 2, \ldots, n$, the respective autocorrelative series are given by:

$$c_j = \sum_{i=1}^{n-j} a_i a_{i+j} \qquad \text{and} \qquad d_j = \sum_{i=1}^{n-j} b_i b_{i+j} \qquad \text{(EQ. 1)}$$

Ideally, the two sequences $\{a_i\}$ and $\{b_i\}$ are complementary if $c_j + d_j = 0 \quad j \neq 0$

and $c_0 + d_0 = 2n$.

Where n is the length of the code word.

In practice it is difficult to achieve the ideal condition but good codes will have one main peak with minimum residual peaks.

Let's test sequences 1 and 2 for the autocorrelative property of two binary complementary codes. Table 2 is a tabulation of the autocorrelation functions for sequences 1 and 2. The autocorrelation function is the result of the autocorrelation over all bit shifts of the codes. This is analogous to computing the autocorrelation of a digital signal over all phase shifts of the signal. In Table 2 the c_j and d_j terms represent the difference between the number of agreements and disagreements between the shifted and unshifted codes. For the zero shift c_j and d_j are a maximum, i.e., 8. For all other shifts the c_j and d_j terms are minimized and

$$c_j + d_j = \begin{cases} 0 & j \neq 0 \\ 2n & j = 0 \end{cases}$$

So our two sequences are indeed characterized by the autocorrelative property for binary complementary codes.

Besides the autocorrelative property of binary complementary codes there are a number of other properties that are useful in synthesizing sets of complementary codes. The interested reader can check references [4] - [9] for methods of generating complementary codes.

Polyphase Codes

Now that we have described a binary complementary code pair, let's consider polyphase complementary codes. The binary complementary code was merely a binary sequence having complementary properties. Likewise a polyphase complementary code is a sequence having complementary properties, the elements of which have phase parameters. For example a polyphase code could contain elements having four different phases. The code set defined in the IEEE 802.11 high rate draft standard is a complex complementary code set. That is to say its elements a_i are a member of the set of complex numbers $\{1, -1, j, -j\}$ and the code set is characterized by the autocorrelative property described previously for binary codes. In addition, the IEEE 802.11 codes have been shown to possess good Euclidean distance properties for yielding low bit error rates in multipath environments [10].

TABLE 2. TABULATION OF AUTOCORRELATION FUNCTIONS FOR A PAIR OF COMPLEMENTARY CODES

SEQUENCE 1										SEQUENCE 2									
SHIFT	CODE								c_j	CODE								d_j	$c_j + d_j$
0	-1	-1	-1	1	1	1	-1	1	8	-1	-1	-1	1	-1	-1	1	-1	8	16
	-1	-1	-1	1	1	1	-1	1		-1	-1	-1	1	-1	-1	1	-1		
1	-1	-1	-1	1	1	1	-1	1	0	-1	-1	-1	1	-1	-1	1	-1	0	0
	1	-1	-1	-1	1	1	1	-1		-1	-1	-1	-1	1	-1	-1	1		
2	-1	-1	-1	1	1	1	-1	1	0	-1	-1	-1	1	-1	-1	1	-1	0	0
	-1	1	-1	-1	-1	1	1	1		1	-1	-1	-1	-1	1	-1	-1		
3	-1	-1	-1	1	1	1	-1	1	-4	-1	-1	-1	1	-1	-1	1	-1	+4	0
	1	-1	1	-1	-1	-1	1	1		-1	1	-1	-1	-1	-1	1	-1		
4	-1	-1	-1	1	1	1	-1	1	0	-1	-1	-1	1	-1	-1	1	-1	0	0
	1	1	-1	1	-1	-1	-1	1		-1	-1	1	-1	-1	-1	-1	1		
5	-1	-1	-1	1	1	1	-1	1	-4	-1	-1	-1	1	-1	-1	1	-1	+4	0
	1	1	1	-1	1	-1	-1	-1		1	-1	-1	1	-1	-1	-1	-1		
6	-1	-1	-1	1	1	1	-1	1	0	-1	-1	-1	1	-1	-1	1	-1	0	0
	-1	1	1	1	-1	1	-1	-1		-1	1	-1	-1	1	-1	-1	-1		
7	-1	-1	-1	1	1	1	-1	1	0	-1	-1	-1	1	-1	-1	1	-1	0	0
	-1	-1	1	1	1	-1	1	-1		-1	-1	1	-1	-1	1	-1	-1		

CCK Modulation

So much for the primer on complementary codes. Now let's see how the IEEE Standard 802.11 code set is used to modulate a digital waveform. Since the direct sequence spread spectrum (DSSS) technique is used for the high rate modulation scheme, the complementary codes defined in the draft standard are referred to as spreading codes because they are used to spread the occupied bandwidth of the DSSS waveform. Bandwidth spreading and despreading is the basis for obtaining processing gain in DSSS systems. See application note AN9820 for more on bandwidth spreading and processing gain. For now let's stick to the subject of CCK modulation as defined by the 802.11 draft standard.

The IEEE 802.11 complementary spreading codes have a code length 8 and a chipping rate of 11 Mchip/s. The 8 complex chips comprise a single symbol. By making the symbol rate 1.375 MS/s the 11Mbps waveform ends up occupying the same approximate bandwidth as that for the 2Mbps 802.11 QPSK waveform thereby allowing for 3 non-overlapping channels in the ISM band. This is important for maximizing aggregate system throughput in a wireless LAN network and was one reason for choosing CCK as the modulation technique. The 8-bit CCK code words are derived from the following formula:

$$c = \left\{ e^{j(\varphi_1+\varphi_2+\varphi_3+\varphi_4)}, e^{j(\varphi_1+\varphi_3+\varphi_4)}, e^{j(\varphi_1+\varphi_2+\varphi_4)}, -e^{j(\varphi_1+\varphi_4)}, e^{j(\varphi_1+\varphi_2+\varphi_3)}, e^{j(\varphi_1+\varphi_3)}, -e^{j(\varphi_1+\varphi_2)}, e^{j\varphi_1} \right\} \qquad \text{(EQ. 2)}$$

where C is the code word with LSB first to MSB last. This strange looking formula is used to generate the code sets for both 11 and 5.5Mbps data rates. Thus a subset of the 11Mbps code set is used at the 5.5Mbps data rate. The parameters φ1 - φ4 determine the phase values of the complex code set and are defined in the 802.11 high rate standard. For the 11Mbps data rate each symbol represents 8 bits of information. At 5.5Mbps 4 bits per symbol are transmitted. For the purpose of this discussion the 11Mbps mode will be described. Referring to Figure 3, in the transmit mode a serial bit stream is fed to the HFA3861A baseband processor via the HFA3841 MAC. The data bit stream is partitioned into bytes as (d7, d6, d5, ..., d0) where d0 is the LSB and is first in time. The 8 bits are used to encode the phase parameters φ1 - φ4 according to scheme shown in Table 3. The encoding is based on differential QPSK modulation as specified in Table 4.

TABLE 3. PHASE PARAMETER ENCODING SCHEME

DIBIT	PHASE PARAMETER
(d1, d0)	φ1
(d3, d2)	φ2
(d5, d4)	φ3
(d7, d6)	φ4

TABLE 4. DQPSK MODULATION OF PHASE PARAMETERS

DIBIT (d_{i+1}, d_i)	PHASE
00	0
01	π
10	π/2
11	-π/2

Let's use an example to see how a typical code word is generated. Assume the 11Mbps mode and a data bit stream given as d7, d6, d5,...,d0 = 1 0 1 1 0 1 0 1. Thus from Table 4
d1, d0 = 01 so φ1 = π. In a similar manner
d3, d2 = 01 so φ2 = π
d5, d4 = 11 so φ3 = -π/2
d7, d6 = 10 and φ4 = π/2

Substituting the phase parameter values into the code word formula we have:

$$c = \{ e^{j(\pi+\pi-\pi/2+\pi/2)}, e^{j(\pi-\pi/2+\pi/2)}, e^{j(\pi+\pi+\pi/2)}, -e^{j(\pi+\pi/2)}, e^{j(\pi+\pi-\pi/2)}, e^{j(\pi-\pi/2)}, -e^{j(\pi+\pi)}, e^{j\pi} \}$$

$$c = \left\{ e^{j2\pi}, e^{j\pi}, e^{j\frac{5\pi}{2}}, -e^{j\frac{3\pi}{2}}, e^{j\frac{3\pi}{2}}, e^{j\pi/2}, -e^{j2\pi}, e^{j\pi} \right\}$$

By Euler's formula we have:

$$e^{j\theta} = \cos\theta + j\sin\theta$$

$$c = \{ \cos 2\pi + j\sin 2\pi, \cos\pi + j\sin\pi, \cos\frac{5\pi}{2} + j\sin\frac{5\pi}{2}, -\cos\frac{3\pi}{2} - j\sin 3\pi/2, \cos\frac{3\pi}{2} + j\sin\frac{3\pi}{2}, \cos\frac{\pi}{2} + j\sin\pi/2, -\cos 2\pi - j\sin 2\pi, \cos\pi + j\sin\pi \}$$

and so our complex code word is

$$c = \{1, -1, j, j, -j, j, -1, -1\}$$

Now let's see how the HFA3861A baseband processor uses the code word to modulate a carrier and spread the bandwidth of the waveform. Referring to Equation 2, we see that phase parameter φ1 is contained in all 8 chips of the code word so it essentially rotates the whole vector. This is important in the circuit implementation of the CCK modulation as we shall see.

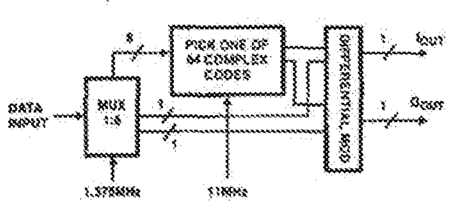


FIGURE 1. BLOCK DIAGRAM OF HFA3861A MODULATOR CIRCUIT

Figure 1 shows the block diagram of the CCK modulator circuit. The output of the HFA3861A data scrambler is partitioned into bytes and fed to a serial in parallel out mux circuit that gets clocked at the symbol rate of 1.375MHz. Six bits of the mux output are used to select one of 64 complex codes which are fed to a differential modulator circuit. The other 2 bits of the mux output are used to QPSK modulate, i.e., rotate, the 8 chip complex code word. The outputs of the differential modulator are the I and Q outputs in accordance with Equation 2 for generating complex codes. And that is essentially CCK modulation in a nutshell.

In the receiver the CCK modulated waveform is converted from analog to digital form after downconversion. Figure 2 shows the demodulator circuit of the HFA3861A.

Demodulation of the CCK modulated signal is done coherently in the HFA3861A baseband processor by a RAKE receiver implementation which features a channel matched filter and Fast Walsh Transform block. A bank of 64 correlators followed by a biggest picker circuit determines which code was transmitted giving 6 bits of the data word (in the 11Mbps mode). The other 2 bits of the 8-bit data word are determined from the QPSK phase of the symbol. Figure 3 shows the HFA3861A baseband processor in the 11Mbps PRISM II radio block diagram. This highly integrated radio features the use of Si Ge process technology in the RF/IF front section, low power consumption, Ethernet like data rates, low cost, reduced bill of materials content, reduced manufacturing costs and improved packet error rate performance in a multipath environment when compared to Intersil's first generation 11Mbps radio based on the HFA3860B baseband processor.

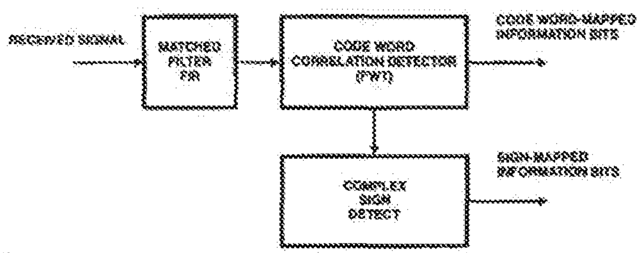


FIGURE 2. HFA3861A RAKE RECEIVER

Conclusions

Complementary codes and CCK modulation as adopted the IEEE in the 802.11 draft standard have been described. A new baseband processor from Intersil, the HFA3861A, implements the CCK waveform to achieve Ethernet data rates over wireless links. The new baseband processor features improved packet error rate performance in multipath environments through the use of a RAKE receiver architecture.

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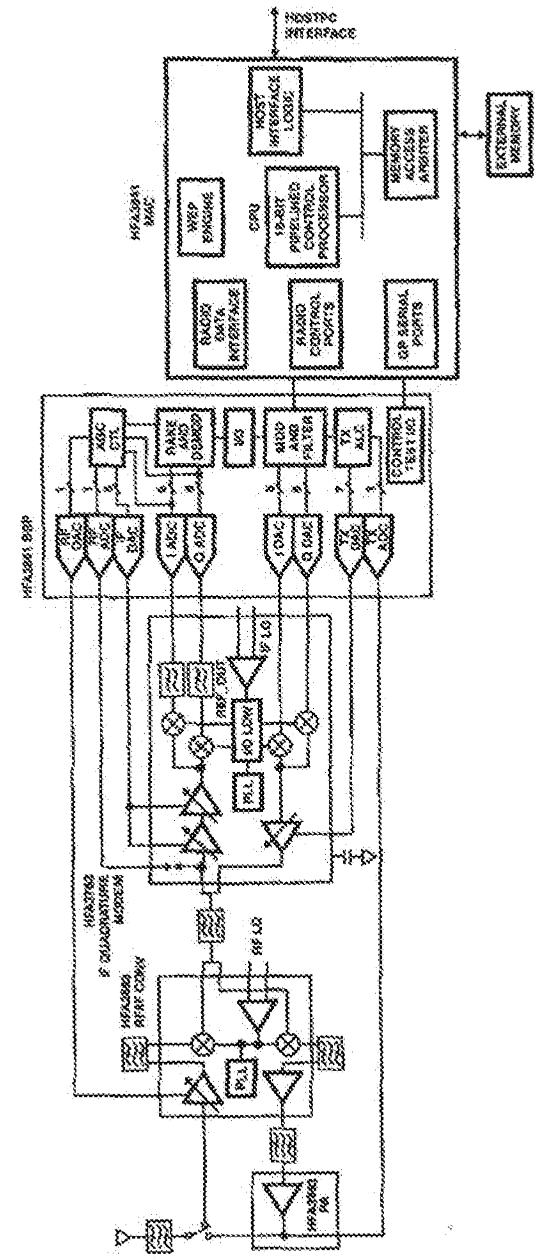

FIGURE 3. PRISM II RADIO BLOCK DIAGRAM

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A 2.4 GHz 11 MBps Baseband Processor for 802.11 Applications

Carl Andren, Systems Engineering,

Harris Semiconductor

Introduction

Harris semiconductor has developed a chip set to implement Wireless Local Area Networks (WLANs) that will provide 1 to 11 MBps rates in the 2.4 GHz ISM band. It is based on a novel modulation scheme to implement high speed extensions to the IEEE 802.11 WLAN standard. This scheme will provide interoperability with the 802.11 DS equipment operating at 1 and 2 MBps and also offer rates of 5.5 and 11 MBps for those users that need more speed. This chip set will be based on the existing PRISM WLAN chipset with the same RF and IF products or ICs supplemented with a new baseband processor and software programmable MAC. Thus, it will offer a ready upgrade path to radio manufacturers who want to incorporate the new rates.

A trade study was initiated to identify compatible modulation methods that would build on the 802.11 modes but achieve higher data rates. M-ary Bi-Orthogonal Keying was picked as the best modulation choice for high rates in the 2.4 GHz ISM band. This technique can easily be made interoperable with the existing 802.11 networks by incorporating the same preamble and header which already has a rate change mechanism.

The M-ary Bi-Orthogonal Keying (MBOK) modulation is well known and has been shown to have outstanding properties. It was extensively studied in the 60's where analog implementation techniques were considered. With analog implementations, the technique didn't catch on as the complexity was too high. Today, with integrated digital implementations, we can effectively use the technique and gain the benefits of higher complexity waveforms.

Background

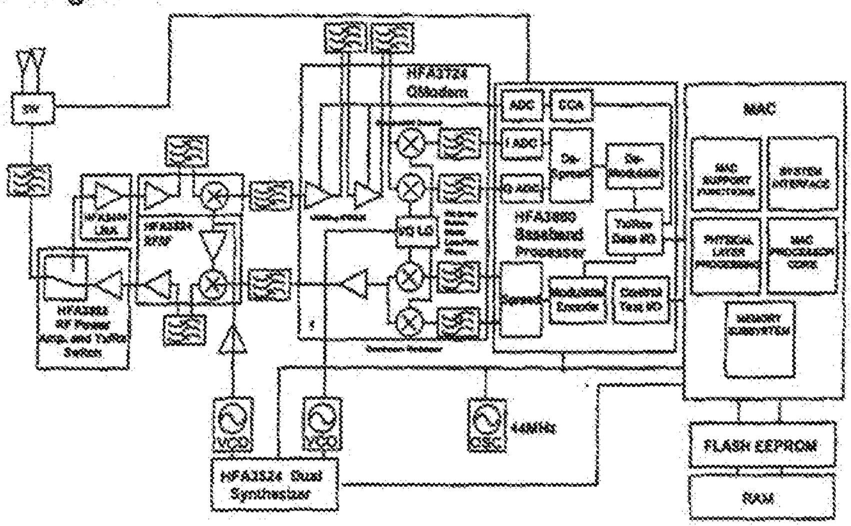


Figure 1. PRISM radio with the high rate capability

MBOK allows multi-channel operation in the ISM band by virtue of keeping the total spread bandwidth the same as the existing 802.11 standard. This also allows the use of the same RF and IF parts in the radio as shown in figure 1. The spreading is actually more uniform than the 802.11 Barker words, but it has the same chipping rate and the same basic spectrum shape. The spectrum is filtered to 17 MHz at the 3 dB points and to 35 dB beyond 22 MHz. This allows placing three non-interfering channels in the ISM band (which is from 2.40 to 2.483 GHz) with allowance for spectral energy reduction at the band edges. With more aggressive filtering 4 channels could be squeezed into the band.

MBOK is a power efficient modulation which means that it provides good range for the higher data rates. It is robust, having good tolerance for interference and multipath.

In this baseband processor, the modulator design is simple, as is usually the case, and requires just a few more circuits than the previous design. These are for the selection of the appropriate spread function for each of the quadrature channels. The demodulator is based on the same coherent carrier tracking principles that we already incorporated into the PRISM 1 architecture, so the additional circuitry for demodulation was simple to include and represented only a modest increase in chip size.

M-ary orthogonal keying (MOK) can be shown to be a generalization of many standard waveforms such as FSK.

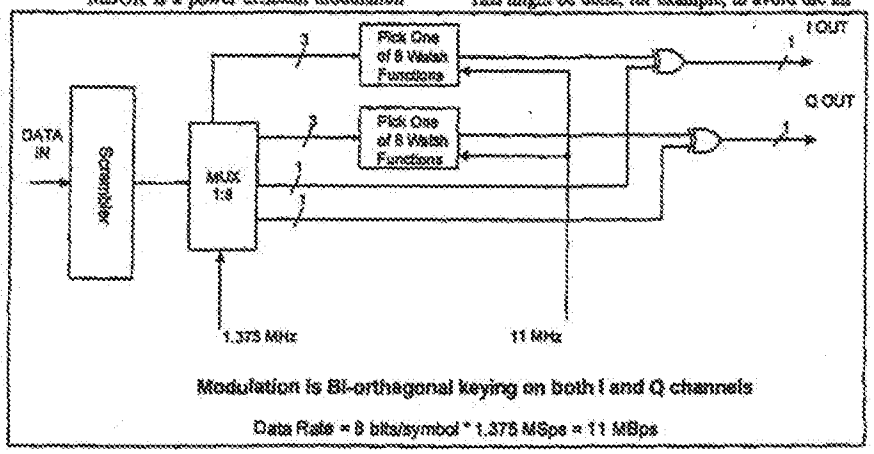


Figure 2 shows how the Bi-Orthogonal modulation is formed

Figure 2 shows how the waveform is created. In this scheme, the spread function is picked from a set of M orthogonal vectors by the data word. Since the I and Q channels can be considered independent when coherently processed, both can be modulated this way. Bi-Orthogonal keying extends this by using both true and inverted versions of the spread functions. This allows us to pack 8 bits into each symbol.

The most well known orthogonal vector set is the Walsh function set. It is available for 8 chip (powers of 2) vectors and has true orthogonality. Modifications to the basic set can be made by adding another fixed bit pattern to it. This might be done, for example, to avoid the all 0's member of the basic set. Figure 3 shows another look at the 4 modulation modes of the extended modulation package. Here, the two 802.11 1 and 2 MBps modes are shown as basically setting the polarity of the I and/or Q channel spreading function. For the 5.5 MBps mode, the incoming data is grouped into 4 bit nibbles where 3 of those bits select the spreading function out of the set of 8 while the 4th bit sets the polarity. The spreading sequence chosen then BPSK modulates the carrier by driving the I and Q modulators in parallel. To make 11 MBps modulation, the input data is grouped into 2 nibbles and used to modulate the I and Q channels independently.

To make the modulation have the same bandwidth as the existing 802.11 DS modulation, the chipping rate is kept at 11 Mcps while the symbol rate is increased to 1.375 MSps. This makes the overall bit rate 11 MBps. This also makes it easy to make the system interoperable with the 802.11 preamble and header. Since the spread rate remains constant, the only thing that changes when transitioning into the data from the header is the data clock rate.

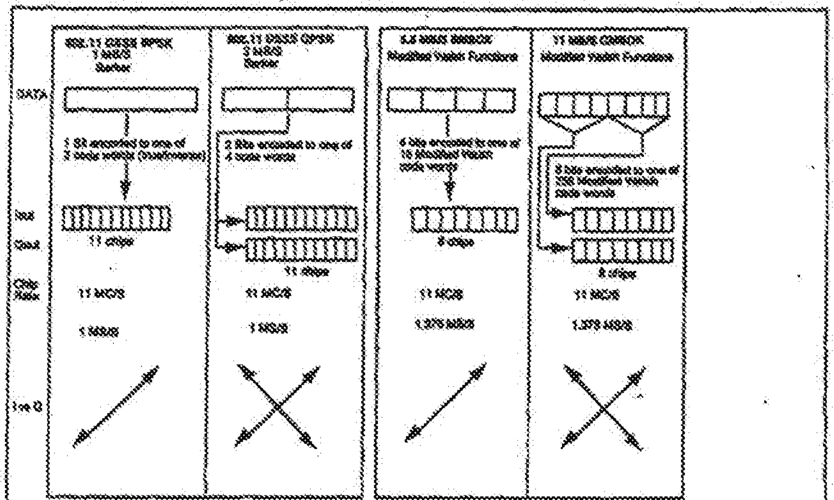


Figure 3, showing the makeup of the 4 modulation modes

MOK modulation has been shown to have slightly (1.6dB) better Eb/N0 performance than BPSK due to embedded coding properties. This makes the waveform the most power efficient of the candidates. This allows the modulation to tolerate more interference than other waveforms. Since there are more bits per symbol with this modulation, it naturally requires more Es/N0 than BPSK, but the increase is minimized.

The spectrum of this waveform is sinx/x, which is the same as the 802.11 waveform.

The multipath performance will depend on the SNR and phase distortion tolerance of the waveform. We have shown through simulation, that this signal will have an adequate performance in the indoor environment. It is obviously worse than the 1 MBps case which can tolerate an SNR of 0 dB.

To use both I and Q channels independently requires that the system process the signal coherently with an absolute phase knowledge. This is not a large concern as the PLCP preamble and header can supply the necessary means to lock up a PLL in a given state and the actual demodulated header can resolve the phase ambiguity. This and the parallel correlators for the demodulation moderately increase the complexity of the demodulator as shown in figure 4.

The demodulator design was based on the concept of minimal changes to the existing PRISM design where the 1 and 2 MBps portions were retained to perform the demodulation of the preamble and header and also the 1 and 2 MBps modes. The original demodulator did not use a complex multiplier for carrier frequency tracking since it was possible to leave the Barker correlators outside the PLL and do the phase correction in the phase domain. Here the phase shifting is a subtraction rather than a multiplication. With the new modes, additional circuitry was necessary to demodulate the MBOK modes. The requirement for coherent processing dictated that the carrier phase be corrected prior to the MBOK correlators. This necessitated a complex multiplier and a new PLL. It was decided not to share the original PLL but to make a new one instead. This minimized the design effort and the testing effort. The MBOK PLL is initiated with the same parameters as the preamble tracking PLL to perform a smooth handoff. Tracking of the carrier and symbol timing is performed with decision directed chip and carrier detectors.

The MBOK correlators are two banks of 8 integrate and dump serial correlators followed by two biggest pickers.

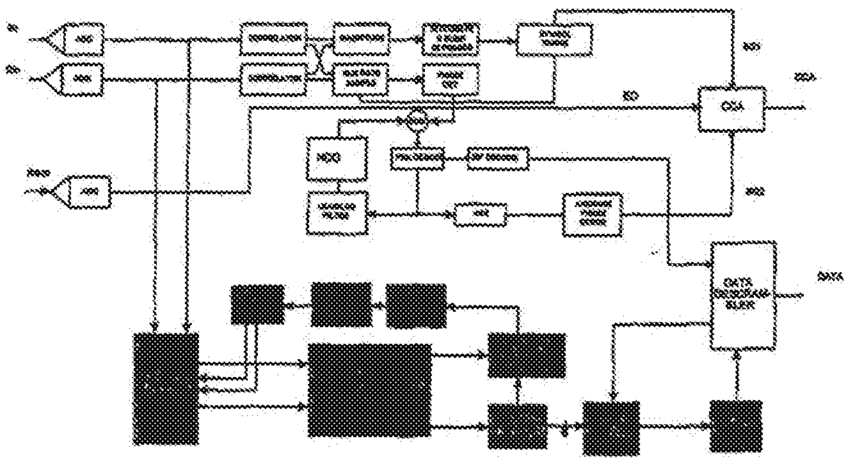
Performance Parameters

The MBOK modulation scheme does not first appear to conform to accepted definitions of processing gain. However, the spreading/despreading operations do provide 10.6 dB of processing gain. This is composed of 9 dB due to the bandwidth reduction and 1.6 dB extra gain due to the use of Bi-Orthogonal coding. Thus, after despreading, the SNR has improved by 10.6 dB over the SNR in the spread bandwidth. We have run simulation to check the processing gain against the FCC requirements and they show ample margin for compliance.

Simulations show that antenna diversity is needed to insure a reliable 11 MBps link with the propagation model chosen for the simulation. The high rate modulation is more susceptible to multipath interference and filter distortion than lower rate modulations would be due to the higher required SNR. We are rapidly progressing on developing the hardware to test the technology and by the time this paper is presented, the test data should be available. Meanwhile, extensive simulations have shown that the link is as robust and reliable as could be expected for the rates being transmitted.

PHY Performance Analysis

HFA 3860 DEMODULATOR BLOCK DIAGRAM



SHADED BLOCK ARE THE ADDITIONS FOR HIGH RATES

Figure 4 shows how easily the new modulation is integrated with the old.

The MBOK modulation when used in a BPSK fashion achieves 5.5 MBps. By using the MBOK scheme on both the quadrature I and Q channels (which are independent), the basic data rate can be doubled to 11 MBps. This also allows options for lower rates which are more robust, giving fall back rates for stressed links. The excellent range that the M-ary Bi-Orthogonal Keying modulation achieves is due to the fact that MBOK has better than BPSK performance. Simulations run on the two basic types of modulation proposed for the multi rate hardware show that the proposed modulation can achieve 150' range reliably. The simulations show that the high rates are more susceptible to multipath than the lower rates as would be expected from the higher required Eb/N0. This leads to a recommendation that antenna diversity be used.

The Eb/N0 performance of the MBOK scheme is better than BPSK of the same rate. This performance is due the embedded coding properties of the MBOK spreading modulation. The modulation basically ties several bits together so that the receiver makes a symbol decision. If a symbol is in error then all of the bits in that symbol are suspect, but not all will necessarily be in error. Thus, the symbol error rate and the bit error rates are related, but not identical. While the SNR required to make a symbol decision correctly is higher than required to make a one bit decision, it is not as high as required to make all of the bit decisions of a symbol separately. Thus, some coding gain is embedded in the basic spreading waveform.

Figure 5 shows the measured Eb/N0 performance of the two MBOK modes and the theoretical performance curves.

13.6 dB for the 5.5 MBps case and 16.8 dB for the 11 MBps case. This Es/N0 is calculated in the symbol rate bandwidth, so when the spread rate bandwidth is considered, the SNR (in this bandwidth) is 9 dB lower or (13.6 - 9) = 4.6 dB for the 5.5 MBps case and 7.8 dB for the 11 MBps case.

The operating Eb/N0 of the 1 MBps 802.11 waveform using the PRISM chip set has been measured at 13 dB. This differs from the ideal performance due to two factors. First, there is a 6 fold error extension due to differential decoding and descrambling and second, there are implementation losses. With 10.4 dB processing gain due to spreading, the operating SNR in the spread bandwidth is +2.6 dB. With QPSK, this is increased by 3 dB since the I and Q channels split the carrier power. This appears to make the operating SNR for the 2 MBps case nearly the same as the 5.5 MBps case

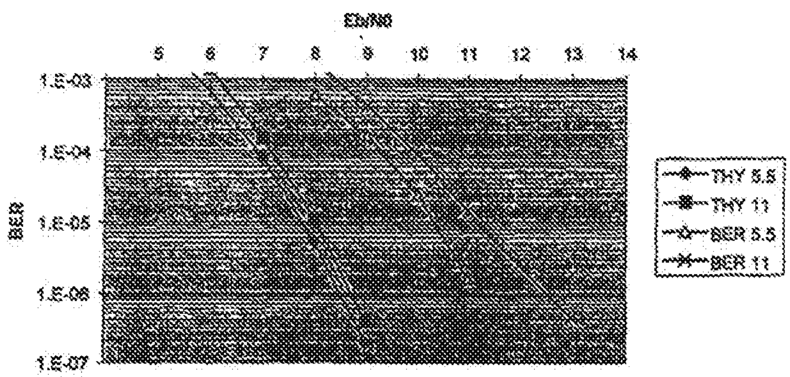


Figure 5. The performance of the new chip is within 3 dB of theoretical.

The Es/N0 performance of the waveform can be calculated by adding 10 log(bits per symbol) or 6 dB to the basic 5.5 MBps biphase waveform to account for the 4 bits per symbol. For the 11 MBps case, add 9 dB for 8 bits per symbol (10 log(8) = 9 dB). You could alternately look it as adding 3 dB more when using both I and Q channels which share the carrier power. This gives a required Es/N0 of

Carrier offset performance

The basic premise of this design is that the frequency offsets for carrier and bit clock are ±50 PPM for both ends of the link. For the carrier, this is less than one eight of the symbol rate. The importance of this is that the modem can acquire the signal without any frequency search.

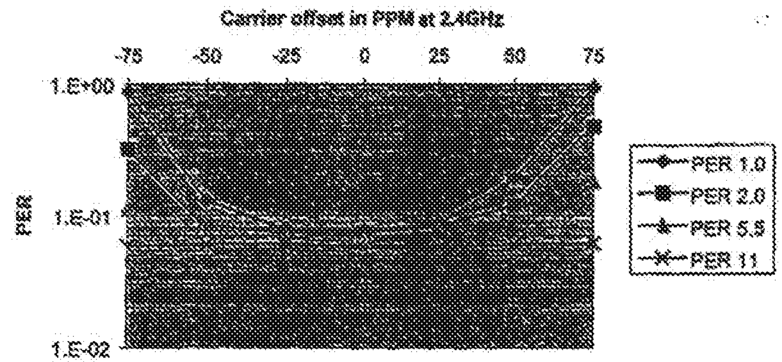


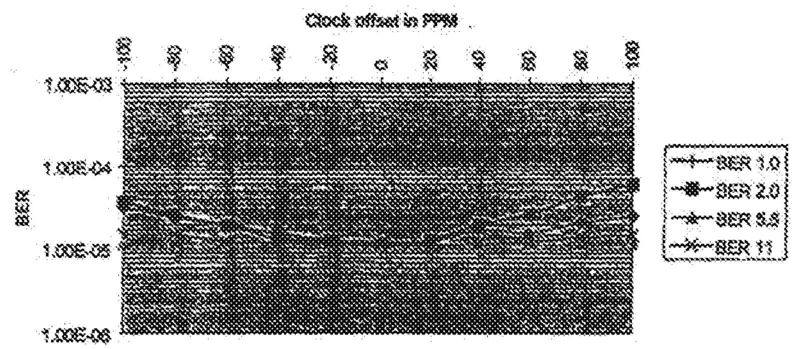
Figure 3. carrier Offset Performance

Figure 6 shows how the modem handles carrier offset. This data was taken by initially setting the SNR to achieve a 10e-5 BER with no offset. Then the carrier was offset and the BER again measured. This shows how the BER degrades with offset.

One thing you can see from this figure is that the 1 and 2 MBps modes degrade more than the 5.5 and 11 MBps modes. This is due to leaving the correlators outside of the carrier tracking loop in these modes. However, the overall degradation at 50 PPM is small.

Clock Offset Performance

The bit clock offset requirements are the



same as the carrier offset or ±50 PPM total offset for both ends of the link. It was decided that this could be handled by a simple tracking procedure using a divided down master clock . This clock is initially set to correspond to the peak of the correlation pulse in the preamble. Every 64 clocks a realignment is performed if necessary. The performance of this scheme is shown in figure 8.

Range

The range and reliability of the Harris technology is illustrated in table 2.

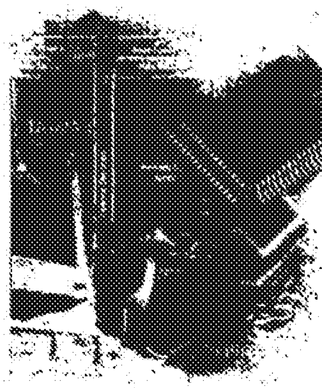
Data Rate	Range	Bytes per packet	TX power	Antenna Diversity	Packet Error Rate
11 MBps	100'	1500	+15 dBm	no	0.15
11 MBps	100'	100	+15 dBm	no	0.115
11 MBps	100'	1500	+15 dBm	yes	0.02
11 MBps	100'	100	+15 dBm	yes	0.013

Table 2, Packet Error Rates

This table was developed from simulation work using a representative path model that includes multipath and blockages. The simulations show that the probability of a missed packet is strongly influenced by multipath as the required Es/N0 becomes higher. This is intuitively correct as the ratio of the multipath to the signal must be lower if the Es/N0 is higher. This result shows a need to implement antenna diversity to achieve good performance. When antenna diversity is taken into account, the single antenna PER values are squared (assuming optimum diversity). This makes the total result acceptable without having to use equalization or other heroic measures.

The performance of the 5.5 MBps case is substantially better than that of the 11 MBps case as illustrated by figure 6. This curve was taken with +20 dBm TX power, so it is slightly better than the table values below.

The essential message of this data is that stressed links can be substantially improved by lowering the raw data rate which can be readily accomplished with the Harris PRISM Enterprise architecture. The other message is that antenna diversity will greatly improve the 11 MBps throughput when multipath is an issue. Harris has measured better range in our indoor tests at 1 MBps and 2 MBps than these simulations show which indicates that the simulations are pessimistic.



CCK, the new IEEE 802.11 standard for 2.4 GHz wireless LANs

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1. Abstract

The IEEE 802.11 committee, to implement Wireless Local Area Networks (WLANs) has adopted a new modulation CCK for 11 Mbps rates in the 2.4 GHz ISM band. This paper discusses the new CCK modulation scheme and the considerations that led to the adoption of this technique for the standard.

Intersil and the IEEE initiated trade studies to identify compatible modulation methods that would build on the 802.11 one and two Mbps modes but achieve higher data rates. Complementary Code Keying (CCK), a variation of M-ary Orthogonal Keying was finally picked as the modulation. The CCK modulation has the same chip rate and therefore the same null to null bandwidth as the lower rates. This makes it interoperable with the existing 802.11 networks by incorporating the same preamble and header that already has a rate change mechanism.

This paper discusses the new CCK modulation scheme and the considerations that led to the adoption of this technique for the standard. It also covers the implementation of the technique and a short discussion of the results of lab and field tests.

2. Introduction

There is increasing market demand for higher data-rate wireless local-area-networks (WLANs). This demand motivates the search for new signaling waveforms and receiver architectures. This paper presents a new signaling waveform for use with RAKE receivers operating in the indoor high multipath environment. Complementary Code Keying (CCK) was developed by Intersil and Lucent Technologies for use at 2.4 GHz for the IEEE 802.11 standard (which has now been approved). The CCK waveform is based on complementary codes which have their origins in RADAR and multislit spectrometry applications. In this paper the background and properties of CCK will be explained. Furthermore, it will be shown that this code provides an increased tolerance to multipath distortion and is attractive for use in high-data rate WLAN applications. Intersil is currently shipping a second generation WLAN PRISM(chipset which uses CCK.

The IEEE 802.11 standards board has approved a higher rate extension to the physical layer of the 802.11 WLAN standard with the intention of delivering Ethernet like speeds over existing 802.11 WLAN systems. This effort was directed at the 2.4 GHz ISM band which is available almost worldwide and offers 83.5 MHz of spectrum into which up to 3 channels can be implemented.

Several competing companies proposed modulations for the

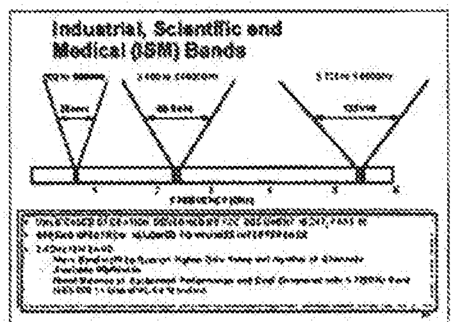


Figure 1: There are three ISM bands available, we are addressing the 2.4 GHz band

high rate application. After months of evaluating various modulation proposals such as M-ary Bi-Orthogonal Keying (MBOK), Barker Code Pulse Position Modulation (BCPM), Orthogonal Frequency Division Multiplex (OFDM), Packet Binary Convolutional Coding, and Orthogonal Code Division Multiplex (OCDM), the working group came to consensus on a single compromise modulation, CCK.

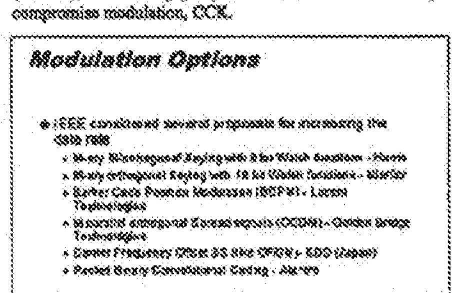


Figure 2: Competing modulation methods were traded off before CCK was selected

Intersil and Lucent Technologies joined forces and developed the compromise approach based on Complementary Code Keying (CCK). In Sept 1998 the 802.11 standards committee adopted CCK as the basis for the high rate physical layer extension to deliver data rates of 11Mbps. This higher rate extension was chosen because it easily provides a path for interoperability with the existing 1 and 2Mbps networks by maintaining the same bandwidth and incorporating the same preamble and header, which already has a rate shift mechanism.

IEEE 802.11 is not the only group setting standards for wireless LANs. There are other standards efforts like: Bluetooth, Home RF Working Group and Personal Area Networks that seek to define WLANs for various activities, but 802.11 is the only one addressing high data rates for building wide networks.

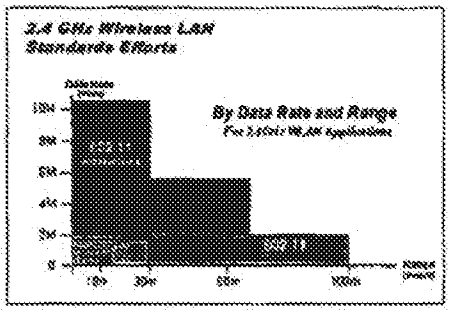


Figure 3: Other efforts are addressing Wireless applications in this band too.

3. Complementary Code Keying

3.1 CCK Background

Complementary codes were originally conceived by M. J. E. Golay for infrared multislit spectrometry. However, their properties make them good codes for radar and communications applications. The original description of these codes for these applications is in [1]. This publication defines a complementary series as a pair of equally long sequences composed of two types of elements which have the property that the number of pairs of like elements with any given separation in one series is equal to the number of pairs of unlike elements with the same separation in the other series. Figure 4 shows this property for the complementary pair, 1001010001 and 1000000110.

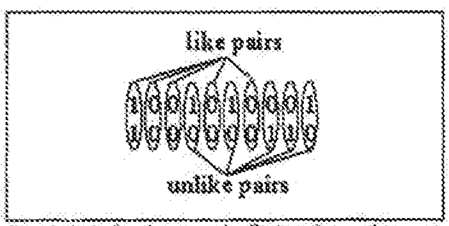


Figure 4: A pair of complementary codes. This figure illustrates their property that the number of pairs of like elements with any given separation in one series is equal to the number of pairs of unlike elements with the same separation.

This property is more easily expressed in terms of the autocorrelation function which is discussed in the following section.

3.2 Autocorrelation Properties

Good code sets for communications applications require good auto and cross correlation properties. Good means that the codes have a large correlation only at zero offset and small or zero otherwise. Multipath will cause the received signal to have multiple echoes of the signal which will cause both interchip and intersymbol interference. This is especially bad if the have poor auto of cross correlation..

3.2.1 Binary Complementary Codes

The unique structure of binary complementary codes yields some unusual autocorrelation properties. However, in order to describe these properties, we must first establish some notation. Let the code words be given by $S_1^k, S_2^k, \ldots S_N^k$ where N is the length of the code word, and k indicates the code word. (In the case of a pair of code words, k = 1,2.) The aperiodic autocorrelation of the code words is given by

$$R^k(j) = \sum_{i=1}^{N-j} s_i^k \cdot s_{i+j}^k.$$

Complementary code words have the property that

$$\sum_{k=1}^{2} R^k(j) = \begin{cases} 0 & \text{for } j \neq 0, \\ 2N & \text{for } j = 0. \end{cases}$$

Reference [1] gives the following rules for generating complementary pairs:

a) Interchanging the series.
b) Reversing the first series.
c) Reversing the second series.
d) Altering the first series.
e) Altering the second series.
f) Altering the elements of even order of each series.

Altering means replacing each element with its complement. (A -1 is replaced by a 1, and a 1 is replaced by a -1.)

Golay's publication [1] only discusses pairs of binary complementary codes. Later, Tseng and Liu [2] extended the concept to "sets" of complementary sequences. A set of K codes is considered complementary if and only if it satisfies the following equation

$$(1) \quad \sum_{k=1}^{K} R^k(j) = \begin{cases} 0 & \text{for } j \neq 0, \\ KN & \text{for } j = 0. \end{cases}$$

As shown by Kretschmer and Gerlach [3], if a collection of sequences is written in matrix form so that the sequences form the rows of the matrix. Those sequences are complementary if the columns of that matrix are mutually orthogonal. (This is a sufficient but not necessary condition.)

3.2.2 Polyphase Complementary Codes

Thus far, we have only considered binary complementary codes; however, polyphase codes can also be complementary [3], [4]. The polyphase codes described in the literature consist of complex elements with unit magnitude. Thus,

where

$$s(t) = p(t - iT)e^{j\phi_i} \quad \text{where } p(t) = \begin{cases} 1 & \text{for } 0 \le t < T \\ 0 & \text{otherwise.} \end{cases}$$

These complementary polyphase codes must satisfy equation (1). Both references [3] and [4] discuss construction of these polyphase complementary codes.

3.3 Crosscorrelation Properties

Tseng and Liu [2] also describe crosscorrelation properties between sets of complementary codes. Let's denote one set of complementary codes with $\{c_i^j\}$ and another set by $\{e_i^j\}$. Set $\{e_i^j\}$ is considered to be a mate of $\{c_i^j\}$ if they satisfy the following conditions:

1) the two sequences are the same length,
2) the set and are complementary sets, and
3) $\psi^{c}(j) = \sum_{i=1}^{N-j} c_i^j e_{i+j}^j = 0 \quad \forall j$.

3.4 Applications of Complementary Codes

The original application of complementary codes was for infrared multislit spectrometry. However, their properties also make them useful in radar applications [3]-[10] and more recently for OFDM and discrete multitone communications [11]-[13]. They have also been proposed for multiple access and M-ary communication. In these systems, they have been implemented in ways that exploit their complementary nature. There appears to be nothing in the literature that proposes using complementary codes the way the 802.11 utilizes them.

3.4.1 Complementary Code Keying

CCK can be described as a variation of M-ary Orthogonal Keying (MOK) using codes with complex symbol structures. CCK allows for multi-channel operation in the 2.4GHz ISM band by virtue of using the existing 802.11 1 and 2Mbps direct sequence spread spectrum (DSSS) channelization scheme. The spreading employs the same chipping rate and spectrum shape as the 802.11 Barker code spread functions allowing for three non-interfering channels in the 2.4 to 2.483 GHz ISM band. The scheme is also interoperable by virtue of using the same preamble and header for all transmission rates.

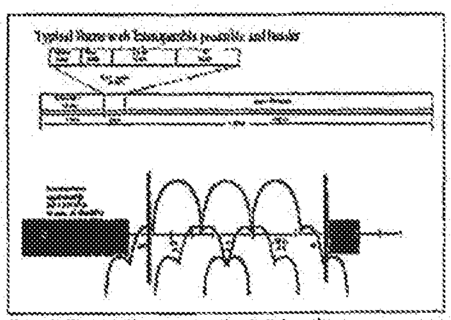


Figure 5: The available spectrum can handle 3 channels.

CCK is a form of M-ary code word modulation where one of set of M unique signal codewords is chosen for transmission.

The spread function for CCK is chosen from a set of M nearly orthogonal vectors by the data word. CCK uses one vector from a set of 64 complex (QPSK) vectors for the symbol and thereby modulates 6-bits (one-of-64) on each 8 chip spreading code symbol. Two additional bits are sent by QPSK modulating the whole code symbol and this thus modulates 8-bits onto each symbol. The formula that defines the CCK codewords is shown in Fig 6. In it, there are 4 phase terms which are defined by data di-bits (pairs of data bits). One of the phase terms modulates all of the chips and thus is used for the QPSK rotation of the whole code vector. The others modulate respectively, every odd chip, every odd pair of chips, and every odd quad of chips.

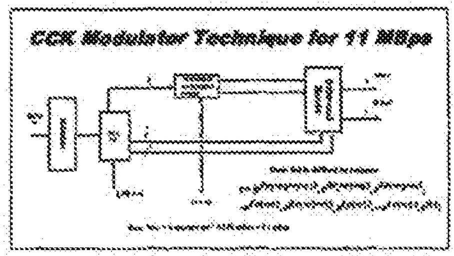


Figure 6: The encoding function for CCK is very simple

Walsh functions were used for the M-ary Bi-Orthogonal Keying (MBOK) modulation first proposed by Intersil. They are the most well known orthogonal BPSK vector set and available in 8 chip (powers of 2) vectors. To transmit enough bits per symbol, the MBOK modulation was used independently on the I and Q channels of the waveform effectively doubling the data rate. The IEEE chosen waveform, CCK, uses a complex set of Walsh/Hadamard functions known as Complementary Codes. Walsh/Hadamard code properties are similar to those of Walsh functions but they are complex, that is, more than two phase. With complex code symbols, you cannot transmit simultaneous independent code symbols on the same carrier as with MBOK. However, since the set of complementary codes is more extensive, we have a larger set of good codes to pick from and can still get the same number of bits transmitted per symbol. Additionally, the multipath performance of CCK is better than MBOK due to the lack of cross rail interference as will be explained.

For MBOK, there are 8 BPSK chips that have a maximum vector space of 256 code words of which you can find sets of 8 that are mutually orthogonal. Two independent BPSK vector sets are selected for the orthogonal I and Q carrier channels which can modulate 3-bits on each. Two additional bits are used to BPSK modulate each of the spreading code vectors. For CCK, on the other hand, there are 65536 possible code words, and sets of 64 that are nearly orthogonal. It takes 16 bits to define each code word of an 8 chip complex code. To get a lower (5.5 Mbps) data rate, a subset of 4 of the 64 words that have superior coding distance is used.

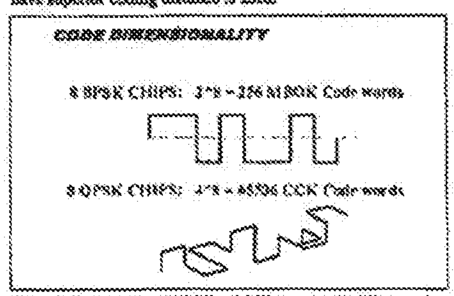


Figure 7: The properties of MBOK and CCK are primarily different in that one is BPSK and the other QPSK.

One of the advantages of CCK over MBOK is that it suffers less from multipath distortion in the form of cross coupling of I and Q channel information. The information in CCK is encoded directly onto complex chips which cannot be cross-couple corrupted by multipath since each channel finger has an A_i* distortion. A single channel path gain-scales and phase-rotates the signal. A gain scale and phase rotation of a complex chip still maintains I/Q orthogonality (does not turn it into another code word). This superior encoding technique avoids the MBOK, corruption resulting from encoding half the information on the I-channel and the other half on the Q-channel, which easily cross-couple corrupts with the multipath's A_i* phase rotation. That is, the rotated multipath echo causes I/Q cross coupling.

4. Codeword Rules for RAKE Receivers

4.1 Transmit Signal Structure

For a RAKE receiver to work well it is necessary to have a proper transmit signal structure. The transmit symbols need a DSSS structure where the transmitted bandwidth is larger than the information bandwidth. Codewords are formed from N chips. The term codeword is used here since use of the term symbol may cause confusion between chips and codeword. The chips are sent with a simple signaling element like QPSK. The codewords chips may be fixed as in a signature sequence or pseudo-random. Some of the information is imposed through a phase modulation of the codeword. For two bits of information per codeword, the whole codeword could be rotated in a quadri-phase fashion: 0, 90, 180 or 270 degrees.

To carry higher data payloads per codeword, the codeword's N chips are selected from a codeword set. Extra information bits select the particular codeword out of the set. An example of this is where Walsh (Hadamard) codes are used for the codeword set. For example, with a 16 chip codeword, 16-ary Walsh codewords could be used. An extra two bits of information can specify the rotational phase of the codeword: 0, 90, 180 or 270 degrees.

For the 2.4 GHz ISM band, IEEE 802.11 uses a codeword set which contains 64 complex codewords and quadriphase modulation. This establishes 8 information bits per transmitted codeword. The 8 chips are QPSK. The optimum receiver correlates the received signal with the codeword set.

4.2 RAKE-Finger Combining

The RAKE receiver works well because it coherently combines the multiple received signals paths (multipath) into a single composite plus echoes. The echoes are eliminated during codeword correlation if the codewords are chosen properly. Ideally, the codewords have (1) impulsive autocorrelation functions, (2) zero cross-correlation functions, (3) are long relative to the multipath spread, and (4) are chosen to have equal energy.

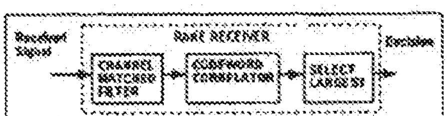


Figure 8: The RAKE receiver consists of a channel matched filter and codeword correlator. The decision selects the largest correlation.

5. CCK for IEEE 802.11

5.1 Description of CCK

The CCK codes that are used by IEEE 802.11 are defined in a paper by Richard van Nee [13]. In this paper, the codes are formed by first making a kernel which is one complementary pair from which all other complementary sequences can be derived. The kernel is formed using Golay's rule for length expansion. As shown in [13], if we start with the length 4 sequence A_1B_1, where $A_1 = [1\ 1]$ and $B_1 = [1\ -1]$, a recursive rule for expansion is: $A_n = A_{n-1}B_{n-1}$ and $B_n = A_{n-1}B'_{n-1}$ ($B' = -B$). Thus the length 8 sequence is [1 1 1 -1 1 1 -1 1].

Using these codes, the next step is to find log2 N orthogonal subsets (where N is the length of the code) for this code. These subsets are formed from the even ordered single elements, pairs and quads. According to [4], each subset can be given a different phase without disturbing the complementary code characteristics. The following equation represents this set of codes based on the kernel given above for N=8. Each phase variable is four-valued.

C={e [illegible]

Based on this analysis, the minimum distance between 3 different complementary codes is N/2 symbols. Therefore, it is possible to correct N/4-1 symbol errors. If M phases are possible, this yields a minimum Euclidean distance of

$$d_{min} = \sqrt{\frac{N}{2}\left|1-\exp\left(j\frac{3\pi}{M}\right)\right|}$$

5.2 Fast Transform Structure

The four phase variables each take on values of [q,p/2, , 3p/2], and there are 256 possible 8 chip codes. These codes have an inherent "Walsh" type structure that allow a simple butterfly implementation of the decoder. Although it is possible to squeeze a few more complementary codes out of this 8 chip set, the rest of the codes cannot be decoded with the modified fast Walsh transform. Figure 9 shows the basic fast Walsh block which brings in 8 chips of soft decision data shown here by x0, x1, ...x 7, and produces 16 possible correlations for given values of j_2 and j_3.

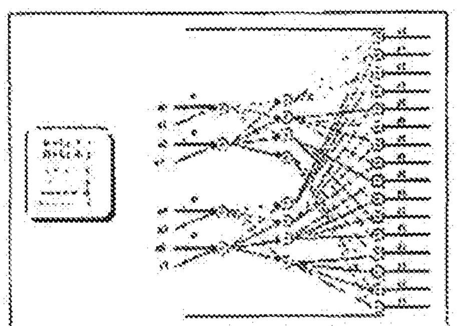


Figure 9: Modified fast Walsh transform: Basic Fast Walsh (BFWB).

To create the correlator for the whole vector set, the structure shown below in Figure 10 creates all 256 possible correlator outputs. The BFWB's are shown in detail in Figure 9. There are 28 butterflies needed for a length 8 transform. Each butterfly requires 4 additions (the phase rotations are trivial for 4-PSK), so the total number of operations is 112 complex additions. The direct calculation method with 64 separate correlators requires 512 complex additions, so the fast transform architecture reduces the complexity by almost a factor of 5.

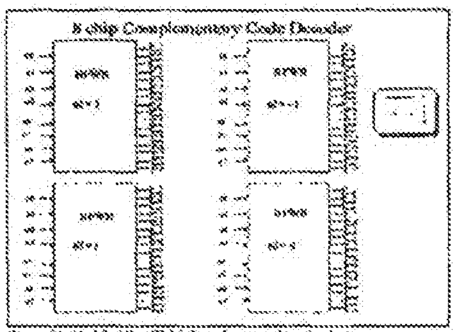


Figure 10: Modified Fast Walsh Transform, combination logic.

5.3 Implementation

The Intersil HFA3861A implements the legacy 802.11 1 and 2 Mbps DSSS modulations and the CCK waveform at 11Mbps as adopted by the 802.11. This chip is part of the overall PRISM chip set as shown in fig 9. The processing of the waveform is carried out in the Baseband Processor (Fig 10). The Barker coded signals such as the preamble are correlated in two time invariant matched filter correlators. This allows rapid acquisition of the preamble and is also used for demodulation of the BPSK and QPSK modulated 1 and 2 Mbps signals. The signal is de-rotated by a complex multiplier and then correlated with a Barker correlator or a Fast Walsh Transform block (FWT). This is followed by a biggest picker and DQPSK demodulator. Carrier tracking uses decision directed phase detection and a lead-lag filter in the tracking loop.

More details of the PRISM II chip set that implements this technique will be given in another paper by Carl Andren.

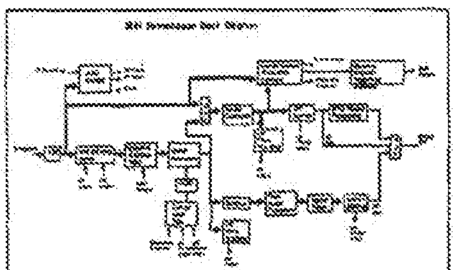


Figure 11: The receiver architecture includes a channel matched filter to implement the RAKE principle.

5.3.1 Other rates

CCK is inherently a quadrature MOK signal. For the full data rate potential, we QPSK modulate the starting phase of the symbols and use 64-ary symboling to get 11 Mbps. To reduce the data rate for a more robust lower data rate, we can trim the signal set to one that has the greatest distance properties with a reduced number of vectors. For 5.5 Mbps, there are two options — first, trim the 64-ary set to 8-ary and BPSK modulate the symbols or second, trim the set to 4-ary and QPSK modulate the symbols. Either scheme achieves 4 bits per symbol but simulations show that the latter is more robust in multipath. Experience and simulations also show that the phase shift portion of the waveform has better Es/N0 performance than the MOK portion. For 1 and 2 Mbps rates, we use the IEEE 802.11 defined DBPSK and DQPSK modes.

6. Lab results

Numerous lab studies and field trials have been run. In general, the chips have performed well and met expectations. We have run SNR curves, delay spread curves, range experiments and a host of other data gathering experiments. The basic data shows that, as expected, the CCK waveform has better Eb/N0 performance than DPSK (figure 12). The evaluation units have passed the FCC CW jamming margin tests in both BER and PER modes.

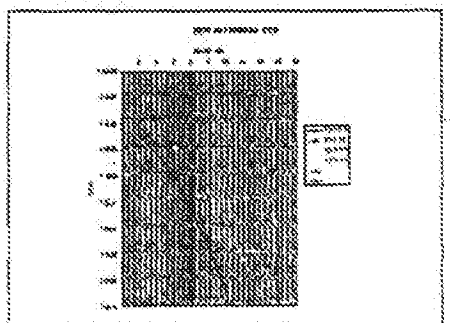
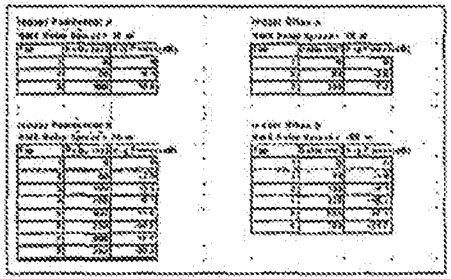


Figure 12: The theoretical and achieved Eb/N0 curves for CCK show a ~1.3 dB implementation loss. One can note that the theoretical performance of CCK is about 3 dB better than can be achieved with DBPSK, which is the waveform used at 1 Mbps. This is due to embedded coding properties inherent in M-ary Orthogonal Keying waveforms.

We experience ranges of about 100 ft for the 11 Mbps links at a TX power of 100 mW in an office environment. This performance is dependent on two main factors, multipath and signal loss. The office multipath environment is typically 40 to 60 ns delay spread. The attenuation seen by the signal is very dependent on the office construction, the placement of walls, the height of the antennas and, their pattern. The loss through most walls is ~6 dB, but the loss through concrete walls is much higher.

The multipath capability of any waveform is difficult to accurately model. There exist many models of the behavior of signals in the indoor environment. Some of the better indoor models were derived by ITC and are illustrated below. This selection shows how the models are configured with a selection of delay paths, delays, and attenuations. We run these models with a 2 KM/h velocity component in the NoiseCom 5700 multipath simulator. The velocity component exercises all phase angles of the multipath rays and provides a more realistic environment for the tests. Using the multipath simulator allows us to do repeat multipath testing consistently. There is a statistical nature to the testing with a velocity component, so all tests are run for at least 50,000 packets.

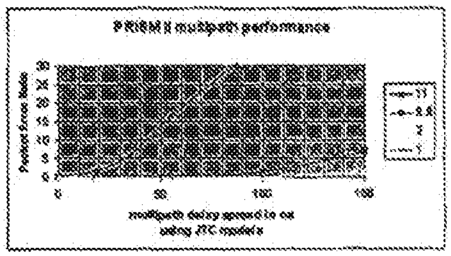
From this set of models, you can see that there is an infinite number of possible combinations for even a fixed number of ray paths. The ITC models are used because, they are a



standard and can be easily modeled in hardware. For the purposes of selecting the waveform to use for the IEEE 802.11b, another model known as the Naftali model was used. This model is a mathematical model with distributed delays and an exponential delay versus attenuation fall off that is easier to use with computer simulations. It, however is difficult to simulate in hardware for real time environment testing.

The performance of our PRISM II hardware with reference to these multipath models is given below. This level of performance has also been achieved with a totally different implementation by another vendor working independently. It represents what can be achieved with a RAKE receiver and standard receiver techniques. We expect that significant improvements will be achieved with decision feedback equalization.

The curves show that the lower data rates have significantly



better multipath performance as would be expected. This is due to the J/S capability of each data rate. With a higher the J/S capability the signal will tolerate more interference, so the level of a multipath ray needs to be higher before it will seriously impact the signal performance. The point at which you would switch over to a lower data rate is about 30% packet error rate, so the 11 Mbps rate can be used to up to 90 ns delay spread.

7. Acknowledgement

The authors wish to make a special acknowledgement of Lucent Technologies for teaming with Intersil to devise CCK for the IEEE 802.11 standard.

8. References

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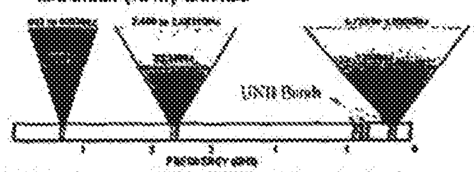
Introduction

- The 1 and 2 Mbps IEEE 802.11 Direct Sequence Spread Spectrum standard was developed for Wireless Local Area Networks in the 2.4 GHz band.
- Intersil (formerly Harris Semiconductor) joined forces with Lucent Technologies to propose a high speed waveform called CCK for 11 Mbps WLAN applications
  - CCK was selected from several other candidates as the waveform for the high rate IEEE 802.11b extension in the 2.4 GHz band
  - CCK Provides 11 Mbps service in the same bandwidth as 1 Mbps
  - The high rate waveforms are interoperable with low rate
- Chipsets and production PCMCIA cards are currently available for 11 Mbps operation and are rapidly being evolved to greater levels of performance

Industrial, Scientific and Medical (ISM) Bands



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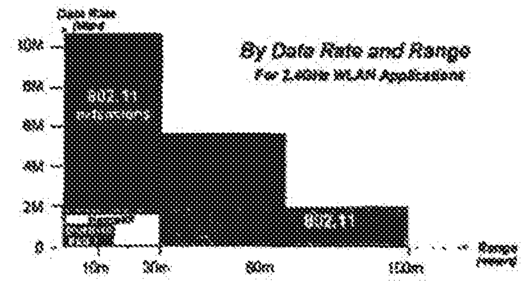
Modulation Options

- In 1998, the IEEE 802.11 standards committee considered several proposals for increasing the data rate from 1 and 2 Mbps
  - M-ary Bi-orthogonal Keying with 8 bit Walsh functions - Intersil
  - M-ary orthogonal Keying with 16 bit Walsh functions - Micrilor
  - Barker Code Position Modulation (BCPM) - Lucent Technologies
  - 16 parallel orthogonal Spread signals (OCDM) - Golden Bridge Technologies
  - Carrier Frequency Offset SS (like OFDM) - KDD (Japan)
  - Packet Binary Convolutional Coding - Alantro
- After much debate, CCK was developed between Lucent and Intersil to combine the best properties of all the waveforms proposed.

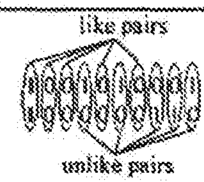
The 2.4 GHz Wireless LAN Standards Efforts



Code Set Properties

- Good spreading code sets for communications applications require good auto and cross correlation properties. Good means that the codes have a large correlation only at zero offset and small or zero otherwise. Multipath will cause the received signal to have multiple echoes of the signal which will cause both interchip and intersymbol interference. This is especially bad if the code symbols have poor auto or cross correlation.
- CCK codes have these good code properties and form the basis of the new high rate DSSS standard for WLANs

The CCK Waveform



- A pair of complementary codes. This figure illustrates their property that the number of pairs of like elements with any given separation in one series is equal to the number of pairs of unlike elements with the same separation.

Complementary Codes

The code words are given by: $\{S_1^k, S_2^k, \cdots S_N^k\}$

The aperiodic autocorrelation of binary complementary code words is given by:

$$R^k(j) = \sum_{i=1}^{N-j} s_i^k \cdot s_{i+j}^k$$

A set of K codes is considered complementary if and only if it satisfies the following equation:

$$\sum_{k=1}^{K} R^k(j) = \begin{cases} 0 & \text{for } j \neq 0, \\ KN & \text{for } j = 0. \end{cases}$$

Polyphase Complementary Codes

To carry higher data payloads per codeword, the codeword's 8 chips are selected from a codeword set. To form the CCK codeword set, four phase terms are defined by pairs of input bits. These phase modulate selected chips in code word. The CCK code set is defined by the equation below where:

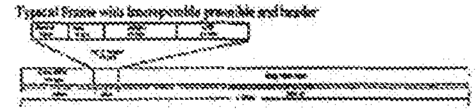
C = the codewords

ϕ_i = phase terms derived from bit pairs

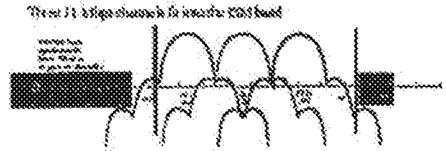
$$C = \{e^{j(\phi_1+\phi_2+\phi_3+\phi_4)}, e^{j(\phi_1+\phi_3+\phi_4)}, e^{j(\phi_1+\phi_2+\phi_4)}, -e^{j(\phi_1+\phi_4)}, e^{j(\phi_1+\phi_2+\phi_3)}, e^{j(\phi_1+\phi_3)}, -e^{j(\phi_1+\phi_2)}, e^{j\phi_1}\}$$

Interoperability with 802.11

Typical frame with interoperable preamble and header



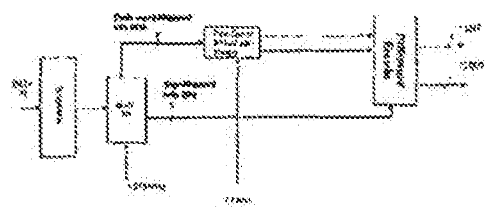
Three 11 Mbps channels fit inside ISM band



CCK Advantages

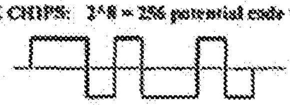
- CCK modulation code words possess an underlying structure which can be exploited by a symbol-decision-based equalizer. This allows the equalizer to operate at low SNR conditions, yet avoid an associated increase in complexity.
- CCK has structure that allows the use of a Fast Walsh Transform for the correlator in the demodulator.
- A channel matched filter can be used as the RAKE processing, providing SNR enhancement.
- The RAKE front-end minimizes the need for heavy precursor equalization.
- The equalizer processing is dominated by simple add/subtract operations in feedback multipath-tail canceling.

CCK Modulator Technique for 11 MBps

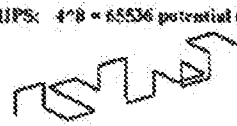


CODE DIMENSIONALITY

8 BPSK CHIPS: 2^8 = 256 potential code words

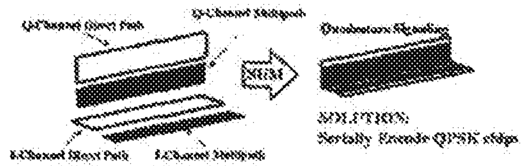


8 QPSK CHIPS: 4^8 = 65536 potential code words



I/Q MULTIPATH CORRUPTION

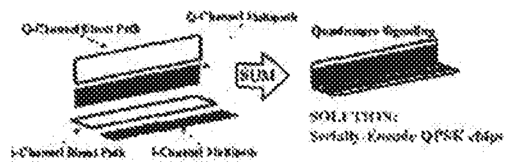
- Parallel encoded quadrature waveforms can be corrupted by multipath phase rotations



SOLUTION:
Serially Encode QPSK chips

I/Q MULTIPATH CORRUPTION

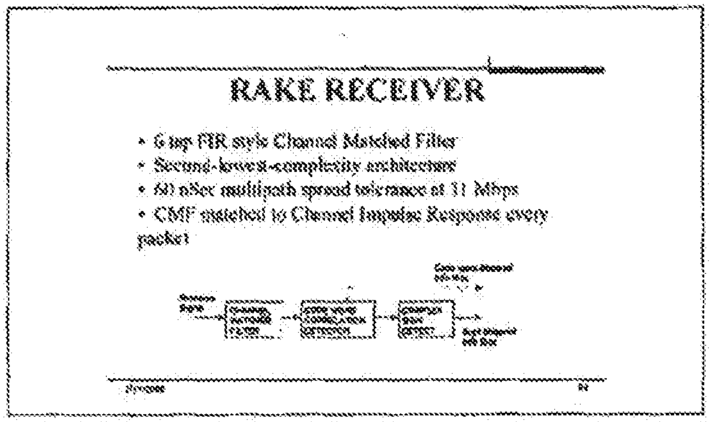
- Parallel encoded quadrature waveforms can be corrupted by multipath phase rotations

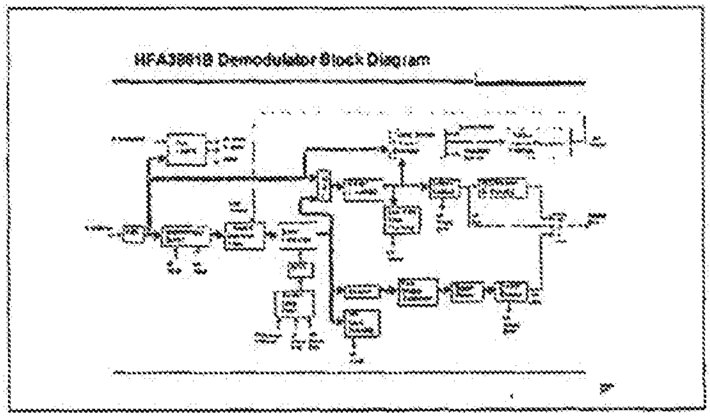


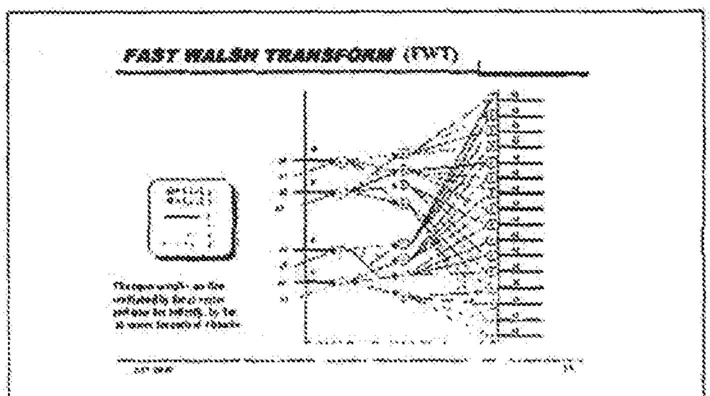
SOLUTION:
Serially Encode QPSK chips

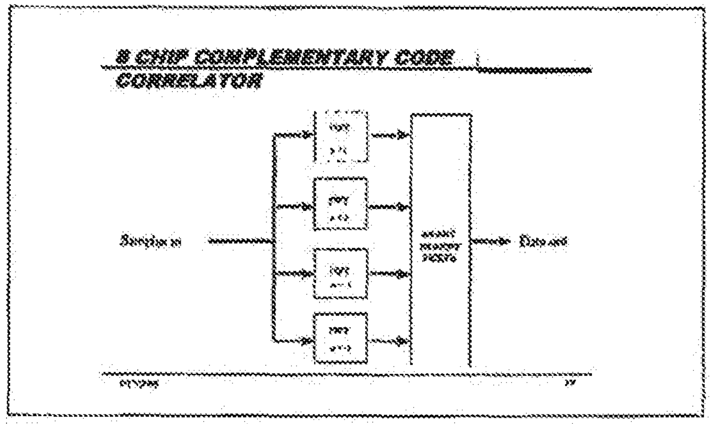
Complementary Codes Are Good with RAKE receivers

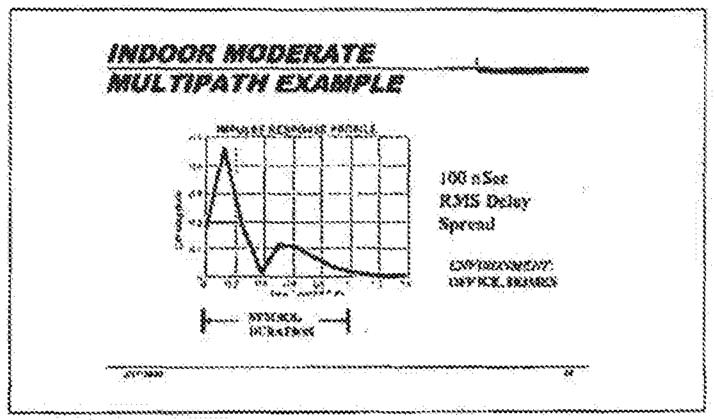
- They are orthogonal (plays into maximizing separation distance). Large distance gives good error-rate performance.
- A cover code does not destroy orthogonality.
- The autocorrelation properties tend to hold across all the code set for a given cover code.
- Since the autocorrelation lags (other than lag zero) sum to zero across the code set, the distance is good (large).

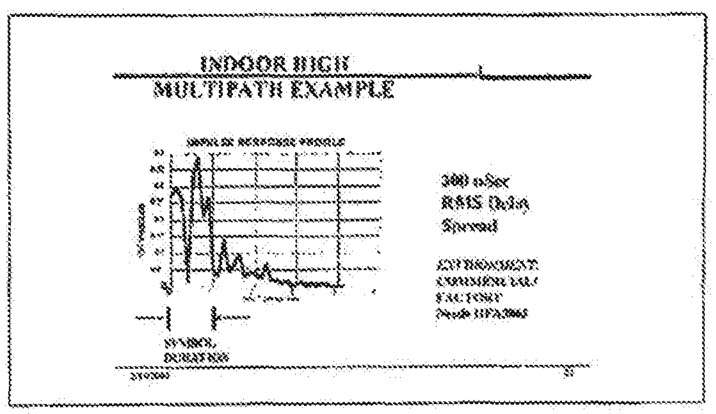

RAKE RECEIVER
• 6 tap FIR style Channel Matched Filter
• Second-lowest-complexity architecture
• 60 nSec multipath spread tolerance at 11 Mbps
• CMF matched to Channel Impulse Response every packet


HFA3861B Demodulator Block Diagram


FAST WALSH TRANSFORM (FWT)

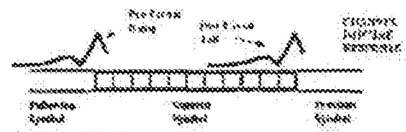

8 CHIP COMPLEMENTARY CODE
CORRELATOR
Samples in
Data out


INDOOR MODERATE
MULTIPATH EXAMPLE
100 nSec
RMS Delay
Spread


INDOOR HIGH
MULTIPATH EXAMPLE
300 nSec
RMS Delay
Spread

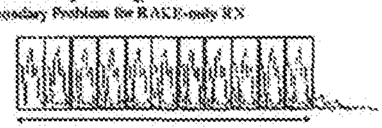
MULTIPATH: ISI LOSS

- InterSymbol Interference (ISI)
- Symbols Smeared Together
- Previous Symbol: Post-Cursor ISI
- Preceding Symbol: Pre-Cursor ISI
- Primary Problem for RAKE only RX



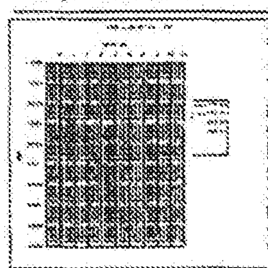
MULTIPATH: ICI LOSS

- InterChip (sub-symbol) Interference (ICI)
- Chips Smeared Together
- Previous Chip: Post-Cursor ICI
- Preceding Chip: Pre-Cursor ICI
- Code word Orthogonality Lost
- Code word Equal-Energy Lost
- Secondary Problem for RAKE-only RX

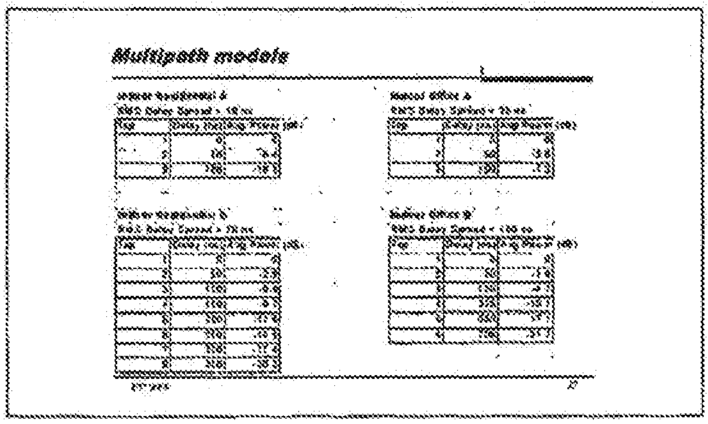


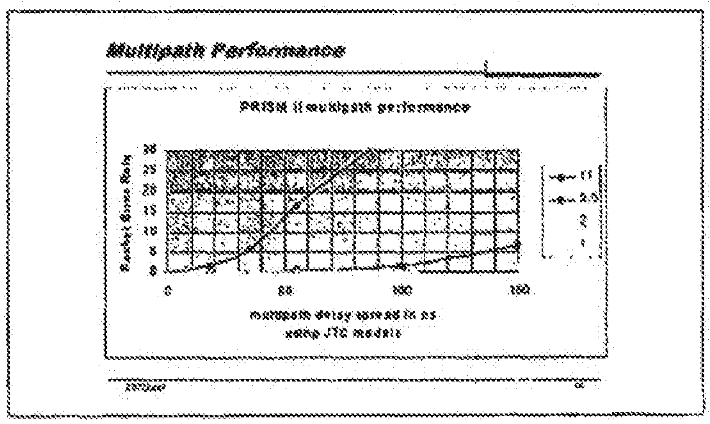
Symbol's Chips are Smeared

CCK performance



CCK performs better than BPSK in an Eb/N0 sense due to imbedded coding properties.


Multipath models


Multipath Performance
PRISM II multipath performance
multipath delay spread in ns
using JTC models

HARRIS SEMICONDUCTOR

HSP3824

Direct Sequence Spread Spectrum Baseband Processor

October 1996

Features

- Complete DSSS Baseband Processor
- High Data Rate. .up to 4 MBPS
- Processing Gain . . . . up to 12dB
- Programmable PN Code . . . . up to 16 Bits
- Ultra Small Package . . . . 7 x 7 x 1mm
- Single Supply Operation (33MHz Max) . . 2.7V to 5.5V
- Single Supply Operation (44MHz Max) . . 3.3V to 5.5V
- Modulation Method . . . . DBPSK or DQPSK
- Supports Full or Half Duplex Operations
- On-Chip A/D Converters for I/Q Data (3-Bit, 44 MSPS) and RSSI (6-Bit, 2 MSPS)

Applications

- Systems Targeting IEEE802.11 Standard
- DSSS PCMCIA Wireless Transceiver
- Spread Spectrum WLAN RF Modems
- TDMA Packet Protocol Radios
- Part 15 Compliant Radio Links
- Portable Bar Code Scanners/POS Terminal
- Portable PDA/Notebook Computer
- Wireless Digital Audio
- Wireless Digital Video
- PCN/Wireless PBX

PRISM™

Description

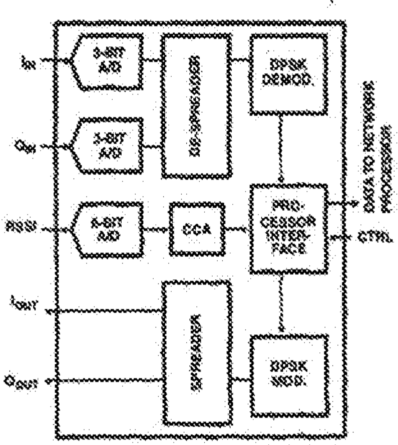
The Harris HSP3824 Direct Sequence (DSSS) baseband processor is part of the PRISM™ 2.4GHz radio chipset, and contains all the functions necessary for a full or half duplex packet baseband transceiver.

The HSP3824 has on-board ADC's for analog I and Q inputs, for which the HFA3724 IF QMODEM is recommended. Differential phase shift keying modulation schemes DBPSK and DQPSK, with optional data scrambling capability, are combined with a programmable PN sequence of up to 16 bits. Built-in flexibility allows the HSP3824 to be configured through a general purpose control bus, for a wide range of applications. A Receive Signal Strength Indicator (RSSI) monitoring function with on-board 6-bit 2 MSPS ADC provides Clear Channel Assessment (CCA) to avoid data collisions and optimize network throughput. The HSP3824 is housed in a thin plastic quad flat package (TQFP) suitable for PCMCIA board applications.

Ordering Information

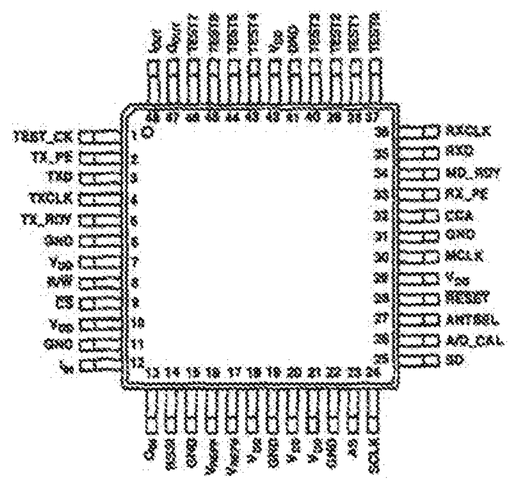
PART NO.	TEMP. RANGE (°C)	PKG. TYPE	PKG. NO.
HSP3824VI	-40 to 85	48 Lead TQFP	Q48.7x7

Simplified Block Diagram



Pinout

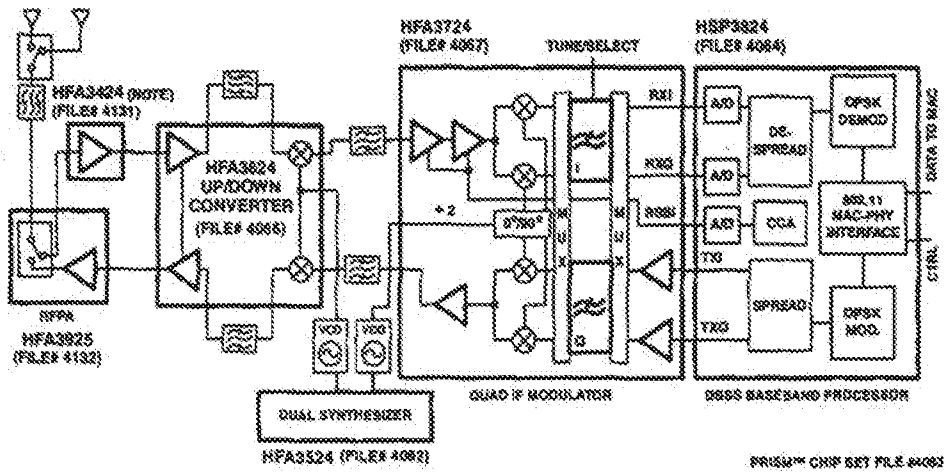
HSP3824 (TQFP)



File Number 4064.4

List of Contents

Typical Application Diagram



TYPICAL TRANSCEIVER APPLICATION CIRCUIT USING THE HSP3824

NOTE: Required for systems targeting 802.11 specifications.

For additional information on the PRISM™ chip set, call (407) 724-7800 to access Harris' AnswerFAX system. When prompted, key in the four-digit document number (File #) of the datasheets you wish to receive.

The four-digit file numbers are shown in Typical Application Diagram, and correspond to the appropriate circuit.

Pin Description

NAME	PIN	TYPE I/O	DESCRIPTION
V_{DD} (Analog)	10, 18, 20	Power	DC power supply 2.7V - 5.5V
V_{DD} (Digital)	7, 21, 28, 42	Power	DC power supply 2.7V - 5.5V
GND (Analog)	11, 15, 19	Ground	DC power supply 2.7V - 5.5V, ground.
GND (Digital)	6, 22, 31, 41	Ground	DC power supply 2.7V - 5.5V, ground.
V_{REFN}	17	I	"Negative" voltage reference for ADC's (I and Q) (Relative to V_{REFP})
V_{REFP}	16	I	"Positive" voltage reference for ADC's (I, Q and RSSI)
I_{IN}	12	I	Analog input to the internal 3-bit A/D of the In-phase received data.
Q_{IN}	13	I	Analog input to the internal 3-bit A/D of the Quadrature received data.
RSSI	14	I	Receive Signal Strength Indicator Analog Input.
A/D_CAL	25	O	This signal is used internally as part of the I and Q ADC calibration circuit. When the ADC calibration circuit is active, the voltage references of the ADCs are adjusted to maintain the outputs of the ADCs in their optimum range. A logic 1 on this pin indicates that one or both of the ADC outputs are at their full scale value. This signal can be integrated externally as a control voltage for an external AGC.
TX_PE	2	I	When active, the transmitter is configured to be operational, otherwise the transmitter is in standby mode. TX_PE is an input from the external Media Access Controller (MAC) or network processor to the HSP3824. The rising edge of TX_PE will start the internal transmit state machine and the falling edge will inhibit the state machine. TX_PE envelopes the transmit data.
TXD	3	I	TXD is an input, used to transfer serial Data or Preamble/Header information bits from the MAC or network processor to the HSP3824. The data is received serially with the LSB first. The data is clocked in the HSP3824 at the falling edge of TXCLK.
TXCLK	4	O	TXCLK is a clock output used to receive the data on the TXD from the MAC or network processor to the HSP3824, synchronously. Transmit data on the TXD bus is clocked into the HSP3824 on the falling edge. The clocking edge is also programmable to be on either phase of the clock. The rate of the clock will be depending upon the modulation type and data rate that is programmed in the signaling field of the header.
TX_RDY	5	O	When the HSP3824 is configured to generate the preamble and Header information internally, TX_RDY is an output to the external network processor indicating that Preamble and Header information has been generated and that the HSP3824 is ready to receive the data packet from the network processor over the TXD serial bus. The TX_RDY returns to the inactive state when the TX_PE goes inactive indicating the end of the data transmission. TX_RDY is an active high signal. This signal is meaningful only when the HSP3824 generates its own preamble.
CCA	32	O	Clear Channel Assessment (CCA) is an output used to signal that the channel is clear to transmit. The CCA algorithm is user programmable and makes its decision as a function of RSSI, Energy detect (ED), Carrier Sense (CRS) and the CCA watch dog timer. The CCA algorithm and its programmable features are described in the data sheet. Logic 0 = Channel is clear to transmit. Logic 1 = Channel is NOT clear to transmit (busy). NOTE: This polarity is programmable and can be inverted.
RXD	35	O	RXD is an output to the external network processor transferring demodulated Header information and data in a serial format. The data is sent serially with the LSB first. The data is frame aligned with MD_RDY.
RXCLK	36	O	RXCLK is the clock output bit clock. This clock is used to transfer Header information and data through the RXD serial bus to the network processor. This clock reflects the bit rate in use.RXCLK will be held to a logic "0" state during the acquisition process. RXCLK becomes active when the HSP3824 enters in the data mode. This occurs once bit sync is declared and a valid signal quality estimate is made, when comparing the programmed signal quality thresholds.

Pin Description (Continued)

NAME	PIN	TYPE I/O	DESCRIPTION
MD_RDY	34	O	MD_RDY is an output signal to the network processor, indicating a data packet is ready to be transferred to the processor. MD_RDY is an active high signal and it envelopes the data transfer over the RXD serial bus. MD_RDY returns to its inactive state when there is no more receiver data, when the programmable data length counter reaches its value or when the link has been interrupted. MD_RDY remains inactive during preamble synchronization.
RX_PE	33	I	When active, receiver is configured to be operational, otherwise receiver is in standby mode. This is an active high input signal.
ANTSEL	27	O	The antenna select signal changes state as the receiver switches from antenna to antenna during the acquisition process in the antenna diversity mode.
SD	25	I/O	SD is a serial bi-directional data bus which is used to transfer address and data to/from the internal registers. The bit ordering of an 8-bit word is MSB first. The first 8 bits during transfers indicate the register address immediately followed by 8 more bits representing the data that needs to be written or read at that register.
SCLK	24	I	SCLK is the clock for the SD serial bus.The data on SD is clocked at the rising edge. SCLK is an input clock and it is asynchronous to the internal master clock (MCLK)The maximum rate of this clock is 10MHz or the master clock frequency, whichever is lower.
AS	23	I	AS is an address strobe used to envelope the Address or the data on SD. Logic 1 = envelopes the address bits. Logic 0 = envelopes the data bits.
$R/\overline{W}$	8	I	$R/\overline{W}$ is an input to the HSP3824 used to change the direction of the SD bus when reading or writing data on the SD bus. $R/\overline{W}$ must be set up prior to the rising edge of SCLK. A high level indicates read while a low level is a write.
$\overline{CS}$	9	I	$\overline{CS}$ is a Chip select for the device to activate the serial control port.The $\overline{CS}$ doesn't impact any of the other interface ports and signals, i.e. the TX or RX ports and interface signals. This is an active low signal. When inactive SD, SCLK, AS and $R/\overline{W}$ become "don't care" signals.
TEST 0-7	37, 38, 39, 40, 43, 44, 45, 46	O	This is a data port that can be programmed to bring out internal signals or data for monitoring. This data includes: Correlator phase and magnitude, NCO frequency offset estimate, and signal quality estimates. Some of the discrete signals available include: Carrier Sense (CRS), which becomes active when initial PN acquisition has been declared, Energy Detect (ED) which becomes active when the integrated RSSI value exceeds the programmable threshold. Both ED and CRS are active high signals.These bits are primarily reserved by the manufacturer for testing. A further description of the test port is given at the appropriate section of this data sheet.
TEST_CK	1	O	This is the clock that is used in conjunction with the data that is being output from the test bus (TEST 0-7).
$\overline{RESET}$	28	I	Master reset for device. When active TX and RX functions are disabled. If $\overline{RESET}$ is kept low the HSP3824 goes into the power standby mode. $\overline{RESET}$ does not alter any of the configuration register values nor it presets any of the registers into default values. Device requires programming upon power-up. $\overline{RESET}$ must be inactive during programming of the device.
MCLK	30	I	Master Clock for device. The maximum frequency of this clock is 44MHz. This is used internally to generate all other internal necessary clocks and is divided by 1, 2, 4, or 8 for the transceiver clocks.
I_{OUT}	48	O	TX Spread baseband I digital output data. Data is output at the programmed chip rate.
Q_{OUT}	47	O	TX Spread baseband Q digital output data. Data is output at the programmed chip rate.

NOTE: Total of 48 pins; ALL pins are used.

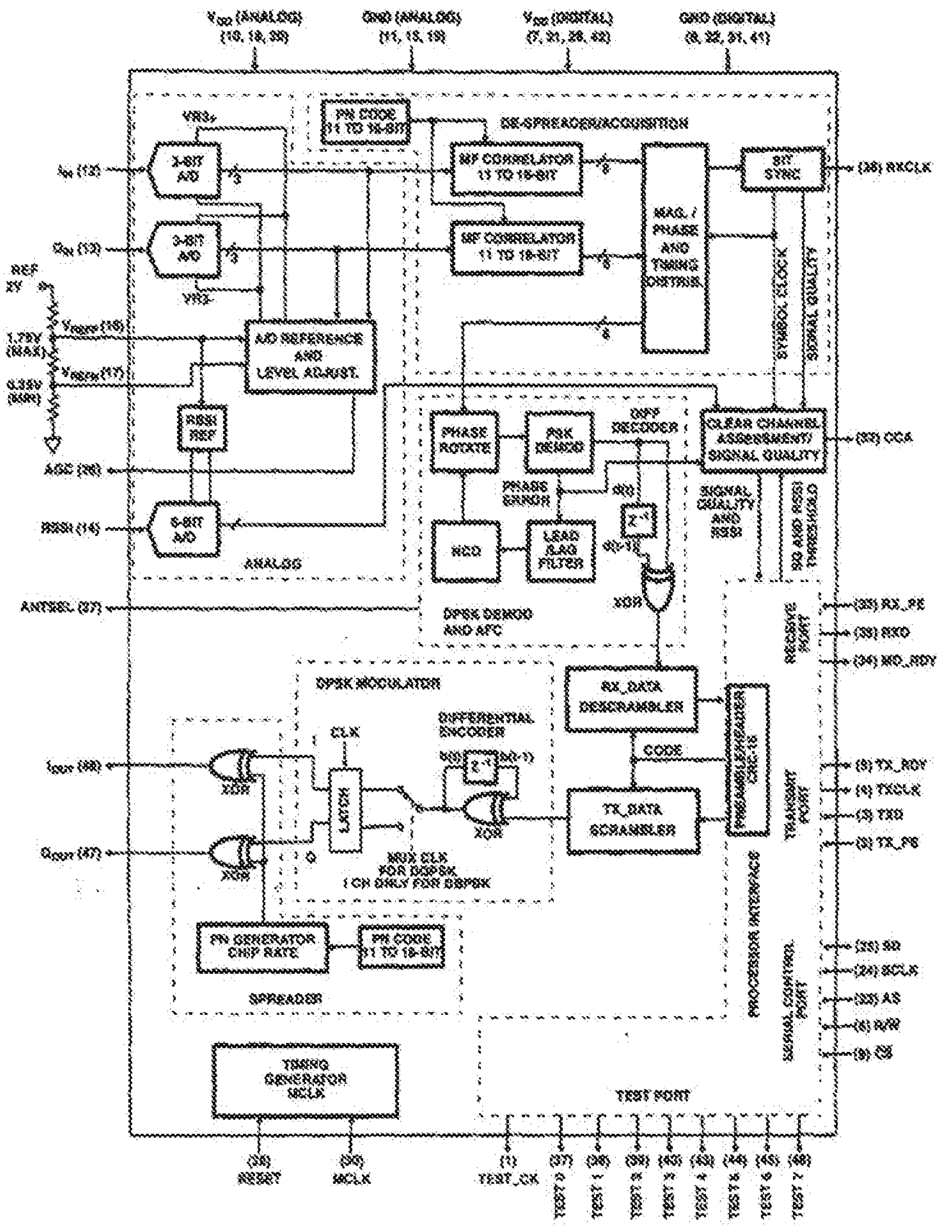


FIGURE 1. DSSS BASEBAND PROCESSOR

External Interfaces

There are three primary digital interface ports for the HSP3824 that are used for configuration and during normal operation of the device. These ports are:

- The TX Port, which is used to accept the data that needs to be transmitted from the network processor.
- The RX Port, which is used to output the received demodulated data to the network processor.
- The Control Port, which is used to configure, write and/or read the status of the internal HSP3824 registers.

In addition to these primary digital interfaces the device includes a byte wide parallel Test Port which can be configured to output various internal signals and/or data (i.e. PN acquisition indicator, Correlator magnitude output etc.). The device can also be set into various power consumption modes by external control. The HSP3824 contains three Analog to Digital (A/D) converters. The analog interfaces to the HSP3824 include, the in phase (I) and quadrature (Q) data component inputs, and the RF signal strength indicator input. A reference voltage divider is also required external to the device.

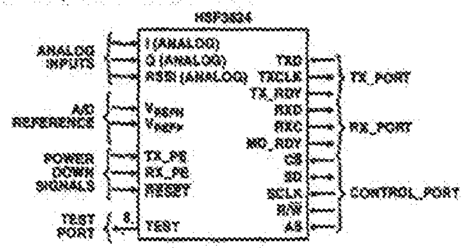
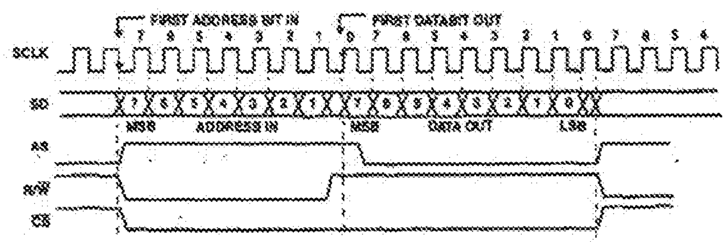


FIGURE 2. EXTERNAL INTERFACES

Control Port

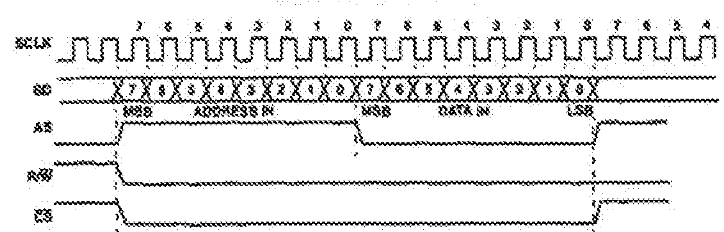
The serial control port is used to serially write and read data to/from the device. This serial port can operate up to a 10MHz rate or the maximum master clock rate of the device, MCLK (whichever is lower). MCLK must be running and $\overline{RESET}$ inactive during programming. This port is used to program and to read all internal registers. The first 8 bits always represent the address followed immediately by the 8 data bits for that register. The two LSBs of address are don't care. The serial transfers are accomplished through the serial data pin (SD). SD is a bidirectional serial data bus. An Address Strobe (AS), Chip Select ($\overline{CS}$), and Read/$\overline{Write}$ (R/$\overline{W}$) are also required as handshake signals for this port. The clock used in conjunction with the address and data on SD is SCLK. This clock is provided by the external source and it is an input to the HSP3824. The timing relationships of these signals are illustrated on Figure 3 and 4. AS is active high during the clocking of the address bits. R/$\overline{W}$ is high when data is to be read, and low when it is to be written. $\overline{CS}$ must be active (low) during the entire data transfer cycle. $\overline{CS}$ selects the device. The serial control port operates asynchronously from the TX and RX ports and it can accomplish data transfers independent of the activity at the other digital or analog ports. $\overline{CS}$ does not effect the TX or RX operation of the device; impacting only the operation of the Control port. The HSP3824 has 57 internal registers that can be configured through the control port. These registers are listed in the Configuration and Control Internal Register table. Table 1 lists the configuration register number, a brief name describing the register, and the HEX address to access each of the registers. The type indicates whether the corresponding register is Read only (R) or Read/Write (R/W). Some registers are two bytes wide as indicated on the table (high and low bytes).



NOTES:

1. Using falling edge SCLK to generate address/control and capture read data.
2. The $\overline{CS}$ is a synchronous interface in reference to SCLK. There is at least one clock required before $\overline{CS}$ transitions to its active state.

FIGURE 3. CONTROL PORT READ TIMING



NOTE: Using falling edge SCLK to generate address/control and data.

FIGURE 4. CONTROL PORT WRITE TIMING

TABLE 1. CONFIGURATION AND CONTROL INTERNAL REGISTER LIST

CONFIGURATION REGISTER	NAME	TYPE	REGISTER ADDRESS HEX
CR0	Modem Config. Register A	R/W	00
CR1	Modem Config. Register B	R/W	04
CR2	Modem Config. Register C	R/W	08
CR3	Modem Config. Register D	R/W	0C
CR4	Internal Test Register A	R/W	10
CR5	Internal Test Register B	R/W	14
CR6	Internal Test Register C	R	18
CR7	Modem Status Register A	R	1C
CR8	Modem Status Register B	R	20
CR9	I/O Definition Register	R/W	24
CR10	RSSI Value Register	R	28
CR11	ADC_CAL_POS Register	R/W	2C
CR12	ADC_CAL_NEG Register	R/W	30
CR13	TX_Spread Sequence (High)	R/W	34
CR14	TX_Spread Sequence (Low)	R/W	38
CR15	Scramble_Seed	R/W	3C
CR16	Scramble_Tap (RX and TX)	R/W	40
CR17	CCA_Timer_TH	R/W	44
CR18	CCA_Cycle_TH	R/W	48
CR19	RSSI_TH	R/W	4C
CR20	RX_Spread Sequence (High)	R/W	50
CR21	RX_Spread Sequence (Low)	R/W	54
CR22	RX_SQ1_ ACQ (High) Threshold	R/W	58
CR23	RX-SQ1_ ACQ (Low) Threshold	R/W	5C
CR24	RX-SQ1_ ACQ (High) Read	R	60
CR25	RX-SQ1_ ACQ (Low) Read	R	64
CR26	RX-SQ1_ Data (High) Threshold	R/W	68
CR27	RX-SQ1-SQ1_ Data (Low) Threshold	R/W	6C
CR28	RX-SQ1_ Data (High) Read	R	70
CR29	RX-SQ1_ Data (Low) Read	R	74
CR30	RX-SQ2_ ACQ (High) Threshold	R/W	78
CR31	RX-SQ2- ACQ (Low) Threshold	R/W	7C
CR32	RX-SQ2_ ACQ (High) Read	R	80

TABLE 1. CONFIGURATION AND CONTROL INTERNAL REGISTER LIST (Continued)

CONFIGURATION REGISTER	NAME	TYPE	REGISTER ADDRESS HEX
CR33	RX-SQ2_ ACQ (Low) Read	R	84
CR34	RX-SQ2_Data (High) Threshold	R/W	88
CR35	RX-SQ2_Data (Low) Threshold	R/W	8C
CR36	RX-SQ2_Data (High) Read	R	90
CR37	RX-SQ2_Data (Low) Read	R	94
CR38	RX_SQ_Read; Full Protocol	R	98
CR39	Reserved (must load 00h)	W	9C
CR40	Reserved (must load 00h)	W	A0
CR41	UW_Time Out_Length	R/W	A4
CR42	SIG_DBPSK Field	R/W	A8
CR43	SIG_DQPSK Field	R/W	AC
CR44	RX_SER_Field	R	B0
CR45	RX_LEN Field (High)	R	B4
CR46	RX_LEN Field (Low)	R	B8
CR47	RX_CRC16 (High)	R	BC
CR48	RX_CRC16 (Low)	R	C0
CR49	UW (High)	R/W	C4
CR50	UW (Low)	R/W	C8
CR51	TX_SER_F	R/W	CC
CR52	TX_LEN (High)	R/W	D0
CR53	TX_LEN (LOW)	R/W	D4
CR54	TX_CRC16 (HIGH)	R	D8
CR55	TX_CRC16 (LOW)	R	DC
CR56	TX_PREM_LEN	R/W	E0

TX Port

The transmit data port accepts the data that needs to be transmitted serially from an external data source. The data is modulated and transmitted as soon as it is received from the external data source. The serial data is input to the HSP3824 through TXD using the falling edge of TXCLK to clock it in the HSP3824. TXCLK is an output from the HSP3824. A timing scenario of the transmit signal handshakes and sequence is shown on timing diagram Figures 5 and 6.

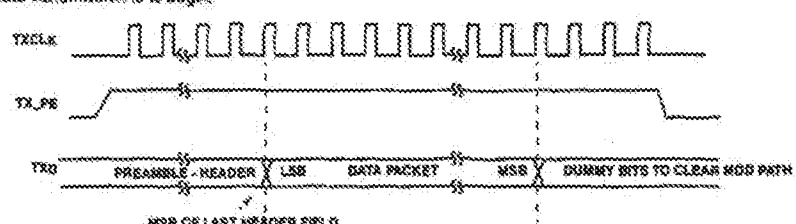
The external processor initiates the transmit sequence by asserting TX_PE. TX_PE envelopes the transmit data packet on TXD. The HSP3824 responds by generating TXCLK to input the serial data on TXD. TXCLK will run until TX_PE goes back to its inactive state indicating the end of the data packet. There are two possible transmit scenarios.

One scenario is when the HSP3824 internally generates the preamble and header information. During this mode the external source needs to provide only the data portion of the packet. The timing diagram of this mode is illustrated on Figure 6. When the HSP3824 generates the preamble internally, assertion of TX_PE will initialize the generation of the preamble and header. TX_RDY, which is an output from the HSP3824, is used to indicate to the external processor that the preamble has been generated and the device is ready to receive the data packet to be transmitted from the external processor. The TX_RDY timing is programmable in case the external processor needs several clocks of advanced notice before actual data transmission is to begin.

The second transmit scenario supported by the HSP3824 is when the preamble and header information are provided by the external data source. During this mode TX_RDY is not required as part of the TX handshake. The HSP3824 will immediately start transmitting the data available on TXD upon assertion of TX_PE. The timing diagram of this TX scenario, where the preamble and header are generated external to the HSP3824, is illustrated on Figure 5.

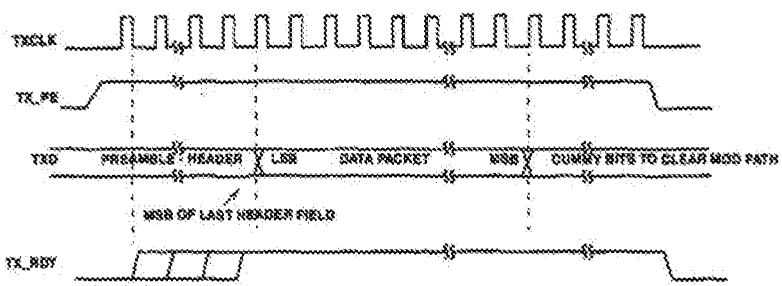
One other signal that can be used for certain applications as part of the TX interface is the Clear Channel Assessment (CCA) signal which is an output from the HSP3824. The CCA is programmable and it is described with more detail in the Transmitter section of this document. CCA provides the indication that the channel is clear of energy and the transmission will not be subject to collisions. CCA can be monitored by the external processor to assist in deciding when to initiate transmissions. The CCA indication can bypassed or ignored by the external processor. The state of the CCA does not effect the transmit operation of the HSP3824. TX_PE alone will always initiate the transmit state independent of the state of CCA. Signals TX_RDY, TX_PE and TXCLK can be set individually, by programming Configuration Register (CR) 9, as either active high or active low signals.

The transmit port is completely independent from the operation of the other interface ports including the RX port, therefore supporting a full duplex mode.



NOTE: Preamble/Header and Data is transmitted LSB first TX_RDY is inactive Logic 0 when generated externally. TXD shown generated from rising edge TXCLK.

FIGURE 5. TX PORT TIMING (EXTERNAL PREAMBLE)



NOTE: Preamble/Header and Data is transmitted LSB first. TXD shown generated from rising edge TXCLK. TX_RDY generated from falling edge.

FIGURE 6. TX PORT TIMING (INTERNAL PREAMBLE)

RX Port

The timing diagram Figure 7 illustrates the relationships between the various signals of the RX port. The receive data port serially outputs the demodulated data from RXD. The data is output as soon as it is demodulated by the HSP3824. RX_PE must be at its active state throughout the receive operation. When RX_PE is inactive the device's receive functions, including acquisition, will be in a stand by mode.

RXCLK is an output from the HSP3824 and is the clock for the serial demodulated data on RXD. MD_RDY is an output from the HSP3824 and it envelopes the valid data on RXD. The HSP3824 can be also programmed to ignore error detections during the CCITT - CRC 16 check of the header fields. If programmed to ignore errors the device continues to output the demodulated data in its entirety regardless of the CCITT - CRC 16 check result. This option is programmed through CR 2, bit 5.

Note that RXCLK becomes active after acquisition, well before valid data begins to appear on RXD and MD_RDY is asserted. MD_RDY returns to its inactive state under the following conditions:

- The number of data symbols, as defined by the length field in the protocol, has been received and output through RXD in its entirety (normal condition).
- PN tracking is lost during demodulation.
- RX_PE is deactivated by the external controller.

MD_RDY can be configured through CR 9, bit 5 to be active low, or active high. Energy Detect (ED) pin 45 (Test port), and Carrier Sense (CRS) pin 46 (Test port), are available outputs from the HSP3824 and can be useful signals for an effective RX interface design. Use of these signals is optional. CRS and ED are further described within this document. The receive port is completely independent from the operation of the other interface ports including the TX port, supporting therefore a full duplex mode.

I/Q ADC Interface

The PRISM baseband processor chip (HSP3824) includes two 3-bit Analog to Digital converters (ADCs) that sample the analog input from the IF down converter. The I/Q ADC clock, MCLK, samples at twice the chip rate. The maximum sampling rate is 44MHz (power supply: 3.3V to 5.0V) or 33MHz (power supply 2.7V to 5.5V).

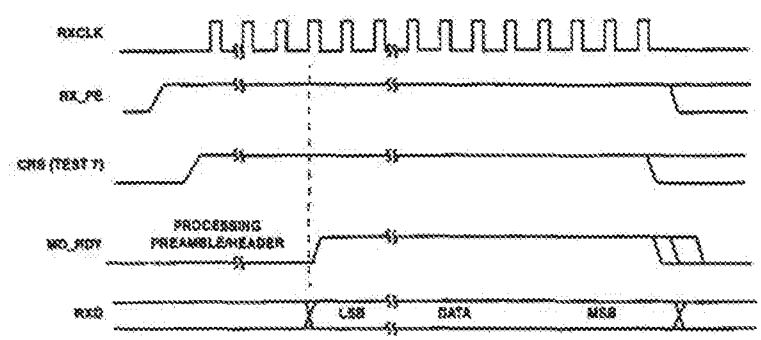
The interface specifications for the I and Q ADCs are listed on Table 2 below.

TABLE 2. I, Q, ADC SPECIFICATIONS

PARAMETER	MIN	TYP	MAX
Full Scale Input Voltage (V_{P-P})	0.25	0.50	1.0
Input Bandwidth (-0.5dB)	-	20MHz	-
Input Capacitance (pF)	-	5	-
Input Impedance (DC)	5kΩ	-	-
FS (Sampling Frequency)	-	-	44MHz

The voltages applied to pin 16, V_{REFP} and pin 17, V_{REFN} set the references for the internal I and Q ADC converters. In addition, V_{REFP} is also used to set the RSSI ADC converter reference. For a nominal 500mV$_{P-P}$, the suggested V_{REFP} voltage is 1.75V, and the suggested V_{REFN} is 0.93V. V_{REFN} should never be less than 0.25V. Since these ADCs are intended to sample AC voltages, their inputs are biased internally and they should be capacitively coupled.

The ADC section includes a compensation (calibration) circuit that automatically adjusts for temperature and component variations of the RF and IF strips. The variations in gain of limiters, AGC circuits, filters etc. can be compensated for up to ±4dB. Without the compensation circuit, the ADCs could see a loss of up to 1.5 bits of the 3 bits of quantization. The ADC calibration circuit adjusts the ADC reference voltages to maintain optimum quantization of the IF input over this variation range. It works on the principle of setting the reference to insure that the signal is at full scale (saturation) a certain percentage of the time. Note that this is not an AGC and it will compensate only for slow variations in signal levels (several seconds).



NOTE: MD_RDY active after CRC16.

FIGURE 7. RX PORT TIMING

The procedure for setting the ADC references to accommodate various input signal voltage levels is to set the reference voltages so that the ADC calibration circuit is operating at half scale. This leaves the maximum amount of adjustment room for circuit tolerances.

Figure 8 illustrates the suggested interface configuration for the ADCs and the reference circuits.

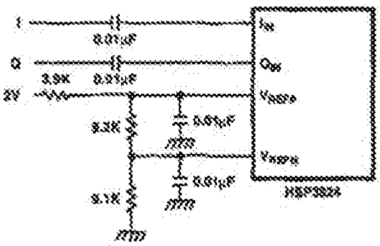


FIGURE 8. INTERFACES

ADC Calibration Circuit and Registers

The ADC compensation or calibration circuit is designed to optimize ADC performance for the I and Q inputs by maintaining the full 3-bit resolution of the outputs. There are two registers (CR 11 AD_CAL_POS and CR 12 AD_CAL_NEG) that set the parameters for the internal I and Q ADC calibration circuit.

Both I and Q ADC outputs are monitored by the ADC calibration circuit and if either has a full scale value, a 24-bit accumulator is incremented as defined by parameter AD_CAL_POS. If neither has a full scale value, the accumulator is decremented as defined by parameter AD_CAL_NEG.

A loop gain reduction is accomplished by using only the 8 MSBs out of the 24 bits to drive a D/A converter that adjusts the ADCs reference. The compensation adjustment is updated at 2kHz rate for a 2 MBPS operation. The ADC calibration circuit is only intended to remove slow component variations.

The ratio of the values from the two registers CR11 and CR12 set the probability that either the I or Q ADC converter will be at the saturation. The probability is set by (AD_CAL_POS)/(AD_CAL_NEG).

This also sets the levels so that operation with either NOISE or DPSK is approximately the same. It is assumed that the RF and IF sections of the receiver have enough gain to cause limiting on thermal noise. This will keep the levels at the ADC approximately same regardless of whether signal is present or not.

The ADC calibration voltage is automatically held during transmit in half duplex operation.

The ADC calibration circuit operation can be defined through CR 1, bits 1 and 0. Table 3 illustrates the possible configurations.

TABLE 3. ADC CALIBRATION

CR 1 BIT 0	CR 1 BIT 1	ADC CALIBRATION CIRCUIT CONFIGURATION
0	0	Automatic real time adjustment of reference.
0	1	Reference set at mid scale.
1	0	Reference held at most recent value.
1	1	Reference set at mid scale.

RSSI ADC Interface

The Receive Signal Strength Indication (RSSI) analog signal is input to a 6-bit ADC, indicating 64 discrete levels of received signal strength. This ADC measures a DC voltage, so its input must be DC coupled. Pin 16 (V_{REFP}) sets the reference for the RSSI ADC converter. V_{REFP} is common for the I and Q and RSSI ADCs. The RSSI signal is used as an input to the programmable Clear Channel Assessment algorithm of the HSP3824. The RSSI ADC output is stored in an 8-bit register (CR10) and it is updated at the symbol rate for access by the external processor to assist in network management.

The interface specifications for the RSSI ADC are listed on Table 4 below (V_{REFP} = 1.75V).

TABLE 4. RSSI ADC SPECIFICATIONS

PARAMETER	MIN	TYP	MAX
Full Scale Input Voltage	-	-	1.19
Input Bandwidth (0.5dB)	1MHz	-	-
Input Capacitance	-	7pF	-
Input Impedance (DC)	1M	-	-

Test Port

The HSP3824 provides the capability to access a number of internal signals and/or data through the Test port, pins TEST 0-7. In addition pin 1 (TEST_CK) is an output clock that can be used in conjunction with the data coming from the test port outputs. The test port is programmable through configuration register (CR5).

There are 8 test modes assigned to the PRISM test port listed in the Test Modes Table 5.

TABLE 5. TEST MODES

MODE	DESCRIPTION	TEST_CLK	TEST (7:0)
0	Normal Operation	TXCLK	CRS, ED, "000", Initial Detect, Reserved (1:0)
1	Correlator Test Mode	TXCLK	Mag (7:0)
2	Frequency Test Mode	DCLK	Frq Reg (7:0)
3	Phase Test Mode	DCLK	Phase (7:0)
4	NCO Test Mode	DCLK	NCO Phase Accum Reg
5	SQ Test Mode	LoadSQ	SQ2 (15:8) Phase Variance
6	Bit Sync Test Mode 1	RXCLK	Bit Sync Accum (7:0)
7	Bit Sync Test Mode 2	LoadSQ	SQ (14:7) Bit Sync Ref-Data

TABLE 5. TEST MODES (Continued)

MODE	DESCRIPTION	TEST_CLK	TEST (7:0)
8	A/D Cal Test Mode	A/D CAL_CK	CRS, ED, "0", ADCal (4:0)
9	Reserved		
10 (0Ah)	Reserved		
11	Reserved		
12	Reserved		
13	Reserved		
14	Reserved		
15	Reserved		

Definitions

Normal - Device in the full protocol mode (Mode 3).

TXCLK - Transmit clock (PN rate).

Initial Detect - Indicates that Signal Quality 1 and 2 (SQ1 and SQ2) exceed their programmed thresholds. Signal qualities are a function of phase error and correlator magnitude outputs.

ED - energy detect indicates that the RSSI value exceeds its programmed threshold.

CRS - indicates that a signal has been acquired (PN acquisition).

Mag - Magnitude output from the correlator.

DCLK - Data symbol clock.

FrqReg - Contents of the NCO frequency register.

Phase - phase of signal after carrier loop correction.

NCO PhaseAccumReg - Contents of the NCO phase accumulation register.

LoadSQ - Strobe that samples and updates Signal Quality, SQ1 and SQ2 values.

SQ2 - Signal Quality measure #2. Signal phase variance after removal of data, 8 MSBs of most recent 16-bit stored value.

RXCLK - Receive clock (RX sample clock). Nominally 22MHz.

BitSyncAccum - Real time monitor of the bit synchronization accumulator contents, mantissa only.

SQ1 - Signal Quality measure #1. Contents of the bit sync accumulator 8 MSBs of most recent 16-bit stored value.

A/D_Cal_ck - Clock for applying A/D calibration corrections.

ADCal - 5-bit value that drives the D/A adjusting the A/D reference.

External AGC Control

The ADC cal output (pin 28) is a binary signal that fluctuates between logic levels as the signals in the I and Q channels are either at full scale or not. If the input level is too high, this output will have a higher duty cycle, and vise versa. Thus, this signal could be integrated with an R-C filter to develop an AGC control voltage. The AGC feedback should be designed to drive it to 50% duty cycle. In the case that an external AGC is in use then the ADC calibration circuit must not be programmed for automatic level adjustment.

Power Down Modes

The power consumption modes of the HSP3824 are controlled by the following control signals.

Receiver Power Enable (RX_PE, pin 33), which disables the receiver when inactive.

Transmitter Power Enable (TX_PE, pin 2), which disables the transmitter when inactive.

Reset ($\overline{\text{RESET}}$, pin 28), which puts the receiver in a sleep mode when it is asserted at least 2 MCLKs after RX_PE is set at its inactive state. The power down mode where, both RESET and RX_PE are used is the lowest possible power consumption mode for the receiver. Exiting this mode requires a maximum of 10μs before the device is back at its operational mode.

The contents of the Configuration Registers is not affected by any of the power down modes. The external processor does not have access and cannot modify any of the CRs during the power down modes. No reconfiguration is required when returning to operational modes.

Table 6 describes the power down modes available for the HSP3824 (V_{CC} = 3.3V). The table values assume that all other inputs to the part (MCLK, SCLK, etc.) continue to run except as noted.

TABLE 6. POWER DOWN MODES

RX_PE	TX_PE	RESET	22MHz	44MHz	DEVICE STATE
Inactive	Inactive	Active	3.9mA	7mA	Both transmit and receive functions disabled. Device in sleep mode. Control interface is still active. Register values are maintained. Device will return to its active state within 10μs.
Inactive	Inactive	Inactive	37mA	50mA	Both transmit and receive operations disabled. Device will become in its active state within 1μs.
Inactive	Active	Inactive	37mA	50mA	Receiver operations disabled. Receiver will return in its active state within 1μs.
Active	Inactive	Inactive	42mA	82mA	Transmitter operations disabled. Transmitter will return to its active state within 2 MCLKs.
I_{CC} Standby			305μA		All inputs at V_{CC} or GND.

Reset

The $\overline{RESET}$ signal is used during the power down mode as described in the Power Down Mode section. The $\overline{RESET}$ does not impact any of the internal configuration registers when asserted. Reset does not set the device to a default configuration, the HSP3824 must always be programmed on power up. The HSP3824 must be programmed with RESET inactive.

Transmitter Description

The HSP3824 transmitter is designed as a Direct Sequence Spread Spectrum DBPSK/DQPSK modulator. It can handle data rates of up to 4 MBPS (refer to AC and DC specifications). The major functional blocks of the transmitter include a network processor interface, DBPSK/DQPSK modulator, a data scrambler and a PN generator, as shown on Figure 9.

The transmitter has the capability to either generate its own synchronization preamble and header or accept the preamble and header information from an external source. In the first case, the transmitter knows when to make the DBPSK to DQPSK switchover, as required.

The preamble and header are always transmitted as DBPSK waveforms while the data packets can be configured to be either DBPSK or DQPSK. The preamble is used by the receiver to achieve initial PN synchronization while the header includes the necessary data fields of the communications protocol to establish the physical layer link. There is a choice of four potential preamble/header formats that the HSP3824 can generate internally. These formats are referred to as mode 0, 1, 2 and 3. Mode 0 uses the minimum number of available header fields while mode 3 is a full protocol mode utilizing all available header fields. The number of the synchronization preamble bits is programmable.

The transmitter accepts data from the external source, scrambles it, differentially encodes it as either DBPSK or DQPSK, and mixes it with the BPSK PN spreading. The baseband digital signals are then output to the external IF modulator.

The transmitter includes a programmable PN generator that can provide 11, 13, 15 or 16 chip sequences. The transmitter also contains a programmable clock divider circuit that allows for various data rates. The master clock (MCLK) can be a maximum of 44MHz.

The chip rates are programmed through CR3 for TX and CR2 for RX. In addition the data rate is a function of the sample clock rate (MCLK) and the number of PN bits per symbol.

The following equations show the Symbol rate for both TX and RX as a function of MCLK, Chips per symbol and N.

N is a programmable parameter through configuration registers CR 2and CR 3. The value of N is 2, 4, 8 or 16. N is used internally to divide the MCLK to generate other required clocks for proper operation of the device.

Symbol Rate = MCLK/(N x Chips per Symbol).

The bit rate Table 7 shows examples of the relationships expressed on the symbol rate equation.

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.

The modulator is completely independent from the demodulator, allowing the PRISM baseband processor to be used in full duplex operation.

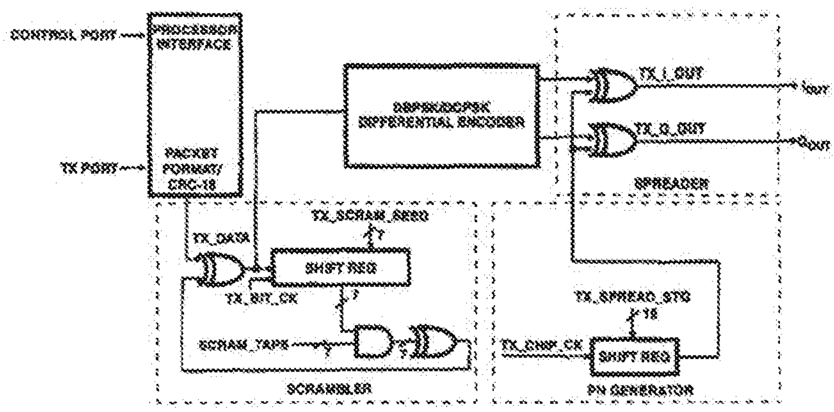


FIGURE 9. MODULATOR DIAGRAM

TABLE 7. BIT RATE TABLE EXAMPLES FOR MCLK = 44MHz

DATA MODULATION	ADC SAMPLE CLOCK (MHz)	TX SETUP CR 3 BITS 4, 3	RX SET UP CR 2 BITS 4, 3	DATA RATE FOR 11 CHIPS/BIT (MBPS)	DATA RATE FOR 13 CHIPS/BIT (MBPS)	DATA RATE FOR 15 CHIPS/BIT (MBPS)	DATA RATE FOR 16 CHIPS/BIT (MBPS)
DQPSK	44	00 (N = 2)	00	4	3.385	2.933	2.75
DQPSK	22	01 (N = 4)	01	2	1.692	1.467	1.375
DQPSK	11	10 (N = 8)	10	1	0.846	0.733	0.688
DQPSK	5.5	11 (N = 16)	11	0.5	0.423	0.367	0.344
DBPSK	44	00 (N = 2)	00	2	1.692	1.467	1.375
DBPSK	22	01 (N = 4)	01	1	0.846	0.733	0.688
DBPSK	11	10 (N = 8)	10	0.5	0.423	0.367	0.344
DBPSK	5.5	11 (N = 16)	11	0.25	0.212	0.183	0.171

Header/Packet Description

The HSP3824 is designed to handle continuous or packetized Direct Sequence Spread Spectrum (DSSS) data transmissions. The HSP3824 can generate its own preamble and header information or it can accept them from an external source.

When preamble and header are internally generated the device supports a synchronization preamble up to 256 symbols, and a header that can include up to five fields. The preamble size and all of the fields are programmable. When internally generated the preamble is all 1's (before entering the scrambler). The actual transmitted pattern of the preamble will be randomized by the scrambler if the user chooses to utilize the data scrambling option.

When the preamble is externally generated the user can choose any desirable bit pattern. Note though, that if the preamble bits will be processed by the scrambler which will alter the original pattern unless it is disabled.

The preamble is always transmitted as a DBPSK waveform with a programmable length of up to 256 symbols long. The HSP3824 requires at least 128 preamble symbols to acquire in a dual antenna configuration (diversity), or a minimum of 78 preamble symbols to acquire under a single antenna configuration. The exact number of necessary preamble symbols should be determined by the system designer, taking into consideration the noise and interference requirements in conjunction with the desired probability of detection vs probability of false alarm for signal acquisition.

The five available fields for the header are:

SFD Field (16 Bits) - This field carries the ID to establish the link. This is a mandatory field for the HSP3824 to establish communications. The HSP3824 will not declare a valid data packet, even if it PN acquires, unless it detects the specific SFD. The SFD field is required for both Internal preamble/header generation and External preamble/header generation. The HSP3824 receiver can be programmed to time out searching for the SFD. The timer starts counting the moment that initial PN synchronization has been established from the preamble.

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.

Service Field (8 Bits) - This field can be utilized as required by the user.

Length Field (16 Bits) - This field indicates the number of data symbols contained in the data packet. The receiver can be programmed to check the length field in determining

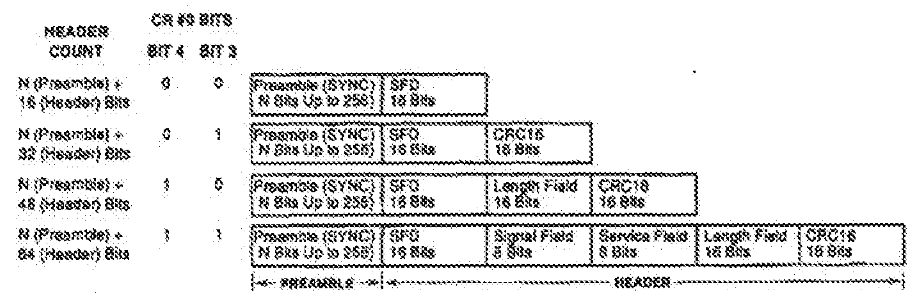


FIGURE 13. PREAMBLE/HEADER MODES

when it needs to de-assert the MD_RDY interface signal. MD_RDY envelopes the received data packet as it is being output to the external processor.

CCITT - CRC 16 Field (16 Bits) - This field includes the 16-bit CCITT - CRC 16 calculation of the five header fields. This value is compared with the CCITT - CRC 16 code calculated at the receiver. The HSP3824 receiver can be programmed to drop the link upon a CCITT - CRC 16 error or it can be programmed to ignore the error and to continue with data demodulation.

The CRC or cyclic Redundancy Check is a CCITT CRC-16 FCS (frame check sequence). It is the ones compliment of the remainder generated by the module 2 division of the protected bits by the polynominal:

$X^{16} + x^{12} + x^{5} + 1$

The protected bits are processed in transmit order. All CRC calculations are made prior to data scrambling. A shift register with two taps is used for the calculation. It is preset to all ones and then the protected fields are shifted through the register. The output is then complimented and the residual shifted out MSB first.

When the HSP3824 generates the preamble and header internally it can be configured into one of four link protocol modes.

Mode 0 - In this mode the preamble is programmable up to 256 bits (all 1's) and the SFD field is the only field utilized for the header. This mode only supports DBPSK transmissions for the entire packet (preamble/header and data).

Mode 1 - In this mode the preamble is programmable up to 256 bits (all 1's) and the SFD and CCITT - CRC 16 fields are used for the header. The data that follows the header can be either DBPSK or DQPSK. The receiver and transmitter must be programmed to the proper modulation type.

Mode 2 - In this mode the preamble is programmable up to 256 bits (all 1's) and the SFD, Length Field, and CCITT - CRC 16 fields are used for the header. The data that follows the header can be either DBPSK or DQPSK. The receiver and transmitter must be programmed to the proper modulation type.

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. This mode is called the full protocol mode in this document.

Figure 10 summarizes the four preamble/header modes. In the case that the device is configured to accept the preamble and header from an external source it still needs to be configured in one of the four modes (0:3). Even though the HSP3824 transmitter does not generate the preamble and header information the receiver needs to know the mode in use so it can proceed with the proper protocol and demodulation decisions.

The following Configuration Registers (CR)are used to program the preamble/header functions, more programming details about these registers can be found in the Control Registers section of this document:

CR 0 - Defines one of the four modes (bits 4, 3) for the TX. Defines whether the SFD timer is active (bit 2). Defines whether the receiver should stop demodulating after the number of symbols indicated in the Length field has been met.

CR 2 - Defines to the receiver one of the four protocol modes (bits 1, 0). Indicates whether any detected CCITT - CRC 16 errors need to reset the receiver (return to acquisition) or to ignore them and continue with demodulation (bit 5). Specifies a 128-bit preamble or an 80-bit preamble (bit 2).

CR 3 - Defines internal or external preamble generation (bit 2). Indicates to the receiver the data packet modulation (bit 0), note that in mode 3 the contents of this register are overwritten by the information in the received signal field of the header. CR 3 specifies the data modulation type used to the transmitter (bit 1). Bit 1 defines the contents of the signaling field in the header to indicate either DBPSK or DQPSK modulation.

CR 41 - Defines the length of time that the demodulator searches for the SFD before returning to acquisition.

CR 42 - The contents of this register indicate that the transmitted data is DBPSK. If CR 4-bit 1 is set to indicate DBPSK modulation then the contents of this register are transmitted in the signal field of the header.

CR 43 - The contents of this register indicates that the transmitted data is DQPSK. If CR 4-bit 1 is set to indicate DQPSK modulation then the contents of this register are transmitted in the signal field of the header.

CR 44, 45, 46, 47, 48 - Status, read only, registers that indicate the service field, data length field and CCITT - CRC 16 field values of the received header.

CR 49, 50 - Defines the transmit SFD field value of the header. The receiver will always search to detect this value before it declares a valid data packet.

CR 51 - Defines the contents of the transmit service field.

CR 52, 53 - Defines the value of the transmit data length field. This value includes all symbols following the last header field symbol.

CR 54,55 - Status, read only, registers indicating the calculated CCITT - CRC 16 value of the most recently transmitted header.

CR 56 - Defines the number of preamble synchronization bits that need to be transmitted when the preamble is internally generated. These symbols are used by the receiver for initial PN acquisition and they are followed by the header fields.

The full protocol requires a setting of 128d = 80h. For other applications, in general increasing the preamble length will improve low signal to noise acquisition performance at the cost of greater link overhead. For dual receive antenna operation, the minimum suggested value is 128d = 80h. For single receive antenna operation, the minimum suggested value is 80d = 50h. These suggested values include a 2 symbol TX power amplifier ramp up. If an AGC is used, its worst case settling time in symbols should be added to these values.

PN Generator Description

The spread function for this radio uses short sequences. The same sequence is applied to every bit. All transmitted symbols, preamble/header and data are always spread by the PN sequence at the chip rate. The PN sequence sets the Processing Gain (PG) of the Direct Sequence receiver. The HSP3824 can be programmed to utilize 11,13,15 and 16 bit sequences. Given the length of these programmable sequences the PG range of the HSP3824 is:

From 10.41dB (10 LOG(11)) to 12.04dB (10 LOG(16))

The transmitter and receiver PN sequences can are programmed independently. This provides additional flexibility to the network designer.

The TX sequence is set through CR 13 and CR 14 while the RX PN sequence is set through CR 20 and CR 21. A maximum of 16 bits can be programmed between the pairs of these configuration registers. For TX Registers CR13 and CR14 contain the high and low bytes of the sequence for the transmitter. In addition Bits 5 and 6 of CR 4 define the sequence length in chips per bit. CR 13, CR 14 and CR 4 must all be programmed for proper functionality of the PN generator. The sequence is transmitted MSB first. When fewer than 16 bits are in the sequence, the MSBs are truncated.

Scrambler and Data Encoder Description

The data coder the implements the desired DQPSK coding as shown in the DQPSK Data Encoder table. This coding scheme results from differential coding of the dibits. When used in the DBPSK modes, only the 00 and 11 dibits are used. Vector rotation is counterclockwise.

TABLE 5. DQPSK DATA ENCODER

PHASE SHIFT	DIBITS
0	00
+90	01
+180	11
-90	10

The data scrambler is a self synchronizing circuit. It consist of a 7-bit shift register with feedback from specified taps of the register, as programmed through CR 16. Both transmitter and receiver use the same scrambling algorithm. All of the bits transmitted are scrambled, including data header and preamble. The scrambler can be disabled.

Scrambling provides additional spreading to each of the spectral lines of the spread DS signal. The additional spreading due to the scrambling will have the same null to null bandwidth, but it will further smear the discrete spectral lines from the PN code sequence. Scrambling might be necessary for certain allocated frequencies to meet transmission waveform requirements as defined by various regulatory agencies.

In the absence of scrambling, the data patterns could contain long strings of ones or zeros. This is definitely the case with the a DS preamble which has a stream of up to 256 continuous ones. The continuous ones would cause the spectrum to be concentrated at the discrete lines defined by the spreading code and potentially cause interference with other narrow band users at those frequencies. Additionally, the DS system itself would be moderately more susceptible to interference at these frequencies. With scrambling, the spectrum is more uniform and these negative effects are reduced, in proportion with the scrambling code length.

Figure 11 illustrates an example of a non scrambled transmission using an 11-bit code with DBPSK modulation with alternate 1's and 0's as data. The data rate is 2 MBPS while the spread rate or chip rate is at 11 MCPS. The 11 spectral lines resulting from the PN code can be clearly seen in Figure 11. In Figure 12, the same signal is transmitted but with the scrambler being on. In this case the spectral lines have been smeared.

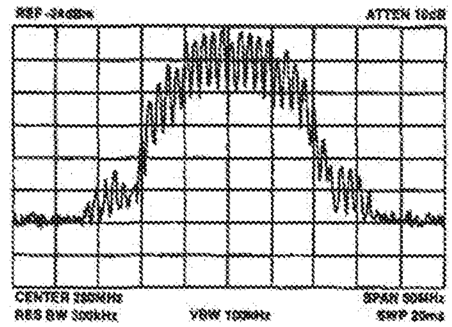


FIGURE 11. UNSCRAMBLED DBPSK DATA OF ALTERNATE 1's0's SPREAD WITH AN 11-BIT SEQUENCE

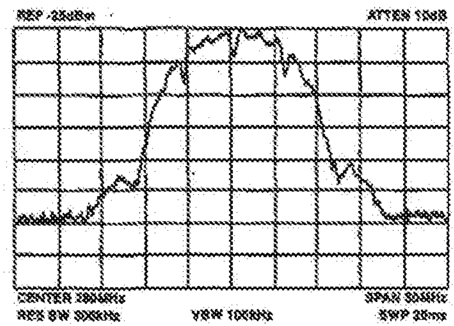


FIGURE 12. SCRAMBLED DBPSK DATA OF ALTERNATE 1's0's SPREAD WITH AN 11-BIT SEQUENCE

Another reason to scramble is to gain a small measure of privacy. The DS nature of the signal is easily demodulated with a correlating receiver. Indeed, the data modulation can be recovered from one of the discrete spectral lines with a narrow band receiver (with a 10dB loss in sensitivity). This means that the signal gets little security from the DS spreading code alone. Scrambling adds a privacy feature to the waveform that would require the listener to know the scrambling parameters in order to listen in. When the data is scrambled it cannot be defeated by listening to one of the scrambling spectral lines since the unintentional receiver in this case is too narrow band to recover the data modulation. This assumes though that each user can set up different scrambling patterns There are 9 maximal length codes that can be utilized with a generator of length 7. The different codes can be used to implement a basic privacy scheme. It needs to be clear though that this scrambling code length and the actual properties of such codes are not a major challenge for a sophisticated intentional interceptor to be listening in. This is why we refer to the scrambling advantage as a communications privacy feature as opposed to a secure communications feature.

Scrambling is done by a polynomial division using a prescribed polynomial. A shift register holds the last quotient and the output is the exclusive-or of the data and the sum of taps in the shift register. The taps and seed are programmable. The transmit scrambler seed is programmed by CR 15 and the taps are set with CR 16. Setting the seed is optional, since the scrambler is self-synchronizing and it will eventually synchronize with the incoming data after flushing the 7 bits stored from the previous transmission.

Modulator Description

The modulator is designed to support both DBPSK and DQPSK signals. The modulator is capable of automatically switching its rate in the case where the preamble and header are DBPSK modulated, and the data is DQPSK modulated. The modulator can support data rates up to 4 MBPS. The programming details of the modulator are given at the introductory paragraph of this section. The HSP3824 can support data rates of up to 4 MBPS (DQPSK) with power supply voltages between 3.3V and 5.0V and data rates of up to 3 MBPS with supply voltages between 2.7V and 5.5V.

Clear Channel Assessment (CCA) and Energy Detect (ED) Description

The clear channel assessment (CCA) circuit implements the carrier sense portion of a carrier sense multiple access (CSMA) networking scheme. The Clear Channel Assessment (CCA) monitors the environment to determine when it is feasible to transmit. The result of the CCA algorithm is available in real time through output pin 32 of the device. The CCA state machine in the HSP3824 can be programmed as a function of RSSI, energy detected on the channel, carrier detection, and a number of on board watchdog timers to time-out under certain conditions. The CCA can be also completely by-passed allowing transmissions independent of any channel conditions. The programmable CCA in combination with the visibility of the various internal parameters (i.e. Energy Detection measurement results), can assist an external processor in executing algorithms that can adapt to the environment. These algorithms can increase network throughput by minimizing collisions and reducing transmissions liable to errors.

There are two measures that are used in the CCA assessment. The receive signal strength (RSSI) which measures the energy at the antenna and the carrier sense (CS), which is triggered upon valid PN correlation of the baseband processor (HSP3824). Both indicators are used since interference can trigger the signal strength indication, but it will not trigger the carrier sense. The carrier sense, however, is slower to respond than the signal strength and it becomes active only when a spread signal with identical PN code has been detected, so it is not adequate in itself. Note that the CS is also vulnerable to false alarms. The CCA looks for changes in these measurements and decides its state based on these measures and the time that has elapsed since the

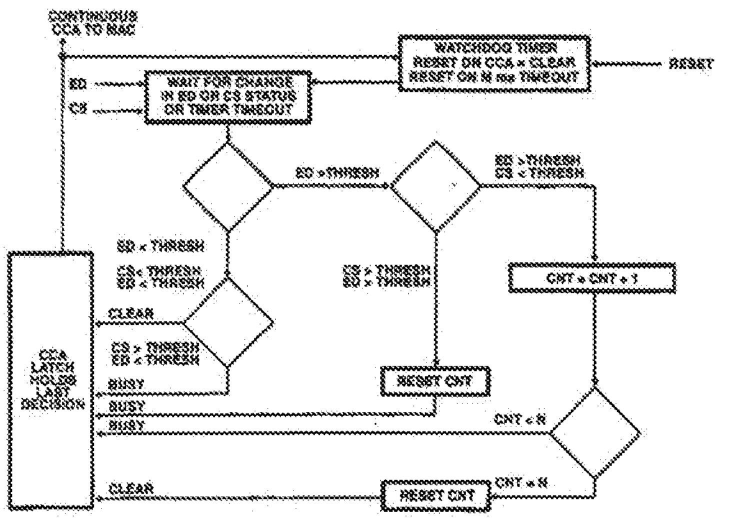


FIGURE 13. CCA FUNCTIONAL FLOW DIAGRAM

channel was last clear. If a source of interference makes it look like the channel is occupied, the circuit will detect a signal without carrier and will wait a proscribed time before deciding to transmit over the interference.

The receive signal strength indication (RSSI) measurement is an analog input to the HSP3824 from the successive IF stage of the radio. The RSSI ADC converts it within the baseband processor and it compares it to a programmable threshold. This threshold is normally set to between -70 and -80dBm. This measure is used in the acquisition decision and is also passed to the clear channel assessment logic. The state diagram in Figure 13 shows the operation of the clear channel assessment state machine.

The energy detection (ED) signal is the digitized RSSI signal. The carrier sense (CS) input is derived from a combination of the Signal Quality 2 (SQ2) based on phase error and the Signal Quality 1(SQ1) based on PN correlator magnitude outputs. Both Signal Quality measures and the ED input are differentiated to sense when they change. These change detectors and the watchdog timer TIME OUT output are combined to initiate a clear channel assessment decision.

The CCA algorithm will always declare the channel busy if CS is active. If only ED is active the state machine will initially declare a busy channel and at the same time it will start timing ED until it meets the programmed time out count. When the time out expires the state machine will declare the channel as being clear even if the ED is still active. This will prevent the transmitter locking out permanently on some persisting interference. This time out period is programmable by 2 parameters that define an inner count M and an outer count N. The total time out period is determined by the time corresponding to the product of MxN. The value of the inner counter M is programmable through CR 17 while the value of the outer counter N is programmable through CR 18. The state machine cycles M times the N count before it asserts CCA, declaring the channel as clear for transmission. Note that the counters are automatically reset to restart the count when CS is detected to be active. In summary the CCA state machine has four basic states. The first state clears the CCA when both the CS and ED are inactive. This indicates that the channel is truly clear.

The second state sets the CCA to BUSY when the CS is active and the ED is inactive. This corresponds to a channel where the signal just went away or dropped below threshold but the carrier is still being sensed. The third state sets the CCA to BUSY and resets the cycle counter when the ED and CS are both active. This is an obviously busy channel.

The fourth state increments the cycle counter if the CS is inactive and the ED is active, and sets the CCA to BUSY if the count is less than N. This is where the channel has just had a new signal come up and the carrier has not yet been acquired or where an interferer turns on.

If the cycle counter reaches N, the counter is reset and the CCA is set to CLEAR. This happens on interference that persists. If the channel has interference, it may be low enough to allow communications. *The CCA state machine does not influence any of the receive or transmit operations within the HSP3824. The CCA algorithm output is an indication to the network processor. The processor can ignore this indicator and decide to have the HSP3824 transmit regardless of the state of CCA.*

The Configuration registers effecting the CCA algorithm operation are summarized below (more programming details on these registers can be found under the Control Registers section of this Document).

The CCA output from pin 32 of the device can be defined as active high or active low through CR 9 (bit 5). The RSSI threshold is set through CR19. If the actual RSSI value from the ADC exceeds this threshold then ED becomes active.

The instantaneous RSSI value can be monitored by the external network processor by reading CR 10. The programmable thresholds on the two signal quality measurements are set through CR22, 23, 30, and 31. Signal Quality 1 and 2 thresholds derive the state of the Carrier Sense. More details on SQ are included under the receiver section of this document.

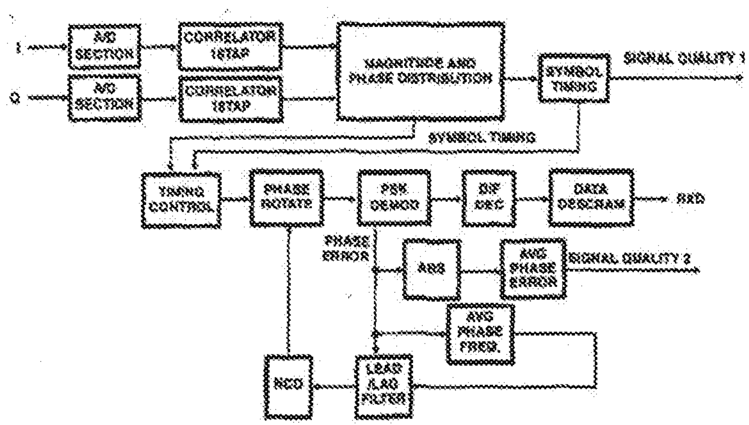


FIGURE 14. DEMODULATOR BLOCK DIAGRAM

Finally, CR 17 and CR 18 are used to set the time out parameters before the CCA algorithm declares permission for transmission.

Receiver Description

The receiver portion of the baseband processor, performs ADC conversion and demodulation of the spread spectrum signal. It correlates the PN spread symbols, then demodulates the DBPSK or DQPSK symbols. The demodulator includes a frequency loop that tracks and removes the carrier frequency offset. In addition it tracks the symbol timing, and differentially decodes and descrambles the data. The data is output through the RX Port to the external processor.

A common practice for burst mode communications systems is to differentially modulate the signal, so that a DPSK demodulator can be used for data recovery. This form of demodulator uses each symbol as a phase reference for the next one. It offers rapid acquisition and tolerance to rapid phase fluctuations at the expense of lower bit error rate (BER) performance.

The PRISM baseband processor, HSP3824 uses differential demodulation for the initial acquisition portion of the processing and then switches to coherent demodulation for the rest of the acquisition and data demodulation. The HSP3824 is designed to achieve rapid settling of the carrier tracking loop during acquisition. Coherent processing substantially improves the BER performance margin. Rapid phase fluctuations are handled with a relatively wide loop bandwidth.

The baseband processor uses time invariant correlation to strip the PN spreading and polar processing to demodulate the resulting signals. These operations are illustrated in Figure 14 which is an overall block diagram of the receiver processor. Input samples from the I and Q ADC converters are correlated to remove the spreading sequence. The magnitude of the correlation pulse is used to determine the symbol timing. The sample stream is decimated to the symbol rate and the phase is corrected for frequency offset prior to PSK demodulation. Phase errors from the demodulator are fed to the NCO through a lead/lag filter to achieve phase lock. The variance of the phase errors is used to determine signal quality for acquisition and lock detection.

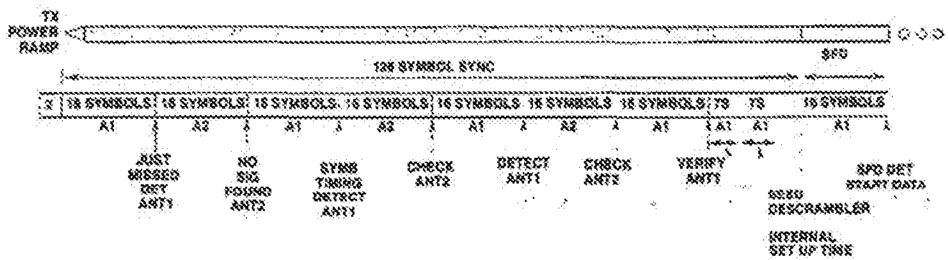
Acquisition Description

The PRISM baseband processor uses either a dual antenna mode of operation for compensation against multipath interference losses or a single antenna mode of operation with faster acquisition times.

Two Antenna Acquisition

During the 2 antenna (diversity) mode the two antennas are scanned in order to find the one with the best representation of the signal. This scanning is stopped once a suitable signal is found and the best antenna is selected.

A projected worst case time line for the acquisition of a signal in the two antenna case is shown in Figure 15. The synchronization part of the preamble is 128 symbols long followed by a 16-bit SFD. The receiver must scan the two antennas to determine if a signal is present on either one and, if so, which has the better signal. The timeline is broken into 16 symbol blocks (dwells) for the scanning process. This length of time is necessary to allow enough integration of the signal to make a good



NOTES:
1. Worst Case Timing: antenna dwell starts before signal is full strength.
2. Time line shown assumes that antenna 2 gets insufficient signal.

FIGURE 15. DUAL ANTENNA ACQUISITION TIMELINE

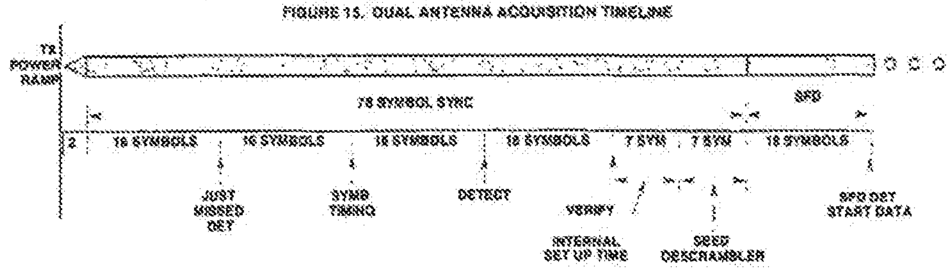


FIGURE 16. SINGLE ANTENNA ACQUISITION TIMELINE

acquisition decision. This worst case time line example assumes that the signal is present on antenna A1 only (A2 is blocked). It further assumes that the signal arrives part way into the first A1 dwell such as to just barely miss detection. The signal and the scanning process are asynchronous and the signal could start anywhere. In this timeline, it is assumed that all 16 symbols are present, but they were missed due to power amplifier ramp up. Since A2 has insufficient signal, the first A2 dwell after the start of the preamble also fails detection. The second A1 dwell after signal start is successful and a symbol timing measurement is achieved.

Meanwhile signal quality and signal frequency measurements are made simultaneous with symbol timing measurements. When the bit sync level, SQ1, and Phase variance SQ2 are above their user programmable thresholds, the signal is declared present for the antenna with the best signal. More details on the Signal Quality estimates and their programmability are given in the Acquisition Signal Quality Parameters section of this document.

At the end of each dwell, a decision is made based on the relative values of the signal qualities of the signals on the two antennas. In the example, antenna A1 is the one selected, so the recorded symbol timing and carrier frequency for A1 are used thereafter for the symbol timing and the PLL of the NCO to begin carrier de-rotation and demodulation.

Prior to initial acquisition the NCO was inactive and DPSK demodulation processing was used. Carrier phase measurement are done on a symbol by symbol basis afterward and coherent DPSK demodulation is in effect. After a brief setup time as illustrated on the timeline of Figure 15, the signal begins to emerge from the demodulator.

If the descrambler is used it takes 7 more symbols to seed the descrambler before valid data is available. This occurs in time for the SFD to be received. At this time the demodulator is tracking and in the coherent PSK demodulation mode it will no longer scan antennas.

One Antenna Acquisition

When only one antenna is being used, the user can delete the antenna switch and shorten the acquisition sequence. Figure 16 shows the single antenna acquisition timeline. It uses a 78 symbol sequence with 2 more for power ramping of the RF front of the radio. This schema deletes the second antenna dwells but performs the same otherwise. It verifies the signal after initial detection for lower false alarm probability.

Acquisition Signal Quality Parameters

Two measures of signal quality are used to determine acquisition and drop lock decisions. The first method of determining signal presence is to measure the correlator output (or bit sync) amplitude. This measure, however, flattens out in the range of high BER and is sensitive to signal amplitude. The second measure is phase noise and in most BER scenarios it is a better indication of good signals plus it is insensitive to signal amplitude. The bit sync amplitude and phase noise are integrated over each block of 16 symbols used in acquisition or over blocks of 128 symbols in the data demodulation mode. The bit sync amplitude measurement represents the peak of the correlation out of the PN correlator. Figure 17 shows the correlation process. The signal is sampled at twice the chip rate (i.e. 22 MSPS). The one sample that falls closest to the peak is used for a bit sync amplitude sample for each symbol. This sample is called the on-time sample. High bit sync amplitude means a good signal. The early and late samples are the two adjacent samples and are used for tracking.

The other signal quality measurement is based on phase noise and that is taken by sampling the correlator output at the correlator peaks. The phase changes due to scrambling are removed by differential demodulation during initial acquisition. Then the phase, the phase rate and the phase variance are measured and integrated for 16 symbols. The phase variance is used for the phase noise signal quality measure. Low phase noise means a stronger received signal.

Procedure to Set Acq. Signal Quality Parameters (Example)

There are four registers that set the acquisition signal quality thresholds, they are: CR 22, 23, 30, and 31 (RX_SQX_IN_ACQ). Each threshold consists of two bytes, high and low that hold a 16-bit number.

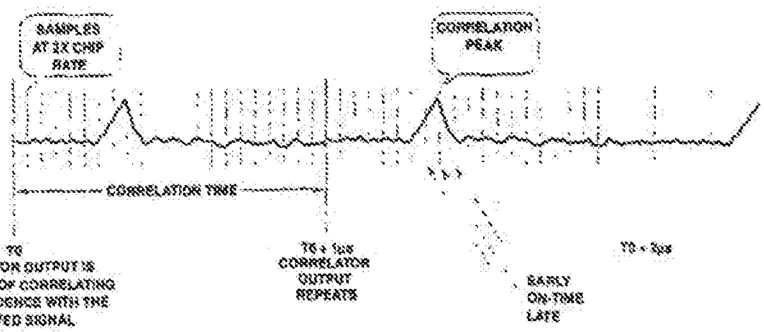


FIGURE 17. CORRELATION PROCESS

The suggested method of optimization is to set the transmitter in a continuous transmit mode. Then, measure the time until the receiver drops lock at low signal to noise ratio. Each of the 2 thresholds should be set individually to the same drop lock time. While setting thresholds for one of the signal qualities the other should be configured at its limit so it does not influence the drop lock decisions. Set CR 28 to 00h while determining the value of CR 34 and 35 for phase error threshold. Set CR 34 to FFh while determining the value of CR 26 and 27 for bit sync. amplitude threshold.

Assuming a 10e-6 BER operating point, it is suggested that the drop lock thresholds are set at 10e-3 BER, with each threshold adjusted individually.

Note that the bit sync amplitude is linearly proportional to the signal amplitude at the ADC converters. If an AGC system is being used instead of a limiter, the bit sync amplitude threshold should be set at or below the minimum amplitude that the radio will see at its sensitivity level.

Data Decoder and Descrambler Description

The data decoder that implements the desired DQPSK coding/decoding as shown in DQPSK Data Decoder Table 9. This coding scheme results from differential coding of the dibits. When used in the DBPSK modes, only the 00 and 11 dibits are used. Vector rotation is counterclockwise.

TABLE 9. DQPSK DATA DECODER

PHASE SHIFT	DIBITS
0	00
+90	01
+180	11
-90	10

The data scrambler and de-scrambler are self synchronizing circuits. They consist of a 7-bit shift register with feedback of some of the taps of the register. The scrambler can be disabled for measuring RF carrier suppression. The scrambler is designed to insure smearing of the discrete spectrum lines produced by the PN code.

One thing to keep in mind is that both the differential decoding and the descrambling when used cause error extension. This causes the errors to occur in groups of 4 and 6. This is due to two properties of the processing. First, the differential decoding process causes errors to occur in pairs. When a symbol error is made, it is usually a single bit error even in QPSK mode. When a symbol is in error, the next symbol will also be decoded wrong since the data is encoded in the change from one symbol to the next. Thus, two errors are made on two successive symbols. In QPSK mode, these may be next to one another or separated by up to 2 bits. Secondly, when the bits are processed by the descrambler, these errors are further extended. The descrambler is a 7-bit shift register with one or more taps exclusive ored with the bit stream. If for example the scrambler polynomial uses 2 taps that are summed with the data, then each error is extended by a factor of three. Since the DPSK errors are close together, however, some of them can be canceled in the descrambler. In this case, two wrongs do make a right, so the observed errors can be in groups of 4 instead of 6.

Descrambling is done by a polynomial division using a prescribed polynomial. A shift register holds the last quotient and the output is the exclusive-or of the data and the sum of taps in the shift register. The taps and seed are programmable. The transmit scrambler seed is programmed by CR 15 and the taps are set with CR 16. One reason for setting the seed is that it can be used to make the SFD scrambling the same every packet so that it can be recognized in its scrambled state.

Demodulator Performance

This section indicates the theoretical performance and typical performance measures for a radio design. The performance data below should be used as a guide. The actual performance depends on the application, interference environment, RF/IF implementation and radio component selection in general.

Overall Eb/N0 Versus BER Performance

The PRISM chip set has been designed to be robust and energy efficient in packet mode communications. The demodulator uses coherent processing for data demodulation. Figure 18 below shows the performance of the baseband processor when used in conjunction with the HSP3724 IF limiter and the PRISM recommended IF filters. Off the shelf test equipment are used for the RF processing. The curves should be used as a guide to assess performance in a complete implementation.

Factors for carrier phase noise, multipath, and other degradations will need to be considered on an implementation by implementation basis in order to predict the overall performance of each individual system.

Figure 18 shows the curve for theoretical DBPSK/DQPSK demodulation with coherent demodulation as well as the PRISM performance measured for DBPSK and DQPSK. The losses include RF and IF radio losses; they do not reflect the HSP3824 losses alone. These are more realistic measurements. The HSP3824 baseband losses from theoretical by themselves are a small percentage of the overall loss.

The PRISM demodulator performs at less than 3dB from theoretical in a AWGN environment with low phase noise local oscillators. The observed errors occurred in groups of 4 and 6 errors and rarely singly. This is because of the error extension properties of differential decoding and descrambling.

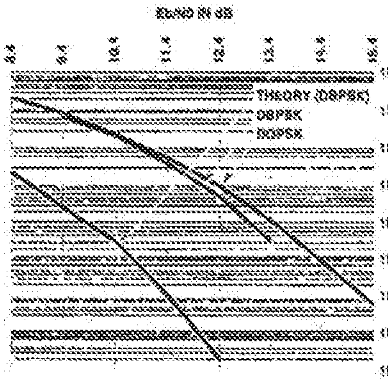


FIGURE 18. BER vs EB/N0 PERFORMANCE

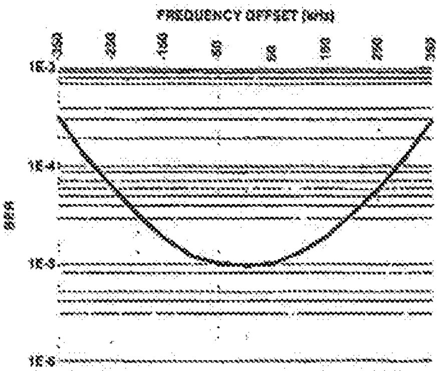


FIGURE 20. BER vs CARRIER OFFSET

Clock Offset Tracking Performance

The PRISM baseband processor is designed to accept data clock offsets of up to ±25ppm for each end of the link (TX and RX). This effects both the acquisition and the tracking performance of the demodulator. The budget for clock offset error is 0.75dB at ±50ppm as shown in Figure 19

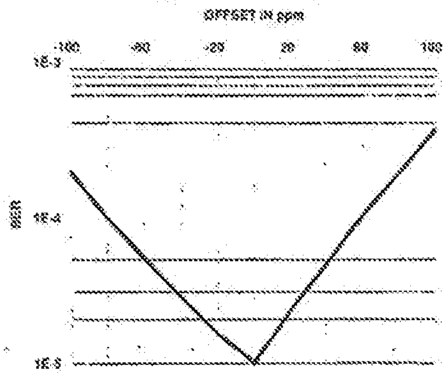


FIGURE 19. BER vs CLOCK OFFSET

Carrier Offset Frequency Performance

The correlators in the baseband processor are time invariant matched filter correlators otherwise known as parallel correlators. They use two samples per chip and are tapped at every other shift register stage. Their performance with carrier frequency offsets is determined by the phase roll rate due to the offset. For an offset of +50ppm (combined for both TX and RX) will cause the carrier to phase roll 22.5 degrees over the length of the correlator. This causes a loss of 0.22dB in correlation magnitude which translates directly to Eb/N0 performance loss. In the PRISM chip design, the correlator is not included in the carrier phase locked loop correction, so this loss occurs for both acquisition and data. Figure 20 shows the loss versus carrier offset taken out to +350kHz (120kHz is 50ppm at 2.4GHz).

I/Q Amplitude Imbalance

Imbalances in the signal cause differing effects depending on where they occur. In a system using a limiter, if the imbalances are in the transmitter, that is, before the limiter, amplitude imbalances translate into phase imbalances between the I and Q symbols. If they occur in the receiver after the limiter, they are not converted to phase imbalances in the symbols, but into vector phase imbalances on the composite signal plus noise. The following curve shows data taken with amplitude imbalances in the transmitter. Starting at the balanced condition, I = 100% of Q, the bit error rate degrades by two orders of magnitude for a 3dB drop in I (70%).

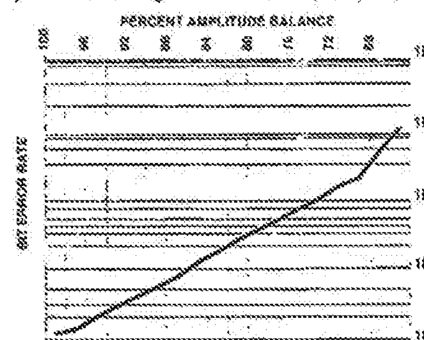


FIGURE 21. I/Q IMBALANCE EFFECTS

A Default Register Configuration

The registers in the HSP3824 are addressed with 14-bit numbers where the lower 2 bits of a 16-bit hexadecimal address are left as unused. This results in the addresses being in increments of 4 as shown in the table below. Table 10 shows the register values for a default Full Protocol configuration (Mode 3) with a single antenna. The data is transmitted as DQPSK. This is a recommended configuration for initial test and verification of the device and for the radio design. The user can later modify the CR contents to reflect the system and the required performance of each specific application

TABLE 10. CONTROL REGISTER VALUES FOR SINGLE ANTENNA ACQUISITION

REGISTER	NAME	TYPE	REG ADDR IN HEX	QPSK	BPSK
CR0	MODEM CONFIG. REG A	R/W	00	3C	64
CR1	MODEM CONFIG. REG B	R/W	04	00	00
CR2	MODEM CONFIG. REG C	R/W	08	07	24
CR3	MODEM CONFIG. REG D	R/W	0C	04	07
CR4	INTERNAL TEST REGISTER A	R/W	10	00	00
CR5	INTERNAL TEST REGISTER B	R/W	14	00	00
CR6	INTERNAL TEST REGISTER C	R	18	X	X
CR7	MODEM STATUS REGISTER A	R	1C	X	X
CR8	MODEM STATUS REGISTER B	R	20	X	X
CR9	I/O DEFINITION REGISTER	R/W	24	00	00
CR10	RSSI VALUESTATUS REGISTER	R	28	X	X
CR11	ADC_CAL_POS REGISTER	R/W	2C	01	01
CR12	ADC_CAL_NEG REGISTER	R/W	30	FD	FD
CR13	TX_SPREAD SEQUENCE(HIGH)	R/W	34	05	05
CR14	TX_SPREAD SEQUENCE (LOW)	R/W	38	B8	B8
CR15	SCRAMBLE_SEED	R/W	3C	00	00
CR16	SCRAMBLE_TAP (RX AND TX)	R/W	40	48	48
CR17	CCA_TIMER_TH	R/W	44	2C	2C
CR18	CCA_CYCLE_TH	R/W	48	03	03
CR19	RSSI_TH	R/W	4C	1E	1E
CR20	RX_SPREAD SEQUENCE (HIGH)	R/W	50	05	05
CR21	RX_SREAD SEQUENCE (LOW)	R/W	54	B8	B8
CR22	RX_SQ1_ IN_ACQ (HIGH) THRESHOLD	R/W	58	01	01
CR23	RX-SQ1_ IN_ACQ (LOW) THRESHOLD	R/W	5C	E8	E8
CR24	RX-SQ1_ OUT_ACQ (HIGH) READ	R	60	X	X
CR25	RX-SQ1_ OUT_ACQ (LOW) READ	R	64	X	X
CR26	RX-SQ1_ IN_DATA (HIGH) THRESHOLD	R/W	68	0F	0F
CR27	RX-SQ1-SQ1_ IN_DATA (LOW) THRESHOLD	R/W	6C	FF	FF
CR28	RX-SQ1_ OUT_DATA (HIGH)READ	R	70	X	X
CR29	RX-SQ1_ OUT_DATA (LOW) READ	R	74	X	X
CR30	RX-SQ2_ IN_ACQ (HIGH) THRESHOLD	R/W	78	00	00

TABLE 10. CONTROL REGISTER VALUES FOR SINGLE ANTENNA ACQUISITION (Continued)

REGISTER	NAME	TYPE	REG ADDR IN HEX	QPSK	BPSK
CR31	RX-SQ2- IN-ACQ (LOW) THRESHOLD	R/W	7C	CA	CA
CR32	RX-SQ2_ OUT_ACQ (HIGH) READ	R	80	X	X
CR33	RX-SQ2_ OUT_ACQ (LOW) READ	R	84	X	X
CR34	RX-SQ2 IN DATA (HIGH)THRESHOLD	R/W	88	C5	09
CR35	RX-SQ2_ IN_DATA (LOW) THRESHOLD	R/W	8C	8C	80
CR36	RX-SQ2_ OUT_DATA (HIGH) READ	R	90	X	X
CR37	RX-SQ2_ OUT_DATA (LOW) READ	R	94	X	X
CR38	RX_SQ_READ: FULL PROTOCOL	R	98	X	X
CR39	RESERVED	W	9C	00	00
CR40	RESERVED	W	A0	00	00
CR41	UW_Time Out_LENGTH	R/W	A4	00	80
CR42	SIG_DBPSK Field	R/W	A8	CA	0A
CR43	SIG_DQPSK Field	R/W	AC	13	14
CR44	RX_SER_Field	R	B0	X	X
CR45	RX_LEN Field (HIGH)	R	B4	X	X
CR46	RX_LEN Field (LOW)	R	B8	X	X
CR47	RX_CRC16 (HIGH)	R	BC	X	X
CR48	RX_CRC16 (LOW)	R	C0	X	X
CR49	UW -(HIGH)	R/W	C4	F3	F3
CR50	UW _(LOW)	R/W	C8	40	A0
CR51	TX_SER_F	R/W	CC	00	00
CR52	TX_LEN (HIGH)	R/W	D0	FF	FF
CR53	TX_LEN(LOW)	R/W	D4	FF	FF
CR54	TX_CRC16 (HIGH)	R	D8	X	X
CR55	TX_CRC16 (LOW)	R	DC	X	X
CR56	TX_PREM_LEN	R/W	E0	80	80

Control Registers

The following tables describe the function of each control register along with the associated bits in each control register.

CONFIGURATION REGISTER 0 ADDRESS (0h) MODEM CONFIGURATION REGISTER A

Bit 7	This bit selects the transmit antenna, controlling the output ANT_SEL pin. It is only used in half duplex mode (Bit 5 = 0) Logic 1 = Antenna A. Logic 0 = Antenna B.
Bit 6	In single antenna operation this bit is used as the output of the ANT_SEL pin. In dual antenna mode this bit is ignored. Logic 1 = Antenna A. Logic 0 = Antenna B
Bit 5	This control bit is used to select between full duplex and half duplex operation. If set for full duplex operation, the ANT_SEL pin reflects the setting of CR0 bit 7 when TX_PE is active and reflects the receiver's choice when TX_PE is inactive. In full duplex operation, the ANT_SEL pin always reflects the receiver's choice antenna. Logic 1 = full duplex. Logic 0 = half duplex
Bit 4, 3	These control bits are used to select one of the four input Preamble Header modes for transmitting data. The preamble and header are DBPSK for all modes of operation. Mode 0 is followed by DBPSK data. For modes 1-3, the data can be configured as either DBPSK or DQPSK. This is a "don't care" if the header is generated externally.

MODE	BIT 4	BIT 3	MODE DESCRIPTION
0	0	0	Preamble with SFD Field.
1	0	1	Preamble with SFD, and CRC16.
2	1	0	Preamble with SFD, Length, and CRC16.
3	1	1	Full preamble and header.

Bit 2	This control bit is used to enable the SFD (Start Frame Delimiter) timer. If the time is set and expires before the SFD has been detected, the HSP3824 will return to its acquisition mode. Logic 1: Enables the SFD timer to start counting once the PN acquisition has been achieved. Logic 0. Disables the SFD Timer.
Bit 1	This control bit enables counting the number of data bits per the length field embedded in the header. Only used in header modes 2 and 3. Then according to the count it returns the processor into its acquisition mode at the end of the count. If length field is 0000h, modem will reset at end of SFD regardless of this bit setting. Logic 1 = Enable Length Time Out. Logic 0 = Disabled.
Bit 0	Unused don't care.

CONFIGURATION REGISTER 1 ADDRESS (04h) MODEM CONFIGURATION REGISTER B

Bit 7	When active this bit maintains the RXCLK and TXCLK rates constant for preamble and data transfers even if the data is modulated in DQPSK. This bit is used if the external processor can not accommodate rate changes. This is an active high signal. The rate used is the QPSK rate and the BPSK header bits are double clocked.
Bit 6, 5, 4, 3, 2	These control bits are used to define a binary count (N) from 0 - 31. This count is used to assert TX_RDY N - clocks (TXCLK) before the beginning of the first data bit. If this is set to zero, then the TX_RDY will be asserted immediately after the last bit of the Preamble Header.
Bit 1	When active the internal A/D calibration circuit sets the reference to mid-scale. When inactive then the calibration circuit adjusts the reference voltage in real time to optimize I, Q levels. Logic 1 = Reference set at mid-scale (fixed). Logic 0 = Real time reference adjustment.
Bit 0	When active the A/D calibration circuit is held at its last value. Logic 1 = Reference held at the most recent value. Logic 0 = Real time reference level adjustment.

CONFIGURATION REGISTER 2 ADDRESS (08h) MODEM CONFIGURATION REGISTER C

Bit 7, 6

These control bits are used to select the number of chips per symbol used in the I and Q paths of the receiver matched filter correlators (see table below).

CHIPS PER SYMBOL	BIT 7	BIT 6
11	0	0
13	0	1
15	1	0
16	1	1

Bit 5

This control bit is used to disable the CRC16 check. When this bit is set, the processor will accept the received packet and any packet error checks have to be detected externally. The HSP3824 will remain in the receive mode until either the carrier is lost or the network processor resets the device to the acquisition mode, or if, in modes 2 or 3, the length times out.
Logic 1 = Disable receiver error checks.
Logic 0 = Enable receiver checks.

Bit 4, 3

These control bits are used to select the divide ratio for the demodulators receive chip clock timing.The value of N is determined by the following equation:
Symbol Rate = MCLK/(N x Chips per symbol).

MASTER CLOCK/N	BIT 4	BIT 3
N = 2	0	0
N = 4	0	1
N = 8	1	0
N = 16	1	1

Bit 2

This control bit sets the receiver into single or dual antenna mode. The Preamble acquisition processing length and whether the modem scans antennas is controlled by this bit. If in single antenna mode, the ANT_SEL pin reflects CR0 bit 6 otherwise it reflects the receiver's choice of antenna.
Logic 0 = Acquisition processing is for dual antenna acquisition.
Logic 1 = Acquisition processing is for single antenna acquisition.

Bit 1, 0

These control bits are used to indicate one of the four Preamble Header modes for receiving data. Each of the modes includes different combinations of Header fields. Users can choose the mode with the fields that are more appropriate for their networking requirements. The Header fields that are combined to form the various modes are:

- SFD field
- CRC16 field
- Data length field (indicates the number of data bits that follow the Header information)
- Full protocol Header

INPUT MODE	BIT 1	BIT 0	RECEIVE PREAMBLE - HEADER FIELDS
0	0	0	Preamble, with SFD Field
1	0	1	Preamble, with SFD, CRC16
2	1	0	Preamble, with SFD Length, CRC16
3	1	1	Preamble, with Full Protocol Header

CONFIGURATION REGISTER 3 ADDRESS (0Ch) MODEM CONFIGURATION REGISTER D

Bit 7	Reserved (must set to '0').

CONFIGURATION REGISTER 3 ADDRESS (0Ch) MODEM CONFIGURATION REGISTER D (Continued)

<table>
<tr><td>Bit 6, 5</td><td>These control bits combined are used to select the number of chips per symbol used in the I and Q transmit paths (see table below).
<table>
<tr><th>CHIPS PER</th><th>BIT 6</th><th>BIT 5</th></tr>
<tr><td>11</td><td>0</td><td>0</td></tr>
<tr><td>13</td><td>0</td><td>1</td></tr>
<tr><td>15</td><td>1</td><td>0</td></tr>
<tr><td>16</td><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td>Bit 4, 3</td><td>These control bits are used to select the divide ratio for the transmit chip clock timing.
NOTE The value of N is determined by the following equation: Symbol Rate = MCLK/(N x Chips per symbol)
<table>
<tr><th>MASTER</th><th>BIT 4</th><th>BIT 3</th></tr>
<tr><td>N = 2</td><td>0</td><td>0</td></tr>
<tr><td>N = 4</td><td>0</td><td>1</td></tr>
<tr><td>N = 8</td><td>1</td><td>0</td></tr>
<tr><td>N = 16</td><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td>Bit 2</td><td>This control bit is used to select the origination of Preamble/Header information
Logic 1: The HSP3824 generates the Preamble and Header internally by formatting the programmed header information and generating a TX_RDY to indicate the beginning of the data packet.
Logic 0: Accepts the Preamble/Header information from an externally generated source.</td></tr>
<tr><td>Bit 1</td><td>This control bit is used to indicate the signal modulation type for the transmitted data packet. When configured for mode 0 header or mode 3 and external header, this bit is ignored. See Register 0 bits 4 and 3.
Logic 1 = DBPSK modulation for data packet.
Logic 0 = DQPSK modulation for data packet.</td></tr>
<tr><td>Bit 0</td><td>This control bit is used to indicate the signal modulation type for the received data packet. Used only with header modes 1 and 2. See register 2 bits 1 and 0.
Logic 1 = DBPSK.
Logic 0 = DQPSK</td></tr>
</table>

CONFIGURATION REGISTER 4 ADDRESS (10h) INTERNAL TEST REGISTER A

Bit 7 - 0	These control bits are used to direct various internal signals to test port output pins. These internal signals are monitored to fault isolate the device at manufacturing testing. During normal operation, the value 0h is recommended. This will result in the following signals becoming available at the output test pins of the device: Pin 46 (TEST7): Carrier Sense (CRS), a Logic 1 indicates PN lock. Pin 45 (TEST6): Energy Detect (ED), a Logic 1 indicates that there is energy detected in the channel. The ED goes active when the RSSI exceeds the threshold level programmed by the user Pin 1 (TEST_CK): PN clock.

CONFIGURATION REGISTER 5 ADDRESS (14h,18h) INTERNAL TEST REGISTER B

Bits 7 - 0	These bits need to be programmed to 0h. They are used for manufacturing test only.

CONFIGURATION REGISTER 7 ADDRESS (1Ch) MODEM STATUS REGISTER A

Bit 7	This bit indicates the status of the TX_RDY output pin. TX_RDY is used only when the HSP3824 generates the Preamble/Header data internally. Logic 1: Indicates that the HSP3824 has completed transmitting Preamble header information and is ready to accept data from the external source (i.e. MAC) to transmit. Logic 0: Indicates that the HSP3824 is in the process of transmitting Preamble Header information.
Bit 6	This status bit indicates the antenna selected by the device. Logic 0: Antenna A is selected. Logic 1: Antenna B is selected.

I and Q A/D AC Electrical Specifications

PARAMETER	MIN	TYP	MAX	UNITS
Full Scale Input Voltage (V_{p-p})	0.25	0.50	1.0	V
Input Bandwidth (-0.5dB)	-	20	-	MHz
Input Capacitance	-	5	-	pF
Input Impedance (DC)	5	-		kΩ
FS (Sampling Frequency)	-	-	22	MHz

RSSI A/D Electrical Specifications

PARAMETER	MIN	TYP	MAX	UNITS
Full Scale Input Voltage (Vp-p)	-	-	1.15	V
Input Bandwidth (0.5dB)	1MHz	-	-	MHz
Input Capacitance (DC)	-	7pF	-	pF
Input Impedance	1M	-	-	MΩ

CONFIGURATION REGISTER 7 ADDRESS (1Ch) MODEM STATUS REGISTER A (Continued)

Bit 5	This status bit indicates the present state of clear channel assessment (CCA) which is output pin 33. The CCA is being asserted as a result of a channel energy monitoring algorithm that is a function of RSSI, carrier sense, and time out counters that monitor the channel activity.
Bit 4	This status bit, when active indicates Carrier Sense, or PN lock. Logic 1: Carrier present. Logic 0: No Carrier Sense.
Bit 3	This status bit indicates whether the RSSI signal is above or below the programmed RSSI 6-bit threshold setting. This signal is referred as Energy Detect (ED). Logic 1: RSSI is above the programmed threshold setting Logic 0: RSSI is below the programmed threshold setting.
Bit 2	This bit indicates the status of the output control pin MD_RDY (pin 34). It signals that a valid Preamble/Header has been received and that the next available bit on the TXD bus will be the first data packet bit. Logic 1: Envelopes the data packet as it becomes available on pin 3 (TXD). Logic 0: No data packet on TXD serial bus.
Bit 1	This status bit indicates whether the external device has acknowledged that the channel is clear for transmission. This is the same as the input signal TX_PE on pin 2. Logic 1 = Acknowledgment that channel is clear to transmit. Logic 0 = Channel is NOT clear to transmit.
Bit 0	This status bit indicates that a valid CRC16 has been calculated. The CRC16 is calculated on the Header information. The CRC16 does not cover the preamble bits. Logic 1 = Valid CRC16 check. Logic 0 = Invalid CRC16 check.

CONFIGURATION REGISTER 8 ADDRESS (20h) MODEM STATUS REGISTER B

Bit 7	This status bit is meaningful only when the device operates under the full protocol mode. Errors imply CRC errors of the header fields. Logic 0 = Valid packet received. Logic 1 = Errors in received packet.
Bit 6	This bit is used to indicate the status of the SFD search timer. The device monitors the incoming Header for the SFD. If the timer, times out the HSP3824 returns to its signal acquisition mode looking to detect the next Preamble and Header. Logic 1 = SFD not found, return to signal acquisition mode. Logic 0 = No time out during SFD search.
Bit 5	This status bit is used to indicate the modulation type for the data packet. This signal is generated by the header detection circuitry in the receive interface. Logic 0 = DBPSK. Logic 1 = DQPSK.
Bit 4	Unused, don't care.
Bit 3	Unused, don't care.
Bit 2	Unused, don't care.
Bit 1	Unused, don't care.
Bit 0	Unused, don't care.

CONFIGURATION REGISTER 9 ADDRESS (24h) I/O DEFINITION REGISTER

	This register is used to define the phase of clocks and other interface signals.
Bit 7	This bit needs to always be set to logic 0
Bit 6	This control bit selects the active level of the MD_RDY output pin 34. Logic 1 = MD_RDY is active 0. Logic 0 = MD_RDY is active 1.

CONFIGURATION REGISTER 9 ADDRESS (24h) I/O DEFINITION REGISTER

Bit 5	This control bit selects the active level of the Clear Channel Assessment (CCA) output pin 32. Logic 1 = CCA active 1. Logic 0 = CCA active 0.
Bit 4	This control bit selects the active level of the Energy Detect (ED) output which is an output pin at the test port, pin 45. Logic 1 = ED active 0. Logic 0 = ED active 1.
Bit 3	This control bit selects the active level of the Carrier Sense (CRS) output pin which is an output pin at the test port, pin 46. Logic 1 = CRS active 0. Logic 0 = CRS active 1.
Bit 2	This control bit selects the active level of the transmit ready (TX_RDY) output pin 5. Logic 1 = TX_RDY active 0 Logic 0 = TX_RDY active 1.
Bit 1	This control bit selects the active level of the transmit enable (TX_PE) input pin 2. Logic 1 = TX_PE active 0 Logic 0 = TX_PE active 1.
Bit 0	This control bit selects the phase of the transmit output clock (TXCLK) pin 4. Logic 1 = Inverted TXCLK. Logic 0 = NON-inverted TXCLK

CONFIGURATION REGISTER 10 ADDRESS (28h) RSSI VALUE REGISTER

Bits 0 - 7	This is a read only register reporting the value of the RSSI analog input signal from the on chip 6-bit ADC. This register is updated at (chip rate/11). Bits 7 and 6 are not used and set to Logic 0. Example:

	BITS (0:7)	RANGE
RSSI_STAT	7 6 5 4 3 2 1 0	
	0 0 0 0 0 0 0 0	00h (Min)
	0 0 1 1 1 1 1 1	3Fh (Max)

CONFIGURATION REGISTER 11 ADDRESS (2Ch) A/D CAL POS REGISTER

Bits 0 - 7	This 8-bit control register contains a binary value used for positive increment for the level adjusting circuit of the A/D reference. The larger the step the faster the level reaches saturation.

CONFIGURATION REGISTER 12 ADDRESS (30h) A/D CAL NEG REGISTER

Bits 0 - 7	This 8-bit control register contains a binary value used for the negative increment for the level adjusting reference of the A/D. The number is programmed as 256 - the value wanted since it is a negative number.

CONFIGURATION REGISTER 13 ADDRESS (34h) TX SPREAD SEQUENCE (HIGH)

Bits 0 - 7	This 8-bit register is programmed with the upper byte of the transmit spreading code. This code is used for both the I and Q signaling paths of the transmitter. This register combined with the lower byte TX_SPREAD(LOW) generates a transmit spreading code programmable up to 16 bits. Code lengths permitted are 11, 13, 15, and 16. Right justified MSB first.

SOME SUITABLE CODES

LENGTH	CR13	CR14	TYPE
11	05	B8	Barker
13	1F	35	Barker
15	1F	35	Modified Barker
16	1F	35	Modified Barker

CONFIGURATION REGISTER 14 ADDRESS (38h) TX SPREAD SEQUENCE (LOW)

Bits 0 - 7

This 8-bit register is programmed with the lower byte of the transmit spreading code. This code is used for the I and Q signaling paths of the transmitter. This register combined with the higher byte TX_SPREAD(HIGH) generates the transmit spreading code programmable up to 16 bits.
The example below illustrates the bit positioning for one of the 11 bit Barker PN codes
Example:

Transmit Spreading Code: 11-Bit Barker Word Right Justified MSB First.

	MSB	LSB
TX_SPREAD(HIGH)	15 14 13 12 11 10 9 8	
TX_SPREAD(LOW)		7 6 5 4 3 2 1 0
11-Bit Barker code	X X X X X 1 0 1	1 0 1 1 1 0 0 0

CONFIGURATION REGISTER 15 ADDRESS (3Ch) SCRAMBLER SEED

Bits 0 - 7

This register contains the 7-bit (seed) value for the transmit scrambler which is used to preset the transmit scrambler to a known starting state. The MSB bit position (7) is unused and must be programmed to a Logic 0. The example [illegible]

CONFIGURATION REGISTER 16 ADDRESS (40h) SCRAMBLER TAP

Bits 0 - 7

This register is used to configure the transmit scrambler with a 7-bit polynomial tap configuration. The transmit scrambler is a 7-bit shift register, with 7 configurable taps. A logic 1 in the respective bit position enables that particular tap. The MSB bit 7 is not used and it is set to a Logic 0. The example below illustrates the register configuration for the polynomial $F(x) = 1 + X^{-4} + X^{-7}$. Each clock is a shift left

		LSB
Bits (0-7)		7 6 5 4 3 2 1 0
		$X X^{-7} X^{-6} X^{-5} X^{-4} X^{-3} X^{-2} X^{-1}$
Scrambler Taps	$F(x) = 1 + X^{-4} + X^{-7}$	0 1 0 0 1 0 0 0

CONFIGURATION REGISTER 17 ADDRESS (44h) CCA TIMER THRESHOLD

Bits 0 - 7

This 8-bit register is used to configure the period of the time-out threshold of the CCA watchdog timer. If the channel is busy the timer counts until it reaches the programmed value and at that point it declares that the channel is clear independent of the actual energy measured within the channel. This register is programmable up to 8 bits.

$$\text{Time (ms)} = 1000 \times \frac{N \times 1024}{\text{Chip Rate}}$$, where N is the programmable value of CR17.

For example, for a chip rate of 11 MCPS and a desired timeout of ~11ms, N = 2Ah.

	LSB	
Bits (0-7)	7 6 5 4 3 2 1 0	
	0 0 0 0 0 0 1 0	02h (Min)
CCA_TIMER_TH	1 1 1 1 1 1 1 1	FFh (Max)

CONFIGURATION REGISTER 18 ADDRESS (48h) CCA CYCLE THRESHOLD

Bits 0 - 7

This 8-bit register is used to configure how many times the CCA timer is allowed to reach its maximum count before the channel is declared clear for transmission independent of the actual energy in the channel. This is an outer counter loop of the CCA timer. Each increment represents a time out of the CCA timer. Use a value of 02h for a time out of 2 CCA timer counts.

	MSB LSB	
Bits (0-7)	7 6 5 4 3 2 1 0	
	0 0 0 0 0 0 1 0	2h 1 CCA timer (Min)
CCA_TIMER_TH	1 1 1 1 1 1 1 1	FFh 256 CCA timer (Max)

CONFIGURATION REGISTER 19 ADDRESS (4Ch) RSSI THRESHOLD, ENERGY DETECT

Bits 0 - 7	This register contains the value for the RSSI threshold for measuring and generating energy detect (ED). When the RSSI exceeds the threshold ED is declared. ED indicates the presence of energy in the channel. The threshold that activates ED is programmable. Bits 7 an 6 of this register are not used and set to Logic 0.

	MSB LSB	
Bits (0:7)	7 6 5 4 3 2 1 0	
	0 0 0 0 0 0 0 0	00h (Min)
RSSI_STAT	0 0 1 1 1 1 1 1	3Fh (Max)

CONFIGURATION REGISTER 20 ADDRESS (50h) RX SPREAD SEQUENCE (HIGH)

Bits 0 - 7	This 8-bit register is programmed with the upper byte of the receive despreading code. This code is used for both the I and Q signaling paths of the receiver. This register combined with the lower byte RX_SPRED(LOW) generates a receive despreading code programmable up to 16 bits. Right justified MSB first. See address 13 and 14 for example.

CONFIGURATION REGISTER 21 ADDRESS (54h) RX SPREAD SEQUENCE (LOW)

Bits 0 - 7	This 8-bit register is programmed with the lower byte of the receiver despreading code. This code is used for both the I and Q signaling paths of the receiver. This register combined with the upper byte RX_SPRED(HIGH) generates a receive despreading code programmable up to 16 bits.

CONFIGURATION REGISTER 22 ADDRESS (58h) RX SIGNAL QUALITY 1 ACQ (HIGH) THRESHOLD

Bits 0 - 7	This control register contains the upper byte bits (8 - 14) of the bit sync amplitude signal quality threshold used for acquisition. This register combined with the lower byte represents a 15-bit threshold value for the bit sync amplitude signal quality measurements made during acquisition at each antenna dwell. This threshold comparison is added with the SQ2 threshold in registers 30 and 31 for acquisition. A lower value on this threshold will increase the probability of detection and the probability of false alarm. Set the threshold according to instructions in the text.

CONFIGURATION REGISTER 23 ADDRESS (5Ch) RX SIGNAL QUALITY 1 ACQ THRESHOLD (LOW)

Bits 0 - 7	This control register contains the lower byte bits (0 - 7) of the bit sync amplitude signal quality threshold used for acquisition. This register combined with the upper byte represents a 15-bit threshold value for the bit sync amplitude signal quality measurement made during acquisition at each antenna dwell.

CONFIGURATION REGISTER 24 ADDRESS (60h) RX SIGNAL QUALITY 1 ACQ READ (HIGH)

Bits 0 - 7	This status register contains the upper byte bits (8 - 14) of the measured signal quality threshold for the bit sync amplitude used for acquisition. This register combined with the lower byte represents a 15-bit value, representing the measured bit sync amplitude. This measurement is made at each antenna dwell and is the result of the best antenna.

CONFIGURATION REGISTER 25 ADDRESS (64h) RX SIGNAL QUALITY 1 ACQ READ (LOW)

Bits 0 - 7	This register contains the lower byte bits (0 - 7) of the measured signal quality threshold for the bit sync amplitude used for acquisition. This register combined with the higher byte represents a 15-bit value, of the measured bit sync amplitude. This measurement is made at each antenna dwell and is the result of the best antenna.

CONFIGURATION REGISTER 26 ADDRESS (68h) RX SIGNAL QUALITY 1 DATA THRESHOLD (HIGH)

Bits 0 - 7	This control register contains the upper byte bits (8-14) of the bit sync amplitude signal quality threshold used for drop lock decisions. This register combined with the lower byte represents a 15-bit threshold value for the bit sync amplitude signal quality measurements, made every 128 symbols. These thresholds set the drop lock probability. A higher value will increase the probability of dropping lock.

CONFIGURATION REGISTER ADDRESS 27 (6CH) RX SIGNAL QUALITY 1 DATA THRESHOLD (LOW)

Bits 0 - 7	This control register contains the lower byte bits (0 - 7) of the bit sync amplitude signal quality threshold used for drop lock decisions. This register combined with the upper byte represents a 15-bit threshold value for the bit sync amplitude signal quality measurements, made every 128 symbols.

CONFIGURATION REGISTER 28 ADDRESS (70h) RX SIGNAL QUALITY 1 DATA (high) THRESHOLD READ (HIGH)

Bits 0 - 7	This status register contains the upper byte bits (8-15) of the measured signal quality of bit sync amplitude used for drop lock decisions. This register combined with the lower byte represents a 16-bit value, representing the measured signal quality for the bit sync amplitude. This measurement is made every 128 symbols.

CONFIGURATION REGISTER 29 ADDRESS (74h) RX SIGNAL QUALITY 1 DATA THRESHOLD READ (LOW)

Bits 0 - 7	This register contains the lower byte bits (0-7) of the measured signal quality of bit sync amplitude used for drop lock decisions. This register combined with the lower byte represents a 16-bit value, representing the measured signal quality for the bit sync amplitude. This measurement is made every 128 symbols.

CONFIGURATION REGISTER 30 ADDRESS (78h) RX SIGNAL QUALITY 2 ACQ THRESHOLD (HIGH)

Bits 0 - 7	This control register contains the upper byte bits (8-15) of the carrier phase variance threshold used for acquisition. This register combined with the lower byte represents a 16-bit threshold value for carrier phase variance measurement made during acquisition of each antenna dwell and is based on the choice of the best antenna. This threshold is used with the bit sync threshold in registers 22 and 23 to declare acquisition. A higher value in this threshold will increase the probability of acquisition and false alarm.

CONFIGURATION REGISTER 31 ADDRESS (7Ch) RX SIGNAL QUALITY 2 ACQ THRESHOLD (LOW)

Bits 0 - 7	This control register contains the lower byte bits (0-7) of the carrier phase variance threshold used for acquisition.

CONFIGURATION REGISTER 32 ADDRESS (80h) RX SIGNAL QUALITY 2 ACQ READ (HIGH)

Bits 0 - 7	This status register contains the upper byte bits (8-15) of the measured signal quality of the carrier phase variance used for acquisition. This register combined with the lower byte generates a 16-bit value, representing the measured signal quality of the carrier phase variance. This measurement is made during acquisition at each antenna dwell and is based on the selected best antenna.

CONFIGURATION REGISTER 33 ADDRESS (84h) RX SIGNAL QUALITY 2 ACQ READ (LOW)

Bits 0 - 7	This status register contains the lower byte bits (0-7) of the measured signal quality of the carrier phase variance used for acquisition. This register combined with the lower byte generates a 16-bit value, representing the measured signal quality of the carrier phase variance. This measurement is made during acquisition at each antenna dwell and is based on the selected best antenna.

CONFIGURATION REGISTER 34 ADDRESS (88h) RX SIGNAL QUALITY 2 DATA THRESHOLD (HIGH)

Bits 0-7	This control register contains the upper byte bits (8-15) of the carrier phase variance threshold. This register combined with the lower byte represents a 16-bit threshold value for the carrier phase variance signal quality measurements made every 128 symbols.

CONFIGURATION REGISTER 35 ADDRESS (8Ch) RX SIGNAL QUALITY 2 DATA THRESHOLD (LOW)

Bits 0-7	This control register contains the lower byte bits (0-7) of the carrier phase variance threshold. This register combined with the upper byte) represents a 16-bit threshold value for the carrier phase variance signal quality measurements made every 128 symbols

CONFIGURATION REGISTER 36 ADDRESS (90h) RX SIGNAL QUALITY 2 DATA READ (HIGH)

Bits 0-7	This status register contains the upper byte bits (8-15) of the measured signal quality of the carrier phase variance. This register combined with the lower byte represents a 16-bit value, of the measured carrier phase variance. This measurement is made every 128 symbols.

CONFIGURATION REGISTER 37 ADDRESS (94h) RX SIGNAL QUALITY 2 DATA READ (LOW)

Bits 0-7	This register contains the lower byte bits (0-7) of the measured signal quality of the carrier phase variance. This register combined with the represents a 16-bit value, of the measured carrier phase variance. This measurement is made every 128 symbols.

CONFIGURATION REGISTER ADDRESS 38 (98h) RX SIGNAL QUALITY 8-BIT READ

Bits 0 - 7	This 8-bit register contains the bit sync amplitude signal quality measurement derived from the 16-bit Bit Sync signal quality value stored in the CR28-29 registers. This value is the result of the signal quality measurement for the best antenna dwell. The signal quality measurement provides 256 levels of signal to noise measurement.

CONFIGURATION REGISTER 39 ADDRESS RESERVED

	Reserved

CONFIGURATION REGISTER 40 ADDRESS RESERVED

	Reserved

CONFIGURATION REGISTER 41 ADDRESS (A4h) SFD SEARCH TIME

Bits 0 - 7	This register is programmed with an 8-bit value which represents the length of time for the demodulator to search for a SFD in a receive Header. Each bit increment represents 1 symbol period.

CONFIGURATION REGISTER 42 ADDRESS (A8h) DBPSK SIGNAL

Bits 0 - 7	This register contains an 8-bit value indicating the data packet modulation is DBPSK. This value will be a 0AH for full protocol operation at a data rate of 1 MBPS, and is used in the transmitted Signaling Field of the Header. This value will also be used for detecting the modulation type on the received Header.

CONFIGURATION REGISTER 43 ADDRESS (ACh) DQPSK SIGNAL

Bits 0 - 7	This register contains the 8-bit value indicating the data packet modulation is DQPSK. This value will be a 14h for full protocol operation at a data rate of 2 MBPS and is used in the transmitted Signaling Field of the header. This value will also be used for detecting the modulation type on the received header.

CONFIGURATION REGISTER 44 ADDRESS (B0h) RX SERVICE FIELD (RESERVED)

Bits 0 - 7	This register contains the detected received 8-bit value of the Service Field for the Header. This field is reserved for the full protocol mode for future use and should be always a 00h.

CONFIGURATION REGISTER 45 ADDRESS (B4h) RX DATA LENGTH (HIGH)

Bits 0 - 7	This register contains the detected higher byte (bits 8-15) of the received Length Field contained in the Header. This byte combined with the lower byte indicates the number of transmitted bits in the data packet.

CONFIGURATION REGISTER 46 ADDRESS (B8h) RX DATA LENGTH (LOW)

Bits 0 - 7	This register contains the detected lower byte of the received Length Field contained in the Header. This byte combined with the upper byte indicates the number of transmitted bits in the data packet.

CONFIGURATION REGISTER 47 ADDRESS (BCh) RX CRC16 (HIGH)

Bits 0 - 7	This register contains the upper byte bits (8 -15) of the received CRC16 field Header. This register combined with the lower byte represents a 16-bit CRC16 value protecting transmitted header. The fields protected are selected by configuring the header control bits at configuration register 2.

CONFIGURATION REGISTER 48 ADDRESS (C0h) RX CRC16 (LOW)

Bits 0 - 7	This register contains the lower byte bits (0-7) of the received CRC16 field Header. This register combined with the upper byte represents a 16-bit CRC16 value protecting transmitted header. The fields protected are selected by configuring the header control bits at configuration register 2.

	MSB LSB
RX_CRC16	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
RX_CRC16(HIGH)	7 6 5 4 3 2 1 0
RX_CRC16(LOW)	7 6 5 4 3 2 1 0

NOTE: The receive CRC16 field protects the following fields depending upon the mode selection as defined in configuration register 2.

Mode 0 CRC16 not used
Mode 1 CRC16 protects SFD
Mode 2 CRC16 protects SFD, and Length Field
Mode 3 CRC16 protects Signaling Field, Service Field, and Length Field

CONFIGURATION REGISTER 49 ADDRESS (C4h) SFD (HIGH)

Bits 0 - 7	This 8-bit register contains the upper byte bits (8-15) of the SFD used for both the Transmit and Receive header. This register combined with the lower byte represents the 16-bit value for the SFD field

CONFIGURATION REGISTER 50 ADDRESS (C8h) SFD (LOW)

Bits 0 - 7	This 8-bit register contains the upper byte bits (0-7) of the SFD used for both the Transmit and Receive header. This register combined with the lower byte represents the 16-bit value for the SFD field.

CONFIGURATION REGISTER 51 ADDRESS (CCh) TX SERVICE FIELD

Bits 0 - 7	This 8-bit register is programmed with the 8-bit value of the Service Field to be transmitted in a Header. This field is reserved for future use and should be always a 00h.

CONFIGURATION REGISTER 52 ADDRESS (D0h) TX DATA LENGTH FIELD (HIGH)

Bits 0 - 7	This 8-bit register contains the higher byte (bits 8-15) of the transmit Length Field described in the Header. This byte combined with the lower byte indicates the number of bits to be transmitted in the data packet. CR 52/53 should not be set to 0000h. This value would cause the modem to reset after SFD.

CONFIGURATION REGISTER 53 ADDRESS (D4h) TX DATA LENGTH FIELD (LOW)

Bits 0 - 7	This 8-bit register contains the lower byte bits (0-7) of the transmit Length Field described in the Header. This byte combined with the higher byte indicates the number of bits to be transmitted in the data packet, including the MAC payload header. CR 52/53 should not be set to 0000h. This value would cause the modem to reset after SFD.

CONFIGURATION REGISTER 54 ADDRESS (D8h) TX CRC16 (HIGH)

Bits 0 - 7	This 8-bit register contains the upper byte (bits 8-15) of the transmitted CRC16 Field for the Header. This register combined with the lower byte represents a 16-bit CRC16 value calculated by the HSP3824 to protect the transmitted header. The fields protected are selected by configuring the header mode control bits at register address 02.

CONFIGURATION REGISTER 55 ADDRESS (DCh) TX CRC16 (LOW)

Bits 0 - 7	This 8-bit register contains the lower byte (bits 0-7) of the transmitted CRC16 Field for the Header. This register combined with the higher byte represents a 16-bit CRC16 value calculated by the HSP3824 to protect the transmitted header. The fields protected are selected by configuring the header mode control bits at register address 02. [illegible]

	MSB LSB
RX_CRC16	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
RX_CRC16(HIGH)	7 6 5 4 3 2 1 0
RX_CRC16(LOW)	7 6 5 4 3 2 1 0

NOTE: The receive CRC16 Field protects the following fields depending upon the mode selection, as defined in register address 02.

Mode 0 CRC16 not used
Mode 1 CRC16 protects SFD
Mode 2 CRC16 protects SFD, and Length Field
Mode 3 CRC16 protects signaling Field, Service Field, and Length Field

CONFIGURATION REGISTER 56 ADDRESS (E0h) TX PREAMBLE LENGTH

Bits 0 - 7	This register contains the count for the Preamble length counter. This counter is programmable up to 8 bits and represents the number of preamble bits. This should be set at 80h for 1 antenna and 80h for dual antennas.

Best A[illegible]ble Copy [illegible] at 33MHz

Absolute Maximum Ratings

Supply Voltage 7.0V
Input, Output or I/O Voltage . . . . . . GND -0.5V to V_{CC}+0.5V
ESD Classification . . . . Class 1

Operating Conditions

Operating Voltage Range . . . . +2.70V to +3.30V
Operating Temperature Range . . . . . . -40°C to 85°C

Thermal Information

Thermal Resistance (Typical, Note 1) . . . . . θ_{JA} (°C/W)
TQFP Package 80
Maximum Storage Temperature Range . . . . -65°C to 150°C
Maximum Junction Temperature . . . . 150°C
Maximum Lead Temperature (Soldering 10s) . . . . 300°C
(Lead Tips Only)

Die Characteristics

Gate Count . . . . 25,000 Gates

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

DC Electrical Specifications V_{CC} = 3.0V to 3.6V ±10%, T_A = -40° to 85°C

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Power Supply Current	I_{CCOP}	V_{CC} = 3.3V, CLK Frequency 33MHz (Notes 2, 3)		42	55	mA
Standby Power Supply Current	I_{CCSB}	V_{CC} = Max, Outputs Not Loaded	-	1	2.5	mA
Input Leakage Current	I_I	V_{CC} = Max, Input = 0V or V_{CC}	-10	1	10	µA
Output Leakage Current	I_O	V_{CC} = Max, Input = 0V or V_{CC}	-10	1	10	µA
Logical One Input Voltage	V_{IH}	V_{CC} = Max, Min	0.7 V_{CC}		-	V
Logical Zero Input Voltage	V_{IL}	V_{CC} = Min, Max	-		V_{CC}/3	V
Logical One Output Voltage	V_{OH}	I_{OH} = -1mA, V_{CC} = Min	V_{CC}-0.4	V_{CC}-.2	-	V
Logical Zero Output Voltage	V_{OL}	I_{OL} = 2mA, V_{CC} = Min	-	.2	0.4	V
Input Capacitance	C_{IN}	CLK Frequency 1MHz. All measurements referenced to GND. T_A = 25°C, Note 3	-	5	10	pF
Output Capacitance	C_{OUT}		-	5	10	pF

NOTES:

2. Output load 30pF. I_{CCOP} = 5.5 + 4.7(V) × 3.75 · f [illegible] V = Volts, f = Freq. Example: [illegible]
3. Not tested, but characterized at initial design and at major process/design changes.

AC Electrical Specifications V_{CC} = 3.0V to 3.3V ±10%, T_A = -40° to 85° (Note 4)

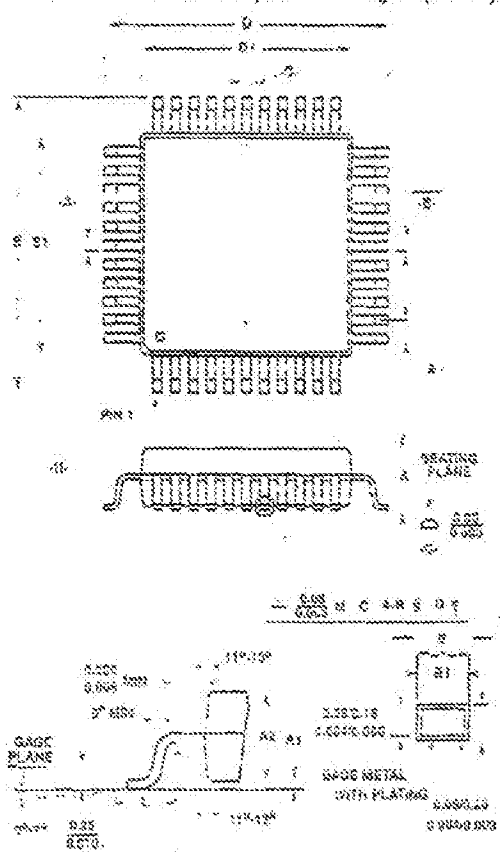
PARAMETER	SYMBOL	33MHz MIN	33MHz MAX	UNITS
CLK Period (MCLK)	t_{CP}	30	-	ns
CLK High (MCLK)	t_{CH}	9	-	ns
CLK Low (MCLK)	t_{CL}	9	-	ns
Setup Time to MCLK (TXD)	t_{DS}	10	-	ns
Hold Time from MCLK (TXD)	t_{DH}	30	-	ns
SCLK Clock Period	t_P	10Xs of MCLK	-	ns
SCLK High	t_H	20	-	ns
SCLK Low	t_L	20	-	ns
Set up to SCLK (SD, AS, R/W, CS)	t_{SS}	20	-	ns
Hold Time from SCLK (SD, AS, R/W, CS)	t_{SH}	20	-	ns
SD_{OUT} from SCLK	t_{DV}	-	30	ns
Output Enable of SD from R/W High	t_{OE}	-	20	ns (Note 5)
Output disable of SD after R/W Low	t_{OD}	-	20	ns (Note 5)
TXCLK, TXRDY, I, Q from MCLK	t_{DO}	-	35	ns
RXCLK, MD_RDY, RXD from MCLK	t_{RD}	-	35	ns
[illegible] from MCLK	$t_{[illegible]}$	-	40	ns
ANTSEL, TEST_CK		-	-	-
OUTPUT Rise/Fall		-	10	ns (Notes 5, 6)

NOTES:

4. AC tests performed with C_L = 40pF, I_{OL} = 2mA, and I_{OH} = -1mA. Input reference level [illegible]
5. Not tested, but characterized at initial design and at major process/design changes.
6. Measured from V_{IL} to V_{IH}.

Best Available Copy

Thin Plastic Quad Flatpack Packages (TQFP)



Q48.7x7 (JEDEC MO-136AE ISSUE C)
48 LEAD THIN PLASTIC QUAD FLATPACK PACKAGE

SYMBOL	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX	NOTES
A	-	0.047	-	1.20	-
A1	0.002	0.006	0.05	0.15	
A2	0.038	0.041	0.95	1.05	-
b	0.007	0.010	0.17	0.27	6
b1	0.007	0.008	0.17	0.23	-
D	0.347	0.362	8.80	9.20	3
D1	0.272	0.280	6.90	7.10	4, 5
E	0.347	0.362	8.80	9.20	3
E1	0.272	0.280	6.90	7.10	4, 5
L	0.018	0.029	0.45	0.75	
N	48		48		7
e	0.020 BSC		0.50 BSC		-

Rev. [illegible]

NOTES:

1. Controlling dimension: MILLIMETER. Converted inch dimensions are not necessarily exact.
2. All dimensions and tolerances per ANSI Y14.5M-1982.
3. Dimensions D and E to be determined at seating plane -C-.
4. Dimensions D1 and E1 to be determined at datum plane -H-.
5. Dimensions D1 and E1 do not include mold protrusion. Allowable protrusion is 0.25mm (0.010 inch) per side.
6. Dimension b does not include dambar protrusion. Allowable dambar protrusion shall not cause the lead width to exceed the maximum b dimension by more than 0.08mm (0.003 inch).
7. "N" is the number of terminal positions.

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Waveforms

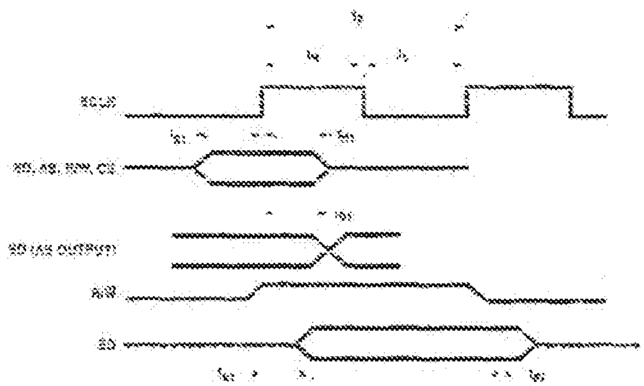


FIGURE 23. SERIAL CONTROL PORT SIGNAL TIMING

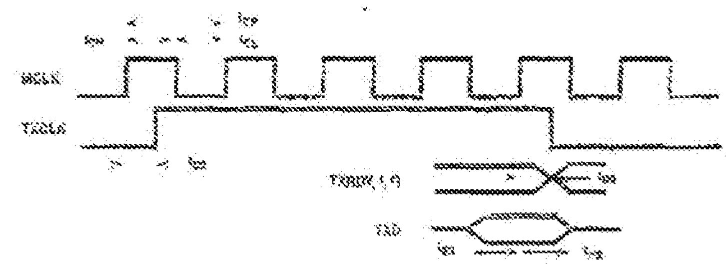
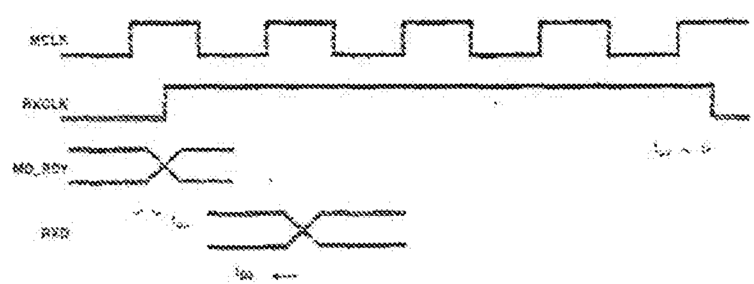


FIGURE 24. TX PORT SIGNAL TIMING



NOTE: [illegible]

FIGURE 25. RX PORT SIGNAL TIMING

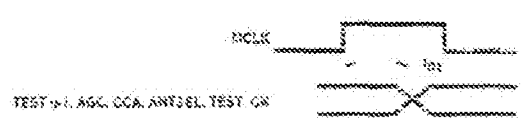


FIGURE 26. MISCELLANEOUS SIGNAL TIMING

Absolute Maximum Ratings

Supply Voltage 7.0V
Input, Output or I/O Voltage . . . . GND -0.5V to V_{CC} +0.5V
ESD Classification . . . . Class 1

Operating Conditions

Operating Voltage Range . . . . . . +3.0V to +5.0V
Operating Temperature Range . . . . -40°C to 85°C

Thermal Information

Thermal Resistance (Typical, Note 7) . . . . θ_{JA} (°C/W)
TQFP Package . . . . [illegible]
Maximum Storage Temperature Range . . . . -65°C to 150°C
Maximum Junction Temperature . . . . . . 150°C
Maximum Lead Temperature (Soldering 10s) . . . . 300°C
(Lead Tips Only)

Die Characteristics

Gate Count . . . . [illegible] Gates

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. [illegible]

NOTE:

7. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

DC Electrical Specifications V_{CC} = 3.3V to 5.0V, T_A = -40° to 85°C

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Power Supply Current	ICCOP	V_{CC} = 3.6V, CLK Frequency 44MHz (Notes 8, 9)	-	50	70	mA
See previous DC table for remaining DC specifications.						

NOTES:

8. Output load 30pF, [illegible]
9. Not tested, but characterized at initial design and major process/design changes.

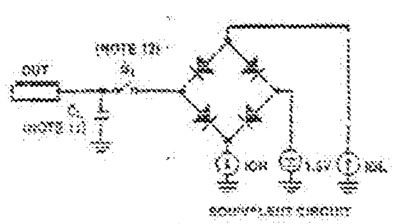
AC Electrical Specifications V_{CC} = 3.3V to 5.0V, T_A = -40° to 85°C (Note 10)

PARAMETER	SYMBOL	44MHz		UNITS
		MIN	MAX	
CLK Period (MCLK)	t_{CP}	22.5	-	ns
CLK High (MCLK)	t_{CH}	8	-	ns
CLK Low (MCLK)	t_{CL}	8	-	ns
TXCLK, TXRDY, I, Q from MCLK	t_{D1}		28	ns
RXCLK, MD_RDY, RXD from MCLK	t_{D2}	-	25	ns
TEST 0-7, CCA, AGC from MCLK	t_{D3}	-	27	ns
ANSTEL, TEST CK	-	-	-	-
See previous AC table for remaining AC specifications.				

NOTE:

10. AC tests performed with C_L = 40pF, I_{OL} = 2mA, and I_{OH} = -1mA. Input reference level all inputs 1.5V. Test V_{IH} = V_{CC}, V_{IL} = 0V, V_{OH} = V_{OL} = V_{CC}/2.

Test Circuit



NOTES:

11. Includes Stray and JIG Capacitance
12. Switch S_1 Open for I_{CC} [illegible]

FIGURE 20. TEST LOAD CIRCUIT

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
LINCOLN LABORATORY

IFF Working Paper No. 41WP-5036 Date 29 October 1979

Subject: Orthogonal Signalling . . . BOK and DPSK

Author: J. R. Cafarella

This work is being performed under Air Force Contract No. F19628-80-C-0002 and is sponsored by ASD/XRQ-NIS.

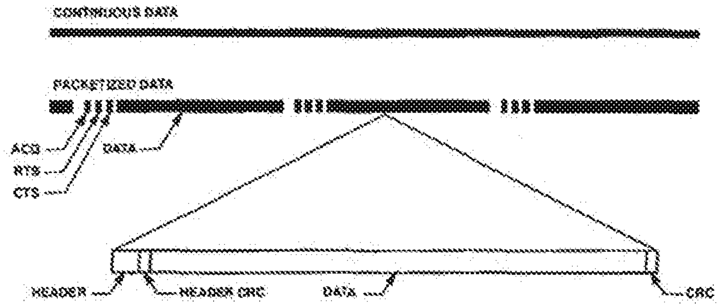


FIGURE 3. PACKET TRANSMISSION

References

For Intersil documents available on the internet, see web site http://www.intersil.com/

[1] The 2.4GHz ISM band has been called the Junk band because it is already contaminated by oven emissions. Years ago, 2.43GHz was allocated to the microwave oven and it was felt that no one else would ever want to co-occupy this band. As pressure to allocate more spectrum to communications was felt, the FCC set up rules for unlicensed Instrumentation, Scientific and Medical (ISM) operation in this "worthless" band.

[2] Remember the days of typewriters where typing a whole page without error was a trying experience. The first word processor that allowed you to look over and correct each sentence before committing it to paper was a real breakthrough.

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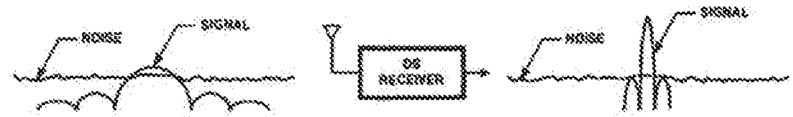

FIGURE 2A. LOW POWER DENSITY

FIGURE 2B. INTERFERENCE REJECTION

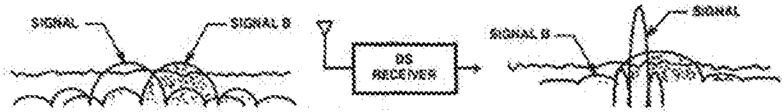

FIGURE 2C. MULTIPLE ACCESS

FIGURE 2. DIRECT SEQUENCE SPREAD SPECTRUM PROPERTIES

Finally, DS spread spectrum can allow more than one user to occupy the same channel through a feature called multiple access. Each DS receiver collapses only correlated signals to the data bandwidth. Other, non correlated signals will remain spread in this step. When the desired signal is filtered to the signal bandwidth, only a small fraction of the undesired signal remains. See Figure 2C.

The term packet radio or packet communications is common where the communications medium is not well controlled. There are numerous reasons why a radio communications link may be interrupted, such as the microwave oven. [1] The microwave oven radiates in the middle of the ISM band with a 50% duty cycle and a pulse rate locked to the power line. Thus it is off for 8ms every 16ms. These off periods allow the transmission of bursts (or packets) of 1000 bytes at a time. Frequency hopping also means that the radio communications is interrupted every 400ms while the sending and receiving radios are retuned. The breaking up of a large block of data into small "packets" is a common technique in communications to insure that error free communications can take place even with interruptions. [2] If the medium is corrupted intermittently, a large block of data will never make it through without errors. In the packet technique this block is broken into small packets that each have some error detection bits added. Then, if an error is detected, a retransmission of the small packet that was corrupted will not unduly burden the network. This packet communications technique has short control packets that check to see if the medium is clear, the other end is ready to receive and, to request a retransmission if a packet did not get through correctly. See Figure 3. All of this requires some overhead expense that reduces the net system throughput. Packet length can be optimized to minimize overhead while insuring the greatest throughput with data integrity.

When continuous data is packetized, the instantaneous rate must increase since the time allowed for data transmission is reduced. This allows time for the packet protocol interchange, packet headers and other overhead. Packet communications can be used with various access protocols such as carrier sense multiple access (CSMA) or time division multiple access (TDMA). CSMA allows asynchronous communications, but requires each communicator to first establish that the medium is not busy. It then establishes the link with an interchange consisting of a request to send (RTS), followed by a clear to send (CTS), the data packet and acknowledgment or not (ACK/NAK). TDMA allows synchronous communications where each user is allocated a time slot to communicate in. The network overhead in this scheme is in the wasted time when some users have nothing to send and in the packets from the controller necessary to allocate the time slots.

The combination of spread spectrum and packet communications for the 802.11 wireless local area networks allows robust communications in a crowded and noisy band.

Introduction

There has been some controversy recently as to the performance characteristics of Differential-Phase-Shift Keying (DPSK) compared to Binary-Orthogonal Keying (BOK). The purpose of this memo is to clarify the comparison of DPSK and BOK. It will be shown that DPSK can be interpreted as a form of BOK. When considering Doppler performance, we shall find that the question is how does one choose an orthogonal pair of signals which remain orthogonal when Doppler shifted.

DPSK as BOK

The use of Binary-Orthogonal signaling is well known; a common example is Frequency-Shift Keying. A standard means for reception of BOK is shown in Fig. 1, and is refered to as "mark-space matched filtering". The essential feature of BOK is that, at the instant that the true channel is producing the maximum signal, the other channel signal component is zero.

Differential-Phase-Shift Keying is a commonly used signaling technique which has a variety of interpretations, which leads to some confusion. In DPSK the data is represented as 0 or π differential carrier phase between successive transmitted bit waveforms. One form of demodulation for DPSK is shown in Fig. 2, and refered to as "delay and multiply." When using this technique, the interpretation of DPSK which is often invoked is that it is a differentially coherent antipodal decision, but there is some problem with the concept of differential coherence. Another commonly used form of DPSK demodulation is shown in Fig. 3. Here the presence or absence of a phase flip between two bits is detected by using mark-space filtering with two-bit-long structures. This implimentation shows that successive bits of information are obtained as the result of binary-orthogonal decisions. The most reasonable interpretation of DPSK is that it is, in fact, a binary-orthogonal signal which is two bits long. If one compares the bit-error-probability curves for DPSK and BOK (i.e., FSK) one finds the same functional form with a three deciBel shift in signal-to-noise ratio due to the doubled energy in two bits. If we shorten the DPSK bits by one half, the BER characteristics of BOK and DPSK are identical, but the data rate for DPSK is twice that of BOK. The results of this section are, of course, for zero Doppler shift. In the next section, we will consider the Doppler performance of BOK, and show that the means by which two signals are made orthogonal is important.

Doppler Performance of BOK

The realization that DPSK is a form of BOK signaling shows one means by which we may generate a pair of orthogonal waveforms: choose one waveform arbitrarily and generate the second waveform from the first by introducing a phase flip in the center. Thus, the integral of the product of the two waveforms is zero, which is what we mean by orthogonality. In general we may form an orthogonal pair by choosing

$$S_0(t) \text{ arbitrary} \tag{1}$$

$$S_1(t) = S_0(t)*W(t)$$

$$\left(\text{where } \int W(t)\, dt = 0\right)$$

We will first consider $S_0(t)$ and $W(t)$ to be binary codes phase modulated onto a carrier. We may consider a situation in which a zero is sent, that is $S_0(t)$ is transmitted. An error is obtained when the output of the matched filter for $S_1(t)$ is larger than the output of the filter matched $S_0(t)$. At zero Doppler this occurs when a noise spike is large enough compared to the signal to cause this condition. At large Doppler shifts, the output of the S_0 matched filter is lower than at zero Doppler, so that less noise is required to cause an error.

$$\int S_0(t)\, S_0(t)\, e^{(j\omega t)}\, dt = \int e^{(j\omega t)}\, dt \qquad (2)$$

(where we have assumed $S_0^2 = 1$)

Notice that the degradation of the S_0 matched filter when a zero is sent is independent of the waveform chosen. The degradation of this output in dB is not sufficient to describe the signal-to-noise performance since this is not the only effect produced by the Doppler shift. The second effect we must consider is that the filter matched to S_1 will not truly be a null for large Doppler. The output of the S_1 matched filter when a zero is sent is

$$\int S_0(t)\, S_1(t)\, e^{(j\omega t)}\, dt = \int W(t)\, e^{(j\omega t)}\, dt \qquad (3)$$

We see from this that the degradation of BOK with Doppler depends on how the second waveform was made orthogonal to the first. In particular, it depends on the Fourier transform of $W(t)$.

(It should be noted here that the above statements are restricted to waveforms which have no range-Doppler coupling, i.e., no second derivative of phase with respect to time. The reason for this is that such waveforms when subjected to Doppler shift move the position of the correlation peak, and while the amplitude at the zero-Doppler time position behaves as described in Eq. 2, the amplitude of the time-shifted correlation peak might not be significantly reduced. A familiar example of this situation is the case of linear FM modulation. In general one must consider the ambiguity functions of the waveforms and their cross-ambiguity function in order to understand the Doppler performance of arbitrary waveforms.]

We might now consider the choice of W(t). We have above narrowed the discussion to binary-coded waveforms. This is particularly convenient from a hardware point of view because the generation of S_0, W, and their product can be done in the digital portion of the system, and only the resulting baseband waveform need be modulated onto a carrier. We shall not consider at all the means by which S_0 is selected, rather we shall concentrate on the choice of W. The code for S_0 is assumed to contain $N=2^k$ bits. It is possible to systematically explore the characteristics of waveforms orthogonal to S_0 by choosing an orthogonal set of functions for W. An obvious choice of functions would be the Walsh functions, WAL_1 through WAL_{2N}, which would generate N-1 waveforms orthogonal to S_0. For our discussion, however, we shall consider the lesser number of orthogonal functions of N bits, R_1 through R_k, the Rademacher functions. The first few Rademacher functions are shown in Fig. 4.

The performance of a BOK system which generates S_1 by multiplying S_0 by R_1 is limited in Doppler performance as shown in Fig. 5. Assuming that a zero is sent, we see that the output of the mark filter has risen to equal the output of the space filter at a Doppler shift significantly below the null frequency predicted by Eq. 2. The system becomes unuseable at this point independent of signal-to-noise ratio. The peak of the spectrum of the Rademacher functions occurs at higher frequencies for the higher-order functions as shown in Fig. 6, so that we might expect the best Doppler performance from a system which uses R_k to generate S_1 from S_0. Thus, it would be desirable to create S_1 by complimenting every other bit of S_0, rather than complimenting the second half. As a practical matter, it is only necessary to choose the order of the Rademacher function to be high enough that the mark filter output does not rise significantly before the first null for the space filter. All BOK systems using higher-order Rademacher functions would have the performance predicted by Eq. 2.

Another means for achieving DOK performance is to generate a quasi-orthogonal pair of signals by randomly choosing both S_0 and S_1. In this case one would expect that the Doppler shift would never cause one of the signals to strongly resemble the other. The problem with such a system is that the random nature of the signals does not constrain the cross-correlation of the waveforms to be small except in the average sense. Thus, it is likely that unpredicted degradation might occur even at zero Doppler due to chance correlation.

Effect of Chirped Carrier

The above results were for waveforms with no range-doppler coupling. If a combination of PN and chirp are used, it is necessary to consider that the correlation spike for a doppler-shifted signal moves in time relative to a zero-doppler spike. For a linear FM waveform with no phase flips the correlation peak occurs at a shift of $\nu T/B$ with an amplitude reduced by $1-\nu/B$, where B is the chirp bandwidth; T is the chirp duration, and ν, the doppler shift, is less than about $B/2$. For a chirp/PSK waveform the amplitude degradation is given approximately by $1-\nu N/B$, where N is the number of chips per bit. This degradation is faster than the simple chirp, but can be considerably slower than the $\sin(2\pi\nu T)/2\pi\nu T)$ degradation for PSK with no chirp.

In the previous sections we have considered the Doppler degratation of the correct channel to be the same for all waveforms, and focused on the behavior of the incorrect channel with Doppler to predict performance. We now see that an effect of a chirped carrier can be to maintain the correct-channel output at a high level for large Doppler shifts than predicted by Eq. 2.

Distribution

IFF Study Group

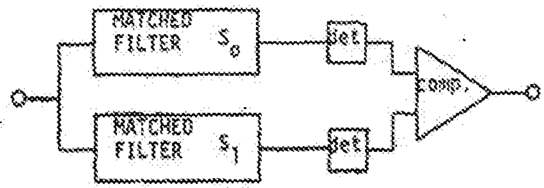

Fig. 1. Mark-Space Filter for BOK

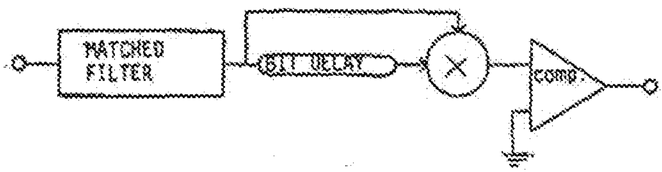

Fig. 2. Delay and Multiply DPSK Demodulation

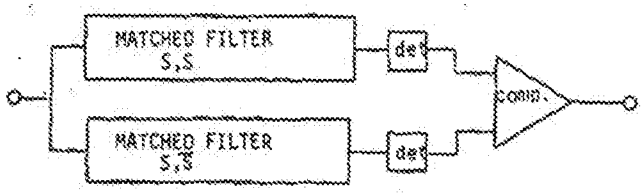

Fig. 3. Mark-Space DPSK Demodulation

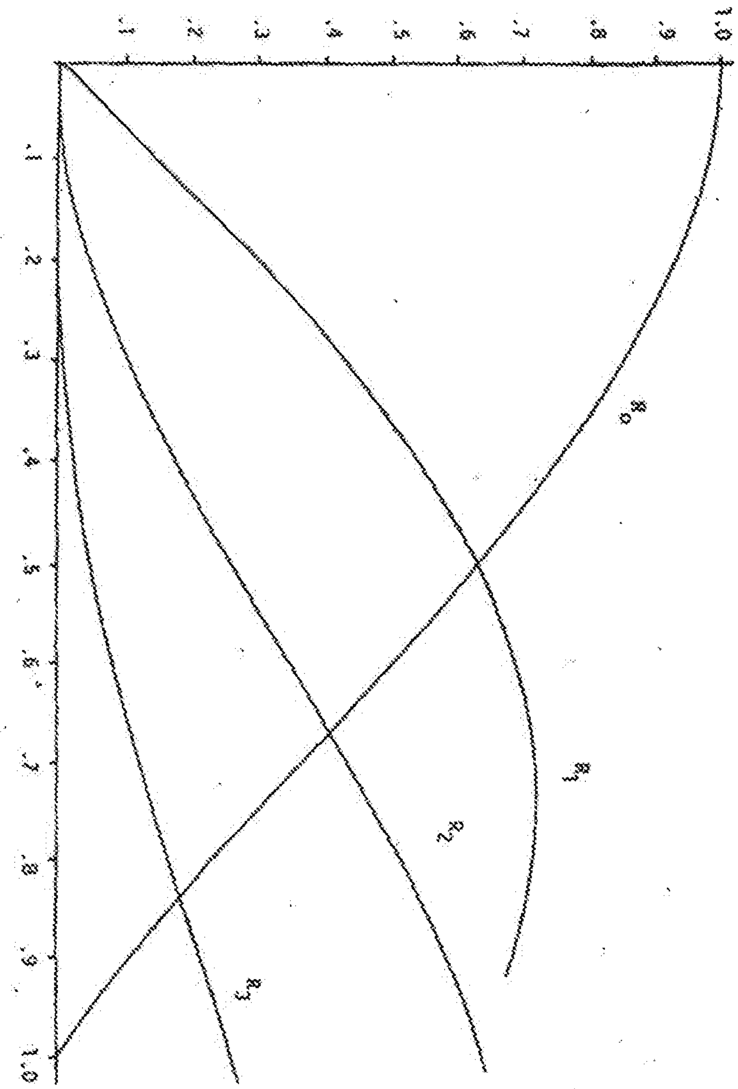

Fig. 6 Normalized Fourier Transforms of Rademacher Functions

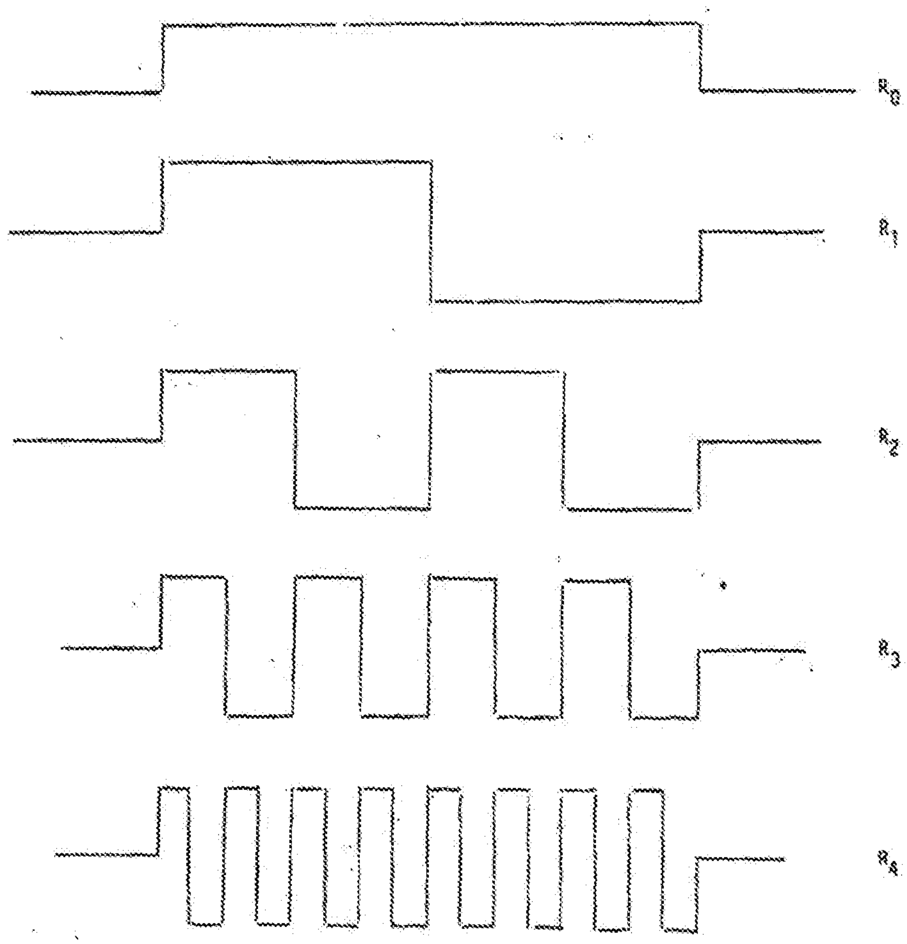

Fig. 4. Rademacher Functions

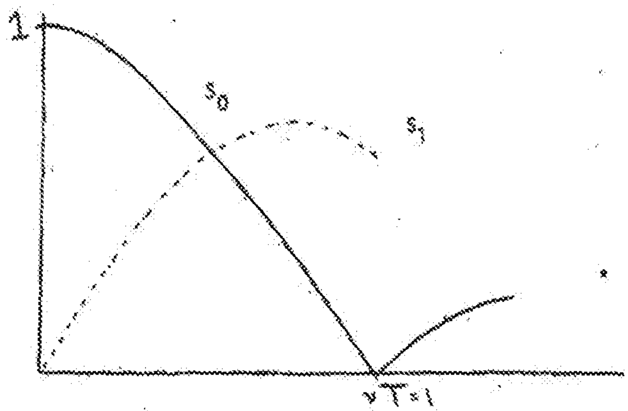

Fig. 5. Doppler Outputs for $S_1 = S_0 \cdot B_1$

DPSK OR BOK

PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 1996

Application or Docket Number: 819,846

CLAIMS AS FILED - PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY RATE	SMALL ENTITY FEE	OR	OTHER THAN SMALL ENTITY RATE	OTHER THAN SMALL ENTITY FEE
BASIC FEE				385.00	OR		770.00
TOTAL CLAIMS	61 minus 20 =	* 41	x$11=		OR	x$22=	902
INDEPENDENT CLAIMS	7 minus 3 =	* 4	x40=		OR	x80=	320
MULTIPLE DEPENDENT CLAIM PRESENT			+130=		OR	+260=	
			TOTAL		OR	TOTAL	1992

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

AMENDMENT A

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE	ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
Total	*	Minus	**	=	x$11=		OR	x$22=	
Independent	*	Minus	***	=	x40=		OR	x80=	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+130=		OR	+260=	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE	ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
Total	*	Minus	**	=	x$11=		OR	x$22=	
Independent	*	Minus	***	=	x40=		OR	x80=	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+130=		OR	+260=	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE	ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
Total	*	Minus	**	=	x$11=		OR	x$22=	
Independent	*	Minus	***	=	x40=		OR	x80=	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+130=		OR	+260=	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

FORM PTO-875 (Rev. 10/96) *U.S. Government Printing Office: 1996 - 413-288/40191 Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET (FOR USE WITH FORM PTO-875)

SERIAL NO. | FILING DATE

APPLICANT(S)

CLAIMS

	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
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50		1				
TOTAL IND.	5					
TOTAL DEP.	45					
TOTAL CLAIMS	50					

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98						
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100						
TOTAL IND.	1					
TOTAL DEP.	10					
TOTAL CLAIMS	11					

* MAY BE USED FOR ADDITIONAL CLAIMS OR AMENDMENTS

U.S. DEPARTMENT OF COMMERCE Patent and Trademark Office

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Table of Contents

Family 1/1

13 record(s) per family, collapsed by 7 record(s)

Record 1/7 US5982807A High data rate spread spectrum transceiver and associated methods

Publication Number: US5982807A 19991109

Title: High data rate spread spectrum transceiver and associated methods
Title - DWPI: High data rate spread spectrum transceiver has baseband processor and interconnected radio circuit modulator for spread spectrum; PSK modulating information for transmission via radio circuit, and includes at least one modified Walsh code for reducing average DC signal during AC sig
Priority Number: US1997819846A
Priority Date: 1997-03-17
Application Number: US1997819846A
Application Date: 1997-03-17
Publication Date: 1999-11-09
IPC Class Table:

IPC	Section	Class	Subclass	Class Group	Subgroup
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

IPC Class Table - DWPI:

IPC - DWPI	Section - DWPI	Class - DWPI	Subclass - DWPI	Class Group - DWPI	Subgroup - DWPI
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707

H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732
H04B000169	H	H04	H04B	H04B0001	H04B000169

Assignee/Applicant: Harris Corporation,Palm Bay,FL,US

JP F Terms:

JP FI Codes:

Assignee - Original: Harris Corporation

Any CPC Table:

Type	Invention	Additional	Version	Office
Current	**H04J 13/0048**	-	20130101	EP
Current	H04B 1/707		20130101	EP
Current	H04J 13/12		20130101	EP
Current	H04L 27/18		20130101	EP

ECLA: H04J001300B7B \| H04B0001707 \| H04J001312 \| H04L002718 \| T04J001300B7B \| T04J001312

Abstract:

A spread spectrum radio transceiver includes a high data rate baseband processor and a radio circuit connected thereto. The baseband processor preferably includes a modulator for spread spectrum phase shift keying (PSK) modulating information for transmission via the radio circuit. The modulator may include at least one modified Walsh code function encoder for encoding information according to a modified Walsh code for substantially reducing an average DC signal component to thereby enhance overall system performance when AC-coupling the received signal through at least one analog-to-digital converter to the demodulator. The demodulator is for spread spectrum PSK demodulating information received from the radio circuit. 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. Method aspects are also disclosed.

Language of Publication: EN

INPADOC Legal Status Table:

Gazette Date	Code	INPADOC Legal Status Impact
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C.,DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC.,CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-08-28	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC.,NEW JERSEY CONFIRMATORY ASSIGNMENT; ASSIGNORS:INTERSIL CORPORATION; INTERSIL AMERICAS, INC.; REEL/FRAME:021450/0637 2008-08-27		
2007-05-09	FPAY	+
Description: FEE PAYMENT		
2007-01-31	AS	-
Description: ASSIGNMENT INTERSIL CORPORATION, FLORIDA RELEASE BY SECURED PARTY; ASSIGNOR:CREDIT SUISSE FIRST BOSTON, AS COLLATERAL AGENT; REEL/FRAME:018826/0359 2003-03-06		
2006-11-20	AS	-
Description: ASSIGNMENT BANK OF NEW YORK TRUST COMPANY, N.A.,ILLINOIS SECURITY INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:018545/0298 2006-11-13		
2005-11-01	AS	-
Description: ASSIGNMENT CONEXANT, INC.,NEW JERSEY CHANGE OF NAME; ASSIGNOR:GLOBESPANVIRATA, INC.; REEL/FRAME:016937/0061 2004-05-28		
2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC.,NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0550 2003-07-15		
2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPAN VIRATA, INC.,NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0040 2003-07-15		

2003-05-08	FPAY	+
Description: FEE PAYMENT		
2002-09-24	RF	-
Description: REISSUE APPLICATION FILED 2002-11-09		
1999-11-08	AS	-
Description: ASSIGNMENT CREDIT SUISSE FIRST BOSTON, AS COLLATERAL AGENT, N SECURITY INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:010351/0410 1999-08-13		
1999-09-27	AS	-
Description: ASSIGNMENT INTERSIL CORPORATION, FLORIDA AMEND TO ADD PROPERTIES RECORDED ON REEL 10247, FRAME 0043.; ASSIGNOR:HARRIS CORPORATION; REEL/FRAME:010884/0394 1999-08-13		
1997-09-19	AS	-
Description: ASSIGNMENT HARRIS CORPORATION, FLORIDA ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:SNELL, JAMES LEROY; REEL/FRAME:008728/0769 1997-08-11		

Post-Issuance (US): REIS Reissue Statement 2002-09-09 2002 2002-09-24 2002 Re. S.N. 10/005,843 Ex. Gp.: 2734 | REIS Reissue Statement 2008-04-08 2008 RE040231

Reassignment (US) Table:

Assignee	Assignor	Date Signed	Reel/Frame	Date
CONEXANT INC.,NEWPORT BEACH,CA,US	BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.)	2008-10-17	021731/0845	2008-10-27
Conveyance: RELEASE BY SECURED PARTY (SEE DOCUMENT FOR DETAILS).				
Correspondent: HAW-MINN LU 9645 SCRANTON ROAD, SUITE 140 SAN DIEGO, CA 92121				
XOCYST TRANSFER AG L.L.C.,WILMINGTON,DE,US	CONEXANT, INC.	2008-10-16	022043/0591	2009-01-02
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Correspondent: MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP 300 SOUTH WACKER DRIVE ROBERT J. IRVINE III CHICAGO, IL 60606				
GLOBESPANVIRATA	INTERSIL CORPORATION	2008-08-27	021450/0637	2008-08-28

INC.,RED BANK,NJ,US				
	INTERSIL AMERICAS, INC.	2008-08-27	-	-
Conveyance: CONFIRMATORY ASSIGNMENT				
Correspondent: PATRICIA DAILEY 100 SCHULZ DRIVE CONEXANT SYSTEMS, INC. RED BANK, NJ 07701				
BANK OF NEW YORK TRUST COMPANY N.A.,CHICAGO,IL,US	CONEXANT, INC.	2006-11-13	018545/0298	2006-11-20
Conveyance: SECURITY INTEREST (SEE DOCUMENT FOR DETAILS).				
Correspondent: WALTER G. HANCHUK CHADBOURNE & PARKE LLP 30 ROCKEFELLER PLAZA NEW YORK, NY 10112				
CONEXANT INC.,RED BANK,NJ,US	GLOBESPANVIRATA, INC.	2004-05-28	016937/0061	2005-11-01
Conveyance: CHANGE OF NAME (SEE DOCUMENT FOR DETAILS).				
Correspondent: SAM TELPSLACKY SB4-407 9868 SCRANTON RD. SAN DIEGO, CA 92121				
GLOBESPANVIRATA INC.,RED BANK,NJ,US	INTERSIL CORPORATION	2003-07-15	016561/0550	2005-07-25
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Correspondent: SAM TALPALATSKY SB4-407 9868 SCRANTON RD. SAN DIEGO, CA 92121				
GLOBESPAN VIRATA INC.,RED BANK,NJ,US	INTERSIL CORPORATION	2003-07-15	016561/0040	2005-07-25
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Correspondent: SAM TALPALATSKY SB4-407 9868 SCRANTON RD. SAN DIEGO, CA 92121				
INTERSIL CORPORATION,PALM BAY,FL,US	CREDIT SUISSE FIRST BOSTON, AS COLLATERAL AGENT	2003-03-06	018826/0359	2007-01-31
Conveyance: RELEASE BY SECURED PARTY (SEE DOCUMENT FOR DETAILS).				
Correspondent: DENNIS HOPKINS CHADBOURNE & PARKE LLP 30 ROCKEFELLER PLAZA NEW YORK, NY 10112				
INTERSIL CORPORATION,PALM BAY,FL,US	HARRIS CORPORATION	1999-08-13	010884/0394	1999-09-27
Conveyance: AMEND TO ADD PROPERTIES RECORDED ON REEL 10247, FRAME 0043.				
Correspondent: FISH & RICHARDSON P.C. TIMOTHY A. FRENCH 225 FRANKLIN STREET BOSTON, MA 02110-2804				

CREDIT SUISSE FIRST BOSTON AS COLLATERAL AGENT,NEW YORK,NY,US	INTERSIL CORPORATION	1999-08-13	010351/0410	1999-11-08
Conveyance: SECURITY INTEREST (SEE DOCUMENT FOR DETAILS).				
Corresponent: CRAVATH, SWAINE & MOORE CHIANN BAO WORLDWIDE PLAZA, 44TH FLOOR 825 EIGHTH AVENUE NEW YORK, NY 10019				
HARRIS CORPORATION,PALM BAY,FL,US	SNELL, JAMES LEROY	1997-08-11	008728/0769	1997-09-19
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Corresponent: ALLEN, DYER, DOPPELT, MILBRATH ET AL. CHRISTOPHER F. REGAN, ESQ. 255 S. ORANGE AVE., P.O. BOX 3791 ORLANDO, FL 32802				

Maintenance Status (US):

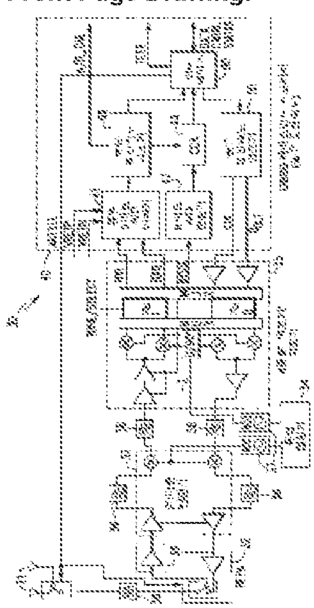
Litigation (US):

Opposition (EP):

License (EP):

EPO Procedural Status:

Front Page Drawing:



Assignee - Current US: CONEXANT INC.

Record 2/7 EP1401114A3 High data rate spread spectrum transceiver and associated methods | Bandspreizender Sendeempfänger mit hoher Übertragungsgeschwindigkeit und zugehörige Verfahren | Emetteur récepteur à spectre dispersé avec débit élevé et procédés associés

Publication Number: EP1401114A3 20040519
EP1401114A2 20040324

Title: High data rate spread spectrum transceiver and associated methods | Bandspreizender Sendeempfänger mit hoher Übertragungsgeschwindigkeit und zugehörige Verfahren | Emetteur récepteur à spectre dispersé avec débit élevé et procédés associés
Title - DWPI:
Priority Number: US1997819846A | EP1998103451A
Priority Date: 1997-03-17 | 1998-02-26
Application Number: EP200322554A
Application Date: 1998-02-26
Publication Date: 2004-05-19
IPC Class Table:

IPC	Section	Class	Subclass	Class Group	Subgroup
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

IPC Class Table - DWPI:
Assignee/Applicant: HARRIS CORPORATION,Melbourne, FL 32919,US,02197180
JP F Terms:
JP FI Codes:
Assignee - Original: HARRIS CORPORATION
Any CPC Table:

Type	Invention	Additional	Version	Office
Current	**H04J 13/0048**	-	20130101	EP
Current	H04B 1/707		20130101	EP
Current	H04J 13/12		20130101	EP
Current	H04L 27/18		20130101	EP

ECLA: H04J001300B7B | H04B0001707 | H04J001312 | H04L002718 | T04J001300B7B | T04J001312

Abstract:

A method of generating an rf signal for transmitting binary information in a packet format including a header field followed by a data field. The method comprises the steps of:
* spread spectrum encoding a sequence of first data symbols from said binary information within said header field by combining said first data symbols with a spreading sequence generated at a predetermined chip rate;
* encoding a sequence of N-bit second data symbols, where N is greater than 1, from said binary information within said data field by generating for each of said N-bit second data symbols one of a set of 2N chip sequences generated at the same chip rate as said spreading sequence: and
* applying the spread-spectrum encoded symbols of said header field and the selected chip sequences of said data field to the I and Q inputs of a phase shift modulator to produce said rf signal.

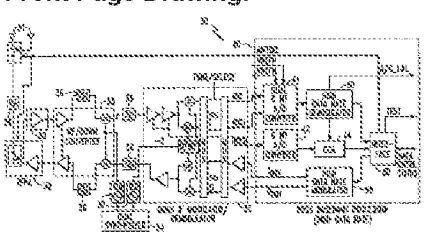
Language of Publication: EN

INPADOC Legal Status Table:

Gazette Date	Code	INPADOC Legal Status Impact
2014-12-24	RAP1	-
Description: TRANSFER OF RIGHTS OF AN EP PUBLISHED APPLICATION INTELLECTUAL VENTURES I LLC		
2010-01-20	RAP1	-
Description: TRANSFER OF RIGHTS OF AN EP PUBLISHED APPLICATION XOCYST TRANSFER AG L.L.C.		
2008-12-17	RAP1	-
Description: TRANSFER OF RIGHTS OF AN EP PUBLISHED APPLICATION CONEXANT, INC.		
2006-08-23	17Q	+
Description: FIRST EXAMINATION REPORT 2004-07-20		
2005-02-09	AKX	+
Description: PAYMENT OF DESIGNATION FEES DE; FR; GB; IT; SE		
2004-09-01	17Q	+
Description: FIRST EXAMINATION REPORT 2004-07-20		
2004-05-19	AX	+
Description: REQUEST FOR EXTENSION OF THE EUROPEAN PATENT TO		
2004-05-19	AK	+

Description: DESIGNATED CONTRACTING STATES: EP 1401114 A3 DE; FR; GB; IT; SE		
2004-03-24	AX	+
Description: REQUEST FOR EXTENSION OF THE EUROPEAN PATENT TO		
2004-03-24	AK	+
Description: DESIGNATED CONTRACTING STATES: EP 1401114 A2 DE; FR; GB; IT; SE		
2004-03-24	AC	-
Description: DIVISIONAL APPLICATION (ART. 76) OF: EP 0866588 P		
2004-03-24	17P	+
Description: REQUEST FOR EXAMINATION FILED 2003-10-02		

Post-Issuance (US):
Reassignment (US) Table:
Maintenance Status (US):
Litigation (US):
Opposition (EP):
License (EP):
EPO Procedural Status: EX-RQ 2003-10-02 2003 Request for examination
Front Page Drawing:



Assignee - Current US:

Record 3/7 EP866588B1 High data rate spread spectrum transceiver and associated methods | Bandspreizender Sendeempfänger mit hoher Übertragungsgeschwindigkeit und zugehörige Verfahren | Emetteur récepteur à spectre dispersé avec débit élevé et procédé associé

Publication Number: EP866588B1 20041201
EP866588A2 19980923
EP866588A3 20021204

Title: High data rate spread spectrum transceiver and associated methods | Bandspreizender Sendeempfänger mit hoher Übertragungsgeschwindigkeit und zugehörige Verfahren | Emetteur récepteur à spectre dispersé avec débit élevé et procédé associé
Title - DWPI: High data rate spread spectrum transceiver has baseband processor and interconnected radio circuit modulator for spread spectrum; PSK modulating information for transmission via radio circuit, and includes at least one modified Walsh code for reducing average DC signal during AC sig
Priority Number: US1997819846A
Priority Date: 1997-03-17
Application Number: EP1998103451A
Application Date: 1998-02-26
Publication Date: 2004-12-01
IPC Class Table:

IPC	Section	Class	Subclass	Class Group	Subgroup
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

IPC Class Table - DWPI:

IPC - DWPI	Section - DWPI	Class - DWPI	Subclass - DWPI	Class Group - DWPI	Subgroup - DWPI
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718

H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732
H04B000169	H	H04	H04B	H04B0001	H04B000169

Assignee/Applicant: HARRIS CORPORATION,Melbourne, Florida 32903,US,00313798
JP F Terms:
JP FI Codes:
Assignee - Original: HARRIS CORPORATION
Any CPC Table:

Type	Invention	Additional	Version	Office
Current	**H04J 13/0048**	-	20130101	EP
Current	H04B 1/707		20130101	EP
Current	H04J 13/12		20130101	EP
Current	H04L 27/18		20130101	EP

ECLA: H04J001300B7B | H04B0001707 | H04J001312 | H04L002718 | T04J001300B7B | T04J001312
Abstract:

A spread spectrum radio transceiver includes a high data rate baseband processor and a interconnected radio circuit. The baseband processor includes a modulator for spread spectrum phase shift keying (PSK) modulating information for transmission via the radio circuit. The modulator includes at least one modified Walsh code function encoder for encoding information according to a modified Walsh code for substantially reducing an average DC signal component to enhance overall system performance when AC-coupling the received signal through at least one analog-to-digital converter to the demodulator. The demodulator is for spread spectrum PSK demodulating information received from the radio circuit. The modulator and demodulator are each 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.
Language of Publication: EN
INPADOC Legal Status Table:

Gazette Date	Code	INPADOC Legal Status Impact
2016-04-29	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
2016-01-25	REG	-
Description: REFERENCE TO A NATIONAL CODE FR PLFP FEE PAYMENT		
2015-05-29	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		

2015-05-29	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
2015-04-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
2015-01-26	REG	-
Description: REFERENCE TO A NATIONAL CODE FR PLFP FEE PAYMENT		
2014-06-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
2014-05-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		
2014-04-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
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Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
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2013-04-30	PGFP	+
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2012-06-29	PGFP	+
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2012-05-31	PGFP	+
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2012-04-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		

2011-07-29	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
2011-05-31	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		
2011-05-31	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
2010-06-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
2010-06-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
2010-05-31	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		
2009-12-18	REG	-
Description: REFERENCE TO A NATIONAL CODE FR TP TRANSMISSION OF PROPERTY		
2009-10-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		
2009-09-09	REG	-
Description: REFERENCE TO A NATIONAL CODE GB 732E AMENDMENTS TO THE REGISTER IN RESPECT OF CHANGES OF NAME OR CHANGES AFFECTING RIGHTS (SECT. 32/1977) REGISTERED BETWEEN 20090813 AND 20090819		
2009-06-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
2009-05-29	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
2009-02-20	REG	-
Description: REFERENCE TO A NATIONAL CODE FR TP TRANSMISSION OF PROPERTY		

2009-02-20	REG	-
Description: REFERENCE TO A NATIONAL CODE FR CD CHANGE OF NAME OR COMPANY NAME		
2008-10-31	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
2008-07-31	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
2008-07-31	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		
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Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
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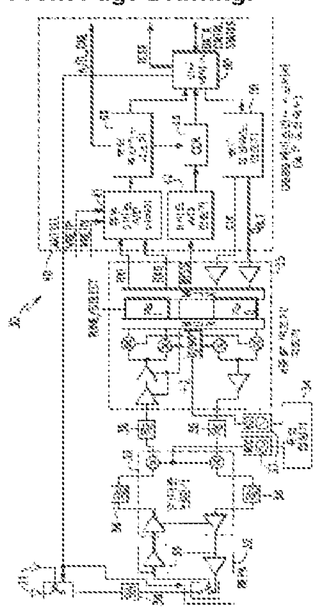
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		
2007-04-25	REG	-
Description: REFERENCE TO A NATIONAL CODE GB 732E AMENDMENTS TO THE REGISTER IN RESPECT OF CHANGES OF NAME OR CHANGES AFFECTING RIGHTS (SECT. 32/1977)		
2007-04-25	25	-
Description: LAPSED IN A CONTRACTING STATE ANNOUNCED VIA POSTGRANT INFORM. FROM NAT. OFFICE TO EPO SE 2005-03-01		
2007-03-30	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE DE		
2007-02-23	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE GB		
2006-02-17	PGFP	+
Description: POSTGRANT: ANNUAL FEES PAID TO NATIONAL OFFICE FR		
2005-12-16	ET	+

Description: FR: TRANSLATION FILED		
2005-11-23	26N	+
Description: NO OPPOSITION FILED 2005-09-02		
2005-03-01	PG25	-
Description: LAPSED IN A CONTRACTING STATE ANNOUNCED VIA POSTGRANT INFORM. FROM NAT. OFFICE TO EPO SE LAPSE BECAUSE OF FAILURE TO SUBMIT A TRANSLATION OF THE DESCRIPTION OR TO PAY THE FEE WITHIN THE PRESCRIBED TIME-LIMIT 2005-03-01		
2005-01-05	REF	-
Description: CORRESPONDS TO: DE 69827866 P		
2004-12-01	REG	-
Description: REFERENCE TO A NATIONAL CODE GB FG4D EUROPEAN PATENT GRANTED		
2004-12-01	PG25	-
Description: LAPSED IN A CONTRACTING STATE ANNOUNCED VIA POSTGRANT INFORM. FROM NAT. OFFICE TO EPO IT LAPSE BECAUSE OF FAILURE TO SUBMIT A TRANSLATION OF THE DESCRIPTION OR TO PAY THE FEE WITHIN THE PRESCRIBED TIME-LIMIT 2004-12-01		
2004-12-01	AK	+
Description: DESIGNATED CONTRACTING STATES: EP 0866588 B1 DE; FR; GB; IT; SE		
2003-08-27	AKX	+
Description: PAYMENT OF DESIGNATION FEES DE; FR; GB; IT; SE		
2003-05-07	17Q	+
Description: FIRST EXAMINATION REPORT 2003-03-25		
2003-04-02	17P	+
Description: REQUEST FOR EXAMINATION FILED 2003-02-04		
2002-12-04	RIC1	-
Description: CLASSIFICATION (CORRECTION) 7H 04L 27/30 A, 7H 04B 1/707 B, 7H 04L 12/28 B		
2002-12-04	AX	+
Description: REQUEST FOR EXTENSION OF THE EUROPEAN PATENT TO AL; LT; LV; MK; RO; SI		

2002-12-04	AK	+
Description: DESIGNATED CONTRACTING STATES: EP 0866588 A3 AT; BE; CH; DE; DK; ES; FI; FR; GB; GR; IE; IT; LI; LU; MC; NL; PT; SE		
1998-09-23	AX	+
Description: REQUEST FOR EXTENSION OF THE EUROPEAN PATENT TO AL; LT; LV; MK; RO; SI		
1998-09-23	AK	+
Description: DESIGNATED CONTRACTING STATES: EP 0866588 A2 AT; BE; CH; DE; DK; ES; FI; FR; GB; GR; IE; IT; LI; LU; MC; NL; PT; SE		

Post-Issuance (US):
Reassignment (US) Table:
Maintenance Status (US):
Litigation (US):
Opposition (EP):
License (EP):
EPO Procedural Status: EX-REPORT 2003-03-25 2003 Dispatch of 1st examination report | EX-RQ 2003-02-04 2003 Request for examination
Front Page Drawing:



Assignee - Current US:

Record 4/7 DE69827866T2 Bandspreizender Sendeempfänger mit hoher Übertragungsgeschwindigkeit und zugehörige Verfahren

Publication Number: DE69827866T2 20051215
DE69827866D1 20050105

Title: Bandspreizender Sendeempfänger mit hoher Übertragungsgeschwindigkeit und zugehörige Verfahren
Title - DWPI: High data rate spread spectrum transceiver has baseband processor and interconnected radio circuit modulator for spread spectrum; PSK modulating information for transmission via radio circuit, and includes at least one modified Walsh code for reducing average DC signal during AC sig
Priority Number: US1997819846A
Priority Date: 1997-03-17
Application Number: DE69827866A
Application Date: 1998-02-26
Publication Date: 2005-12-15
IPC Class Table:

IPC	Section	Class	Subclass	Class Group	Subgroup
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

IPC Class Table - DWPI:

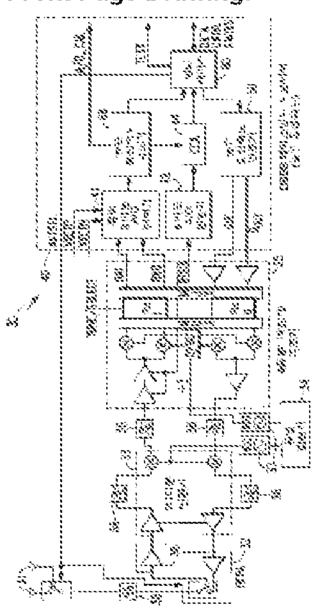
IPC - DWPI	Section - DWPI	Class - DWPI	Subclass - DWPI	Class Group - DWPI	Subgroup - DWPI
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

H04B000169	H	H04	H04B	H04B0001	H04B000169

Assignee/Applicant: Harris Corp.,US
JP F Terms:
JP FI Codes:
Assignee - Original: Harris Corp.
Any CPC Table:

Type	Invention	Additional	Version	Office
Current	**H04J 13/0048**	-	20130101	EP
Current	H04B 1/707		20130101	EP
Current	H04J 13/12		20130101	EP
Current	H04L 27/18		20130101	EP

ECLA: H04J001300B7B | H04B0001707 | H04J001312 | H04L002718 | T04J001300B7B | T04J001312
Abstract:
Language of Publication: DE
INPADOC Legal Status Table:
Post-Issuance (US):
Reassignment (US) Table:
Maintenance Status (US):
Litigation (US):
Opposition (EP):
License (EP):
EPO Procedural Status:
Front Page Drawing:



Assignee - Current US:

Record 5/7 CN1284305C High data rate spread spectrum transceiver and associated methods | High data rate spread spectrum transceiver and related method

Publication Number: CN1284305C 20061108
CN1206254A 19990127

Title: High data rate spread spectrum transceiver and associated methods | High data rate spread spectrum transceiver and related method
Title - DWPI: High data rate spread spectrum transceiver has baseband processor and interconnected radio circuit modulator for spread spectrum; PSK modulating information for transmission via radio circuit, and includes at least one modified Walsh code for reducing average DC signal during AC sig
Priority Number: US1997819846A
Priority Date: 1997-03-17
Application Number: CN1998105495A
Application Date: 1998-03-16
Publication Date: 2006-11-08
IPC Class Table:

IPC	Section	Class	Subclass	Class Group	Subgroup
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

IPC Class Table - DWPI:

IPC - DWPI	Section - DWPI	Class - DWPI	Subclass - DWPI	Class Group - DWPI	Subgroup - DWPI
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

H04B000169	H	H04	H04B	H04B0001	H04B000169

Assignee/Applicant: Kenext INC
JP F Terms:
JP FI Codes:
Assignee - Original: Kenext INC
Any CPC Table:

Type	Invention	Additional	Version	Office
Current	**H04J 13/0048**	-	20130101	EP
Current	H04B 1/707		20130101	EP
Current	H04J 13/12		20130101	EP
Current	H04L 27/18		20130101	EP

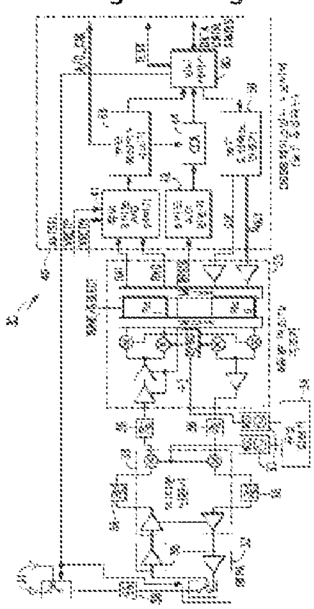
ECLA: H04J001300B7B | H04B0001707 | H04J001312 | H04L002718 | T04J001300B7B | T04J001312
Abstract:

A kind of spread spectrum wireless transceiver comprises a high data rate baseband processor and radio circuit to the first one. The base-band processor comprises a for making via a wireless circuit information transmitted by phase-shift keying (PSK to spread spectrum modulator of modulation mode. The modulator comprises at least one modified Walsh code function encoder according to a modified Walsh code to information code, the average DC signal component in nature, so as to through at least one analogue-to-digital converter to receive alternating current (AC) coupling signal to the demodulator, enhances the performance of the whole system. The demodulator used for making received from the wireless circuit in the information frequency spectrum PSK demodulating method to expand. The modulator and demodulator are or can at a first data rate at phase PSK (BPSK) mode or at a second data rate with four phases PSK (QPSK) mode.
Language of Publication: ZH
INPADOC Legal Status Table:

Gazette Date	Code	INPADOC Legal Status Impact
2010-12-29	COR	-
Description: CHANGE OF BIBLIOGRAPHIC DATA CORRECT: ADDRESS; FROM: AMERICA NEW JERSEY TO: DELAWARE, AMERICA		
2010-12-29	C41	-
Description: TRANSFER OF PATENT APPLICATION OR PATENT RIGHT OR UTILITY MODEL		
2010-12-29	ASS	-
Description: SUCCESSION OR ASSIGNMENT OF PATENT RIGHT CONEXANT SYSTEMS INC. FORMER OWNER: KENEKST CO. 2010-11-17		

2006-11-08	C14	+
Description: GRANT OF PATENT OR UTILITY MODEL		
2000-05-31	C10	-
Description: ENTRY INTO SUBSTANTIVE EXAMINATION		
1999-01-27	C06	+
Description: PUBLICATION		

Post-Issuance (US):
Reassignment (US) Table:
Maintenance Status (US):
Litigation (US):
Opposition (EP):
License (EP):
EPO Procedural Status:
Front Page Drawing:



Assignee - Current US:

Record 6/7 USRE40231E1 High data spread spectrum transceiver and associated methods

Publication Number: USRE40231E1 20080408

Title: High data spread spectrum transceiver and associated methods
Title - DWPI: High data rate spread spectrum transceiver has baseband processor and interconnected radio circuit modulator for spread spectrum; PSK modulating information for transmission via radio circuit, and includes at least one modified Walsh code for reducing average DC signal during AC sig
Priority Number: US1997819846A
Priority Date: 1997-03-17
Application Number: US20015483A
Application Date: 2001-11-09
Publication Date: 2008-04-08
IPC Class Table:

IPC	Section	Class	Subclass	Class Group	Subgroup
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

IPC Class Table - DWPI:

IPC - DWPI	Section - DWPI	Class - DWPI	Subclass - DWPI	Class Group - DWPI	Subgroup - DWPI
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732
H04B000169	H	H04	H04B	H04B0001	H04B000169

Assignee/Applicant: Conexant Inc.,Red Bank,NJ,US
JP F Terms:
JP FI Codes:
Assignee - Original: Conexant Inc.
Any CPC Table:

Type	Invention	Additional	Version	Office
Current	**H04J 13/0048**	-	20130101	EP
Current	H04B 1/707		20130101	EP
Current	H04J 13/12		20130101	EP
Current	H04L 27/18		20130101	EP

ECLA: H04J001300B7B | H04B0001707 | H04J001312 | H04L002718 | T04J001300B7B | T04J001312
Abstract:

A spread spectrum radio transceiver includes a high data rate baseband processor and a radio circuit connected thereto. The baseband processor preferably includes a modulator for spread spectrum phase shift keying (PSK) modulating information for transmission via the radio circuit. The modulator may include at least one modified Walsh code function encoder for encoding information according to a modified Walsh code for substantially reducing an average DC signal component to thereby enhance overall system performance when AC-coupling the received signal through at least one analog-to-digital converter to the demodulator. The demodulator is for spread spectrum PSK demodulating information received from the radio circuit. 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. Method aspects are also disclosed.
Language of Publication: EN
INPADOC Legal Status Table:

Gazette Date	Code	INPADOC Legal Status Impact
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-

Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
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2011-07-22	AS	-
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Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-07-22	AS	-
Description: ASSIGNMENT INTELLECTUAL VENTURES I LLC, DELAWARE MERGER; ASSIGNOR:XOCYST TRANSFER AG L.L.C.; REEL/FRAME:026637/0603 2011-07-18		
2011-04-22	FPAY	+
Description: FEE PAYMENT		
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C., DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C., DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C., DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C., DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C.,DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C., DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C.,DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-

Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C., DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2009-01-02	AS	-
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2009-01-02	AS	-
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2009-01-02	AS	-
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2009-01-02	AS	-
Description: ASSIGNMENT XOCYST TRANSFER AG L.L.C., DELAWARE ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:022043/0591 2008-10-16		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC., CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC., CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC., CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC., CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC.,CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF		

NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC.,CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-10-27	AS	-
Description: ASSIGNMENT CONEXANT, INC., CALIFORNIA RELEASE BY SECURED PARTY; ASSIGNOR:BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.); REEL/FRAME:021731/0845 2008-10-17		
2008-08-28	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC., NEW JERSEY CONFIRMATORY ASSIGNMENT; ASSIGNORS:INTERSIL CORPORATION; INTERSIL AMERICAS, INC.; REEL/FRAME:021450/0637 2008-08-27		
2008-08-28	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC., NEW JERSEY CONFIRMATORY ASSIGNMENT; ASSIGNORS:INTERSIL CORPORATION; INTERSIL AMERICAS, INC.; REEL/FRAME:021450/0637 2008-08-27		
2008-08-28	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC.,NEW JERSEY CONFIRMATORY ASSIGNMENT; ASSIGNORS:INTERSIL CORPORATION; INTERSIL AMERICAS, INC.; REEL/FRAME:021450/0637 2008-08-27		
2008-08-28	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC.,NEW JERSEY CONFIRMATORY ASSIGNMENT; ASSIGNORS:INTERSIL CORPORATION; INTERSIL AMERICAS, INC.; REEL/FRAME:021450/0637 2008-08-27		
2008-07-15	CC	-
Description: CERTIFICATE OF CORRECTION		
2007-01-31	AS	-
Description: ASSIGNMENT INTERSIL CORPORATION, FLORIDA RELEASE BY SECURED PARTY; ASSIGNOR:CREDIT SUISSE FIRST BOSTON, AS COLLATERAL AGENT; REEL/FRAME:018826/0359 2003-03-06		
2006-11-20	AS	-
Description: ASSIGNMENT BANK OF NEW YORK TRUST COMPANY, N.A., ILLINOIS SECURITY INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:018545/0298 2006-11-13		

2006-11-20	AS	-
Description: ASSIGNMENT BANK OF NEW YORK TRUST COMPANY, N.A., ILLINOIS SECURITY INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:018545/0298 2006-11-13		
2006-11-20	AS	-
Description: ASSIGNMENT BANK OF NEW YORK TRUST COMPANY, N.A.,ILLINOIS SECURITY INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:018545/0298 2006-11-13		
2006-11-20	AS	-
Description: ASSIGNMENT BANK OF NEW YORK TRUST COMPANY, N.A., ILLINOIS SECURITY INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:018545/0298 2006-11-13		
2006-11-20	AS	-
Description: ASSIGNMENT BANK OF NEW YORK TRUST COMPANY, N.A.,ILLINOIS SECURITY INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:018545/0298 2006-11-13		
2006-11-20	AS	-
Description: ASSIGNMENT BANK OF NEW YORK TRUST COMPANY, N.A., ILLINOIS SECURITY INTEREST; ASSIGNOR:CONEXANT, INC.; REEL/FRAME:018545/0298 2006-11-13		
2005-11-01	AS	-
Description: ASSIGNMENT CONEXANT, INC.,NEW JERSEY CHANGE OF NAME; ASSIGNOR:GLOBESPANVIRATA, INC.; REEL/FRAME:016937/0061 2004-05-28		
2005-11-01	AS	-
Description: ASSIGNMENT CONEXANT, INC., NEW JERSEY CHANGE OF NAME; ASSIGNOR:GLOBESPANVIRATA, INC.; REEL/FRAME:016937/0061 2004-05-28		
2005-11-01	AS	-
Description: ASSIGNMENT CONEXANT, INC.,NEW JERSEY CHANGE OF NAME; ASSIGNOR:GLOBESPANVIRATA, INC.; REEL/FRAME:016937/0061 2004-05-28		
2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPAN VIRATA, INC.,NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0040 2003-07-15		
2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPAN VIRATA, INC.,NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0040 2003-07-15		

2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC.,NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0550 2003-07-15		
2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC., NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0550 2003-07-15		
2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA, INC.,NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0550 2003-07-15		
2005-07-25	AS	-
Description: ASSIGNMENT GLOBESPAN VIRATA, INC., NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNOR:INTERSIL CORPORATION; REEL/FRAME:016561/0040 2003-07-15		
2004-03-05	AS	-
Description: ASSIGNMENT GLOBESPANVIRATA INCORPORATED, NEW JERSEY ASSIGNMENT OF ASSIGNORS INTEREST; ASSIGNORS:ANDREN, CARL F.; LUCAS, LEONARD VICTOR; REEL/FRAME:015045/0740; SIGNING DATES FROM 20040303 TO 20040304		

Post-Issuance (US): CORR-CERT Certificate of Correction 2008-07-15 2008 2008-08-05 2008 A Certificate of Correction was issued for this patent

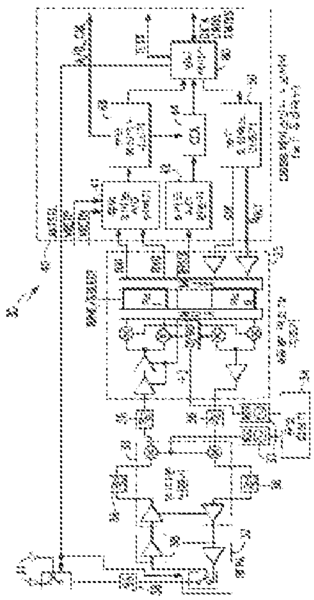
Reassignment (US) Table:

Assignee	Assignor	Date Signed	Reel/Frame	Date
INTELLECTUAL VENTURES I LLC,WILMINGTON,DE,US	XOCYST TRANSFER AG L.L.C.	2011-07-18	026637/0603	2011-07-22
Conveyance: MERGER (SEE DOCUMENT FOR DETAILS).				
Correspondent: FOLEY & LARDNER LLP 150 EAST GILMAN STREET MADISON, WI 53701-1497				
CONEXANT INC.,NEWPORT BEACH,CA,US	BANK OF NEW YORK MELLON TRUST COMPANY, N.A. (FORMERLY, BANK OF NEW YORK TRUST COMPANY, N.A.)	2008-10-17	021731/0845	2008-10-27
Conveyance: RELEASE BY SECURED PARTY (SEE DOCUMENT FOR DETAILS).				
Correspondent: HAW-MINN LU 9645 SCRANTON ROAD, SUITE 140 SAN DIEGO, CA 92121				
XOCYST TRANSFER AG	CONEXANT, INC.	2008-10-16	022043/0591	2009-01-02

L.L.C.,WILMINGTON,DE,US				
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Corresponent: MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP 300 SOUTH WACKER DRIVE ROBERT J. IRVINE III CHICAGO, IL 60606				
GLOBESPANVIRATA INC.,RED BANK,NJ,US	INTERSIL CORPORATION	2008-08-27	021450/0637	2008-08-28
	INTERSIL AMERICAS, INC.	2008-08-27	-	-
Conveyance: CONFIRMATORY ASSIGNMENT				
Corresponent: PATRICIA DAILEY 100 SCHULZ DRIVE CONEXANT SYSTEMS, INC. RED BANK, NJ 07701				
BANK OF NEW YORK TRUST COMPANY N.A.,CHICAGO,IL,US	CONEXANT, INC.	2006-11-13	018545/0298	2006-11-20
Conveyance: SECURITY INTEREST (SEE DOCUMENT FOR DETAILS).				
Corresponent: WALTER G. HANCHUK CHADBOURNE & PARKE LLP 30 ROCKEFELLER PLAZA NEW YORK, NY 10112				
CONEXANT INC.,RED BANK,NJ,US	GLOBESPANVIRATA, INC.	2004-05-28	016937/0061	2005-11-01
Conveyance: CHANGE OF NAME (SEE DOCUMENT FOR DETAILS).				
Corresponent: SAM TELPSLACKY SB4-407 9868 SCRANTON RD. SAN DIEGO, CA 92121				
GLOBESPANVIRATA INCORPORATED,RED BANK,NJ,US	ANDREN, CARL F.	2004-03-03	015045/0740	2004-03-05
	LUCAS, LEONARD VICTOR	2004-03-04	-	-
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Corresponent: HUNTON & WILLIAMS LLP KEVIN T. DUNCAN, ESQ. 1900 K STREET, N.W. SUITE 1200 SUITE 1200 WASHINGTON, DC 20006-1109				
GLOBESPANVIRATA INC.,RED BANK,NJ,US	INTERSIL CORPORATION	2003-07-15	016561/0550	2005-07-25
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Corresponent: SAM TALPALATSKY SB4-407 9868 SCRANTON RD. SAN DIEGO, CA 92121				
GLOBESPAN VIRATA INC.,RED BANK,NJ,US	INTERSIL CORPORATION	2003-07-15	016561/0040	2005-07-25
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).				
Corresponent: SAM TALPALATSKY SB4-407 9868 SCRANTON RD. SAN DIEGO, CA 92121				

INTERSIL CORPORATION,PALM BAY,FL,US	CREDIT SUISSE FIRST BOSTON, AS COLLATERAL AGENT	2003-03-06	018826/0359	2007-01-31
Conveyance: RELEASE BY SECURED PARTY (SEE DOCUMENT FOR DETAILS).				
Correspondent: DENNIS HOPKINS CHADBOURNE & PARKE LLP 30 ROCKEFELLER PLAZA NEW YORK, NY 10112				

Maintenance Status (US): CC
Litigation (US):
Opposition (EP):
License (EP):
EPO Procedural Status:
Front Page Drawing:



Assignee - Current US: INTELLECTUAL VENTURES I LLC

Record 7/7 JP04203551B2 The high data rate spread-spectrum transceiver and a related method

Publication Number: JP04203551B2 20090107
JP10322242A 19981204

Title: The high data rate spread-spectrum transceiver and a related method
Title - DWPI: High data rate spread spectrum transceiver has baseband processor and interconnected radio circuit modulator for spread spectrum; PSK modulating information for transmission via radio circuit, and includes at least one modified Walsh code for reducing average DC signal during AC sig
Priority Number: US1997819846A
Priority Date: 1997-03-17
Application Number: JP199867463A
Application Date: 1998-03-17
Publication Date: 2009-01-07
IPC Class Table:

IPC	Section	Class	Subclass	Class Group	Subgroup
H04B000140	H	H04	H04B	H04B0001	H04B000140
H04B0001707	H	H04	H04B	H04B0001	H04B0001707
H04J001300	H	H04	H04J	H04J0013	H04J001300
H04J001312	H	H04	H04J	H04J0013	H04J001312
H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732

IPC Class Table - DWPI:

IPC - DWPI	Section - DWPI	Class - DWPI	Subclass - DWPI	Class Group - DWPI	Subgroup - DWPI
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H04L002718	H	H04	H04L	H04L0027	H04L002718
H04L002730	H	H04	H04L	H04L0027	H04L002730
H04Q000732	H	H04	H04Q	H04Q0007	H04Q000732
H04B000169	H	H04	H04B	H04B0001	H04B000169

Assignee/Applicant: CONEXANT INC,JP
JP F Terms: | 5K011BA10 | 5K011DA15 | 5K011JA01 | 5K022EE02 | 5K022EE22 | 5K022EE32 | 5K033AA01 | 5K033BA02 | 5K033BA04 | 5K033BA11 | 5K033DA17 | 5K033DA19 | 5K033DB09 | 5K033DB10 | 5K067AA23 | 5K067BB02 | 5K067CC10 | 5K067EE02 | 5K067EE10 | 5K067HH11
JP FI Codes: | H04B00013822 | H04B000140 | H04B0001707 | H04B000726-V | H04J001300-200 | H04J001300-400 | H04J001300-D | H04J001316 | H04L001100-310B | H04L001228-300Z | H04Q000700-641 | H04W008802
Assignee - Original: CONEXANT INC
Any CPC Table:

Type	Invention	Additional	Version	Office
Current	**H04J 13/0048**	-	20130101	EP
Current	H04B 1/707		20130101	EP
Current	H04J 13/12		20130101	EP
Current	H04L 27/18		20130101	EP

ECLA: H04J001300B7B | H04B0001707 | H04J001312 | H04L002718 | T04J001300B7B | T04J001312
Abstract:
Language of Publication: JA
INPADOC Legal Status Table:

Gazette Date	Code	INPADOC Legal Status Impact
2014-10-07	R250	+
Description: RECEIPT OF ANNUAL FEES JAPANESE INTERMEDIATE CODE: R250		
2013-10-08	R250	+
Description: RECEIPT OF ANNUAL FEES JAPANESE INTERMEDIATE CODE: R250		
2012-10-16	FPAY	+
Description: RENEWAL FEE PAYMENT (PRS DATE IS RENEWAL DATE OF DATABASE) PAYMENT UNTIL: 20131024		
2011-10-25	FPAY	+
Description: RENEWAL FEE PAYMENT (PRS DATE IS RENEWAL DATE OF DATABASE) PAYMENT UNTIL: 20121024		
2011-10-20	FPAY	+
Description: RENEWAL FEE PAYMENT (PRS DATE IS RENEWAL DATE OF DATABASE) PAYMENT UNTIL: 20111024		
2010-11-24	R350	-
Description: WRITTEN NOTIFICATION OF REGISTRATION OF TRANSFER JAPANESE INTERMEDIATE CODE: R350		

2010-11-24	FPAY	+
Description: RENEWAL FEE PAYMENT (PRS DATE IS RENEWAL DATE OF DATABASE) PAYMENT UNTIL: 20111024		
2010-11-15	S111	-
Description: REQUEST FOR CHANGE OF OWNERSHIP OR PART OF OWNERSHIP JAPANESE INTERMEDIATE CODE: R313113		
2010-11-15	FPAY	+
Description: RENEWAL FEE PAYMENT (PRS DATE IS RENEWAL DATE OF DATABASE) PAYMENT UNTIL: 20111024		
2008-10-24	R150	+
Description: CERTIFICATE OF PATENT (=GRANT) OR REGISTRATION OF UTILITY MODEL JAPANESE INTERMEDIATE CODE: R150		
2008-10-24	FPAY	+
Description: RENEWAL FEE PAYMENT (PRS DATE IS RENEWAL DATE OF DATABASE) PAYMENT UNTIL: 20111024		
2008-10-01	A521	-
Description: WRITTEN AMENDMENT JAPANESE INTERMEDIATE CODE: A821 2008-09-01		
2008-09-04	A61	+
Description: FIRST PAYMENT OF ANNUAL FEES (DURING GRANT PROCEDURE) JAPANESE INTERMEDIATE CODE: A61 2008-08-29		
2008-08-30	A711	-
Description: NOTIFICATION OF CHANGE IN APPLICANT JAPANESE INTERMEDIATE CODE: A711 2008-08-29		
2008-08-11	A602	-
Description: WRITTEN PERMISSION OF EXTENSION OF TIME JAPANESE INTERMEDIATE CODE: A602 2008-08-08		
2008-07-31	A601	-
Description: WRITTEN REQUEST FOR EXTENSION OF TIME JAPANESE INTERMEDIATE CODE: A601 2008-07-30		
2008-07-02	A01	+
Description: WRITTEN DECISION TO GRANT A PATENT OR TO GRANT A REGISTRATION (UTILITY MODEL) JAPANESE INTERMEDIATE CODE: A01 2008-07-01		
2008-02-28	A521	-

Description: WRITTEN AMENDMENT JAPANESE INTERMEDIATE CODE: A523 2008-02-27		
2007-11-28	A131	-
Description: NOTIFICATION OF REASONS FOR REFUSAL JAPANESE INTERMEDIATE CODE: A131 2007-11-27		
2007-05-02	A521	-
Description: WRITTEN AMENDMENT JAPANESE INTERMEDIATE CODE: A523 2007-05-01		
2007-01-31	A131	-
Description: NOTIFICATION OF REASONS FOR REFUSAL JAPANESE INTERMEDIATE CODE: A131 2007-01-30		
2007-01-11	A977	-
Description: REPORT ON RETRIEVAL JAPANESE INTERMEDIATE CODE: A971007 2007-01-11		
2005-02-24	A621	+
Description: WRITTEN REQUEST FOR APPLICATION EXAMINATION JAPANESE INTERMEDIATE CODE: A621 2005-02-23		

Post-Issuance (US):
Reassignment (US) Table:
Maintenance Status (US):
Litigation (US):
Opposition (EP):
License (EP):
EPO Procedural Status:
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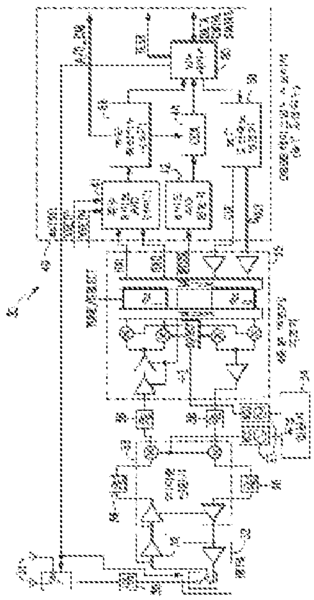

Assignee - Current US:

United States Patent and Trademark Office

Office of the Commissioner for Patents

HIGH DATA RATE SPREAD SPECTRUM TRANSCEIVER AND ASSOCIATED METHODS

PATENT #	APPLICATION #	FILING DATE	ISSUE DATE
5982807	08819846	03/17/1997	11/09/1999

Payment Window Status

WINDOW	STATUS	FEES
11.5 Year	Not Open	Not Due

Window	First Day to Pay	Surcharge Starts	Last Day to Pay	Status	Fees
3.5 Year	11/09/2002	05/10/2003	11/10/2003	Closed	Paid
7.5 Year	11/09/2006	05/10/2007	11/09/2007	Closed	Paid
11.5 Year	11/09/2010	05/10/2011	11/09/2011	Not Open	Not Due

Patent has been reissued as Patent Number RE40231, Application Number 10005483.

Patent Holder Information

Customer # 204

Entity Status UNDISCOUNTED

Phone Number 3014248890

Address COMPUTER PACKAGES, INC.
414 HUNGERFORD DRIVE
ROCKVILLE, MD 20850
UNITED STATES

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	SYSTEM AND METHOD OF COMMUNICATION USING AT LEAST TWO MODULATION METHODS
First Named Inventor/Applicant Name:	Gordon E. Bremer
Filer:	Jon Steven Baughman/ginny blundell
Attorney Docket Number:	110797-0019-502

Filed as Large Entity

Filing Fees for ex parte reexam

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
REQUEST FOR EX PARTE REEXAMINATION	1812	1	12000	12000
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**12000**

Electronic Acknowledgement Receipt

EFS ID:	26903085
Application Number:	90013809
International Application Number:	
Confirmation Number:	7821
Title of Invention:	SYSTEM AND METHOD OF COMMUNICATION USING AT LEAST TWO MODULATION METHODS
First Named Inventor/Applicant Name:	Gordon E. Bremer
Customer Number:	28120
Filer:	Jon Steven Baughman/giny blundell
Filer Authorized By:	Jon Steven Baughman
Attorney Docket Number:	110797-0019-502
Receipt Date:	12-SEP-2016
Filing Date:	
Time Stamp:	23:50:24
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$12000
RAM confirmation Number	7693
Deposit Account	181945
Authorized User	BAUGHMAN, STEVEN

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Ex_A_US8457228_Bremer.pdf	1289823 123eb0eb5e9be30a8abeb2adc1b2560fdfae6c78	no	19
Warnings:					
Information:					
2	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Ex_B_US13198568.pdf	1602468 69126666b6c8579d7c227661e1e08d1d23b9b9ee	no	41
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3	Reexam - Correspondence Address Change for 3rd Party	Ex_C_US8457228_Prosecution_History.pdf	16496599 5f35ee96936d57aa603464b8fc8e68d2cf8c7eb4	no	384
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6	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Ex_I_Kamerman.pdf	1084692 6b8e686c52b581a67b7cf9682d8561be954f50e7	no	12
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14	Copy of patent for which reexamination is requested	Copy_Patent_US8457228_Bremer.pdf	1278700 1c154fc8c6ef3d788574694612028fa3e744a0c2	no	19
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Information:					
		Total Files Size (in bytes):	86891181		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Exhibit A

US008457228B2

(12) **United States Patent**
Bremer

(10) **Patent No.: US 8,457,228 B2**
(45) **Date of Patent: *Jun. 4, 2013**

(54) **SYSTEM AND METHOD OF COMMUNICATION USING AT LEAST TWO MODULATION METHODS**

(76) Inventor: **Gordon F. Bremer**, Clearwater, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/198,568**

(22) Filed: **Aug. 4, 2011**

(65) **Prior Publication Data**

US 2012/0106604 A1 May 3, 2012

Related U.S. Application Data

(63) Continuation of application No. 12/543,910, filed on Aug. 19, 2009, now Pat. No. 8,023,580, which is a continuation of application No. 11/774,803, filed on Jul. 9, 2007, now Pat. No. 7,675,965, which is a continuation of application No. 10/412,878, filed on Apr. 14, 2003, now Pat. No. 7,248,626, which is a continuation-in-part of application No. 09/205,205, filed on Dec. 4, 1998, now Pat. No. 6,614,838.

(60) Provisional application No. 60/067,562, filed on Dec. 5, 1997.

(51) **Int. Cl.**
H04L 5/12 (2006.01)

(52) **U.S. Cl.**
USPC **375/261**; 375/295; 455/102; 332/108; 332/119; 332/151

(58) **Field of Classification Search**
USPC 375/261, 269, 285, 222, 298, 302, 375/305, 308; 455/102, 110; 332/108, 119, 332/120, 151
See application file for complete search history.

(56) **References Cited**

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(Continued)

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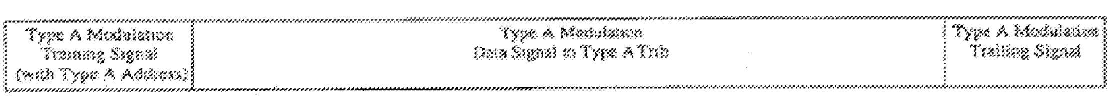
(Continued)

Primary Examiner — Dac Ha
(74) *Attorney, Agent, or Firm* — Condo Roccia LLP

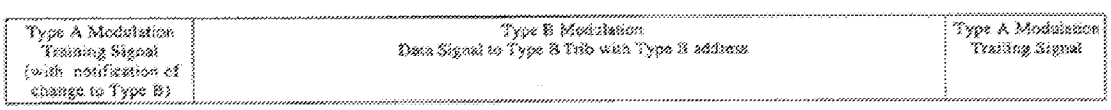
(57) **ABSTRACT**

A device may be capable of communicating using at least two type types of modulation methods. Methods and systems are provided for communication of data according to a communications method in which a master transceiver communicates with one or more slave transceivers according to a master/slave relationship. A first data message may include first information and second information that are modulated according to a first modulation method. The second information may include lower data rate data. A second data message may include third information that may be modulated according to the first modulation method and that may indicate an impending change to a second modulation method. The second modulation method may be used for transmitting fourth information, and the fourth information may be included in the second message. The fourth information may include higher data rate data, for example Internet access data.

52 Claims, 8 Drawing Sheets



170



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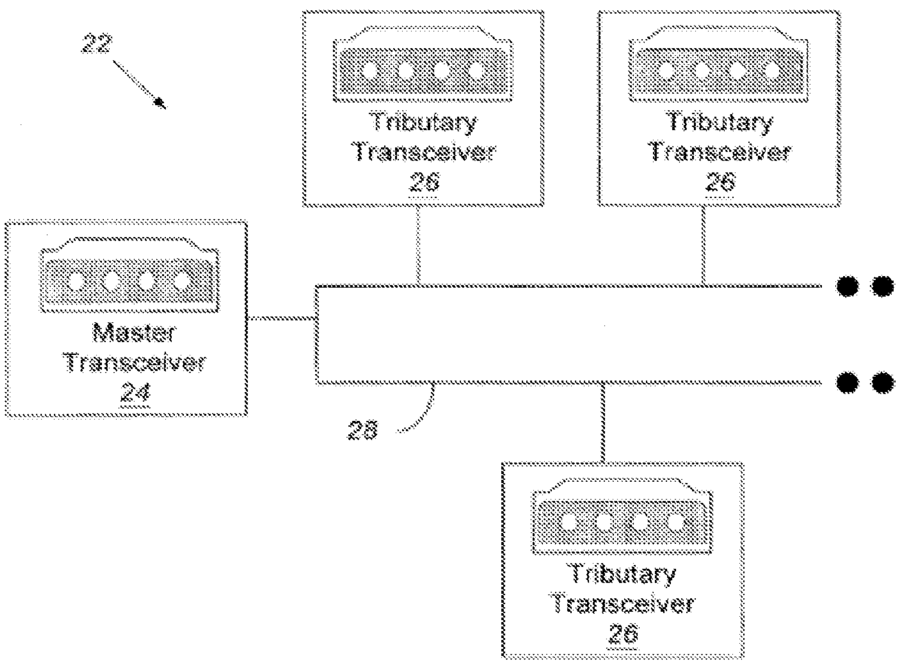


FIG. 1
Prior Art

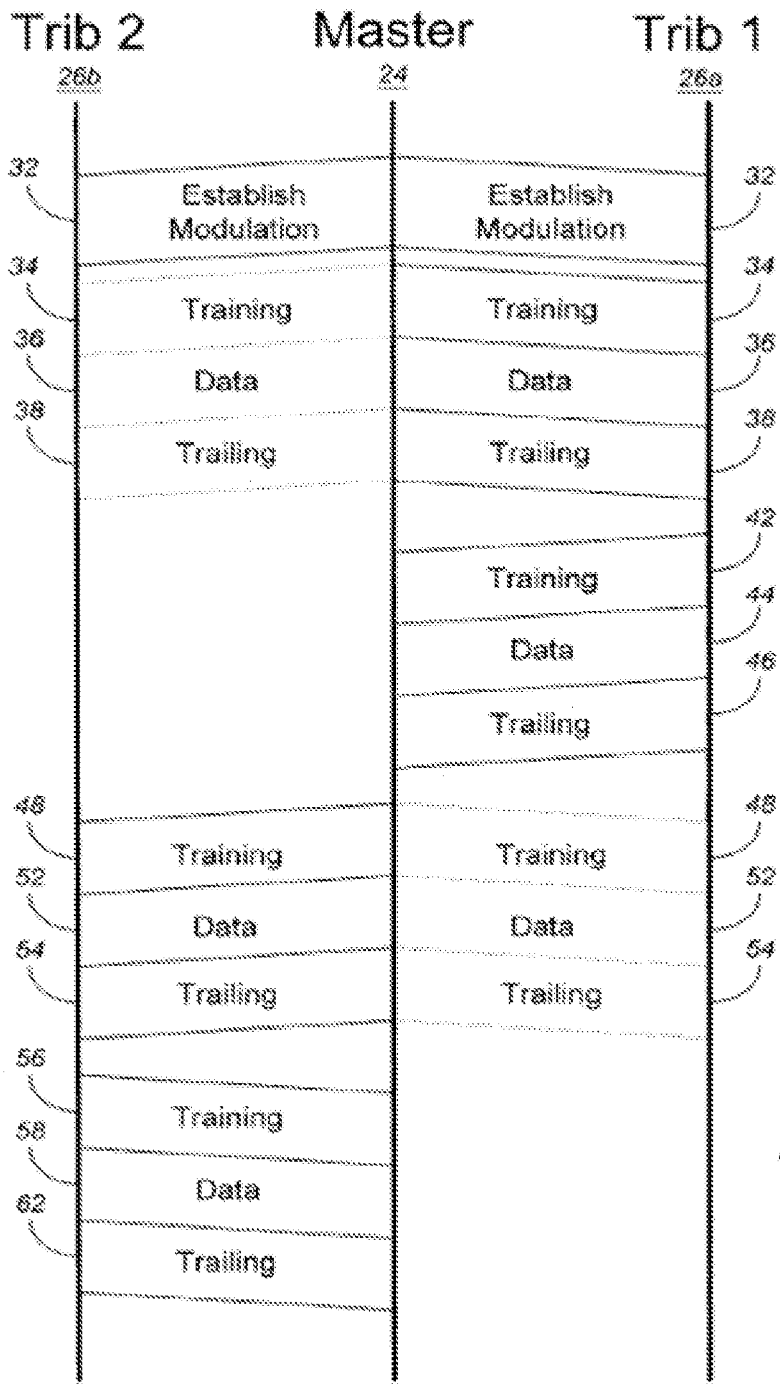

Trib 2
26b
Master
24
Trib 1
26a
32
Establish Modulation
Establish Modulation
32
34
Training
Training
34
36
Data
Data
36
38
Trailing
Trailing
38
42
Training
44
Data
46
Trailing
48
Training
Training
48
52
Data
Data
52
54
Trailing
Trailing
54
56
Training
58
Data
62
Trailing

FIG. 2

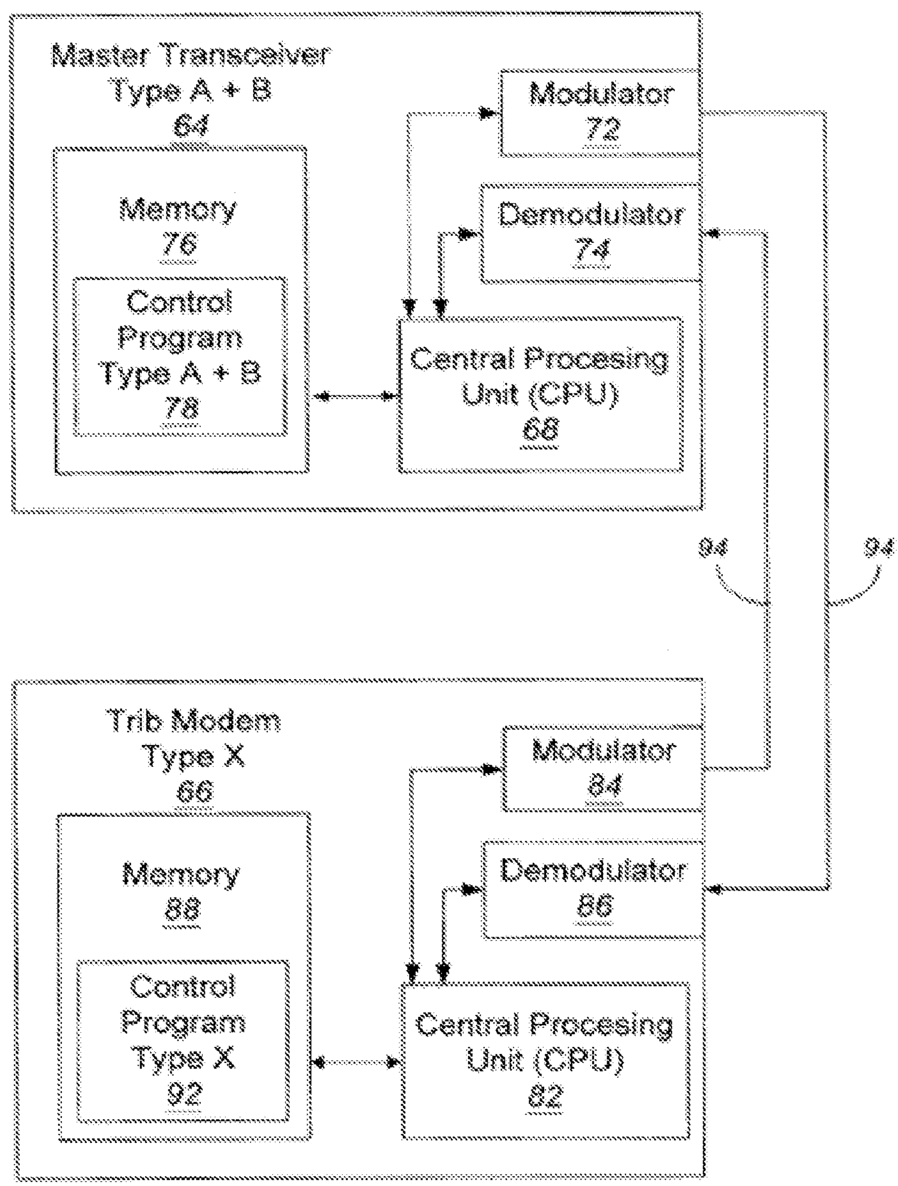

Master Transceiver
Type A + B
64
Memory
76
Control
Program
Type A + B
78
Modulator
72
Demodulator
74
Central Procesing
Unit (CPU)
68
94
94
Trib Modem
Type X
66
Memory
88
Control
Program
Type X
92
Modulator
84
Demodulator
86
Central Procesing
Unit (CPU)
82

FIG. 3

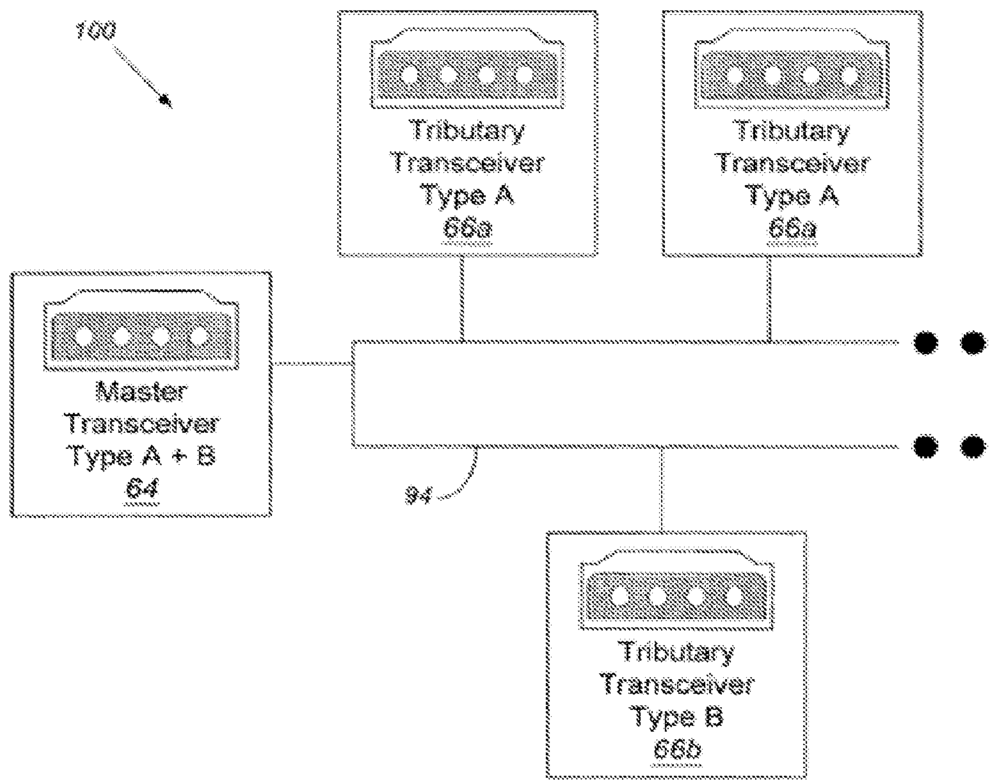

100
Tributary
Transceiver
Type A
66a
Tributary
Transceiver
Type A
66a
Master
Transceiver
Type A + B
64
94
Tributary
Transceiver
Type B
66b

FIG. 4

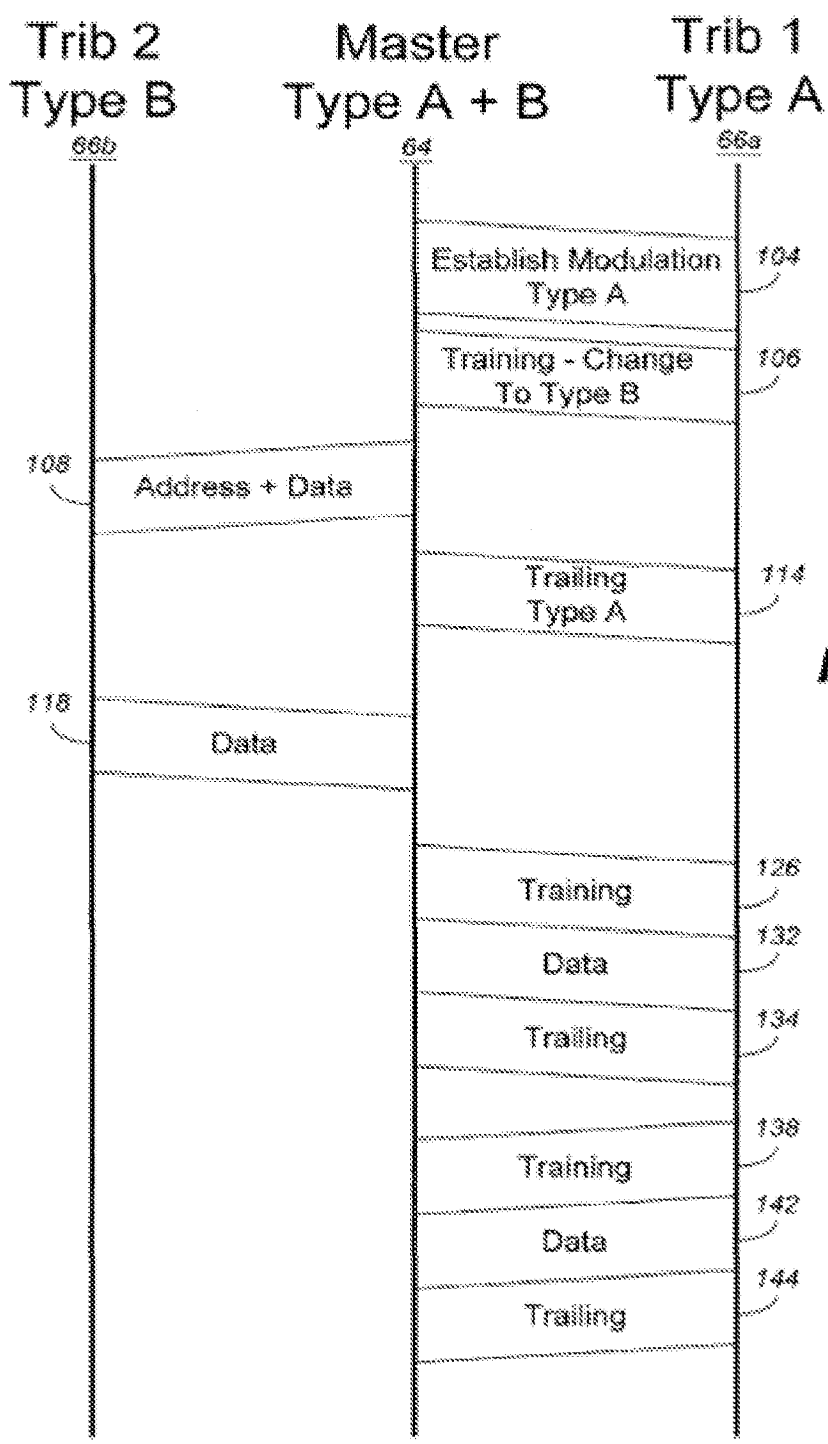
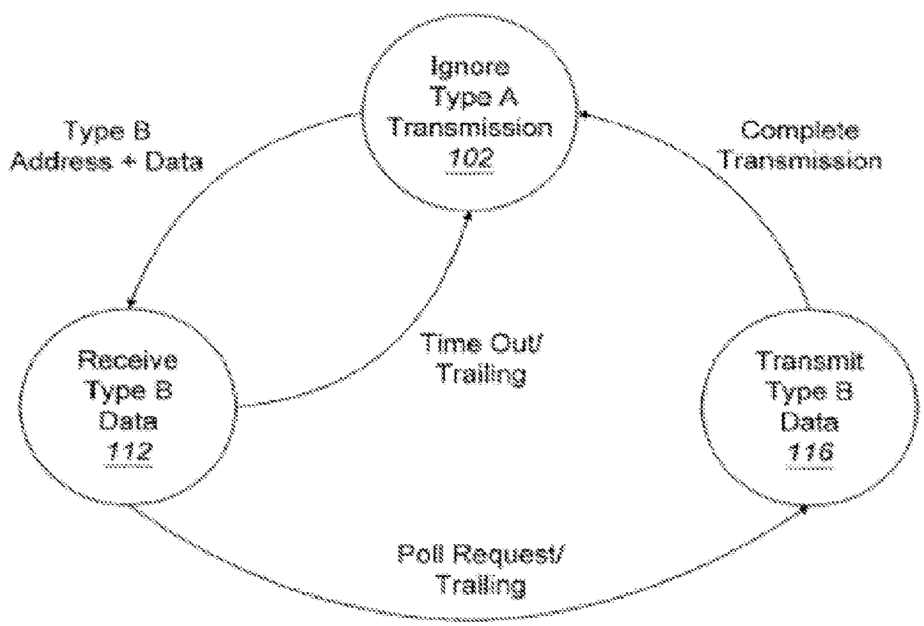

Trib 2
Type B
66b
Master
Type A + B
64
Trib 1
Type A
66a
Establish Modulation
Type A
104
Training - Change
To Type B
106
108
Address + Data
Trailing
Type A
114
118
Data
Training
126
Data
132
Trailing
134
Training
138
Data
142
Trailing
144

FIG. 5



Ignore
Type A
Transmission
102
Type B
Address + Data
Complete
Transmission
Receive
Type B
Data
112
Time Out/
Trailing
Transmit
Type B
Data
116
Poll Request/
Trailing

FIG. 6

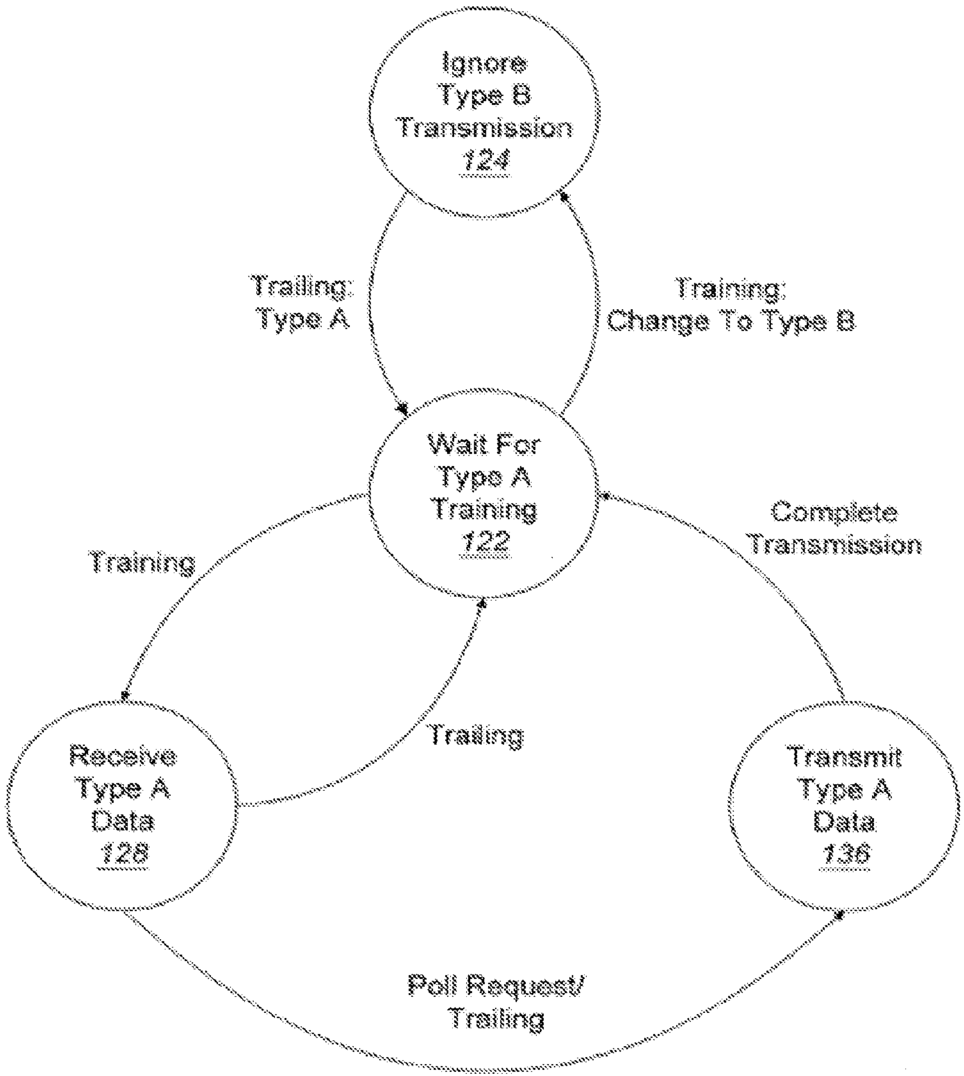

Ignore
Type B
Transmission
124
Trailing:
Type A
Training:
Change To Type B
Wait For
Type A
Training
122
Training
Complete
Transmission
Receive
Type A
Data
128
Trailing
Transmit
Type A
Data
136
Poll Request/
Trailing

FIG. 7

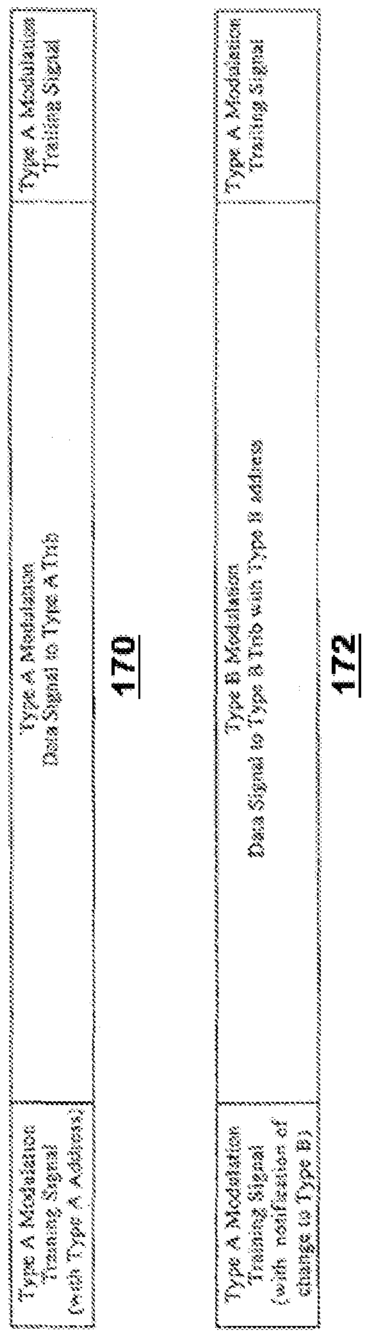

Type A Modulation Training Signal (with Type A Address)
Type A Modulation Data Signal to Type A Trib
Type A Modulation Trailing Signal
170
Type A Modulation Training Signal (with notification of change to Type B)
Type B Modulation Data Signal to Type B Trib with Type B address
Type A Modulation Trailing Signal
172

FIG. 8

SYSTEM AND METHOD OF COMMUNICATION USING AT LEAST TWO MODULATION METHODS

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of U.S. application Ser. No. 12/543,910 filed on Aug. 19, 2009, which is a continuation of U.S. application Ser. No. 11/774,803, filed on Jul. 9, 2007, which is a continuation of U.S. application Ser. No. 10/412,878, filed Apr. 14, 2003, which is a continuation-in-part of U.S. application Ser. No. 09/205,205, filed Dec. 4, 1998, and which claims priority to and the benefit of the filing date of U.S. Provisional Application No. 60/067,562, filed Dec. 5, 1997, each of which is incorporated by reference herein.

TECHNICAL FIELD

The present invention relates generally to the fields of data communications and modulator/demodulators (modems), and, more particularly, to a data communications system in which a plurality of modulation methods are used to facilitate communication among a plurality of modem types.

BACKGROUND

In existing data communications systems, a transmitter and receiver modem pair can successfully communicate only when the modems are compatible at the physical layer. That is, the modems must use compatible modulation methods. This requirement is generally true regardless of the network topology. For example, point- to-point, dial-up modems operate in either the industry standard V.34 mode or the industry standard V.22 mode. Similarly, in a multipoint architecture, all modems operate, for example, in the industry standard V.27bis mode. While the modems may be capable of using several different modulation methods, a single common modulation is negotiated at the beginning of a data session to be used throughout the duration of the session. Should it become necessary to change modulation methods, the existing data session is torn down, and a new session is negotiated using the new modulation method. Clearly, tearing down an existing data session causes a significant disruption in communication between the two modems.

As discussed in the foregoing, communication between modems is generally unsuccessful unless a common modulation method is used. In a point-to-point network architecture, 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 resulting modem pair uses a common modulation method.

In a multipoint architecture, a single central, or "master," modem communicates with two or more tributary or "trib" modems using a single modulation method. 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. Moreover, repeated attempts by the master to communicate with the incompatible trib(s) will disturb communications with compatible trib(s) due to time wasted in making the futile communication attempts.

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 with much more expensive state of the art devices 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.

Accordingly, 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.

SUMMARY

The present invention disclosed herein includes methods and systems for communication of data according to a communications method in which a master transceiver communicates with one or more slave transceivers according to a master/slave relationship. Communication from the one or more slave transceivers may be in response to a communication from the master to at least one of the one or more slave transceivers. Example communication methods may include transmitting at least a first message, which may be low data rate message, of a plurality of data messages. The plurality of data messages may be transmitted over a communication medium from the master transceiver to the one or more slave transceivers. The first message may include first information, and the first information may be modulated according to a first modulation method. The first message may include second information. The second information may be modulated according to the first modulation method. The second information may comprise lower data rate data, for example low data rate application data. The first message may include first message address data that may be indicative of an identity of one of the one or more slave transceivers as an intended destination of the second information. Example communication methods may include transmitting a second message, which may be a high data rate message, of the plurality of data messages. The second message may comprise third information (e.g., first information of the second message/high data rate message), and the third information may be modulated according to the first modulation method. The third information may be indicative of an impending change in modulation to a second modulation method for transmission of fourth information (e.g., second information of the second message/high data rate message). The second message may comprise the fourth information, and the fourth information may be transmitted after transitioning from the first modulation method to the second modulation method. The fourth information may be modulated according to the second modulation method. The second modulation method may be of a different type than the first modulation method. The fourth information may comprise higher data rate data, for example Internet access application data. The fourth information may be intended for a single slave transceiver of the one or more

slave transceivers. The higher data rate data may be transmitted at a higher data rate than the low data rate application data. The second message may indicate an identity of the single slave transceiver as being an intended destination of the fourth information using second message address data included in the second message.

The present invention has many advantages, a few of which are delineated hereafter as merely examples.

One advantage of the present invention is that it provides to the use of a plurality of modem modulation methods on the same communication medium.

Another advantage of the present invention is that a master transceiver can communicate seamlessly with tributary transceivers or modems using incompatible modulation methods.

Other features and advantages of the present invention will become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional features and advantages be included herein within the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention can be better understood with reference to the following drawings. The components and representations in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present invention. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is a block diagram of a prior art multipoint communication system including a master transceiver and a plurality of tributary transceivers;

FIG. **2** is a ladder diagram illustrating the operation of the multipoint communication system of FIG. **1**;

FIG. **3** is a block diagram of a master transceiver and tributary transceiver for use in the multipoint communication system of FIG. **1** in accordance with the principles of the present invention;

FIG. **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**;

FIG. **5** is a ladder diagram illustrating the operation of the multipoint communication system of FIG. **4**;

FIG. **6** is a state diagram for a tributary transceiver of FIGS. **3**-**5** using a secondary modulation method in accordance with the principles of the present invention;

FIG. **7** is a state diagram for a tributary transceiver of FIGS. **3**-**5** using a primary modulation method in accordance with the principles of the present invention; and

FIG. **8** is a signal diagram for an exemplary transmission according to an embodiment.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

While the invention is susceptible to various modifications and alternative forms, a specific embodiment thereof is shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the invention to the particular form disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the claims.

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 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 **26**_a_, **26**_b_ 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 **26**_a_. As a result, trib **26**_b_ ignores training sequence **34**. After completion of the training sequence **34**, master transceiver **24** transmits data **36** to trib **26**_a_ 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 **26**_b_ 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 **26**_a_ transmits training sequence **42** to initiate a communication session with master transceiver **24**. Because master transceiver **24** selected trib **26**_a_ for communication as part of training sequence **34**, trib **26**_a_ is the only modem that will return a transmission. Thus, trib **26**_a_ 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 **26**_b_ in training sequence **48**. In this case, trib **26**_a_ 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 **26**_b_ 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 **26***b* transmits training sequence **56** to establish a communication session. Master transceiver **24** is conditioned to expect data only from trib **26***b* because trib **26***b* was selected as part of training sequence **48**. Trib **26***b* transmits data **58** to master transceiver **24** terminated by trailing sequence **62**.

The foregoing discussion is based on a two-wire, half-duplex multipoint system. Nevertheless, it should be understood that the concept is equally applicable to four-wire systems.

Consider the circumstance in which master transceiver **24** and trib **26***b* share a common modulation type A while trib **26***a* uses a second modulation type B. When master transceiver attempts to establish A as a common modulation during sequence **32**, trib **26***a* will not be able to understand that communication. Moreover, trib **26***a* will not recognize its own address during training interval **34** and will therefore ignore data **36** and trailing sequence **38**. Master transceiver **24** may time out waiting for a response from trib **26***a* because trib **26***a* will never transmit training sequence **42**, data **44**, and trailing sequence **46** due to the failure of trib **26***a* to recognize the communication request (training sequence **34**) from master transceiver **24**. Thus, if the tribs in a multipoint communication system use a plurality of modulation methods, the overall communication efficiency will be disrupted as specific tribs will be unable to decipher certain transmissions from the master transceiver and any unilateral transmission by a trib that has not been addressed by the master transceiver will violate the multipoint protocol.

As discussed hereinbefore, however, it is desirable to design a multipoint communication system comprising tribs that use a plurality of modulation methods. For example, one moderately priced trib may be used to communicate at a relatively high data rate for some applications, such as Internet access, while another, lower priced, trib is used to communicate at a lower data rate for other applications, such as power monitoring and control. The needs of these different applications cannot be efficiently met by a single modulation. While it is possible to use high performance tribs running state of the art modulation methods such as QAM, CAP, or DMT to implement both the high and low data rate applications, significant cost savings can be achieved if lower cost tribs using low performance modulation methods are used to implement the lower data rate applications.

A block diagram of a master transceiver **64** in communication with a trib **66** in accordance with the principles of the present invention is shown in FIG. **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**.

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 logic for the processes 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. The master transceiver **64** communicates with trib **66** over communication medium **94**.

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 **66***a*-**66***a* run a type A modulation method while one trib **66***b* runs a type B modulation method. The present invention permits a secondary or embedded modulation method (e.g., type B) to replace the standard 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.

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 **66***b* will be discussed first. A state diagram for a type B trib **66***b* is shown in FIG. **6**. Type B trib **66***b* 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 **66***b* responds only to type B modulation transmissions, only the type A tribs **66***a*-**66***a* are receptive to transmission sequence **104**.

To switch from type A modulation to type B modulation, master transceiver **64** transmits a training sequence **106** to type A tribs **66***a* 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 **66***a* 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 **66***b*. In an example, embedded modulation permits a secondary modulation to replace the usual primary modulation for a user data segment located after a primary training sequence. For example, master transceiver **64** may change to modulation Type B and may convey user information to type B trib **66***b*. The type B trib **66***b* 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**.

After completing transmission sequence **108**, master transceiver **64** transmits a trailing sequence **114** using type A modulation thus notifying all type A tribs **66***a* that type B modulation transmission is complete. If master transceiver **64** has not transmitted a poll request to the type B trib **66***b* in sequence **108**, then the type B trib **66***b* 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 the trailing sequence **114** is ineffective in establishing the termination of a communication session between master transceiver **64** and a type B trib **66***b* because the trailing sequence is transmitted using type A modulation.

If, however, master transceiver **64** transmitted a poll request in sequence **108**, then the type B trib **66***b* 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 **66***b* returns to state **102** where type A transmissions are ignored.

With reference to FIG. **5** and FIG. **7**, a communication session between the master transceiver **64** and a type A trib **66***a* will now be discussed. A state diagram for a type A trib

66*a* is shown in FIG. 7. A type A trib 66*a* 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 66*a*-66*a* 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 66*a* returns to state 122 where it awaits a training sequence.

To initiate a communication session with a type A trib 66*a*, master transceiver 64 transmits a training sequence 126 in which an address of a particular type A trib 66*a* is identified. The identified type A trib 66*a* recognizes its own address and transitions to state 128 to receive data from master transceiver 64 as part of sequence 132.

After completing transmission sequence 132, which may include a user data segment transmitted using the usual primary (e.g., type A) modulation, 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 66*a* in sequence 132, then the type A trib 66*a* that was in communication with the master transceiver 64 will return to state 122 after receiving trailing sequence 134.

If, however, master transceiver 64 transmitted a poll request in sequence 132, then the type A trib 66*a* 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 66*a* returns to state 122 to await the next type A modulation training sequence by master transceiver 64.

The control programs 78 and 92 of the present invention can be implemented in hardware, software, firmware, or a combination thereof In the preferred embodiment(s), the control programs 78 and 92 are implemented in software or firmware that is stored in a memory and that is executed by a suitable instruction execution system.

The control programs 78 and 92, which comprise an ordered listing of executable instructions for implementing logical functions, can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (magnetic), a read-only memory (ROM) (magnetic), an erasable programmable read-only memory (EPROM or Flash memory) (magnetic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for instance optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.

In concluding the detailed description, it should be noted that it will be obvious to those skilled in the art that many variations and modifications can be made to the preferred embodiment without substantially departing from the principles of the present invention. All such variations and modifications are intended to be included herein within the scope of the present invention, as set forth in the following claims. Further, in the claims hereafter, the corresponding structures, materials, acts, and equivalents of all means or step plus function elements are intended to include any structure, material, or acts for performing the functions with other claimed elements as specifically claimed.

What is claimed:

1. 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:

a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers, 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

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

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

second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and

wherein the second modulation method results in a higher data rate than the first modulation method.

2. The master communication device as in claim 1, wherein the master transceiver is configured to communicate over the communication medium in accordance with a multi-point communication network communication architecture.

3. The master communication device as in claim 1, wherein the master transceiver is configured to transmit the first message before the second message.

4. The method as in claim 1, wherein the master transceiver is configured to transmit the first message after the second message.

5. The master communication device as in claim 1, wherein the master transceiver is configured additional data modulated according to the first modulation method after transmitting the fourth information.

6. The master communication device of claim 1, wherein the payload portion included in the fourth information is provided for a high data rate application.

7. The master communication device as in claim 6, wherein the high data rate application is configured to access the Internet.

8. The master communication device of claim 1, wherein the payload portion included in the second information is provided for a low data rate application.

9. The master communication device of claim 8, wherein the low data rate application is selected from the group consisting of: power monitoring or control applications.

10. The master communication device as in claim 1, wherein the master transceiver is configured to receive slave data from the single slave transceiver of the one or more slave transceivers, and the slave data is received after transmission of the second message and is modulated according to the second modulation method.

11. The master communication device as in claim 10, wherein the slave data from the single slave transceiver is received in response to a request sent from the master transceiver to the single slave transceiver, the request indicating that the master transceiver requests data from the single slave transceiver.

12. The master communication device as in claim 1, wherein the second information comprises user data.

13. The master communication device as in claim 1, wherein the fourth information comprises user data.

14. The master communication device as in claim 1, wherein the master transceiver is configured to transmit a plurality of user data messages, and the first and second messages correspond to messages in the plurality of user data messages.

15. The master communication device as in claim 14, wherein each of the plurality of user data messages comprises message-specific first information and message-specific second information, and for each of the plurality of user data messages:

the message-specific first information is modulated according to the first modulation method and the message-specific first information is indicative of whether the message-specific second information will be modulated using a different type of modulation method than is used for the message-specific first information; and

the user data message is indicative of a message-specific slave transceiver from among the one or more slave transceivers being an intended destination of the message-specific second information.

16. The master communication device as in claim 15, wherein:

for the first message, the message-specific first information comprises the first information and the message-specific second information comprises the second information; and

for the second message, the message-specific first information comprises the third information and the message-specific second information comprises the fourth information.

17. The master communication device as in claim 15, wherein the message-specific first information is indicative of whether the message-specific second information will be modulated according to the first modulation method or the second modulation method.

18. The master communication device as in claim 1, wherein the master transceiver is configured to transmit a third message, wherein the third message comprises:

fifth information, modulated according to the first modulation method, wherein the fifth information is indicative of an impending change in modulation to the second modulation method;

sixth information, including a payload portion, transmitted after the fifth information and being modulated according to the second modulation method, wherein the sixth information comprises additional data intended for an individual slave transceiver of the one or more slave transceivers, and

third message address information that is indicative of the individual slave transceiver of the one or more slave transceivers being an intended destination of the sixth information.

19. The master communication device as in claim 18, wherein the master transceiver is configured to transmit the third message after the transmitting of the first message and after the transmitting of the second message.

20. The master communication device as in claim 18, wherein the single slave transceiver and the individual slave transceiver are the same slave transceiver.

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.

22. A communication device configured to communicate 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 that is configured to send at least a plurality of communications, wherein each communication from among said plurality of communications comprises at least a respective first portion and a respective payload portion, wherein each communication from among said plurality of communications is addressed for an intended destination of the respective payload portion of that communication, and wherein for each communication from among said plurality of communications:

said respective first portion is modulated according to a first modulation method from among at least two types of modulation methods, wherein the at least two types of modulation methods comprise the first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,

said respective first portion comprises an indication of which of the first modulation method and the second modulation method is used for modulating respective payload data in the respective payload portion, and

the payload data is modulated according to at least one of the first modulation method or the second modulation method in accordance with what is indicated by the respective first portion;

the transceiver further configured to send at least a first communication of the plurality of communications such that payload data included in a payload portion of the first communication is modulated according to the second modulation method based on a first portion of the first communication indicating that the second modulation method will be used for modulating the payload data in the payload portion of the first communication, wherein the payload data is included in the first communication after the first portion of the first communication;

the transceiver further configured to send at least a second communication of the plurality of communications such that payload data included in a payload portion of the second communication is modulated according to the first modulation method based on a first portion of the second communication indicating that the first modulation method will be used for modulating the payload data in the payload portion of the second communication.

23. The communication device as in claim **22**, wherein the transceiver is further configured to receive at least a first response from a slave transceiver based on sending the first communication, and the first response comprises at least first response data that modulated according to the second modulation method.

24. The communication device as in claim **23**, wherein the first response was explicitly requested in the first communication.

25. The communication device as in claim **23**, Wherein the transceiver is further configured to receive at least a second response based on sending the second communication, and the second response comprises at least second response data that is modulated according to the first modulation method.

26. A master communication device configured to communicate 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:

a transceiver configured to transmit signals over a communications medium to a slave device using at least two different types of modulation methods and to receive one or more responses over the communication medium that comprise at least respective response data that is modulated according to one of the at least two different types of modulation methods, the at least two different types of modulation methods comprising a first modulation method and a second modulation method, wherein the transmitted signals comprise first transmitted signals and second transmitted signals, the first transmitted signals comprise at least two transmission sequences, the at least two transmission sequences include a first transmission sequence and a second transmission sequence, the transceiver is configured to transmit the first transmission sequence using the first modulation method, and the transceiver is configured to transmit the second transmission sequence using the second modulation method wherein:

the first transmission sequence includes information that is indicative of an impending change in modulation method from the first modulation method to the second modulation method,

the second transmission sequence includes a payload portion that is transmitted after the first transmission sequence,

the first transmitted signals include first address information that is indicative of the slave device being an intended destination of the payload portion,

the second transmitted signals comprise at least a third transmission sequence and a fourth transmission sequence,

the transceiver is configured to transmit the third transmission sequence using the first modulation method,

the transceiver is configured to transmit the fourth transmission sequence using the first modulation method,

the third transmission sequence includes information indicative that the fourth transmission sequence will be transmitted using the first modulation method,

the fourth transmission sequence includes a second payload portion that is transmitted after the third transmission sequence, and

the second transmitted signals include second address information that is indicative of a specified slave device being an intended destination of the second payload portion .

27. The master communication device as in claim **26**, wherein the first transmission sequence also includes information that is indicative of the type of modulation method used for the second transmission sequence.

28. The master communication device as in claim **26**, wherein the master communication device is configured to implement a polled multipoint protocol.

29. The master communication device as in claim **26**, wherein the first transmission sequence includes a training signal.

30. The master communication device as in claim **29**, wherein the training signal confirms that a slave may communicate using a particular type of modulation method.

31. The master communication device as in claim **29**, wherein the training signal establishes signal level compensation.

32. The master communication device as in claim **29**, wherein the training signal establishes a recovery time.

33. The master communication device as in claim **29**, wherein the training signal permits channel equalization.

34. The master communication device as in claim **29**, wherein the training signal permits echo cancellation.

35. The master communication device as in claim **29**, wherein the training signal includes parameters for optimizing performance.

36. The master communication device as in claim **29**, wherein the training signal includes parameters for the selection of optional features.

37. The master communication device as in claim **26**, wherein the transceiver comprises a modulator configured to modulate information according to one or more of the first modulation method or the second modulation method.

38. The master communication device as in claim **37**, wherein the transceiver further comprises a demodulator, the demodulator is configured to demodulate information from a signal transmitted by a slave, and the signal transmitted by the slave is modulated according to the first modulation method or the second modulation method.

39. The master communication device as in claim **38**, wherein the transceiver further comprises a central processing unit (CPU) operably coupled to the modulator, said CPU configured to operate according to programmed instructions to select either said first modulation method or said second modulation method.

40. The master communication device as in claim **39**, wherein the transceiver further comprises a memory device operably coupled to said CPU, and wherein said memory device is configured to store said programmed instructions.

41. The master communication device as in claim **26**, wherein the second modulation method communicates at a data rate that is higher than that of the first modulation method.

42. The master communication device as in claim **41**, wherein said second modulation method is used for an application requiring Internet access.

43. The master communication device as in claim **26**, wherein at least one of said first or second modulation methods implements phase modulation.

44. The master communication device as in claim **43**, wherein said at least one of said first or second modulation methods also implements amplitude modulation.

45. The master communication device as in claim **26**, wherein at least one of said first or second modulation methods implements quadrature amplitude modulation.

46. The master communication device as in claim **26**, wherein at least one of said first or second modulation methods implements discrete multitone modulation.

47. The master communication device as in claim **26**, wherein said master communication device is configured to communicate with a first slave using said first modulation method and to communicate with a second slave using said second modulation method.

48. The master communication device as in claim **47**, wherein said transceiver is configured to transmit data in a third payload portion according to said first modulation method, and wherein said transceiver is configured to receive a slave response from a slave device with a received payload portion modulated using the first modulation method .

49. The master communication device as in claim **26**, wherein said transceiver is configured to receive transmission signals from a slave device according to one or more of said first modulation method or said second modulation method.

50. The master communication device as in claim **26**, wherein said master communication device is configured to operate in a multipoint network with a plurality of slave devices.

51. The master communication device as in claim **26**, wherein the master communication device is configured to transmit a trailing signal to complete the master communication transmission.

52. The master communication device as in claim **26**, wherein the master transceiver is configured to transmit a plurality of user data messages, wherein each of the plurality of user data messages comprises message-specific first information and message- specific second information, and for each of the plurality of user data messages:

the message-specific first information is modulated according to the first modulation method and the message-specific first information is indicative of whether the message-specific second information will be modulated using a different type of modulation method than is used for the message-specific first information; and the user data message is indicative of a message-specific slave transceiver from among one or more slave transceivers being an intended destination of the message-specific second information.

* * * * *

Exhibit B

UTILITY PATENT APPLICATION TRANSMITTAL		
(Only for new nonprovisional applications under 37 CFR 1.53(b))	*Attorney Docket No.*	REMB_0109_USCON2
	First Inventor	Gordon Bremer
	Title	System and Method of Communication
	Express Mail Label No.	

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents**
P.O. Box 1450
Alexandria VA 22313-1450

1. ☐ **Fee Transmittal Form** (e.g., PTO/SB/17)
2. ☐ **Applicant claims small entity status**. See 37 CFR 1.27.
3. ☑ **Specification** [*Total Pages* 14]
   Both the claims and abstract must start on a new page
   (For information on the preferred arrangement, see MPEP 608.01(a))
4. ☑ **Drawing(s)** (*35 U.S.C. 113*) [*Total Sheets* 8]
5. **Oath or Declaration** [*Total Sheets* ____]
   a. ☐ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
   (for continuation/divisional with Box 18 completed)
   i. ☐ DELETION OF INVENTOR(S)
   Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☑ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**
   (if applicable, items a. – c. are required)
   a. ☐ Computer Readable Form (CRF)
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ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee ____________________
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503)
    (*Should be specifically itemized)*
15. ☐ **Certified Copy of Priority Document(s)**
    (if foreign priority is claimed)
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ☑ Other: Authorization to Treat a Reply as Incorporating an Extension of Time Under CFR 1.136

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☑ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 12/543,910

Prior application information: *Examiner* Dac V. Ha *Art Unit:* 2611

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 15027 ***OR*** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Joseph R. Klinicki/	Date	August 4, 2011
Name (Print/Type)	Joseph R. Klinicki	Registration No. (Attorney/Agent)	68505

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	
Title of Invention	System and Method of Communication Using at Least Two Modulation Methods	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1 Remove

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Gordon		Bremer	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Clearwater	**State/Province**	FL	**Country of Residence** i	US
Citizenship under 37 CFR 1.41(b) i	US				

Mailing Address of Applicant:

Address 1	1930 Clove Lane		
Address 2			
City	Clearwater	**State/Province**	FL
Postal Code	33764	**Country**i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	15027
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Application Information:

Title of the Invention	System and Method of Communication Using at Least Two Modulation Methods		
Attorney Docket Number	REMB_0109_USCON2	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	

Title of Invention	System and Method of Communication Using at Least Two Modulation Methods

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
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Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	12543910	2009-08-19

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12543910	Continuation of	11774803	2007-07-09	7675965	2010-03-09

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11774803	Continuation of	10412878	2003-04-14	7248626	2007-07-24

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10412878	Continuation in part of	09205205	1998-12-04	6614838	2003-09-02

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
09205205	non provisional of	60067562	1997-12-05

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	

Title of Invention	System and Method of Communication Using at Least Two Modulation Methods

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country i	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			◉ Yes ○ No

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Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1 Remove

If the Assignee is an Organization check here. ☒

Organization Name	Summit Technology Systems, LP		
Mailing Address Information:			
Address 1	401 City Avenue		
Address 2			
City	Bala Cynwyd	**State/Province**	PA
Country i	US	Postal Code	19004
Phone Number		Fax Number	
Email Address			

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Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Joseph R. Klinicki/			Date (YYYY-MM-DD)	2011-08-04
First Name	Joseph	Last Name	Klinicki	Registration Number	68505

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	
Title of Invention	System and Method of Communication Using at Least Two Modulation Methods	

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Gordon Bremer

For: System and Method of Communication Using at Least Two Modulation Methods

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

AUTHORIZATION TO TREAT A REPLY AS INCORPORATING AN EXTENSION OF TIME UNDER C.F.R. § 1.136(a)(3)

The Commissioner is hereby requested to grant an extension of time for the appropriate length of time, should one be necessary, in connection with this filing or any further filing submitted to the U.S. Patent and Trademark Office in the above-identified application during the pendency of this application. The Commissioner is further authorized to charge any fees related to any such extension of time to Deposit Account No. 50-5519.

Date: August 4, 2011

/Joseph R. Klinicki /
Joseph R. Klinicki
Registration No.: 68,505

SYSTEM AND METHOD OF COMMUNICATION USING AT LEAST TWO MODULATION METHODS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of U.S. Application No. 12/543,910 filed on August 19, 2009, which is a continuation of U.S. Application No. 11/774,803, filed on July 9, 2007, which is a continuation of U.S. Application No. 10/412,878, filed April 14, 2003, which is a continuation-in-part of U.S. Application No. 09/205,205, filed December 4, 1998, and which claims priority to and the benefit of the filing date of U. S. Provisional Application No. 60/067,562, filed December 5, 1997, each of which is incorporated by reference herein.

TECHNICAL FIELD

[0002] The present invention relates generally to the fields of data communications and modulator/demodulators (modems), and, more particularly, to a data communications system in which a plurality of modulation methods are used to facilitate communication among a plurality of modem types.

BACKGROUND

[0003] In existing data communications systems, a transmitter and receiver modem pair can successfully communicate only when the modems are compatible at the physical layer. That is, the modems must use compatible modulation methods. This requirement is generally true regardless of the network topology. For example, point- to-point, dial-up modems operate in either the industry standard V.34 mode or the industry standard V.22 mode. Similarly, in a multipoint architecture, all modems operate, for example, in the industry standard V.27bis mode. While the modems may be capable of using several different modulation methods, a single common modulation is negotiated at the beginning of a data session to be used throughout the duration of the session. Should it become necessary to change modulation methods, the existing data session is torn down, and a new session is negotiated using the new modulation method. Clearly, tearing down an existing data session causes a significant disruption in communication between the two modems.

[0004] As discussed in the foregoing, communication between modems is generally unsuccessful unless a common modulation method is used. In a point-to-point network architecture, 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 resulting modem pair uses a common modulation method.

[0005] In a multipoint architecture, a single central, or "master," modem communicates with two or more tributary or "trib" modems using a single modulation method. 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. Moreover, repeated attempts by the master to communicate with the incompatible trib(s) will disturb communications with compatible trib(s) due to time wasted in making the futile communication attempts.

[0006] 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 with much more expensive state of the art devices 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.

[0007] Accordingly, 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.

SUMMARY

[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.

[0009] The present invention has many advantages, a few of which are delineated hereafter as merely examples.

[0010] One advantage of the present invention is that it provides to the use of a plurality of modem modulation methods on the same communication medium.

[0011] Another advantage of the present invention is that a master transceiver can communicate seamlessly with tributary transceivers or modems using incompatible modulation methods.

[0012] Other features and advantages of the present invention will become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional features and advantages be included herein within the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention can be better understood with reference to the following drawings. The components and representations in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present invention. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

[0014] FIG. 1 is a block diagram of a prior art multipoint communication system including a master transceiver and a plurality of tributary transceivers;

[0015] FIG. 2 is a ladder diagram illustrating the operation of the multipoint communication system of FIG. 1;

[0016] FIG. 3 is a block diagram of a master transceiver and tributary transceiver for use in the multipoint communication system of FIG. 1 in accordance with the principles of the present invention;

[0017] FIG. 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;

[0018] FIG. 5 is a ladder diagram illustrating the operation of the multipoint communication system of FIG. 4;

[0019] FIG. 6 is a state diagram for a tributary transceiver of FIGS. 3-5 using a secondary modulation method in accordance with the principles of the present invention;

[0020] FIG. 7 is a state diagram for a tributary transceiver of FIGS. 3-5 using a primary modulation method in accordance with the principles of the present invention; and

[0021] FIG. 8 is a signal diagram for an exemplary transmission according to an embodiment.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0022] While the invention is susceptible to various modifications and alternative forms, a specific embodiment thereof is shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the invention to the particular form disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the claims.

[0023] 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 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.

[0024] 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.

[0025] 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.

[0026] 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.

[0027] The foregoing discussion is based on a two-wire, half-duplex multipoint system. Nevertheless, it should be understood that the concept is equally applicable to four-wire systems.

[0028] Consider the circumstance in which master transceiver 24 and trib 26b share a common modulation type A while trib 26a uses a second modulation type B. When master transceiver attempts to establish A as a common modulation during sequence 32, trib 26a will not be able to understand that communication. Moreover, trib 26a will not recognize its own address during training interval 34 and will therefore ignore data 36 and trailing sequence 38. Master transceiver 24 may time out waiting for a response from trib 26a because trib 26a will never transmit training sequence 42, data 44, and trailing sequence 46 due to the failure of trib 26a to recognize the communication request (training sequence 34) from master transceiver 24. Thus, if the tribs in a multipoint communication system use a plurality of modulation methods, the overall communication efficiency will be disrupted as specific tribs will be unable to decipher certain transmissions from the master transceiver and any unilateral transmission by a trib that has not been addressed by the master transceiver will violate the multipoint protocol.

[0029] As discussed hereinbefore, however, it is desirable to design a multipoint communication system comprising tribs that use a plurality of modulation methods. For example, one moderately priced trib may be used to communicate at a relatively high data rate for some applications, such as Internet access, while another, lower priced, trib is used to communicate at a lower data rate for other applications, such as power monitoring and control. The needs of these different applications cannot be efficiently met by a single modulation. While it is possible to use high performance tribs running state of the art modulation methods such as QAM, CAP, or DMT to implement both the high and low data rate applications, significant cost savings can be achieved if lower cost tribs using low performance modulation methods are used to implement the lower data rate applications.

[0030] A block diagram of a master transceiver 64 in communication with a trib 66 in accordance with the principles of the present invention is shown in FIG. 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.

[0031] 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 logic for the processes 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. The master transceiver 64 communicates with trib 66 over communication medium 94.

[0032] 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 B) to replace the standard 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.

[0033] 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.

[0034] 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.

[0035] 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 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.

[0036] 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.

[0037] 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.

[0038] 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.

[0039] 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.

[0040] 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.

[0041] The control programs 78 and 92 of the present invention can be implemented in hardware, software, firmware, or a combination thereof. In the preferred embodiment(s), the control programs 78 and 92 are implemented in software or firmware that is stored in a memory and that is executed by a suitable instruction execution system.

[0042] The control programs 78 and 92, which comprise an ordered listing of executable instructions for implementing logical functions, can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (magnetic), a read-only memory (ROM) (magnetic), an erasable programmable read-only memory (EPROM or Flash memory) (magnetic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for instance optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.

[0043] In concluding the detailed description, it should be noted that it will be obvious to those skilled in the art that many variations and modifications can be made to the preferred embodiment without substantially departing from the principles of the present invention. All such variations and modifications are intended to be included herein within the scope of the present invention, as set forth in the following claims. Further, in the claims hereafter, the corresponding structures, materials, acts, and equivalents of all means or step plus function elements are intended to include any structure, material, or acts for performing the functions with other claimed elements as specifically claimed.

What is Claimed:

1. A communication system, comprising:

a transmitter capable of transmitting at least two modulation methods, wherein the at least two modulation methods comprise a first modulation method and a second modulation, wherein the second method is different than the first modulation method, and wherein the first transceiver is configured to transmit

a first sequence, in the first modulation method, that indicates an impending change from the first modulation method to the second modulation method, and

a second sequence, in the second modulation method, wherein the second sequence is transmitted after the first data sequence.

2. The system 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 has reverted to the first modulation method.

3. The system of claim 1, wherein first modulation method is a frequency shift keying modulation.

4. The system of claim 3, wherein the second modulation method is a shift keying modulation.

5. The system of claim 1, wherein the second modulation method is different than the first modulation method in performance.

6. The system of claim 5, wherein the first modulation method has a lower performance than the second modulation method.

7. The system of claim 1, wherein the second modulation method is different than the first modulation method in data rate.

8. The system of claim 7, wherein the first modulation method has a lower data rate than the second modulation method.

9. The system of claim 1, wherein the first transceiver is configured to transmit the second sequence according to a specific time interval.

10. The system of claim 1, wherein the first transceiver is configured to transmit the second sequence according to a particular quantity of data.

11. The system of claim 1, further comprising a processor and a memory, wherein the memory has stored therein instructions that when executed by the processor cause the transmitter to transmit the first sequence and the second sequence.

12. The system of claim 11, wherein the memory has stored therein program code for the first modulation method and the second modulation method.

13. The system of claim 11, wherein the memory comprises random access memory.

14. The system of claim 11, wherein the memory comprises read-only memory.

15. The device of claim 11, wherein the memory has stored therein program code for a multipoint communications protocol.

16. The system of claim 1, wherein the first sequence comprises an address.

17. The system of claim 1, wherein the first sequence and the second sequence are contained in a burst transmission.

18. The system of claim 17, wherein the burst transmission is a poll in accordance with a multipoint communications protocol.

19. A communications device, comprising:

a processor; and

a memory having stored therein executable instructions for execution by the processor, wherein the executable instructions direct transmission of first data with a first modulation method followed by second data with a second modulation method, wherein the first modulation method is different than the second modulation method, and wherein the first data comprises an indication of an impending change from the first modulation method to the second modulation method.

20. The device of claim 19, wherein the executable instructions direct transmission of third data with the first modulation method after the second data, wherein the third data indicates that communication has reverted to the first modulation method.

ABSTRACT

A device may be capable of communicating using at least two type types of modulation methods. The device may include a transceiver 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. The master transceiver may send transmissions structured with a first portion and a payload portion. 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 discrete transmissions may be addressed for an intended destination of the payload portion.

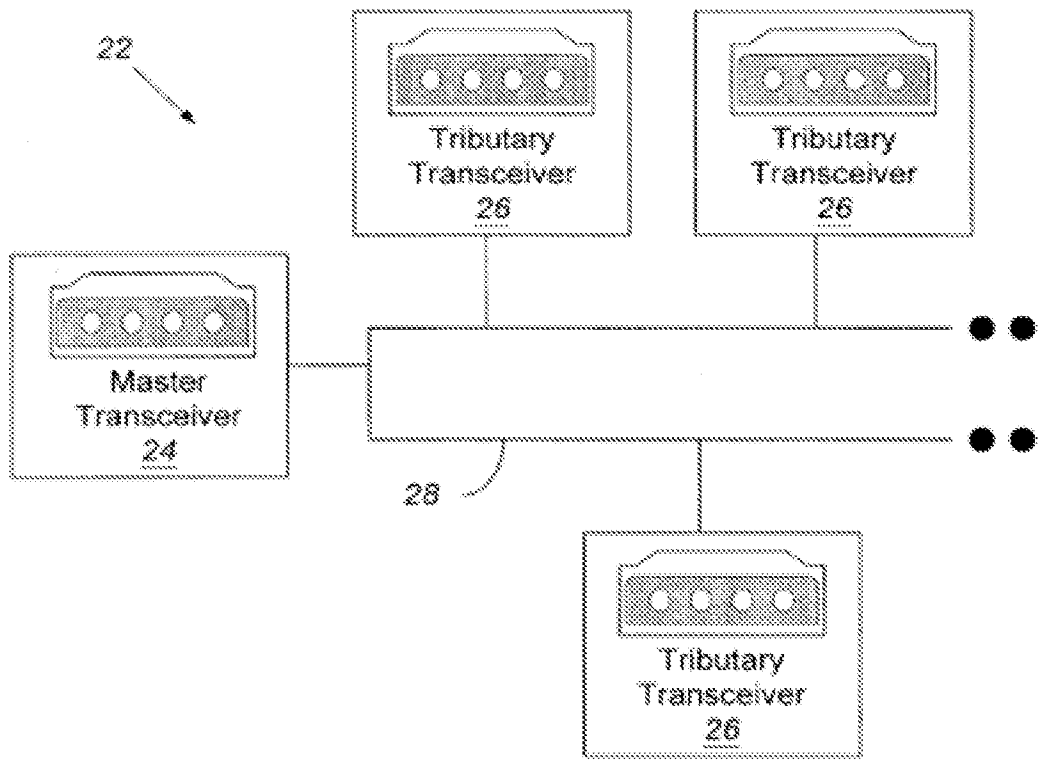


FIG. 1
Prior Art

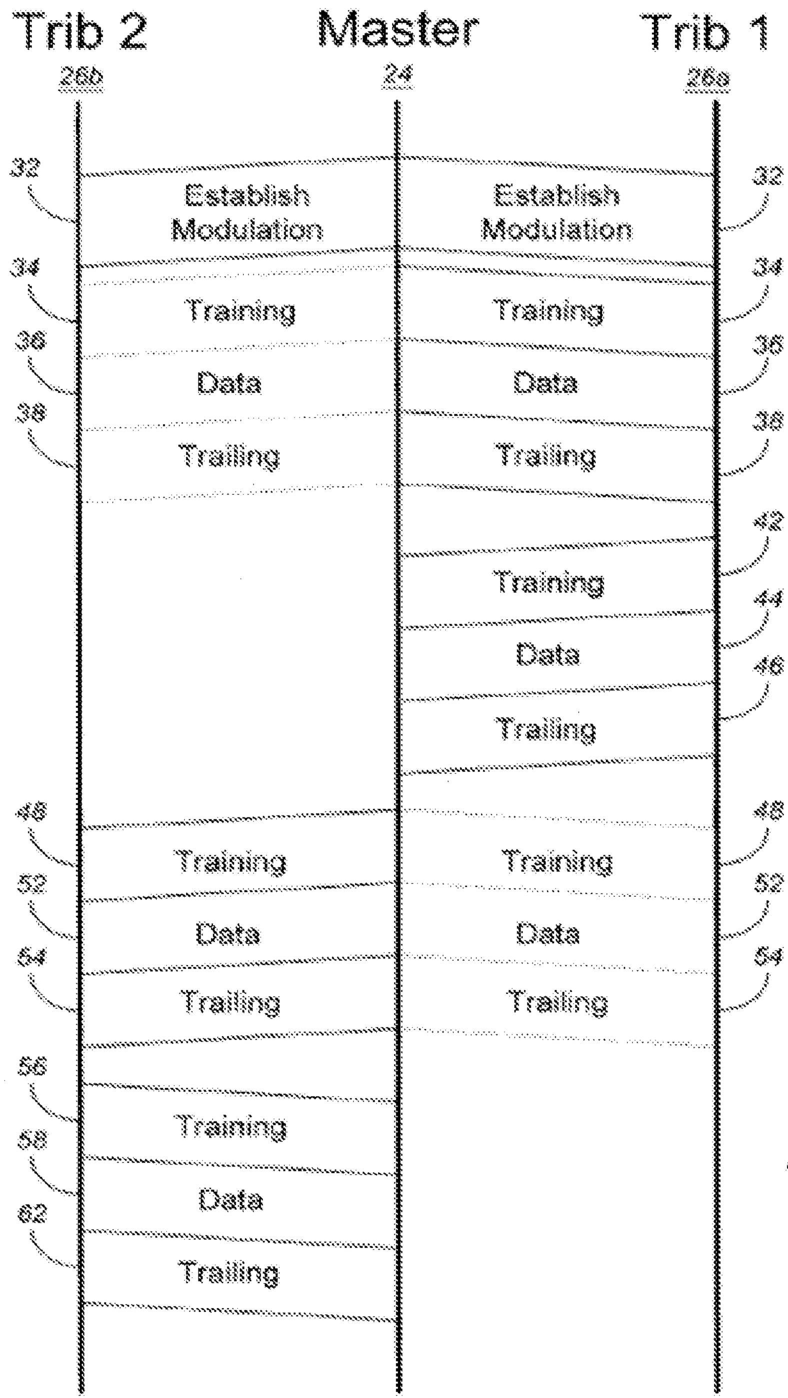

Trib 2
26b
Master
24
Trib 1
26a
32
Establish Modulation
Establish Modulation
32
34
Training
Training
34
36
Data
Data
36
38
Trailing
Trailing
38
42
Training
44
Data
46
Trailing
48
Training
Training
48
52
Data
Data
52
54
Trailing
Trailing
54
56
Training
58
Data
62
Trailing

FIG. 2

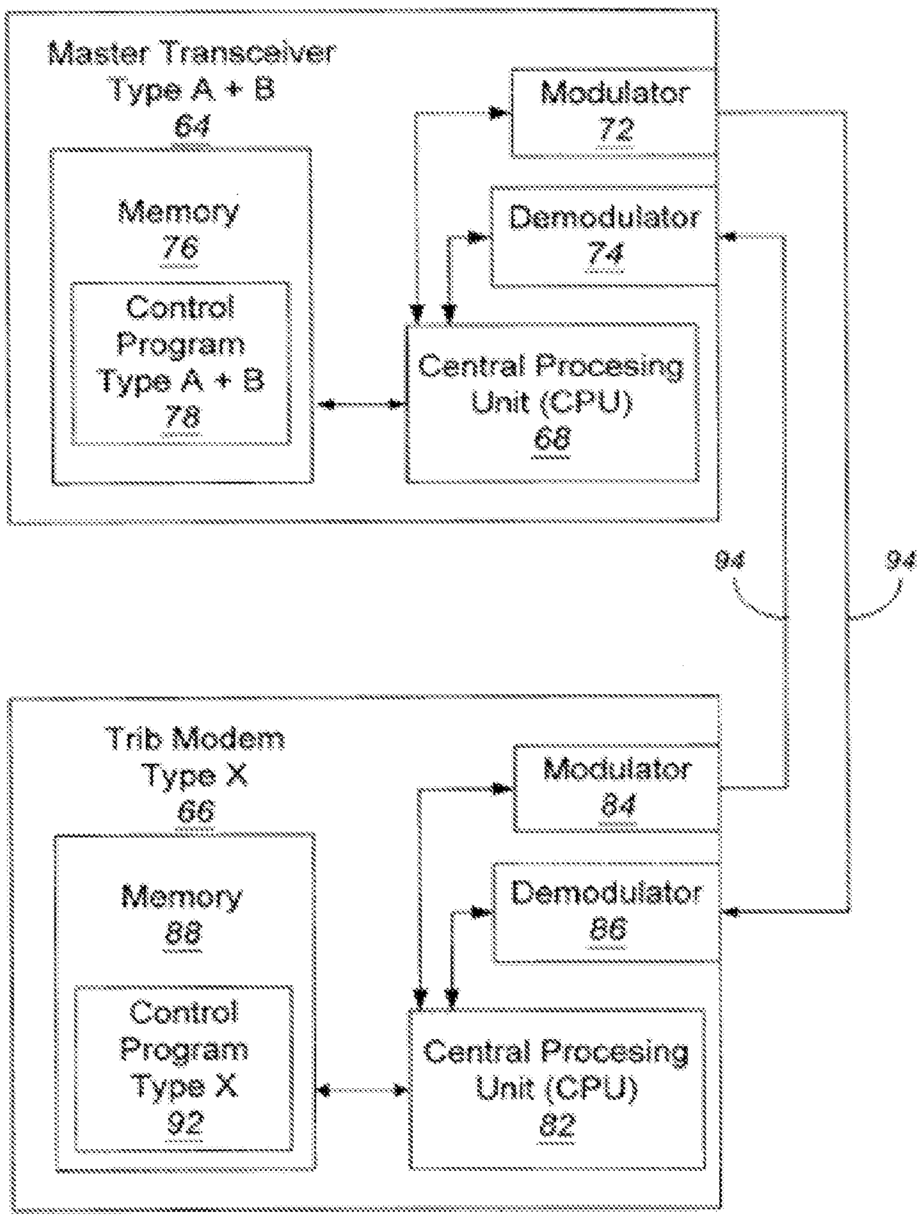

Master Transceiver
Type A + B
64
Memory
76
Control
Program
Type A + B
78
Modulator
72
Demodulator
74
Central Procesing
Unit (CPU)
68
94
94
Trib Modem
Type X
66
Memory
88
Control
Program
Type X
92
Modulator
84
Demodulator
86
Central Procesing
Unit (CPU)
82

FIG. 3

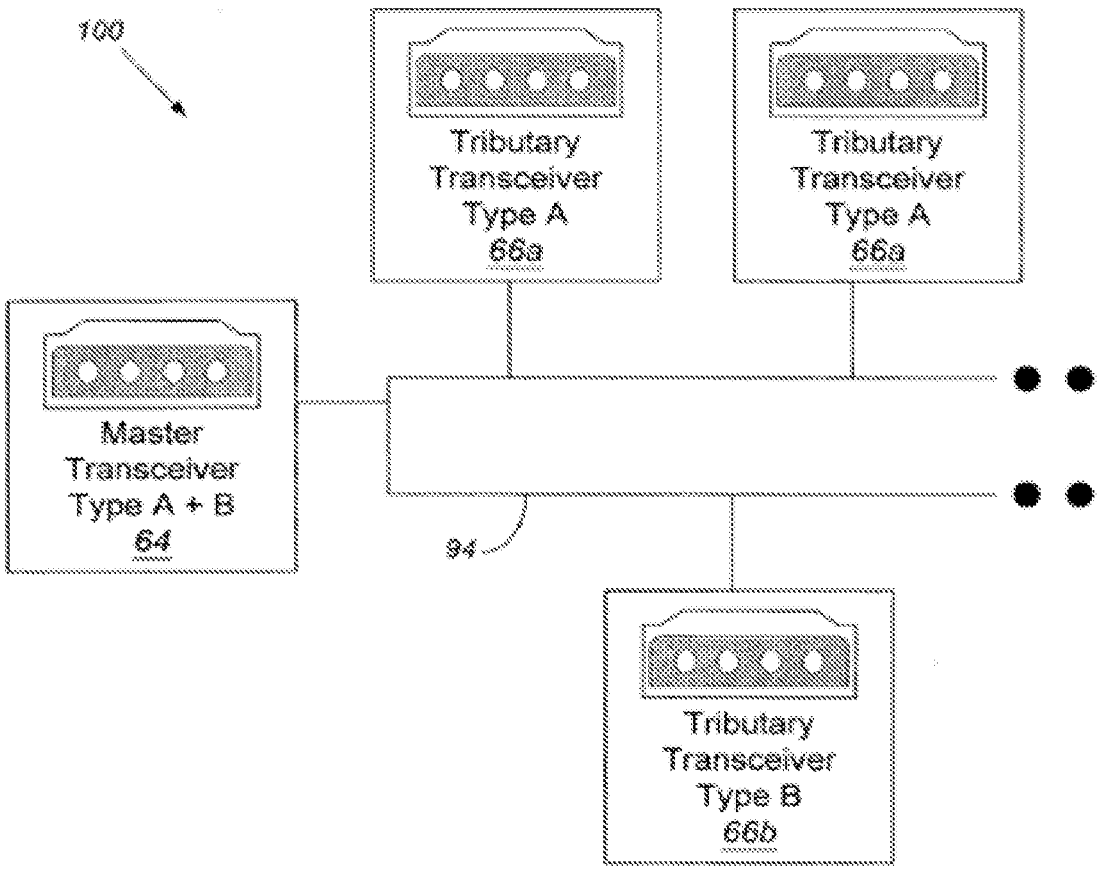

100
Tributary
Transceiver
Type A
66a
Tributary
Transceiver
Type A
66a
Master
Transceiver
Type A + B
64
94
Tributary
Transceiver
Type B
66b

FIG. 4

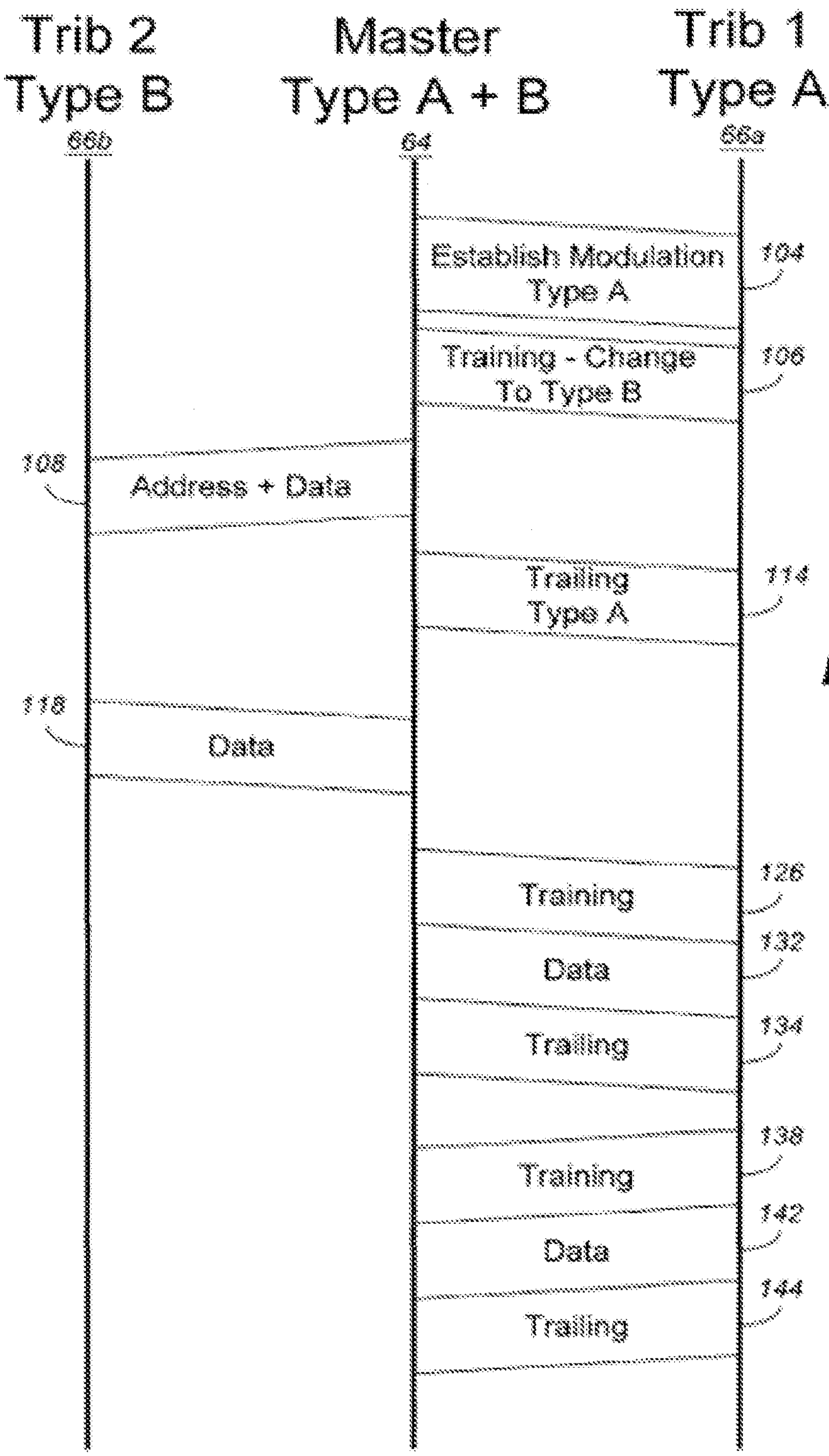

Trib 2
Type B
66b
Master
Type A + B
64
Trib 1
Type A
66a
Establish Modulation
Type A
104
Training - Change
To Type B
106
108
Address + Data
Trailing
Type A
114
118
Data
Training
126
Data
132
Trailing
134
Training
138
Data
142
Trailing
144

FIG. 5

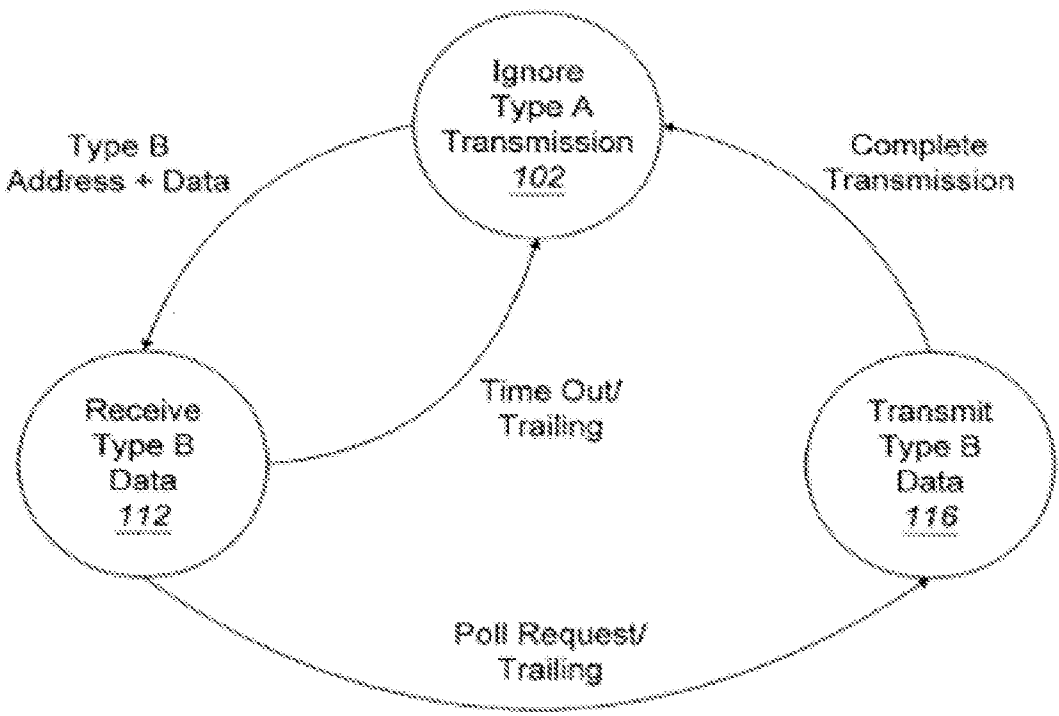
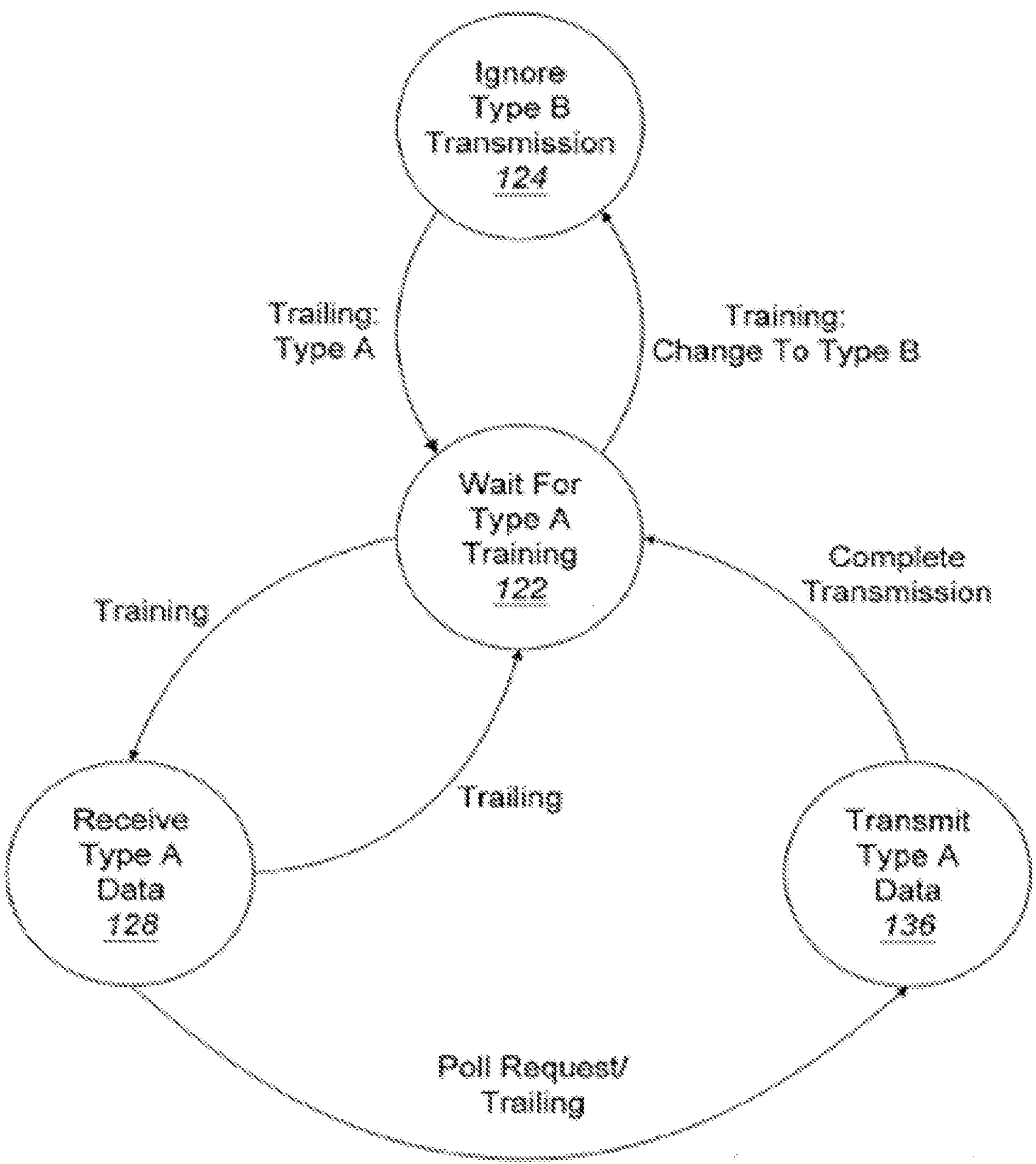
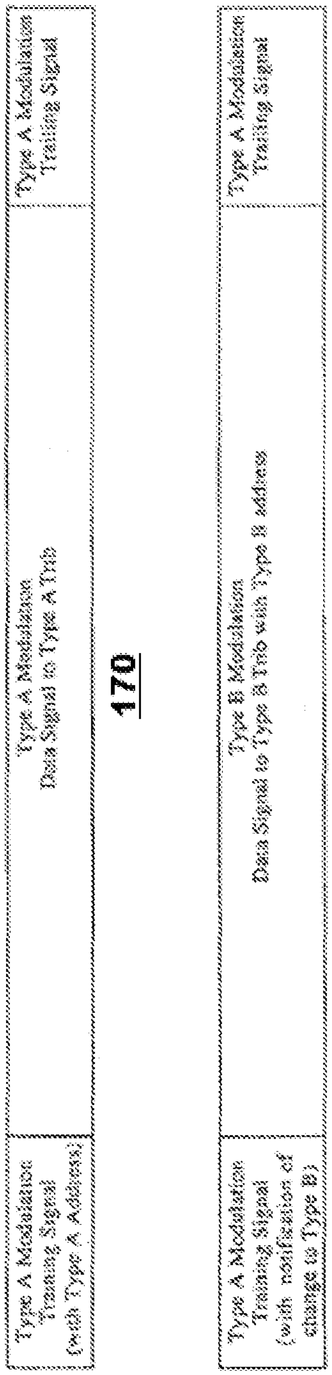

Ignore
Type A
Transmission
102
Type B
Address + Data
Complete
Transmission
Receive
Type B
Data
112
Time Out/
Trailing
Transmit
Type B
Data
116
Poll Request/
Trailing

FIG. 6



Ignore
Type B
Transmission
124
Trailing:
Type A
Training:
Change To Type B
Wait For
Type A
Training
122
Training
Complete
Transmission
Receive
Type A
Data
128
Trailing
Transmit
Type A
Data
136
Poll Request/
Trailing

FIG. 7


Type A Modulation Training Signal (with Type A Address)
Type A Modulation Data Signal to Type A Trib
Type A Modulation Trailing Signal
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

170

172

FIG. 8

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon Bremer
Filer:	Michael Koptiw Jr./diana kang
Attorney Docket Number:	REMB_0109_USCON2

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	330	330
Utility Search Fee	1111	1	540	540
Utility Examination Fee	1311	1	220	220
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1090**

Electronic Acknowledgement Receipt

EFS ID:	10671713
Application Number:	13198568
International Application Number:	
Confirmation Number:	8059
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon Bremer
Customer Number:	15027
Filer:	Michael Koptiw Jr./diana kang
Filer Authorized By:	Michael Koptiw Jr.
Attorney Docket Number:	REMB_0109_USCON2
Receipt Date:	04-AUG-2011
Filing Date:	
Time Stamp:	18:36:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1090
RAM confirmation Number	5430
Deposit Account	505519
Authorized User	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	REMB0109USCON2transmittalfiled080411.pdf	275225 008920cf43733dfe23111e3cbfbb1e9af159b724	no	2

Warnings:

Information:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
2	Application Data Sheet	REMB0109USCON2ADSfiled080411.pdf	1031825 8de01cf65cb667ea93bdc6e2f6e0c3c55f926581	no	5

Warnings:

Information:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
3	Authorization for Extension of Time all replies	REMB0109USCON02authexttimefiled080411final.pdf	71613 fd64b709e18d8f8dc875190a2e917d50e1712526	no	1

Warnings:

Information:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
4		REMB_0109_USCON2_APPLICATION.pdf	114148 6b77635c9baeebd245a6574a03539fdce34c1f41	yes	14

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	10
Claims	11	13
Abstract	14	14

Warnings:

Information:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
5	Drawings-only black and white line drawings	REMB_0109_USCONdrawings.pdf	289281 54ea8acb8813a393b0b4d77042f16eb85f635dc3	no	8

Warnings:

Information:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
6	Fee Worksheet (SB06)	fee-info.pdf	32846 c0ef9d7ed0cbfbaf50858f3254f74415e917aceb	no	2

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/198,568	08/04/2011	Gordon Bremer	REMB_0109_USCON2

CONFIRMATION NO. 8059

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

FORMALITIES LETTER

OC000000049356168

Date Mailed: 08/17/2011

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
  A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
  Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $**130** for a non-small entity, must be submitted.

SUMMARY OF FEES DUE:

Total fee(s) required within **TWO MONTHS** from the date of this Notice is $**130** for a non-small entity
- $**130** Surcharge.

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Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/198,568

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED		(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A		N/A	N/A			N/A	330
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A		N/A	N/A			N/A	540
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A		N/A	N/A			N/A	220
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 =	*			OR	x 52 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 =	*				x 220 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))								0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL			TOTAL	1090

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/198,568	08/04/2011	2611	1090	REMB_0109_USCON2	20	2

CONFIRMATION NO. 8059

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

FILING RECEIPT

OC000000049356167

Date Mailed: 08/17/2011

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Gordon Bremer, Clearwater, FL;

Assignment For Published Patent Application

SUMMIT TECHNOLOGY SYSTEMS, LP, Bala Cynwyd, PA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 12/543,910 08/19/2009
which is a CON of 11/774,803 07/09/2007 PAT 7,675,965
which is a CON of 10/412,878 04/14/2003 PAT 7,248,626
which is a CIP of 09/205,205 12/04/1998 PAT 6,614,838
which claims benefit of 60/067,562 12/05/1997

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 08/16/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/198,568**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

System and Method of Communication Using at Least Two Modulation Methods

Preliminary Class

375

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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Exhibit C

PTO/SB/05 (08-08)
Approved for use through 09/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office. U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	REMB_0109_USCON2
First Inventor	Gordon Bremer
Title	System and Method of Communication
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents**
P.O. Box 1450
Alexandria VA 22313-1450

1. ☐ **Fee Transmittal Form** (e.g., PTO/SB/17)
2. ☐ **Applicant claims small entity status**. See 37 CFR 1.27.
3. ☑ **Specification** [*Total Pages* 14]
   Both the claims and abstract must start on a new page
   (For information on the preferred arrangement, see MPEP 608.01(a))
4. ☑ **Drawing(s)** (*35 U.S.C. 113*) [*Total Sheets* 8]
5. **Oath or Declaration** [*Total Sheets* ____]
   a. ☐ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
   (for continuation/divisional with Box 18 completed)
   i. ☐ DELETION OF INVENTOR(S)
   Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☑ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**
   (if applicable, items a. – c. are required)
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
   i. ☐ CD-ROM or CD-R (2 copies); or
   ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee ____________________
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503)
    (Should be specifically itemized)
15. ☐ **Certified Copy of Priority Document(s)**
    (if foreign priority is claimed)
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ☑ Other: Authorization to Treat a Reply as Incorporating an Extension of Time Under CFR 1.136

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☑ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 12/543,910

Prior application information: *Examiner* Dac V. Ha *Art Unit:* 2611

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 15027 ***OR*** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Joseph R. Klinicki/	Date	August 4, 2011
Name (Print/Type)	Joseph R. Klinicki	Registration No. (Attorney/Agent)	68505

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	

Title of Invention	System and Method of Communication Using at Least Two Modulation Methods

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1 Remove

Applicant Authority ◉ Inventor ◯ Legal Representative under 35 U.S.C. 117 ◯ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Gordon		Bremer	

Residence Information (Select One) ◉ US Residency ◯ Non US Residency ◯ Active US Military Service

City	Clearwater	**State/Province**	FL	**Country of Residence** i	US
Citizenship under 37 CFR 1.41(b) i	US				

Mailing Address of Applicant:

Address 1	1930 Clove Lane		
Address 2			
City	Clearwater	**State/Province**	FL
Postal Code	33764	**Country**i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	15027	
Email Address		Add Email Remove Email

Application Information:

Title of the Invention	System and Method of Communication Using at Least Two Modulation Methods		
Attorney Docket Number	REMB_0109_USCON2	**Small Entity Status Claimed** ☐	
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	
Title of Invention	System and Method of Communication Using at Least Two Modulation Methods	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	15027		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	12543910	2009-08-19

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12543910	Continuation of	11774803	2007-07-09	7675965	2010-03-09

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11774803	Continuation of	10412878	2003-04-14	7248626	2007-07-24

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10412878	Continuation in part of	09205205	1998-12-04	6614838	2003-09-02

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
09205205	non provisional of	60067562	1997-12-05

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	

Title of Invention	System and Method of Communication Using at Least Two Modulation Methods

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country i	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			◉ Yes ○ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1 Remove

If the Assignee is an Organization check here. ☒

Organization Name	Summit Technology Systems, LP		
Mailing Address Information:			
Address 1	401 City Avenue		
Address 2			
City	Bala Cynwyd	**State/Province**	PA
Country i	US	Postal Code	19004
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the **Add** button. Add

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Joseph R. Klinicki/			Date (YYYY-MM-DD)	2011-08-04
First Name	Joseph	Last Name	Klinicki	Registration Number	68505

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REMB_0109_USCON2
	Application Number	

Title of Invention	System and Method of Communication Using at Least Two Modulation Methods

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

DOCKET NO.: REMB_0109_USCON2 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Gordon Bremer

For: System and Method of Communication Using at Least Two Modulation Methods

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

AUTHORIZATION TO TREAT A REPLY AS INCORPORATING AN EXTENSION OF TIME UNDER C.F.R. § 1.136(a)(3)

The Commissioner is hereby requested to grant an extension of time for the appropriate length of time, should one be necessary, in connection with this filing or any further filing submitted to the U.S. Patent and Trademark Office in the above-identified application during the pendency of this application. The Commissioner is further authorized to charge any fees related to any such extension of time to Deposit Account No. 50-5519.

Date: August 4, 2011

/Joseph R. Klinicki /
Joseph R. Klinicki
Registration No.: 68,505

SYSTEM AND METHOD OF COMMUNICATION USING AT LEAST TWO MODULATION METHODS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of U.S. Application No. 12/543,910 filed on August 19, 2009, which is a continuation of U.S. Application No. 11/774,803, filed on July 9, 2007, which is a continuation of U.S. Application No. 10/412,878, filed April 14, 2003, which is a continuation-in-part of U.S. Application No. 09/205,205, filed December 4, 1998, and which claims priority to and the benefit of the filing date of U. S. Provisional Application No. 60/067,562, filed December 5, 1997, each of which is incorporated by reference herein.

TECHNICAL FIELD

[0002] The present invention relates generally to the fields of data communications and modulator/demodulators (modems), and, more particularly, to a data communications system in which a plurality of modulation methods are used to facilitate communication among a plurality of modem types.

BACKGROUND

[0003] In existing data communications systems, a transmitter and receiver modem pair can successfully communicate only when the modems are compatible at the physical layer. That is, the modems must use compatible modulation methods. This requirement is generally true regardless of the network topology. For example, point- to-point, dial-up modems operate in either the industry standard V.34 mode or the industry standard V.22 mode. Similarly, in a multipoint architecture, all modems operate, for example, in the industry standard V.27bis mode. While the modems may be capable of using several different modulation methods, a single common modulation is negotiated at the beginning of a data session to be used throughout the duration of the session. Should it become necessary to change modulation methods, the existing data session is torn down, and a new session is negotiated using the new modulation method. Clearly, tearing down an existing data session causes a significant disruption in communication between the two modems.

[0004] As discussed in the foregoing, communication between modems is generally unsuccessful unless a common modulation method is used. In a point-to-point network architecture, 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 resulting modem pair uses a common modulation method.

[0005] In a multipoint architecture, a single central, or "master," modem communicates with two or more tributary or "trib" modems using a single modulation method. 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. Moreover, repeated attempts by the master to communicate with the incompatible trib(s) will disturb communications with compatible trib(s) due to time wasted in making the futile communication attempts.

[0006] 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 with much more expensive state of the art devices 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.

[0007] Accordingly, 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.

SUMMARY

[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.

[0009] The present invention has many advantages, a few of which are delineated hereafter as merely examples.

[0010] One advantage of the present invention is that it provides to the use of a plurality of modem modulation methods on the same communication medium.

[0011] Another advantage of the present invention is that a master transceiver can communicate seamlessly with tributary transceivers or modems using incompatible modulation methods.

[0012] Other features and advantages of the present invention will become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional features and advantages be included herein within the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention can be better understood with reference to the following drawings. The components and representations in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present invention. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

[0014] FIG. 1 is a block diagram of a prior art multipoint communication system including a master transceiver and a plurality of tributary transceivers;

[0015] FIG. 2 is a ladder diagram illustrating the operation of the multipoint communication system of FIG. 1;

[0016] FIG. 3 is a block diagram of a master transceiver and tributary transceiver for use in the multipoint communication system of FIG. 1 in accordance with the principles of the present invention;

[0017] FIG. 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;

[0018] FIG. 5 is a ladder diagram illustrating the operation of the multipoint communication system of FIG. 4;

[0019] FIG. 6 is a state diagram for a tributary transceiver of FIGS. 3-5 using a secondary modulation method in accordance with the principles of the present invention;

[0020] FIG. 7 is a state diagram for a tributary transceiver of FIGS. 3-5 using a primary modulation method in accordance with the principles of the present invention; and

[0021] FIG. 8 is a signal diagram for an exemplary transmission according to an embodiment.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0022] While the invention is susceptible to various modifications and alternative forms, a specific embodiment thereof is shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the invention to the particular form disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the claims.

[0023] 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 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.

[0024] 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.

[0025] 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.

[0026] 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.

[0027] The foregoing discussion is based on a two-wire, half-duplex multipoint system. Nevertheless, it should be understood that the concept is equally applicable to four-wire systems.

[0028] Consider the circumstance in which master transceiver 24 and trib 26b share a common modulation type A while trib 26a uses a second modulation type B. When master transceiver attempts to establish A as a common modulation during sequence 32, trib 26a will not be able to understand that communication. Moreover, trib 26a will not recognize its own address during training interval 34 and will therefore ignore data 36 and trailing sequence 38. Master transceiver 24 may time out waiting for a response from trib 26a because trib 26a will never transmit training sequence 42, data 44, and trailing sequence 46 due to the failure of trib 26a to recognize the communication request (training sequence 34) from master transceiver 24. Thus, if the tribs in a multipoint communication system use a plurality of modulation methods, the overall communication efficiency will be disrupted as specific tribs will be unable to decipher certain transmissions from the master transceiver and any unilateral transmission by a trib that has not been addressed by the master transceiver will violate the multipoint protocol.

[0029] As discussed hereinbefore, however, it is desirable to design a multipoint communication system comprising tribs that use a plurality of modulation methods. For example, one moderately priced trib may be used to communicate at a relatively high data rate for some applications, such as Internet access, while another, lower priced, trib is used to communicate at a lower data rate for other applications, such as power monitoring and control. The needs of these different applications cannot be efficiently met by a single modulation. While it is possible to use high performance tribs running state of the art modulation methods such as QAM, CAP, or DMT to implement both the high and low data rate applications, significant cost savings can be achieved if lower cost tribs using low performance modulation methods are used to implement the lower data rate applications.

[0030] A block diagram of a master transceiver 64 in communication with a trib 66 in accordance with the principles of the present invention is shown in FIG. 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.

[0031] 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 logic for the processes 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. The master transceiver 64 communicates with trib 66 over communication medium 94.

[0032] 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 B) to replace the standard 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.

[0033] 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.

[0034] 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.

[0035] 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 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.

[0036] 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.

[0037] 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.

[0038] 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.

[0039] 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.

[0040] 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.

[0041] The control programs 78 and 92 of the present invention can be implemented in hardware, software, firmware, or a combination thereof. In the preferred embodiment(s), the control programs 78 and 92 are implemented in software or firmware that is stored in a memory and that is executed by a suitable instruction execution system.

[0042] The control programs 78 and 92, which comprise an ordered listing of executable instructions for implementing logical functions, can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (magnetic), a read-only memory (ROM) (magnetic), an erasable programmable read-only memory (EPROM or Flash memory) (magnetic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for instance optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.

[0043] In concluding the detailed description, it should be noted that it will be obvious to those skilled in the art that many variations and modifications can be made to the preferred embodiment without substantially departing from the principles of the present invention. All such variations and modifications are intended to be included herein within the scope of the present invention, as set forth in the following claims. Further, in the claims hereafter, the corresponding structures, materials, acts, and equivalents of all means or step plus function elements are intended to include any structure, material, or acts for performing the functions with other claimed elements as specifically claimed.

What is Claimed:

1. A communication system, comprising:

a transmitter capable of transmitting at least two modulation methods, wherein the at least two modulation methods comprise a first modulation method and a second modulation, wherein the second method is different than the first modulation method, and wherein the first transceiver is configured to transmit

a first sequence, in the first modulation method, that indicates an impending change from the first modulation method to the second modulation method, and

a second sequence, in the second modulation method, wherein the second sequence is transmitted after the first data sequence.

2. The system 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 has reverted to the first modulation method.

3. The system of claim 1, wherein first modulation method is a frequency shift keying modulation.

4. The system of claim 3, wherein the second modulation method is a shift keying modulation.

5. The system of claim 1, wherein the second modulation method is different than the first modulation method in performance.

6. The system of claim 5, wherein the first modulation method has a lower performance than the second modulation method.

7. The system of claim 1, wherein the second modulation method is different than the first modulation method in data rate.

8. The system of claim 7, wherein the first modulation method has a lower data rate than the second modulation method.

9. The system of claim 1, wherein the first transceiver is configured to transmit the second sequence according to a specific time interval.

10. The system of claim 1, wherein the first transceiver is configured to transmit the second sequence according to a particular quantity of data.

11. The system of claim 1, further comprising a processor and a memory, wherein the memory has stored therein instructions that when executed by the processor cause the transmitter to transmit the first sequence and the second sequence.

12. The system of claim 11, wherein the memory has stored therein program code for the first modulation method and the second modulation method.

13. The system of claim 11, wherein the memory comprises random access memory.

14. The system of claim 11, wherein the memory comprises read-only memory.

15. The device of claim 11, wherein the memory has stored therein program code for a multipoint communications protocol.

16. The system of claim 1, wherein the first sequence comprises an address.

17. The system of claim 1, wherein the first sequence and the second sequence are contained in a burst transmission.

18. The system of claim 17, wherein the burst transmission is a poll in accordance with a multipoint communications protocol.

19. A communications device, comprising:

a processor; and

a memory having stored therein executable instructions for execution by the processor, wherein the executable instructions direct transmission of first data with a first modulation method followed by second data with a second modulation method, wherein the first modulation method is different than the second modulation method, and wherein the first data comprises an indication of an impending change from the first modulation method to the second modulation method.

20. The device of claim 19, wherein the executable instructions direct transmission of third data with the first modulation method after the second data, wherein the third data indicates that communication has reverted to the first modulation method.

ABSTRACT

A device may be capable of communicating using at least two type types of modulation methods. The device may include a transceiver 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. The master transceiver may send transmissions structured with a first portion and a payload portion. 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 discrete transmissions may be addressed for an intended destination of the payload portion.

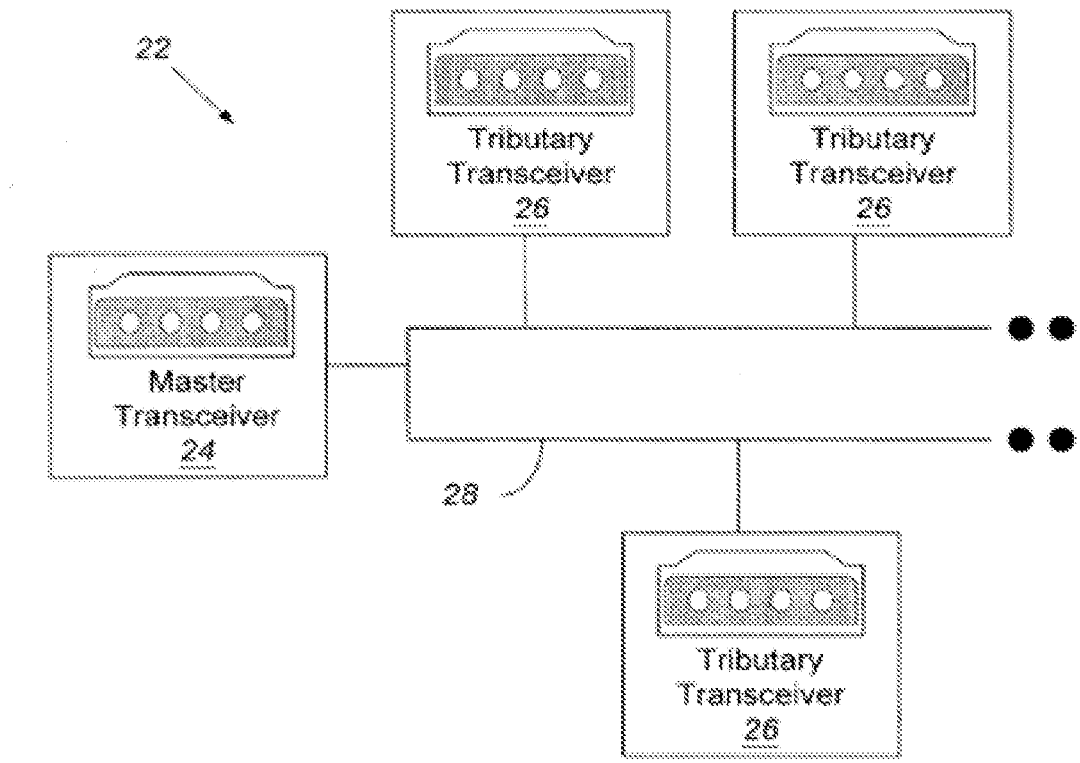

FIG. 1
Prior Art

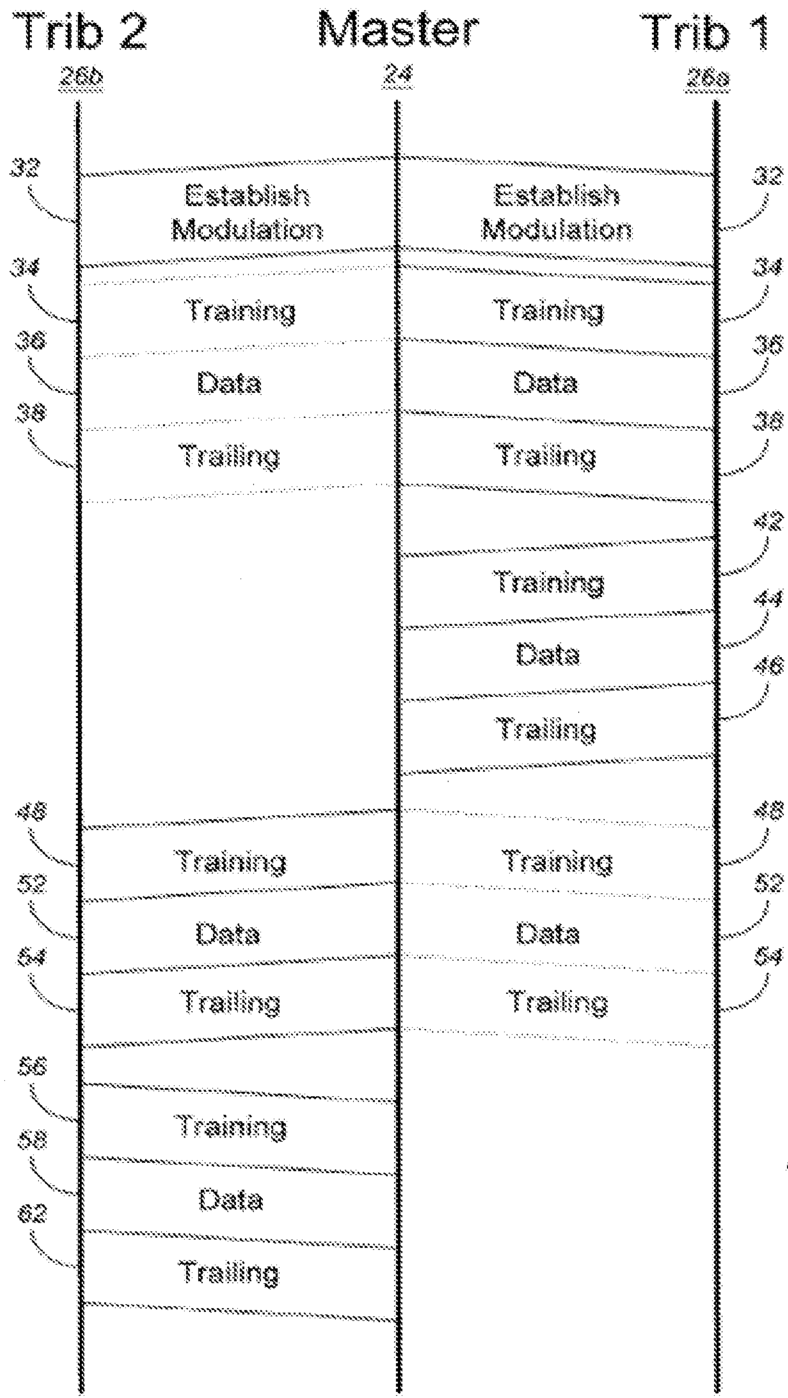
Trib 2
Master
Trib 1
26b
24
26a
32
Establish Modulation
Establish Modulation
32
34
Training
Training
34
36
Data
Data
36
38
Trailing
Trailing
38
42
Training
44
Data
46
Trailing
48
Training
Training
48
52
Data
Data
52
54
Trailing
Trailing
54
56
Training
58
Data
62
Trailing

FIG. 2

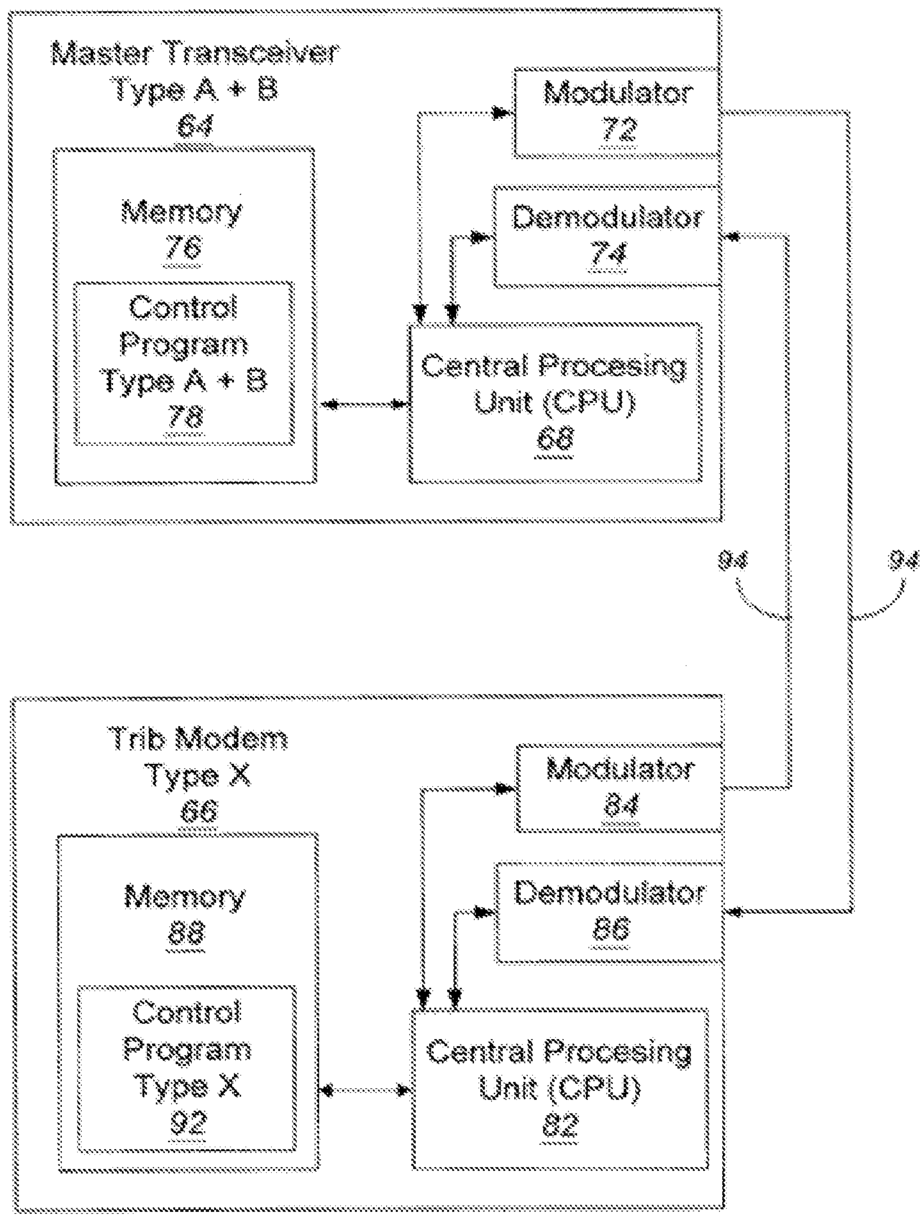
Master Transceiver
Type A + B
64
Memory
76
Control
Program
Type A + B
78
Modulator
72
Demodulator
74
Central Procesing
Unit (CPU)
68
94
94
Trib Modem
Type X
66
Memory
88
Control
Program
Type X
92
Modulator
84
Demodulator
86
Central Procesing
Unit (CPU)
82

FIG. 3

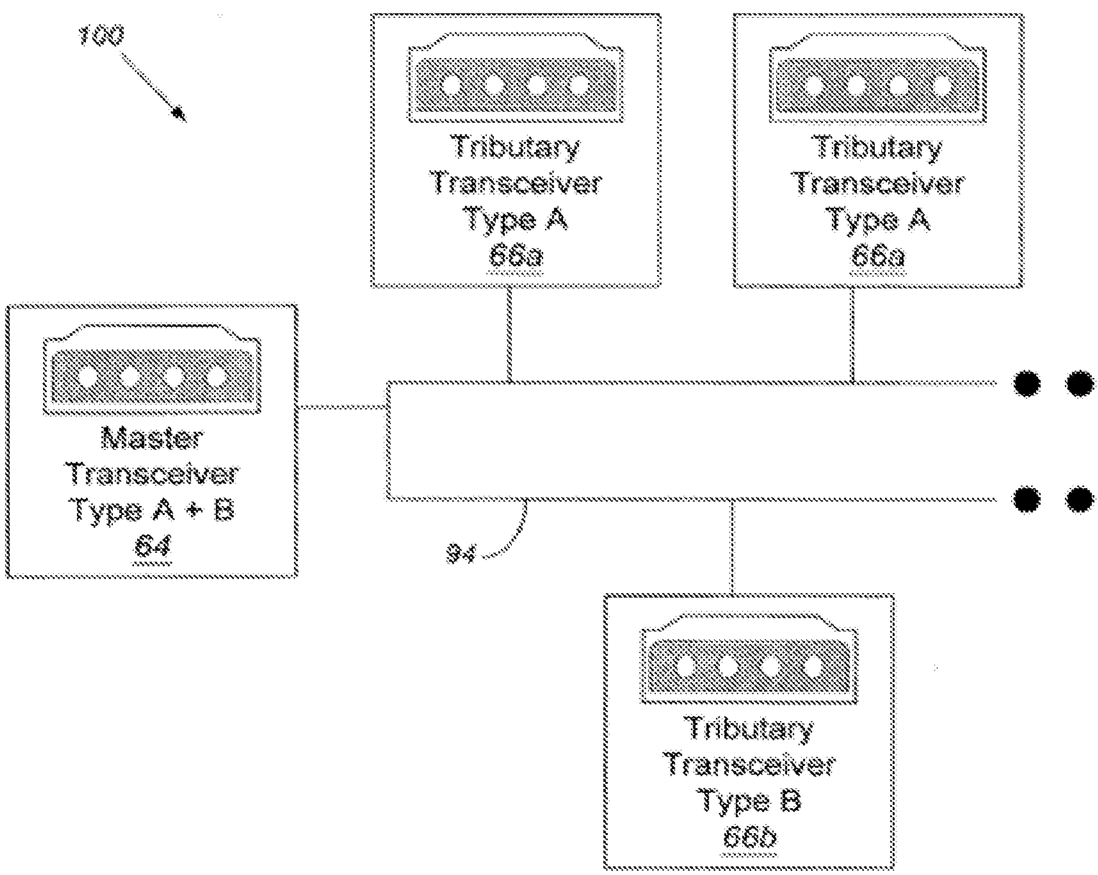
100
Tributary
Transceiver
Type A
66a
Tributary
Transceiver
Type A
66a
Master
Transceiver
Type A + B
64
94
Tributary
Transceiver
Type B
66b

FIG. 4

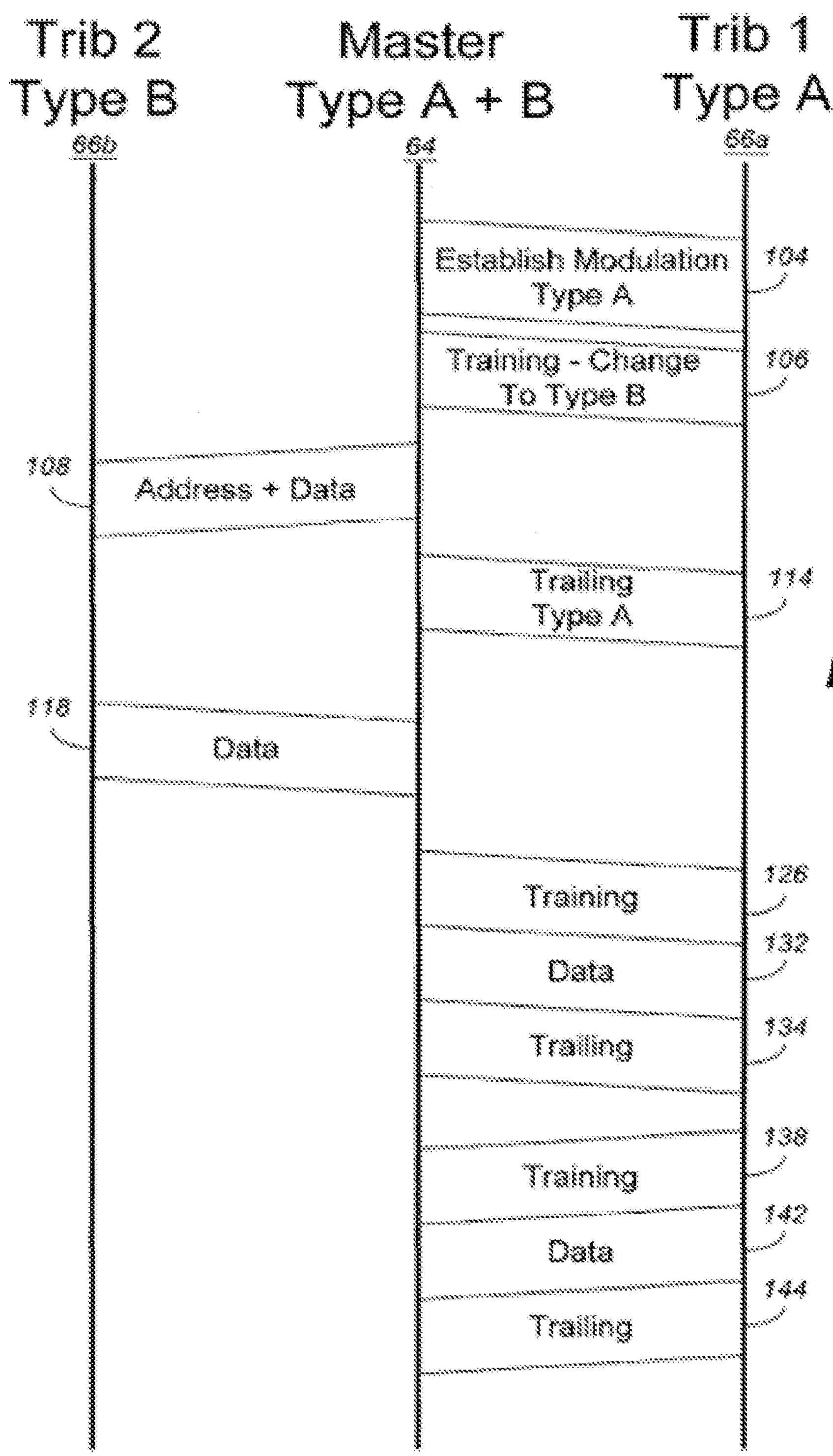
Trib 2
Type B
66b
Master
Type A + B
64
Trib 1
Type A
66a
Establish Modulation Type A
104
Training - Change To Type B
106
108
Address + Data
Trailing Type A
114
118
Data
Training
126
Data
132
Trailing
134
Training
138
Data
142
Trailing
144

FIG. 5

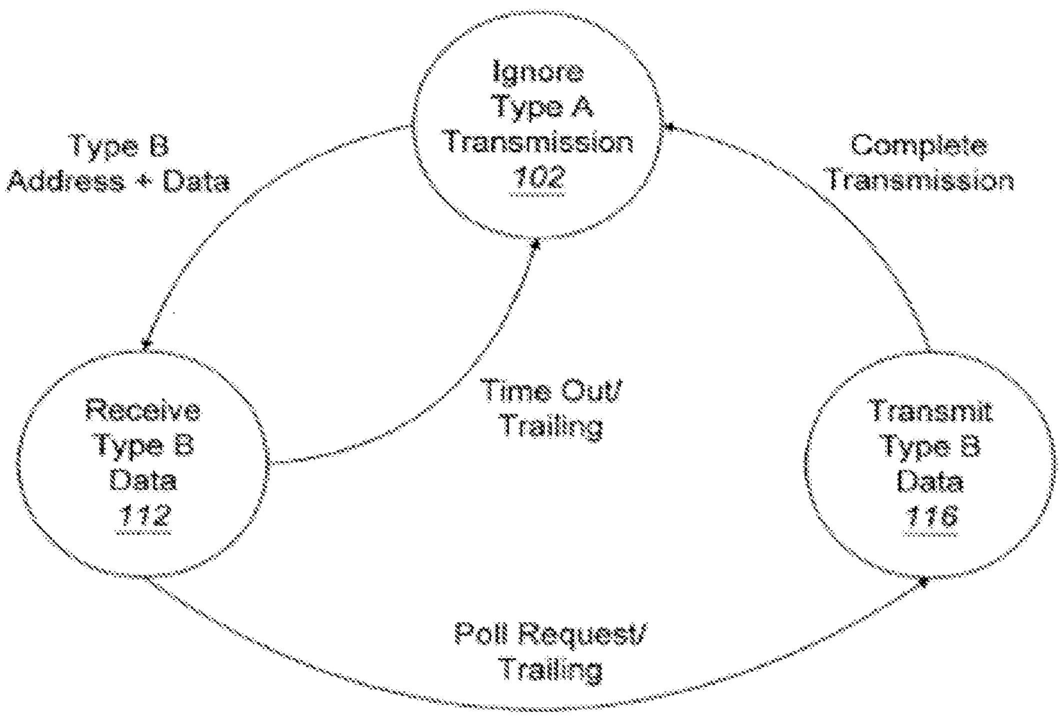
Ignore
Type A
Transmission
102
Type B
Address + Data
Complete
Transmission
Receive
Type B
Data
112
Time Out/
Trailing
Transmit
Type B
Data
116
Poll Request/
Trailing

FIG. 6

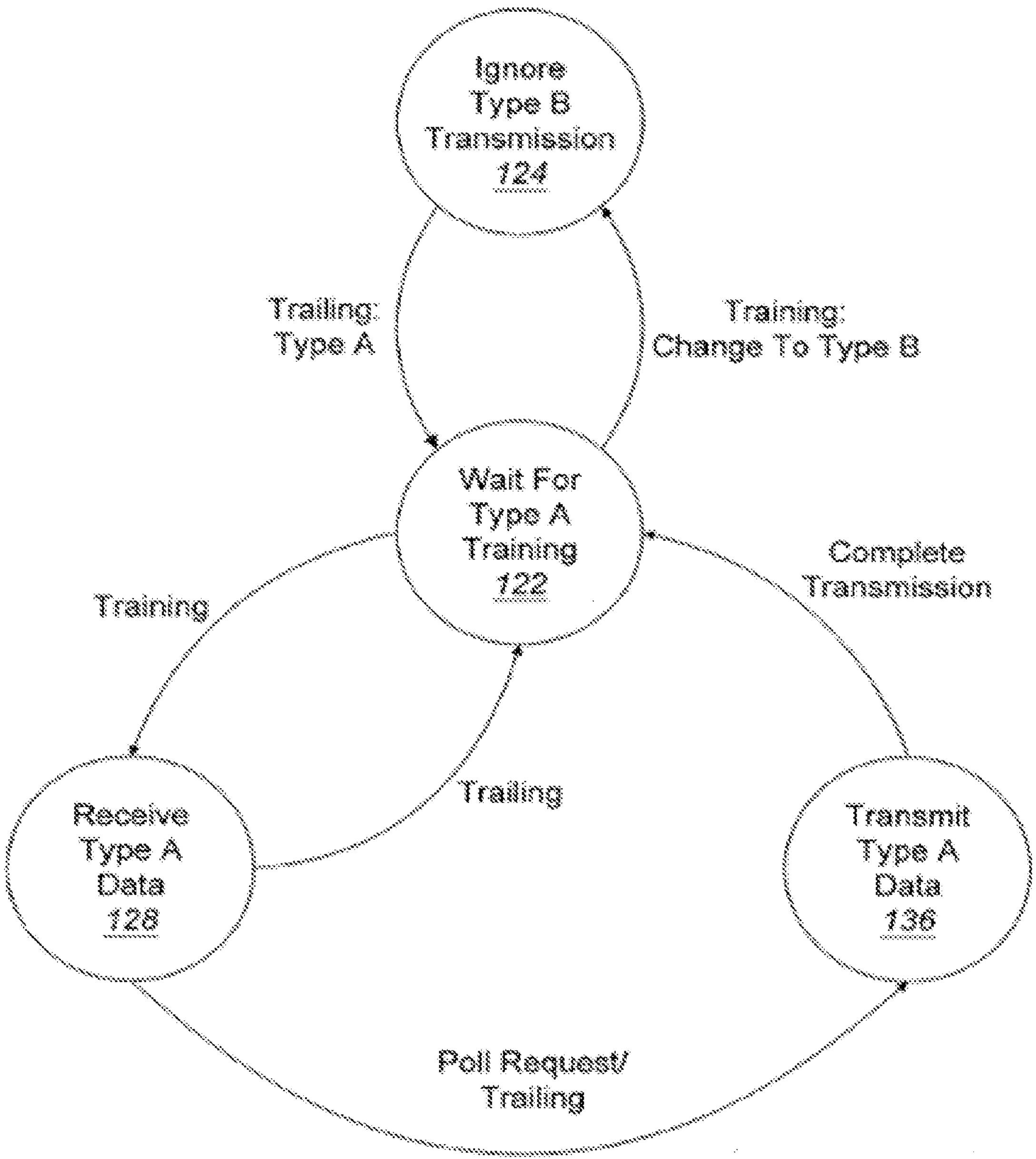
Ignore
Type B
Transmission
124
Trailing:
Type A
Training:
Change To Type B
Wait For
Type A
Training
122
Training
Complete
Transmission
Receive
Type A
Data
128
Trailing
Transmit
Type A
Data
136
Poll Request/
Trailing

FIG. 7

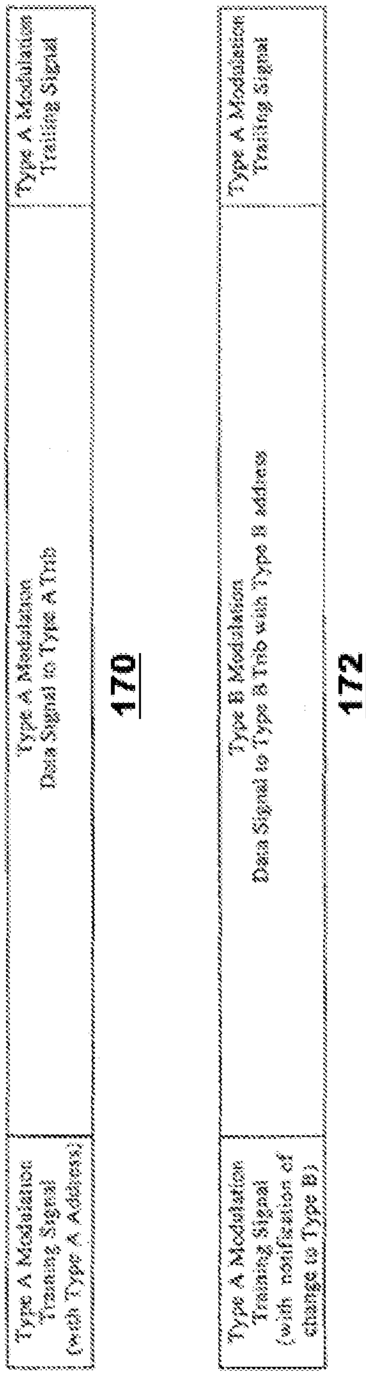
Type A Modulation Training Signal (with Type A Address)
Type A Modulation Data Signal to Type A Trib
Type A Modulation Trailing Signal
170
Type A Modulation Training Signal (with notification of change to Type B)
Type B Modulation Data Signal to Type B Trib with Type B address
Type A Modulation Trailing Signal
172

FIG. 8

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon Bremer
Filer:	Michael Koptiw Jr./diana kang
Attorney Docket Number:	REMB_0109_USCON2

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	330	330
Utility Search Fee	1111	1	540	540
Utility Examination Fee	1311	1	220	220
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1090**

Electronic Acknowledgement Receipt

EFS ID:	10671713
Application Number:	13198568
International Application Number:	
Confirmation Number:	8059
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon Bremer
Customer Number:	15027
Filer:	Michael Koptiw Jr./diana kang
Filer Authorized By:	Michael Koptiw Jr.
Attorney Docket Number:	REMB_0109_USCON2
Receipt Date:	04-AUG-2011
Filing Date:	
Time Stamp:	18:36:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1090
RAM confirmation Number	5430
Deposit Account	505519
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1	Transmittal of New Application	REMB0109USCON2transmittalfiled080411.pdf	275225 008920cf43733dfe23111e3cbfbb1e9af159b724	no	2
Warnings:					
Information:					
2	Application Data Sheet	REMB0109USCON2ADSfiled080411.pdf	1031825 8de01cf65cb667ea93bdc6e2f6e0c3c55f926581	no	5
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3	Authorization for Extension of Time all replies	REMB0109USCON02authexttimefiled080411final.pdf	71613 fd64b709e18d8f8dc875190a2e917d50e1712526	no	1
Warnings:					
Information:					
4		REMB_0109_USCON2_APPLICATION.pdf	114148 6b77635c9baeebd245a6574a03539fdce34c1f41	yes	14

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	10
Claims	11	13
Abstract	14	14

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Information:					
5	Drawings-only black and white line drawings	REMB_0109_USCONdrawings.pdf	289281 54ea8acb8813a393b0b4d77042f16eb85f635dc3	no	8
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	32846 c0ef9d7ed0cbfbaf50858f3254f74415e917aceb	no	2
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/198,568	08/04/2011	Gordon Bremer	REMB_0109_USCON2

CONFIRMATION NO. 8059

FORMALITIES LETTER

OC000000049356168

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Date Mailed: 08/17/2011

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
  A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
  Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $**130** for a non-small entity, must be submitted.

SUMMARY OF FEES DUE:

Total fee(s) required within **TWO MONTHS** from the date of this Notice is $**130** for a non-small entity
- $**130** Surcharge.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/sareebuddin/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
13/198,568

APPLICATION AS FILED - PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	330
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	540
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	220
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 52 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 220 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
			TOTAL			TOTAL	1090

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED - PART II

AMENDMENT A

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/198,568	08/04/2011	2611	1090	REMB_0109_USCON2	20	2

CONFIRMATION NO. 8059

FILING RECEIPT

OC000000049356167

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Date Mailed: 08/17/2011

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Gordon Bremer, Clearwater, FL;

Assignment For Published Patent Application

SUMMIT TECHNOLOGY SYSTEMS, LP, Bala Cynwyd, PA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 12/543,910 08/19/2009
which is a CON of 11/774,803 07/09/2007 PAT 7,675,965
which is a CON of 10/412,878 04/14/2003 PAT 7,248,626
which is a CIP of 09/205,205 12/04/1998 PAT 6,614,838
which claims benefit of 60/067,562 12/05/1997

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 08/16/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/198,568**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

System and Method of Communication Using at Least Two Modulation Methods

Preliminary Class

375

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

PTO/SB/21 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	13/198,568
Filing Date	08-04-2011
First Named Inventor	Gordon Bremer
Art Unit	2611
Examiner Name	Not Yet Assigned
Attorney Docket Number	REMB_0109_USCON2
Total Number of Pages in This Submission	

ENCLOSURES (*Check all that apply*)

- [ ] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [x] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [x] Reply to Missing Parts/ Incomplete Application
  - [x] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [x] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) ____________
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):

Executed declaration from parent application; 373(b) Statement

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Condo Roccia LLP		
Signature	/Joseph R. Klinicki/		
Printed name	Joseph R. Klinicki		
Date	01/17/2012	Reg. No.	68,505

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature			
Typed or printed name		Date	

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Splitterless Communication

As the below named inventor(s), I/we declare that:

This declaration is directed to:

☐ The attached application, or

☒ Application No. 12/543,910 filed on August 19, 2009

☐ As amended on ______ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT International filing date of the continuation-in-part application.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

All statements made herein of my/our own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR(S)

Inventor one: Gordon F. Bremer Date: 3-30-10

Signature: Gordon F. Bremer Citizen of: United States

Inventor two: ______ Date: ______

Signature: ______ Citizen of: ______

☐ Additional inventors or a legal representative are being named on ______ additional form(s) attached hereto.

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 15027

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned <u>only</u> to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 15027

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

Summit Technology Systems, LP
401 City Avenue
Bala Cynwyd, PA 19004

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Derek Wood	Date	6/9/2011
Name	Derek Wood	Telephone	610-822-0100
Title	Secretary of Rembrandt Technologies Management II, LLC, general partner of Assignee		

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: SUMMIT TECHNOLOGY SYSTEMS, LP

Application No./Patent No.: 13/198,568 Filed/Issue Date: 08-04-2011

Titled: System and Method of Communication Using at Least Two Modulation Methods

SUMMIT TECHNOLOGY SYSTEMS, LP, a CORPORATION
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is ________ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel ________, Frame ________, or for which a copy therefore is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: INVENTORS To: PARADYNE CORPORATION
The document was recorded in the United States Patent and Trademark Office at
Reel 018986, Frame 0586, or for which a copy thereof is attached.

2. From: ZHONE TECHNOLOGIES, INC.; PARADYNE To: SUMMIT TECHNOLOGY SYSTEMS, LP
The document was recorded in the United States Patent and Trademark Office at
Reel 019649, Frame 0818, or for which a copy thereof is attached.

3. From: ________ To: ________
The document was recorded in the United States Patent and Trademark Office at
Reel ________, Frame ________, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Joseph R. Klinicki/ January 17, 2012
Signature Date

Joseph R. Klinicki/Reg. No. 68,505 Attorney of Record
Printed or Typed Name Title

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	13198568
Filing Date:	04-Aug-2011
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon Bremer
Filer:	Joseph R. Klinicki/Darleen Yacovone
Attorney Docket Number:	REMB_0109_USCON2

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Late filing fee for oath or declaration	1051	1	130	130
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	1253	1	1270	1270
Miscellaneous:				
		Total in USD ($)		**1400**

Electronic Acknowledgement Receipt

EFS ID:	11856784
Application Number:	13198568
International Application Number:	
Confirmation Number:	8059
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon Bremer
Customer Number:	15027
Filer:	Joseph R. Klinicki/Darleen Yacovone
Filer Authorized By:	Joseph R. Klinicki
Attorney Docket Number:	REMB_0109_USCON2
Receipt Date:	17-JAN-2012
Filing Date:	04-AUG-2011
Time Stamp:	19:57:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1400
RAM confirmation Number	8100
Deposit Account	505519
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	REMB_0109_USCON2_MP_Transmittal.pdf	262512 7c733f57732464bee251e330c289581ff6c72ff1	no	2
Warnings:					
Information:					
2	Oath or Declaration filed	REMB_0109_USCON2_parent_executed_declaration.pdf	118852 407a1481a5b4586dbcdd8379210b6872de5e08e5	no	1
Warnings:					
Information:					
3	Power of Attorney	REMB_0109_USCON2_Power_of_Attorney.pdf	753838 e72d03ab12c899198d887f0fb0bed479435ca8d1	no	2
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73(b).	REMB_0109_USCON2_373b_Statement.pdf	428037 696baef32819aaf740468b612714da9f57717976	no	2
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	32459 60ae311b27f5ae1e67c4f3997908db712e3f3a52	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	1595698	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number
13/198,568

APPLICATION AS FILED - PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	380
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	620
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 250 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
			TOTAL			TOTAL	1250

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED - PART II

AMENDMENT A

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES DEPARTMENT OF COMMERCE
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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/198,568	08/04/2011	2611	1220	REMB_0109_USCON2	20	2

CONFIRMATION NO. 8059

UPDATED FILING RECEIPT

OC000000052190557

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Date Mailed: 01/26/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Gordon F. Bremer, Clearwater, FL;

Assignment For Published Patent Application

SUMMIT TECHNOLOGY SYSTEMS, LP, Bala Cynwyd, PA

Power of Attorney: The patent practitioners associated with Customer Number 15027

Domestic Priority data as claimed by applicant

This application is a CON of 12/543,910 08/19/2009 PAT 8023580
which is a CON of 11/774,803 07/09/2007 PAT 7675965
which is a CON of 10/412,878 04/14/2003 PAT 7248626
which is a CIP of 09/205,205 12/04/1998 PAT 6614838
which claims benefit of 60/067,562 12/05/1997

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 08/16/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/198,568**

Projected Publication Date: 05/03/2012

Non-Publication Request: No

Early Publication Request: No

Title

System and Method of Communication Using at Least Two Modulation Methods

Preliminary Class

375

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2

CONFIRMATION NO. 8059

POA ACCEPTANCE LETTER

OC000000052190541

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Date Mailed: 01/26/2012

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/17/2012.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/rdpaz/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

15027 7590 04/30/2012

Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

EXAMINER	
HA, DAC V	

ART UNIT	PAPER NUMBER
2611	

MAIL DATE	DELIVERY MODE
04/30/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/198,568	Applicant(s) BREMER, GORDON F.	
	Examiner DAC HA	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 August 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) ____ is/are withdrawn from consideration.

6)☐ Claim(s) ____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) ____ is/are objected to.

9)☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *04 August 2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: ____.

DETAILED ACTION

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 1, 2, 9-16 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-5, 7-10, 1 of U.S. Patent No. 8,023,580. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 1, 29-16 are essentially broader version of claims 1-5, 7-10 in Patent No. 8,023,580.

3. Claims 1, 2, 9-11, 13-15 and 19-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 40-47, and 40-41, respectively, of U.S. Patent No. 8,023,580. Although the conflicting claims are not identical, they are not patentably distinct from each other because despite slight difference in wording, claims 40-47 and 40-41 recite essentially the same claimed subject matter of claims 1, 2, 9-11, 13-15 of the present application.

4. Claims 3-8 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1, 40 of U.S. Patent No. 8,023,580. Although the conflicting claims are not identical, they are not patentably distinct from each other because these additional claimed subject matter would have been easily realized by one skilled in the art as conventional. For instance, shift keying modulation is among the well-known modulation in digital communication. And each type of modulation offers unique advantage and disadvantage, therefore, its use would depend on particular application.

5. Claim 17 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 8,023,580 in view of Schramm et al. (US 6,208,663) (hereafter Schramm). Claim 17 recites "burst transmission”. Also relating to plural modulation technique, Schramm discloses such claimed subject matter is not unknown (Fig. 2). Therefore, it would have been obvious to one skilled in the art to incorporate such teaching of burst transmission of Schramm into 8,023,580 and predictable result would have been expected.

6. Claims 1, 2 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,614,838. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 1 of Patent No. 6,614,838 recites essentially all claimed subject matter of claims 1-2 of the present application, despite difference in wording.

7. Claim 18 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 4 of U.S. Patent No. 6,614,838 in view of Schramm. Claim 18 recites "burst transmission”. Also relating to plural modulation technique, Schramm discloses such claimed subject matter is not unknown (Fig. 2). Therefore, it would have been obvious to one skilled in the art to incorporate such teaching of burst transmission of Schramm into 6,614,838 and predictable result would have been expected..

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Siwiak (US 5,537,398)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAC HA whose telephone number is (571)272-3040. The examiner can normally be reached on 4/4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dac V. Ha/
Primary Examiner, Art Unit 2611

Notice of References Cited	Application/Control No. 13/198,568	Applicant(s)/Patent Under Reexamination BREMER, GORDON F.	
	Examiner DAC HA	Art Unit 2611	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-8,023,580	09-2011	Bremer, Gordon F.	375/261
*	B	US-5,537,398	07-1996	Siwiak, Kazimierz	370/204
*	C	US-6,208,663	03-2001	Schramm et al.	370/465
*	D	US-6,614,838	09-2003	Bremer, Gordon	375/220
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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	S					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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BIB DATA SHEET

CONFIRMATION NO. 8059

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/198,568	08/04/2011 RULE	375	2611	REMB_0109_USCON2

APPLICANTS
Gordon F. Bremer, Clearwater, FL;

** **CONTINUING DATA** *************************
This application is a CON of 12/543,910 08/19/2009 PAT 8,023,580
which is a CON of 11/774,803 07/09/2007 PAT 7,675,965
which is a CON of 10/412,878 04/14/2003 PAT 7,248,626
which is a CIP of 09/205,205 12/04/1998 PAT 6,614,838
which claims benefit of 60/067,562 12/05/1997

** **FOREIGN APPLICATIONS** ************************

** **IF REQUIRED, FOREIGN FILING LICENSE GRANTED** **
08/16/2011

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /DAC V HA/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		FL	8	20	2

ADDRESS

Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103
UNITED STATES

TITLE

System and Method of Communication Using at Least Two Modulation Methods

FILING FEE RECEIVED		
1220	FEES: Authority has been given in Paper No.______ to charge/credit DEPOSIT ACCOUNT No.______ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other ______ ☐ Credit

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L25	223	("20010022836" | "20020041662" | "20020167949" | "20030039348" | "20030210773" | "20030210779" | "20040013183" | "20040042510" | "20040052361" | "20040066929" | "20040081233" | "20040179662" | "20040213170" | "20040258236" | "20050025153" | "20050074057" | "20050147158" | "20050152404" | "20050163303" | "20050180545" | "20060188088" | "20060193465" | "20060195712" | "20070047730" | "20070047733" | "20070286187" | "20080013608" | "20080019432" | "20090111422" | "20090262911" | "20090262912" | "20100183055" | "20100246598" | "3736528" | "3761840" | "3970926" | "4091422" | "4335464" | "4381546" | "4464767" | "4503545" | "4509171" | "4516216" | "4525846" | "4525847" | "4532640" | "4630286" | "4645871" | "4654807" | "4663766" | "4677625" | "4782498" | "4811357" | "4862464" | "4924516" | "4926448" | "4939748" | "5008903" | "5050536" | "5081647" | "5099478" | "5168535" | "5206854" | "5230010" | "5239306" | "5239607" | "5251236" | "5251328" | "5257396" | "5280503" | "5311557" | "5311578" | "5345332" | "5355362" | "5373149" | "5392154" | "5412651" | "5414540" | "5436930" | "5444704" | "5448555" | "5473675" | "5475713" | "5506866" | "5513212" | "5513213" | "5521942" | "5530718" | "5537398" | "5537411" | "5537436" | "5540456" | "5548222" | "5550881" | "5559791" | "5559792" | "5559810" | "5563883" | "5570295" | "5577087" | "5602869" | "5629992" | "5642379" | "5651114" | "5661718" | "5671250" | "5684825" | "5684834" | "5711012" | "5719922" | "5719923" | "5748811" | "5764699" | "5793800").PN. OR ("5805669" | "5805755" | "5812537" | "5825517" | "5828657" | "5841500" | "5844944" | "5859877" | "5881047" | "5881142" | "5901205" | "5915003" | "5936949" | "5940438" | "5960400" | "5963620" | "5999563" | "6011814" | "6021158" | "6031897" | "6061392" | "6067297" | "6072779" | "6075512" | "6097858" | "6097860" | "6101299" | "6108347" |	US-PGPUB; USPAT; USOCR	OR	OFF	2012/04/16 12:54

		"6111936" | "6125148" | "6134245" | "6154524" | "6157680" | "6160790" | "6175436" | "6185083" | "6212227" | "6236481" | "6236717" | "6243391" | "6252644" | "6272108" | "6272154" | "6292281" | "6307653" | "6307893" | "6307923" | "6320879" | "6320993" | "6330275" | "6335992" | "6347008" | "6348986" | "6408056" | "6445733" | "6470110" | "6480645" | "6493475" | "6529652" | "6535589" | "6546090" | "6549692" | "6556540" | "6580709" | "6580785" | "6591029" | "6597827" | "6603894" | "6614838" | "6628857" | "6631119" | "6633693" | "6647058" | "6658096" | "6671328" | "6690644" | "6690849" | "6715124" | "6744883" | "6771740" | "6775355" | "6782094" | "6782096" | "6885730" | "6922415" | "6950444" | "6970501" | "7006445" | "7013421" | "7020266" | "7023829" | "7035380" | "7046798" | "7058833" | "7065205" | "7127048" | "7130338" | "7155016" | "7170867" | "7248626" | "7272215" | "7289604" | "7289610" | "7352803" | "7471777" | "7675965" | "7707446" | "7711109" | "7747000").PN.				
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L27	6	("4731796" | "5239306" | "5497401" | "5537398" | "5671253" | "5680102").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/04/16 12:58
L28	64	("5982819").URPN.	USPAT	OR	OFF	2012/04/16 12:59
S11	1	"6445733".pn. and ((test$3 adj signal) with (noise interference antenuat$4 character$5 condition fad$3 distortion))	USPAT	OR	ON	2009/02/03 14:35
S12	5111	((test$3 adj signal) with (noise interference antenuat$4 character$5 condition fad$3 distortion))	US-PGPUB; USPAT	OR	ON	2009/02/03 14:37
S13	19	S12 with ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:38
S14	4	S13 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:38
S15	4	S14 and (test$3 near1 signal)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:41
S17	33	S12 same ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:45
S18	8	S17 not @ad>="19971205"	US-PGPUB;	OR	ON	2009/02/03 14:45

			USPAT			
S20	113	(test$3 adj signal) with ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:48
S21	15	S20 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:49
S22	11	S21 not (S14 S18)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:49
S23	97	(test$3 adj signal) with (data adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:59
S24	130	(test$3 adj signal) with ((transmi$6 data) adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:59
S25	201	(test$3 adj signal) with ((transmi$6 data frame symbol bit) adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:00
S26	47	S25 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 15:00
S29	6176	(channel adj (parameter character$6 condition)) with ((rate ratio impedance power))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:05
S32	1392	S29 with (data adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:06
S33	50	S32 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 15:06
S36	85	S29 with (impedance)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:08
S38	6	S29 with (impedance adj (match$3 mismatch$3))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:09
S40	10	S29 same (impedance adj (match$3 mismatch$3))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:10
S49	716	(channel adj (parameter character$6 condition)) with ((noise near1 ratio))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:43
S54	7803	(cross adj talk) with (noise interference)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:52
S57	1785	(channel adj (parameter character$6 condition estimat$4)) with ((feed$3 adj back) feedback)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:59
S62	6251	((feed$3 adj back) feedback) with ((central adj office) (base adj station) master)	US-PGPUB; USPAT	OR	ON	2009/02/03 16:12
S63	255	S57 same S62	US-PGPUB; USPAT	OR	ON	2009/02/03 16:13
S64	3	S63 not @ad>="19971205"	US-PGPUB;	OR	ON	2009/02/03 16:13

			USPAT			
S70	56	(test$3 adj signal) with (group$3 near1 delay$3)	US-PGPUB; USPAT; USOCR	OR	ON	2009/02/03 17:46
S90	125714	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2010/08/03 15:59
S91	81473	S90 and (modulat$4 cod$4).clm.	US-PGPUB; USPAT	OR	ON	2010/08/03 15:59
S92	24337	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1 (method scheme technique level type))	US-PGPUB; USPAT	OR	ON	2010/08/03 16:02
S93	6900	S91 and S92	US-PGPUB; USPAT	OR	ON	2010/08/03 16:02
S94	651	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4).ab. and S93	US-PGPUB; USPAT	OR	ON	2010/08/03 16:02
S95	278	S94 and "375"/$.ccls.	US-PGPUB; USPAT	OR	ON	2010/08/03 16:03
S96	25	S95 and 375/295.ccls.	US-PGPUB; USPAT	OR	ON	2010/08/03 16:03
S97	1	S96 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2010/08/03 16:04
S100	22	("5537398").URPN.	USPAT	OR	OFF	2010/08/06 14:22
S104	125899	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2010/08/06 14:27
S106	125899	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S107	81583	S106 and (modulat$4 cod$4).clm.	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S108	24381	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1 (method scheme technique level type))	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S142	120	(gordon near1 bremer).in.	US-PGPUB; USPAT	OR	ON	2012/04/12 15:43
S143	42	S142 and modula$5.clm.	US-PGPUB; USPAT	OR	ON	2012/04/12 15:45

4/16/2012 2:01:48 PM
C:\Users\dha\Documents\EAST\Workspace2\13198568.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2611

✓	**Rejected**	-	**Cancelled**	N	**Non-Elected**	A	**Appeal**
=	**Allowed**	÷	**Restricted**	I	**Interference**	O	**Objected**

☐ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

CLAIM		DATE								
Final	Original	04/16/2012								
	1	✓								
	2	✓								
	3	✓								
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	15	✓								
	16	✓								
	17	✓								
	18	✓								
	19	✓								
	20	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2611

SEARCHED

Class	Subclass	Date	Examiner
375	261, 269, 285, 222, 298, 298, 302, 305, 308	4/16/2012	DH
455	102, 110	4/16/2012	DH
332	108, 119, 120, 151	4/16/2012	DH

SEARCH NOTES

Search Notes	Date	Examiner
BRS and Inventor's search	4/16/2012	DH

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner
	PGPUB text search	4/16/2012	DH

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2

CONFIRMATION NO. 8059

PUBLICATION NOTICE

OC000000054081422

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Title: System and Method of Communication Using at Least Two Modulation Methods

Publication No.US-2012-0106604-A1
Publication Date:05/03/2012

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The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 15027

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned <u>only</u> to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 15027

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

REMBRANDT WIRELESS TECHNOLOGIES, LP
1655 NORTH FORT MEYERS DRIVE, SUITE 700
ARLINGTON, VIRGINIA 22209

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Derek Wood	Date	10/12/2012
Name	Derek Wood	Telephone	610-822-0100
Title	Secretary of Rembrandt Virginia Management, LLC, general partner of Rembrandt Wireless Technologies, LP		

PTO/SB/96 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Rembrandt Wireless Technologies, LP

Application No./Patent No.: 13/198,568 Filed/Issue Date: 08-04-2011

Titled: System and Method of Communication Using at Least Two Modulation Methods

Rembrandt Wireless Technologies, LP, a CORPORATION
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is ________ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

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A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel ________, Frame ________, or for which a copy therefore is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

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The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Joseph R. Klinicki/ 10-19-2012
Signature Date

Joseph R. Klinicki Attorney of Record
Printed or Typed Name Title

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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Electronic Acknowledgement Receipt

EFS ID:	14027575
Application Number:	13198568
International Application Number:	
Confirmation Number:	8059
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon F. Bremer
Customer Number:	15027
Filer:	Joseph R. Klinicki/Darleen Yacovone
Filer Authorized By:	Joseph R. Klinicki
Attorney Docket Number:	REMB_0109_USCON2
Receipt Date:	19-OCT-2012
Filing Date:	04-AUG-2011
Time Stamp:	12:46:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	REMB_0109_USCON2_executed_power_of_attorney.pdf	150201 6d0017385b40bff7c8946d03f78c7b9ccd0c649d	no	1

Warnings:

Information:

2	Assignee showing of ownership per 37 CFR 3.73.	REMB_0109_USCON2_Rembrandt_Wireless_Technologies_LP_373b_Statement.pdf	430748 f9d916c6c8bc6ba6121a7f8795fd23a920dab674	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	580949		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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PTO/SB/26 (08-11)
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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) REMB_0109_USCON2

In re Application of: GORDON BREMER

Application No.: 13/198,568

Filed: 08-04-2011

For: System and Method of Communication Using at Least Two Modulation Methods

The owner*, Rembrandt Wireless Technologies, LP, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 6,614,838 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 68,505

/Joseph R. Klinicki/ — Signature

October 19, 2012 — Date

Joseph R. Klinicki — Typed or printed name

215-558-5740 — Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

DOCKET NO.: REMB_0109_USCON2 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Bremer, Gordon **Confirmation No.: 8059**

Application No.: 13/198,568 **Group Art Unit: 2611**

Filing Date: August 04, 2011 **Examiner: Dac V. Ha**

For: System and Method of Communication Using at Least Two Modulation Methods

Filed Via EFS

INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 CFR § 1.56 and in accordance with 37 CFR §§ 1.97-1.98, information relating to the above-identified application is hereby disclosed. Inclusion of information in this statement is not to be construed as an admission that this information is material as that term is defined in 37 CFR § 1.56(b).

☐ **IDS Filed Under 37 CFR 1.97(b)**

In accordance with § 1.97(b), since this Information Disclosure Statement is being filed either within three months of the filing date of the above-identified application, within three months of the date of entry into the national stage of the above identified application as set forth in § 1.491, before the mailing date of a first Office Action on the merits of the above-identified application, or before the mailing date of a first Office Action after the filing of request for continued examination under § 1.114, no additional fee is required.

☒ **IDS filed Under 37 CFR 1.97(c)**

In accordance with § 1.97(c), this Information Disclosure Statement is being filed after the period set forth in § 1.97(b) above but before the mailing date of either a Final Action under § 1.116 or a Notice of Allowance under § 1.311, or before an action that otherwise closes prosecution in the application, therefore:

- ☐ Certification in Accordance with § 1.97(e) is attached; or
- ☒ The fee of **$180.00** as set forth in § 1.17(p) is attached.

☐ **IDS filed Under 37 CFR 1.97(d)**

In accordance with § 1.97(d), this Information Disclosure Statement is being filed after the mailing date of either a Final Action under § 1.113 or a Notice of Allowance under § 1.311 but before, or simultaneously with, the payment of the Issue Fee, therefore included are: Certification in Accordance with § 1.97(e); and the submission fee of **$180.00** as set forth in § 1.17(p).

CONTENT OF IDS PURSUANT TO 37 CFR 1.98

☒ Copies of reference numbers 1-225 listed on the attached Form PTO-1449 are not required to be submitted pursuant to 37 CFR § 1.98(a)(2)(ii).

☐ Copies of reference numbers listed on the attached Form PTO-1449 are enclosed herewith.

☒ Copies of reference numbers 226-264 are not being submitted because they were previously cited by or submitted to the U.S. Patent and Trademark Office in patent application number 12/543,910, filed August 19, 2009 for which a claim for priority under 35 U.S.C. § 120 has been made in the instant application.

☐ The month of publication for reference numbers is not available. However, the year of publication for these references is sufficiently earlier than the effective US filing date and any foreign priority date so that the particular month of publication is not in issue pursuant to 37 CFR § 1.98(b).

STATEMENT OF RELEVANCE OF REFERENCES WITH FULL CITATION INFORMATION NOT AVAILABLE

☐ The following documents do not have the full citation information available and a copy was not available. Accordingly, a concise explanation of the relevance of the references is identified below.

Reference With No Date Available	Cite No.	Relevance of Document

REFERENCES IN A LANGUAGE OTHER THAN ENGLISH

☐ The following documents are not in the English language. Accordingly, a concise explanation of the relevance of the document was incorporated in the specification passages identified below, the document was identified in a foreign communication as identified below or an English language counterpart application has been provided as indicated below.

Foreign Language Document	Cite No.	Pages of Reference in Specification or Relevance of Document

Foreign Language Document	Cite No.	English Language Counterpart	Cite No.

☐ **CERTIFICATION IN ACCORDANCE WITH § 1.97(e)**

I hereby certify that:

☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of this information disclosure statement.

Please charge any deficiency or credit any overpayment to Deposit Account No. 50-5519.

Date: October 19, 2012

/Joseph R. Klinicki/
Joseph R. Klinicki
Registration No. 68,505

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Substitute for 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
Sheet	1	of	12	**Attorney Docket Number**	REMB_0109_USCON2

U. S. PUBLICATION AND PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	1	3,736,528	05-29-1973	Acker et al.
	2	3,761,840	09-25-1973	Bremer, Gordon F.
	3	3,970,926	07-20-1976	Rigby et al.
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Examiner Signature		Date Considered	

Substitute for 1449/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(use as many sheets as necessary)*				*Complete if Known*	
				Application Number	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
				Examiner Name	Dac V. Ha
Sheet	2	of	12	**Attorney Docket Number**	REMB_0109_USCON2

U. S. PUBLICATION AND PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Examiner Signature		**Date Considered**	

Substitute for 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
Sheet	3	of	12	**Attorney Docket Number**	REMB_0109_USCON2

U. S. PUBLICATION AND PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Examiner Signature		**Date Considered**	

Substitute for 1449/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(use as many sheets as necessary)*				***Complete if Known***	
				Application Number	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
				Examiner Name	Dac V. Ha
Sheet	4	of	12	**Attorney Docket Number**	REMB_0109_USCON2

U. S. PUBLICATION AND PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Examiner Signature		Date Considered	

Substitute for 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
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(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
Sheet	5	of	12	**Attorney Docket Number**	REMB_0109_USCON2

U. S. PUBLICATION AND PATENT DOCUMENTS

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Examiner Signature		**Date Considered**	

Substitute for 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
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(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
Sheet	6	of	12	**Attorney Docket Number**	REMB_0109_USCON2

U. S. PUBLICATION AND PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Examiner Signature		**Date Considered**	

Substitute for 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
Sheet	7	of	12	**Attorney Docket Number**	REMB_0109_USCON2

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Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Examiner Signature		**Date Considered**	

Substitute for 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
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(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
Sheet	8	of	12	**Attorney Docket Number**	REMB_0109_USCON2

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Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Substitute for 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
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				First Named Inventor	Bremer, Gordon
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(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
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Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Examiner Signature		**Date Considered**	

Substitute for 1449/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(use as many sheets as necessary)*				*Complete if Known*	
				Application Number	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
				Examiner Name	Dac V. Ha
Sheet	10	of	12	**Attorney Docket Number**	REMB_0109_USCON2

U. S. PUBLICATION AND PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number Number – Kind Code (if known)	Publication or Grant Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
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Examiner Signature		**Date Considered**	

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				Application Number	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
				Examiner Name	Dac V. Ha
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				Application Number	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
				Examiner Name	Dac V. Ha
Sheet	12	of	12	**Attorney Docket Number**	REMB_0109_USCON2

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Examiner Signature		**Date Considered**	

Electronic Patent Application Fee Transmittal

Application Number:	13198568
Filing Date:	04-Aug-2011
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon F. Bremer
Filer:	Joseph R. Klinicki/Cassandra Katz
Attorney Docket Number:	REMB_0109_USCON2

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1202	21	62	1302
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	1253	1	1290	1290
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
Statutory or terminal disclaimer	1814	2	160	320
			Total in USD ($)	**3092**

Electronic Acknowledgement Receipt

EFS ID:	14029145
Application Number:	13198568
International Application Number:	
Confirmation Number:	8059
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon F. Bremer
Customer Number:	15027
Filer:	Joseph R. Klinicki/Cassandra Katz
Filer Authorized By:	Joseph R. Klinicki
Attorney Docket Number:	REMB_0109_USCON2
Receipt Date:	19-OCT-2012
Filing Date:	04-AUG-2011
Time Stamp:	15:59:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$3092
RAM confirmation Number	2740
Deposit Account	505519
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Extension of Time	REMB_0109_USCON2_3moEOT.pdf	83633 3c9db5b4ba4232b4a79674416af2accec9a1ecbc	no	2

Warnings:

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
2		REMB_0109_USCON2_Response_to_4-30-12_NFOA_filed_10-19-12.pdf	149197 90501dd4218cfa921a658b8a7981d565c2c28dd9	yes	21

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Specification	2	5
Claims	6	15
Applicant Arguments/Remarks Made in an Amendment	16	21

Warnings:

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
3	Abstract	REMB_0109_USCON2_ReplacementAbstract.pdf	59417 9961c5e467b495487834909e0ad675cbdb4b85d8	no	1

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
4	Terminal Disclaimer Filed	REMB_0109_USCON2_TerminalDisclaimer_US8023580.pdf	374306 848b7aab1d6e82ef67df6828d608e791985636d7	no	2

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
5	Terminal Disclaimer Filed	REMB_0109_USCON2_TerminalDisclaimer_US6614838.pdf	374100 87c6e9677696751bca61bec143bb7e8cf7c2587f	no	2

Warnings:

Information:

6	Transmittal Letter	REMB_0109_USCON2_IDS_Trans_CR.pdf	106463 f912a3bcb5825b4a1da3ef5c0a7a018c0ffbe22a	no	4
Warnings:					
Information:					
7	Information Disclosure Statement (IDS) Form (SB08)	REMB_0109_USCON2_IDS_1449.pdf	183021 57ab627c0e82087840ea998db0ff600f576a6c21	no	12
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
8	Fee Worksheet (SB06)	fee-info.pdf	35594 67326d18244aae16578422dd477c0d459342cd76	no	2
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) REMB_0109_USCON2
Application Number 13/198,568	Filed August 4, 2011
For System and Method of Communication Using at Least Two Modulation Methods	
Art Unit 2611	Examiner Dac V. Ha

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$150	$75	$
☐ Two months (37 CFR 1.17(a)(2))	$570	$285	$
☒ Three months (37 CFR 1.17(a)(3))	$1,290	$645	$ 1290.00
☐ Four months (37 CFR 1.17(a)(4))	$2,010	$1,005	$
☐ Five months (37 CFR 1.17(a)(5))	$2,730	$1,365	$

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-5519.

☒ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☒ attorney or agent of record. Registration number 68505.

☐ attorney or agent acting under 37 CFR 1.34. Registration number ______.

/Joseph R. Klinicki/	October 19, 2012
Signature	Date
Joseph R. Klinicki	215-558-5727
Typed or printed name	Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☒ * Total of 1 forms are submitted.

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT

Docket Number (Optional)
REMB_0109_USCON2

In re Application of: Gordon F. Bremer

Application No.: 13/198,568

Filed: 08-04-2011

For: System and Method of Communication Using at Least Two Modulation Methods

The owner*, Rembrandt Wireless Technologies, LP, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 8,023,580 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 68,505

/Joseph R. Klinicki/ — Signature

October 19, 2012 — Date

Joseph R. Klinicki — Typed or printed name

215-558-5740 — Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Gordon F. Bremer

Confirmation No.: 8059

Application No.: 13/198,568

Group Art Unit: 2611

Filing Date: August 4, 2011

Examiner: Dac V. Ha

For: System and Method of Communication Using at Least Two Modulation Methods

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY PURSUANT TO 37 CFR § 1.111

In response to the Official Action dated **April 30, 2012**, reconsideration is respectfully requested in view of the amendments and/or remarks as indicated below:

- ☒ **Amendments to the Specification** begin on page 2 of this paper.
- ☒ **Amendments to the Claims** are reflected in the listing of the claims which begins on page 6 of this paper.
- ☐ **Amendments to the Drawings** begin on page of this paper and include an attached replacement sheet.
- ☒ **Remarks** begin on page 16 of this paper.
- ☒ The Commissioner is hereby authorized to charge any fee deficiency, charge any additional fees, or credit any overpayment of fees, associated with this application in connection with this filing, or any future filing, submitted to the U.S. Patent and Trademark Office during the pendency of this application, to Deposit Account No. 50-5519.

Amendments to the Specification:

Please replace the Summary section, which corresponds to paragraphs [0008] – [0012] of the specification, as follows:

[0008] The present invention disclosed herein includes methods and systems for communication of data according to a communications method in which a master transceiver communicates with one or more slave transceivers according to a master/slave relationship. Communication from the one or more slave transceivers may be in response to a communication from the master to at least one of the one or more slave transceivers. Example communication methods may include transmitting at least a first message, which may be low data rate message, of a plurality of data messages. The plurality of data messages may be transmitted over a communication medium from the master transceiver to the one or more slave transceivers. The first message may include first information, and the first information may be modulated according to a first modulation method. The first message may include second information. The second information may be modulated according to the first modulation method. The second information may comprise lower data rate data, for example low data rate application data. The first message may include first message address data that may be indicative of an identity of one of the one or more slave transceivers as an intended destination of the second information. Example communication methods may include transmitting a second message, which may be a high data rate message, of the plurality of data messages. The second message may comprise third information (*e.g.*, first information of the second message/high data rate message), and the third information may be modulated according to the first modulation method. The third information may be indicative of an impending change in modulation to a second modulation method for transmission of fourth information (*e.g.*, second information of the second message/high data rate message). The second message may comprise the fourth information, and the fourth information may be transmitted after transitioning from the first modulation method to the second modulation method. The fourth information may be modulated according to the second modulation method. The second modulation method may be of a different type than the first modulation method. The fourth information may comprise higher data rate data, for example Internet access application data. The fourth information may be intended for a single slave transceiver of the one or more slave transceivers. The higher data rate data may be transmitted at a higher data rate than the low data rate application data. The second message may indicate an identity of the single slave transceiver as being an intended destination of the fourth information using second message address data included in the second message.

~~[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.~~

[0009] The present invention has many advantages, a few of which are delineated hereafter as merely examples.

[0010] One advantage of the present invention is that it provides to the use of a plurality of modem modulation methods on the same communication medium.

[0011] Another advantage of the present invention is that a master transceiver can communicate seamlessly with tributary transceivers or modems using incompatible modulation methods.

[0012] Other features and advantages of the present invention will become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional features and advantages be included herein within the scope of the present invention.

Please amend paragraph [0034] of the specification as follows:

[0034] 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. <u>In an example, embedded modulation permits a secondary modulation to replace the usual primary modulation for a user data segment located after a primary training sequence. For example, master transceiver 64 may change to modulation Type B and may convey user information to type B trib 66b.</u> 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.

Please amend paragraphs [0039] of the specification as follows:

[0039] After completing transmission sequence 132<u>, which may include a user data segment transmitted using the usual primary (*e.g.*, type A) modulation</u>, 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.

Please amend the Abstract as shown below. A clean version of the amended Abstract has also been included on a separate sheet that is submitted herewith the present response.

A device may be capable of communicating using at least two type types of modulation methods. Methods and systems are provided for communication of data according to a communications method in which ~~The device may include a transceiver capable of acting as~~ a master transceiver communicates with one or more slave transceivers 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~~. A first data message may include first information and second information that are modulated according to a first modulation method. The second information may include lower data rate data. A second data message may include third information that may be ~~The master transceiver may send transmissions structured with a first portion and a payload portion. Information in the first portion may be~~ modulated according to ~~a~~ the first modulation method and that may indicate an impending change to a second modulation method.~~, which is~~ The second modulation method may be used for transmitting fourth information, and the fourth information may be included in the second message ~~the payload portion. The discrete transmissions may be addressed for an intended destination of the payload portion~~. The fourth information may include higher data rate data, for example Internet access data.

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

Listing of Claims:

1-20. (Cancelled)

21. (New) A method for a master transceiver to communicate with one or more slave transceivers according to a master/slave relationship, the method comprising:

transmitting at least a first message of a plurality of data messages, the plurality of data messages being transmitted over a communication medium from the master transceiver to the one or more slave transceivers, wherein transmitting at least the first message of the plurality of data messages comprises:

transmitting first information, the first information being transmitted as part of the first message and being modulated according to a first modulation method, and

transmitting second information, the second information being transmitted as part of the first message and being modulated according to the first modulation method, wherein the second information comprises lower data rate data, and said first message includes first message address data that is indicative of an identity of one of the one or more slave transceivers as an intended destination of the second information; and

transmitting a second message of the plurality of data messages, wherein transmitting the second message of the plurality of data messages comprises:

transmitting third information, the third information being transmitted as part of the second message and being modulated according to the first modulation method, wherein the third information comprises at least information that is indicative of an impending change in modulation to a second modulation method for transmission of fourth information that is included in the second message, and

transmitting the fourth information, the fourth information being transmitted as part of the second message and being 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 higher data rate data intended for a single slave transceiver of the one or more slave transceivers, the higher data rate data is transmitted at a higher data rate than the lower data rate data, and the second message indicates that the single slave transceiver is an intended destination of the fourth information that is included in the second message using second message address data included in the second message.

22. (New) The method as in claim 21, wherein the communication medium supports a multi-point communication network communication architecture.

23. (New) The method as in claim 21, wherein the first message of the plurality of data messages is transmitted before the second message of the plurality of data messages.

24. (New) The method as in claim 21, wherein the first message of the plurality of data messages is transmitted after the second message of the plurality of data messages.

25. (New) The method as in claim 21, further comprising transmitting additional data modulated according to the first modulation method after transmitting the fourth information.

26. (New) The method of claim 21, further comprising providing a high data rate application, wherein transmission of the fourth information comprises communicating for the high data rate application.

27. (New) The method as in claim 26, wherein the high data rate application is an Internet access application.

28. (New) The method of claim 21, further comprising providing a low data rate application, wherein transmission of the second information comprises communicating for the low data rate application.

29. (New) The method of claim 28, wherein the low data rate application is selected from the group consisting of: power monitoring and control applications.

30. (New) The method as in claim 21, further comprising receiving by the master transceiver, after the transmitting of the second message, data from the single slave transceiver of the one or more slave transceivers modulated according to the second modulation method.

31. (New) The method as in claim 30, wherein the data from the single slave transceiver is received in response to a request sent from the master transceiver to the single slave transceiver, the request indicating that the master transceiver requests data from the single slave transceiver.

32. (New) The method as in claim 21, wherein lower data rate data comprises user data.

33. (New) The method as in claim 21, wherein higher data rate data comprises user data.

34. (New) The method as in claim 21, wherein the plurality of data messages are a plurality of user data messages.

35. (New) The method as in claim 34, wherein each of the plurality of user data messages comprises message-specific first information and message-specific second information, and for each of the plurality of user data messages:

the message-specific first information is modulated according to the first modulation method and the message-specific first information indicates whether the message-specific second information will be modulated using a different type of modulation method than is used for the message-specific first information; and the user data message indicates that a message-specific slave transceiver from among the one or more slave transceivers is an intended destination of the message-specific second information.

36. (New) The method as in claim 35, wherein:

for the first message, the message-specific first information comprises the first information and the message-specific second information comprises the second information; and

for the second message, the message-specific first information comprises the third information and the message-specific second information comprises the fourth information.

37. (New) The method as in claim 35, wherein the message-specific first information is indicative of whether the message-specific second information will be modulated according to the first modulation method or the second modulation method.

38. (New) The method as in claim 21, further comprising transmitting a third message of the plurality of data messages, wherein transmitting the third message comprises:

transmitting fifth information, the fifth information being transmitted as part of the third message and being modulated according to the first modulation method, wherein the fifth information is indicative of an impending change in modulation to the second modulation method for transmission of sixth information that is included the third message; and

transmitting the sixth information, the sixth information being transmitted as part of the third message and being transmitted after transitioning from the first modulation method to the second modulation method, the sixth information being modulated according to the second modulation method, wherein the sixth information comprises additional higher data rate data intended for an individual slave transceiver of the one or more slave transceivers, the third message indicates an identity of the individual slave transceiver of the one or more slave transceivers as being an intended destination of the sixth information that is included in the third message using third message address data included in the third message.

39. (New) The method as in claim 38, where the transmitting of the third message occurs after the transmitting of the first message and after the transmitting of the second message.

40. (New) The method as in claim 38, wherein the single slave transceiver and the individual slave transceiver are the same slave transceiver.

41. (New) The method as in claim 21, wherein the first information that is included in the first message comprises the first message address data.

42. (New) A method for implementing an Internet access application by providing communication of Internet access application data according to a communications method in which a master transceiver communicates with one or more slave transceivers according to a master/slave relationship, wherein communication from the one or more slave transceivers is in response to a communication from the master to at least one of the one or more slave transceivers, the communications method comprising:

transmitting at least a low data rate message of a plurality of data messages, the plurality of data messages being transmitted over a communication medium from the master transceiver to the one or more slave transceivers, each of the plurality of data messages comprising first data and second data, wherein the low data rate message comprises:

first information of the low data rate message, the first information of the low data rate message being modulated according to a first modulation method, wherein the first information included in the low data rate message comprises addressing information for an intended destination of second information that is included in the low data rate message, and

the second information of the low data rate message, the second information of the low data rate message being modulated according to the first modulation method, wherein the second information of the low data rate message comprises low data rate application data, and said low data rate message includes low data rate message address data indicative of an identity of one of the one or more slave transceivers as an intended destination of the second information of the low data rate message; and

transmitting a high data rate message of the plurality of data messages, wherein the high data rate message of the plurality of data messages comprises:

first information of the high data rate message, the first information of the high data rate message being modulated according to the first modulation method, wherein the first information of the high data rate message is indicative of an impending change in modulation to a second modulation method for transmission of second information of the high data rate message, and

the second information of the high data rate message, the second information of the high data rate message being transmitted after transitioning from the first modulation method to the second modulation method, the second information of the high data rate message being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the second information of the high data rate message comprises Internet access application data intended for a single slave transceiver of the one or more slave transceivers, the Internet access application data is transmitted at a higher data rate than the low data rate application data, and the high data rate message indicates an identity of the single slave transceiver as being an intended destination of the second information of the high data rate message using high data rate message address data included in the high data rate message.

43. (New) The method as in claim 42, wherein the communication medium supports a multi-point communication network communication architecture.

44. (New) The method as in claim 42, wherein the low data rate message is transmitted before the high data rate message.

45. (New) The method as in claim 42, wherein the low data rate message is transmitted after the high data rate message.

46. (New) The method as in claim 42, further comprising transmitting data modulated according to the first modulation method after transmitting the second information of the high data rate message.

47. (New) The method as in claim 42, wherein transmission of the second information of the high data rate message comprises communicating for the Internet access application.

48. (New) The method of claim 42, further comprising providing a low data rate application, wherein transmission of the second information of the low data rate message comprises communicating for the low data rate application.

49. (New) The method of claim 42, wherein the low data rate application is selected from the group consisting of: power monitoring and control applications.

50. (New) The method as in claim 42, further comprising receiving slave transceiver data from the single slave transceiver of the one or more slave transceivers, wherein the slave transceiver data is modulated according to the second modulation method and is received after the transmitting of the high data rate message.

51. (New) The method as in claim 50, wherein the slave transceiver data is received in response to a request sent from the master transceiver to the single slave transceiver, the request indicating that the master transceiver requests data from the single slave transceiver.

52. (New) The method as in claim 42, wherein the low data rate application data comprises user data.

53. (New) The method as in claim 42, wherein the Internet access application data comprises user data.

54. (New) The method as in claim 42, wherein the plurality of data messages are a plurality of user data messages.

55. (New) The method as in claim 54, wherein each of the plurality of user data messages comprises message-specific first information and message-specific second information, and for each of the plurality of user data messages:

the message-specific first information is modulated according to the first modulation method and the message-specific first information indicates whether the message-specific second information will be modulated using a different type of modulation method than is used for the message-specific first information; and

the user data message indicates that a message-specific slave transceiver from among the one or more slave transceivers is an intended destination of the message-specific second information.

56. (New) The method as in claim 56, wherein:

for the low data rate message, the message-specific first information comprises the first information of the low data rate message and the message-specific second information comprises the second information of the low data rate message; and

for the high data rate message, the message-specific first information comprises the first information of the high data rate message and the message-specific second information comprises the second information of the high data rate message.

57. (New) The method as in claim 56, wherein the message-specific first information is indicative of whether the message-specific second information will be modulated according to the first modulation method or the second modulation method.

58. (New) The method as in claim 42, further comprising transmitting a second high data rate message of the plurality of data messages, wherein transmitting the second high data rate message comprises:

transmitting first information of the second high data rate message, the first information of the high data rate message being modulated according to the first modulation method, wherein the first information of the second high data rate message is indicative of an impending change in modulation to the second modulation method for transmission of second information of the second high data rate message; and

transmitting the second information of the second high data rate message, the second information of the high data rate message being transmitted after transitioning from the first modulation method to the second modulation method, the second information of the second high data rate message being modulated according to the second modulation method, wherein the second information of the high data rate message comprises additional Internet access application data intended for an individual slave transceiver of the one or more slave transceivers, the additional Internet access application data is transmitted at a higher data rate than the low data rate application data, and the high data rate message indicating an identity of the individual slave transceiver as being an intended destination of the second information of the second high data rate message using second high data rate message address data included in the second high data rate message.

59. (New) The method as in claim 58, wherein the single slave transceiver and the individual slave transceiver are the same slave transceiver.

60. (New) A system configured to communicate with one or more slave transceivers according to a master/slave relationship, the system including the master in the master/slave relationship wherein communication from the one or more slave transceivers is in response to a communication from the master to at least one of the one or more slave transceivers, the system comprising:

an Internet access application;

a transmitter configured to transmit at least a low data rate message of a plurality of data messages, the plurality of data messages being transmitted over a communication medium, the communication medium being between the system and the one or more slave transceivers, wherein the low data rate message comprises:

first information of the low data rate message, the first information of the low data rate message being modulated according to a first modulation method, wherein the first information included in the low data rate message comprises addressing information for an intended destination of second information that is included in the low data rate message, and

the second information of the low data rate message, the second information of the low data rate message being modulated according to the first modulation method, wherein the second information of the low data rate message comprises lower data rate data, and said low data rate message includes low data rate message address data indicative of an identity of one of the one or more slave transceivers as an intended destination of the second information of the low data rate message; and

the transmitter being further configured to transmit at least a high data rate message of the plurality of data messages, wherein at least the high data rate message of the plurality of data messages comprises:

first information of a high data rate message, the first information of the high data rate message being modulated according to the first modulation method, wherein the first information of the high data rate message is indicative of an impending change in modulation to a second modulation method for transmission of second information of the high data rate message, and

the second information of the high data rate message, the second information of the high data rate message being transmitted after transitioning from the first modulation method to the second modulation method, the second information of the high data rate message being modulated according to the second modulation method, the second modulation method being of a different type than the first modulation method, wherein the second information of the high data rate message comprises higher data rate data intended for a single slave transceiver of the one or more slave transceivers, the higher data rate data is transmitted at a higher data rate than the lower data rate data, and the high data rate message indicates an identity of the single slave transceiver as being an intended destination of the second information of the high data rate message.

61. (New) The system of claim 56, wherein the second information of the high data rate message comprises data provided by the Internet access application.

REMARKS

Upon entering the foregoing amendments, claims 21-61 will be pending in the present application, of which claims 21, 42, and 60 are independent. Claims 1-20 have been cancelled. Claims 21-61 are new. Support for the new claims can be found throughout the application, for example in at least paragraphs [0029] – [0040].

Amendments to the specification

Applicant has made certain amendments to paragraphs [0034] and [0039] of the specification. Applicant submits that the amendments contain no new matter. For example, support for the amendments to paragraphs [0034] and [0039] can be found throughout the as-filed application, for example in paragraphs [0023] or [0040]. Additionally, support for the amendments to the specification can be found throughout U.S. Provisional Application No. 60/067,562 ("the Provisional"), which is claimed as a priority document by the present application and is incorporated by reference therein.

For example, Applicant has amended paragraph [0034] to recite that "[i]n an example, embedded modulation permits a secondary modulation to replace the usual primary modulation for a user data segment located after a primary training sequence. For example, master transceiver 64 may change to modulation Type B and may convey user information to type B trib 66b." Similarly, Applicant has amended paragraph [0039] to recite "after completing transmission sequence 132, which may include a user data segment transmitted using the usual primary (*e.g.*, type A) modulation …" Support for these amendments can be found at least in page 4, lines 4-5 of the Provisional ("Embedded modulation permits a secondary modulation to replace the usual primary modulation user data segment normally located after the primary training sequence…"), page 4, lines 15-16 ("changes to modulation Type B and conveys user information (perhaps a stipulated amount) and likely a trib address), or page 4, line 29 ("receive the Type B user information which will usually contains [sic] addressing for a particular trib"). As such, Applicants respectfully request that the amendments to paragraphs [0034] and [0039] be entered by the examiner.

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, the replacement summary section and the replacement abstract are meant to ensure the replacement sections are in harmony with the pending claims. Applicant respectfully submits that the replacement summary section and the replacement abstract are fully supported in the as-filed application, for example in at least paragraphs [0029] – [0040]. Therefore, Applicant respectfully requests that the replacement summary section and the replacement abstract be entered in the present application.

Double Patenting

Claims 1, 2, and 9-16 stand rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claims 1-5 and 7-10 of U.S. Patent No. 8,023,580. Claims 1, 2, 9-11, 13-15, and 19-20 stand rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claims 40-47 of U.S. Patent No. 8,023,580. Claims 3-8 stand rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claims 1 and 40 of U.S. Patent No. 8,023,580. Claim 17 stands rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claim 1 of U.S. Patent No. 8,023,580 in view of U.S. Patent No. 6,208,663 to Schramm (*et al.* "Schramm"). Claims 1 and 2 stand rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claim 1 of U.S. Patent No. 6,614,838. Claim 17 stands rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over claim 1 of U.S. Patent No. 6,614,838 in view of Schramm.

Applicant respectfully submits that the cancellation of claims 1-20 render moot the double patenting rejection raised in the Office Action. However, in an effort to avoid further double patenting rejections for the new claims, Applicant is filing a Terminal Disclaimer with respect to U.S. Patent No. 8,023,580 and U.S. Patent No. 6,614,838 contemporaneously with the present response.

New Claims

Applicant has added new claims 21-61, of which claims 21, 42, and 60 are independent. Applicant respectfully submits that new claims 21-57, including independent claims 21, 42, and 60, are allowable for at least similar reasons as those applicable to original claims 1-20. For example, claim 21 recites a "method for a master transceiver to communicate with one or more slave transceivers according to a master/slave relationship, the method comprising: transmitting at least a first message of a plurality of data messages, the plurality of data messages being transmitted over a communication medium from the master transceiver to the one or more slave transceivers, wherein transmitting at least the first message of the plurality of data messages comprises: transmitting first information, the first information being transmitted as part of the first message and being modulated according to a first modulation method, and transmitting second information, the second information being transmitted as part of the first message and being modulated according to the first modulation method, wherein the second information comprises lower data rate data, and said first message includes first message address data that is indicative of an identity of one of the one or more slave transceivers as an intended destination of the second information; and transmitting a second message of the plurality of data messages, wherein transmitting the second message of the plurality of data messages comprises: transmitting third information, the third information being transmitted as part of the second message and being modulated according to the first modulation method, wherein the third information comprises at least information that is indicative of an impending change in modulation to a second modulation method for transmission of fourth information that is included in the second message, and transmitting the fourth information, the fourth information being transmitted as part of the second message and being 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 higher data rate data intended for a single slave transceiver of the one or more slave transceivers, the higher data rate data is transmitted at a higher data rate than the lower data rate data, and the second message indicates that the single slave transceiver is an intended destination of the fourth information that is included in the second message using second message address data included in the second message." None of the art of record teaches or suggests such features. Applicants respectfully submit that claims 42 and 60 recite similar elements and thus are allowable for at least similar reasons.

General Remarks

Applicant again notes that it has filed a terminal disclaimer over the parent for this application, U.S. Patent No. 8,023,580, in an effort to avoid further double patenting rejections for the pending claims. For the avoidance of doubt, Applicant notes that in claiming the invention, both here and in the parent case, Applicant has used identifiers such as "first," "second," "third," "fourth," etc. in the claims. Such identifiers are not meant to imply an order of claim elements (*e.g.*, an ordering of transmissions), nor are they intended to limit the claims to a given number of elements (*e.g.*, limiting the number of transmissions to a given number). As noted in MPEP 2111.03, "reference to 'first,' 'second,' and 'third' blades in the claim was not used to show a serial or numerical limitation but instead was used to distinguish or identify the various members of the group." (*See also Gillette Co. v. Energizer Holdings, Inc.*, 405 F.3d 1367, 1373 (Fed. Cir. 2005) ("'use of the terms 'first' and 'second' is common patent-law convention to distinguish between repeated instances of an element' and should not necessarily be interpreted to impose a serial limitation on a claim" (*quoting 3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1371 (Fed. Cir. 2003))).

Where Applicant intended to limit the claim elements with a serial limitation, it has done so using, *e.g.*, "before" and "after", for example as in claims 23 and 24. Additionally, since the term "comprising" is used in the claims, and that term is "is inclusive or open-ended and does not exclude additional, unrecited elements or method steps" (MPEP 2111.03), Applicant notes that when "before" or "after" is used in the claims to describe the relative order of two events or steps, intervening events or steps are not disclaimed.

Conclusion

In light of the above amendments and remarks, Applicant respectfully submits that the present application is in condition for allowance, and Applicant respectfully requests a Notice of Allowance for the pending claims 21-61. Should Examiner Ha identify any outstanding issues that would prevent such an allowance, he is urged to contact Applicant's undersigned representative using the contact information below.

Date: October 19, 2012

/Joseph R. Klinicki/
Joseph R. Klinicki
Registration No. 68,505

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One Liberty Place
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ABSTRACT

A device may be capable of communicating using at least two type types of modulation methods. Methods and systems are provided for communication of data according to a communications method in which a master transceiver communicates with one or more slave transceivers according to a master/slave relationship. A first data message may include first information and second information that are modulated according to a first modulation method. The second information may include lower data rate data. A second data message may include third information that may be modulated according to the first modulation method and that may indicate an impending change to a second modulation method. The second modulation method may be used for transmitting fourth information, and the fourth information may be included in the second message. The fourth information may include higher data rate data, for example Internet access data.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/198,568	Filing Date 08/04/2011	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
			TOTAL			TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

AMENDMENT	10/19/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 41	Minus	** 20	= 21	X $ =		OR	X $62=	1302
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	**1302**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/KIMBERLY PANNELL/

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	13/198,568	BREMER, GORDON F.	

Document Code - DISQ	Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed : 10/19/12	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

2 - Tds both approved.

Angie Walker

U.S. Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2

CONFIRMATION NO. 8059

POA ACCEPTANCE LETTER

OC000000057324053

15027
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Date Mailed: 10/29/2012

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/19/2012.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/qtran/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

15027 7590 11/05/2012

Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

EXAMINER	
HA, DAC V	
ART UNIT	PAPER NUMBER
2632	

DATE MAILED: 11/05/2012

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

TITLE OF INVENTION: System and Method of Communication Using at Least Two Modulation Methods

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1770	$300	$0	$2070	02/05/2013

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

15027 7590 11/05/2012

Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

TITLE OF INVENTION: System and Method of Communication Using at Least Two Modulation Methods

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1770	$300	$0	$2070	02/05/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
HA, DAC V	2632	375-261000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 ____________________

2 ____________________

3 ____________________

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies ____________

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number ________ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature ____________________ Date ____________________

Typed or printed name ____________________ Registration No. ____________________

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

15027 7590 11/05/2012

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Philadelphia, PA 19103

EXAMINER	
HA, DAC V	
ART UNIT	**PAPER NUMBER**
2632	

DATE MAILED: 11/05/2012

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/198,568	Applicant(s) BREMER, GORDON F.	
	Examiner DAC HA	Art Unit 2632	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *10/25/12*.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-20*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Dac V. Ha/
Primary Examiner, Art Unit 2632

Index of Claims	Application/Control No. 13198568	Applicant(s)/Patent Under Reexamination BREMER, GORDON F.
	Examiner DAC HA	Art Unit 2632

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/16/2012	11/01/2012							
	1	✓	=							
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Examiner Signature	/Dac Ha/	Date Considered	11/01/2012

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/198,568
				Filing Date	August 04, 2011
				First Named Inventor	Bremer, Gordon
				Art Unit	2611
(use as many sheets as necessary)				**Examiner Name**	Dac V. Ha
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	Application Number	13/198,568
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	First Named Inventor	Bremer, Gordon
	Art Unit	2611
	Examiner Name	Dac V. Ha
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2611

SEARCHED

Class	Subclass	Date	Examiner
375	261, 269, 285, 222, 298, 298, 302, 305, 308	4/16/2012	DH
455	102, 110	4/16/2012	DH
332	108, 119, 120, 151	4/16/2012	DH
	Update	11/1/2012	DH

SEARCH NOTES

Search Notes	Date	Examiner
BRS and Inventor's search	4/16/2012	DH
Update	11/1/2012	DH

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner
	PGPUB text search	4/16/2012	DH
	Update	11/1/2012	DH

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L28	227	("5537398" | "20040013183" | "20040213170" | "20050180545" | "20070286187" | "3970926" | "4091422" | "4381546" | "4464767" | "4677625" | "4924516" | "5008903" | "5168535" | "5251328" | "5280503" | "5311578" | "5355362" | "5537436" | "5550881" | "5684825" | "5764699" | "5844944" | "5881047" | "5940438" | "6212227" | "6320879" | "6330275" | "6348986" | "6445733" | "6580785" | "6658096" | "6690849" | "6715124" | "6782096" | "6885730" | "7046798" | "20010022836" | "20060193465" | "20080013608" | "4663766" | "5239607" | "5345332" | "5475713" | "5521942" | "5559792" | "5570295" | "5602869" | "5642379" | "5711012" | "5719923" | "5748811" | "5825517" | "5828657" | "5859877" | "5999563" | "6011814" | "6021158" | "6072779" | "6108347" | "6252644" | "6272154" | "6347008" | "6771740" | "6782094" | "7020266" | "7707446" | "20020041662" | "20020167949" | "20030039348" | "20030210779" | "20050025153" | "20050147158" | "20060195712" | "20090262912" | "20100183055" | "20100246598" | "4335464" | "4645871" | "5050536" | "5070536" | "5099478" | "5239306" | "5311557" | "5392154" | "5412651" | "5436930" | "5513212" | "5513213" | "5548222" | "5651114" | "5805669" | "5805755" | "6061392" | "6175436" | "6236481" | "6243391" | "6307653" | "6480645" | "6493475" | "6597827" | "6690644" | "7289610" | "7711109" | "6614838" | "20030210773" | "20040052361" | "20040081233" | "20040258236" | "20050163303" | "20080019432" | "20090262911" | "3761840" | "4630286" | "4862464" | "4939748" | "5414540" | "5473675" | "5530718" | "5629992" | "5812537" | "5841500" | "5881142" | "5960400" | "6097858" | "6335992" | "6591029" | "6628857" | "6744883" | "6775355" | "7013421" | "7058833" | "7065205" | "7248626" | "20040042510" | "20060188088" | "20070047730" | "20090111422" | "4525846" | "5081647" | "5208854" | "5506866" | "5540456" | "5661718" | "5671250" | "5719922" |	US-PGPUB; USPAT	OR	OFF	2012/11/01 11:12

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L33	32379	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1 (method scheme technique level type))	US-PGPUB; USPAT	OR	ON	2012/11/01 11:13
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L35	878	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4).ab. and L34	US-PGPUB; USPAT	OR	ON	2012/11/01 11:13
L36	5	30 and 35	US-PGPUB; USPAT	OR	ON	2012/11/01 11:15
L37	70	30 not 36	US-PGPUB; USPAT	OR	ON	2012/11/01 11:15
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		distortion))	USPAT			
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S14	4	S13 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:38
S15	4	S14 and (test$3 near1 signal)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:41
S17	33	S12 same ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:45
S18	8	S17 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:45
S20	113	(test$3 adj signal) with ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:48
S21	15	S20 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:49
S22	11	S21 not (S14 S18)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:49
S23	97	(test$3 adj signal) with (data adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:59
S24	130	(test$3 adj signal) with ((transmi$6 data) adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:59
S25	201	(test$3 adj signal) with ((transmi$6 data frame symbol bit) adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:00
S26	47	S25 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 15:00
S29	6176	(channel adj (parameter character$6 condition)) with ((rate ratio impedance power))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:05
S32	1392	S29 with (data adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:06
S33	50	S32 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 15:06
S36	85	S29 with (impedance)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:08
S38	6	S29 with (impedance adj (match$3 mismatch$3))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:09
S40	10	S29 same (impedance adj (match$3 mismatch$3))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:10
S49	716	(channel adj (parameter character$6 condition)) with ((noise near1 ratio))	US-PGPUB;	OR	ON	2009/02/03 15:43

			USPAT			
S54	7803	(cross adj talk) with (noise interference)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:52
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S62	6251	((feed$3 adj back) feedback) with ((central adj office) (base adj station) master)	US-PGPUB; USPAT	OR	ON	2009/02/03 16:12
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S94	651	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4).ab. and S93	US-PGPUB; USPAT	OR	ON	2010/08/03 16:02
S95	278	S94 and "375"/$.ccls.	US-PGPUB; USPAT	OR	ON	2010/08/03 16:03
S96	25	S95 and 375/295.ccls.	US-PGPUB; USPAT	OR	ON	2010/08/03 16:03
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S106	125899	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S107	81583	S106 and (modulat$4 cod$4).clm.	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S108	24381	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1	US-PGPUB;	OR	ON	2010/08/06 14:31

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S147	64	("5982819").URPN.	USPAT	OR	OFF	2012/04/16 12:59

11/1/2012 11:22:42 AM
C:\Users\dha\Documents\EAST\Workspace2\13198568.wsp

Issue Classification	Application/Control No. 13198568	Applicant(s)/Patent Under Reexamination BREMER, GORDON F.
	Examiner DAC HA	Art Unit 2632

ORIGINAL	
CLASS	SUBCLASS
375	261

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
455	102				
332	108	119	151		

INTERNATIONAL CLASSIFICATION

CLAIMED					NON-CLAIMED
H	0	4	L	5 / 12 (2006.01.01)	

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		17												
	2		18												
	3		19												
	4		20												
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	10														
	11														
	12														
	13														
	14														
	15														
	16														

NONE (Assistant Examiner)	(Date)	Total Claims Allowed: 20	
/DAC HA/ Primary Examiner.Art Unit 2632 (Primary Examiner)	11/01/2012 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

15027 7590 11/14/2012
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

EXAMINER	
HA, DAC V	

ART UNIT	PAPER NUMBER
2632	

MAIL DATE	DELIVERY MODE
11/14/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Supplemental Notice of Allowability	**Application No.** 13/198,568	**Applicant(s)** BREMER, GORDON F.	
	Examiner DAC HA	**Art Unit** 2632	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Telephone's request on 11/13/12*.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *21-61*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)
1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Joseph R. Klinicki (Reg. No. 68,505) on 11/13/12.

The application has been amended as follows:

Claim 56, line 1, "claim 56" has been changed to --claim 55--

Cancelled claims 1-20 were inadvertently indicated as allowed claims in the Notice of Allowance dated 11/05/12. This communication also corrects the allowed claims being 21-61.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAC HA whose telephone number is (571)272-3040. The examiner can normally be reached on 4/4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dac V. Ha/
Primary Examiner, Art Unit 2632

Issue Classification	**Application/Control No.**	**Applicant(s)/Patent Under Reexamination**
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2632

ORIGINAL		**INTERNATIONAL CLASSIFICATION**										
CLASS	**SUBCLASS**	**CLAIMED**					**NON-CLAIMED**					
375	261	H	0	4	L	5 / 12 (2006.0)						

CROSS REFERENCE(S)

CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**				
455	102				
332	108	119	151		

☐ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	21	17	36	33	52										
2	22	18	37	34	53										
3	23	19	38	35	54										
4	24	20	39	36	55										
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7	27	23	42	40	58										
8	28	24	43	41	59										
9	9	25	44	42	60										
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12	31	28	47												
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14	33	30	49												
15	34	31	50												
16	35	32	51												

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 42	
/DAC HA/ Primary Examiner.Art Unit 2632 (Primary Examiner)	11/13/2012 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2632

ORIGINAL		INTERNATIONAL CLASSIFICATION									
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED				
375	261	H	0	4	L	5 / 12 (2006.01.01)					

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
455	102				
332	108	119	151		

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	21	17	37	33	53										
2	22	18	38	34	54										
3	23	19	39	35	55										
4	24	20	40	36	56										
5	25	21	41	37	57										
6	26	22	42	39	58										
7	27	23	43	40	59										
8	28	24	44	41	60										
9	29	25	45	38	61										
10	30	26	46												
11	31	27	47												
12	32	28	48												
13	33	29	49												
14	34	30	50												
15	35	31	51												
16	36	32	52												

NONE (Assistant Examiner)	(Date)	Total Claims Allowed: 41	
/DAC HA/ Primary Examiner.Art Unit 2632 (Primary Examiner)	01/10/2013 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

UNITED STATES DEPARTMENT OF COMMERCE
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

15027 7590 01/11/2013

Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

EXAMINER	
HA, DAC V	

ART UNIT	PAPER NUMBER
2632	

MAIL DATE	DELIVERY MODE
01/11/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Supplemental Notice of Allowability	**Application No.** 13/198,568	**Applicant(s)** BREMER, GORDON F.	
	Examiner DAC HA	**Art Unit** 2632	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *01/09/13*.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *21-61*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☒ Other *Issue Classification*.

/Dac V. Ha/
Primary Examiner, Art Unit 2632

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	13198568	Filing Date	2011-08-04	Docket Number (if applicable)	REMB_0109_USCON2	Art Unit	2632
First Named Inventor	Gordon F. Bremer			Examiner Name	Dac V. Ha		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on ____________
- ☐ Other ____________

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other ____________

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months ____________
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other ____________

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 505519

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature
☐ Applicant Signature

Rembrandt Wireless
Ex. 2012
Apple Inc. v. Rembrandt Wireless Technologies, LP, IPR2020-00034
Page 360

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Signature of Registered U.S. Patent Practitioner			
Signature	/Joseph R. Klinicki/	Date (YYYY-MM-DD)	2013-02-05
Name	Joseph R. Klinicki	Registration Number	68505

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Gordon F. Bremer	**Confirmation No.: 8059**
Application No.: 13/198,568	**Group Art Unit: 2611**
Filing Date: August 4, 2011	**Examiner: Dac V. Ha**

For: System and Method of Communication Using at Least Two Modulation Methods

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY PURSUANT TO 37 CFR § 1.114

In accordance with the Request for Continued Examination filed herewith, reconsideration is respectfully requested in view of the amendments and/or remarks as indicated below:

- ☐ **Amendments to the Specification** begin on page of this paper.
- ☒ **Amendments to the Claims** are reflected in the listing of the claims which begins on page 2 of this paper.
- ☐ **Amendments to the Drawings** begin on page of this paper and include an attached replacement sheet.
- ☒ **Remarks** begin on page 14 of this paper.
- ☒ The Commissioner is hereby authorized to charge any fee deficiency, charge any additional fees, or credit any overpayment of fees, associated with this application in connection with this filing, or any future filing, submitted to the U.S. Patent and Trademark Office during the pendency of this application, to Deposit Account No. 50-5519.

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

Listing of Claims:

1-20. (Cancelled)

21. (Currently amended) A ~~method for a~~ master communication device configured to communicate ~~transceiver 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 ~~method~~ comprising:

a master transceiver configured to transmit ~~transmitting at least~~ a first message ~~of a plurality of data messages, the plurality of data messages being transmitted~~ over a communication medium from the master transceiver to the one or more slave transceivers, wherein ~~transmitting at least~~ the first message ~~of the plurality of data messages~~ comprises:

~~transmitting~~ first information~~, the first information being transmitted as part of the first message and being~~ modulated according to a first modulation method, ~~and~~

~~transmitting~~ second information, including a payload portion, ~~the second information being transmitted as part of the first message and being~~ modulated according to the first modulation method, wherein the second information comprises data intended for one of the one or more slave transceivers ~~lower data rate data, and said first message includes~~ and

first message address information ~~data~~ that is indicative of ~~an identity of~~ the one of the one or more slave transceivers ~~as~~ being an intended destination of the second information; and

said master transceiver configured to transmit ~~transmitting~~ a second message over the communication medium from the master transceiver to the one or more slave transceivers ~~of the plurality of data messages~~, wherein ~~transmitting~~ the second message ~~of the plurality of data messages~~ comprises:

~~transmitting~~ third information~~, the third information being transmitted as part of the second message and being~~ modulated according to the first modulation method, wherein the third information comprises ~~at least~~ information that is indicative of an impending change in modulation to a second modulation method ~~for transmission of fourth information that is included in the second message~~, and

~~transmitting the~~ fourth information, including a payload portion, ~~the fourth information being transmitted as part of the second message and being~~ 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 ~~higher data rate~~ data intended for a single slave transceiver of the one or more slave transceivers, ~~the higher data rate data is transmitted at a higher data rate than the lower data rate data,~~ and

second message address information that is indicative of ~~the second message indicates that~~ the single slave transceiver ~~is~~ being an intended destination of the fourth information ~~that is included in the second message using second message address data included in the second message~~; and

wherein the second modulation method results in a higher data rate than the first modulation method.

22. (Currently amended) The master communication device ~~method~~ as in claim 21, wherein the master transceiver is configured to communicate over the communication medium in accordance with ~~supports~~ a multi-point communication network communication architecture.

23. (Currently amended) The master communication device ~~method~~ as in claim 21, wherein the master transceiver is configured to transmit the first message ~~of the plurality of data messages is transmitted~~ before the second message ~~of the plurality of data messages~~.

24. (Currently amended) The method as in claim 21, wherein the master transceiver is configured to transmit the first message ~~of the plurality of data messages is transmitted~~ after the second message ~~of the plurality of data messages~~.

25. (Currently amended) The master communication device ~~method~~ as in claim 21, wherein the master transceiver is configured to ~~further comprising transmitting~~ additional data modulated according to the first modulation method after transmitting the fourth information.

26. (Currently amended) The master communication device ~~method~~ of claim 21, ~~further comprising providing a high data rate application,~~ wherein ~~transmission of~~ the payload portion included in the fourth information is provided ~~comprises communicating~~ for ~~the~~ a high data rate application.

27. (Currently amended) The master communication device ~~method~~ as in claim 26, wherein the high data rate application is configured to access the ~~is an~~ Internet ~~access application~~.

28. (Currently amended) The master communication device ~~method~~ of claim 21, ~~further comprising providing a low data rate application,~~ wherein ~~transmission of~~ the payload portion included in the second information is provided for a ~~comprises communicating for the~~ low data rate application.

29. (Currently amended) The master communication device ~~method~~ of claim 28, wherein the low data rate application is selected from the group consisting of: power monitoring ~~and~~ or control applications.

30. (Currently amended) The master communication device ~~method~~ as in claim 21, ~~further comprising~~ wherein the master transceiver is configured to receive ~~receiving by the master transceiver, after the transmitting of the second message,~~ slave data from the single slave transceiver of the one or more slave transceivers, and the slave data is received after transmission of the second message and is modulated according to the second modulation method.

31. (Currently amended) The master communication device ~~method~~ as in claim 30, wherein the slave data from the single slave transceiver is received in response to a request sent from the master transceiver to the single slave transceiver, the request indicating that the master transceiver requests data from the single slave transceiver.

32. (Currently amended) The master communication device ~~method~~ as in claim 21, wherein ~~lower data rate data~~ the second information comprises user data.

33. (Currently amended) The master communication device ~~method~~ as in claim 21, wherein ~~higher data rate data~~ the fourth information comprises user data.

34. (Currently amended) The master communication device ~~method~~ as in claim 21, wherein the master transceiver is configured to transmit ~~transmitting the~~ a plurality of user data messages, and the first and second messages correspond to messages in the ~~are a~~ plurality of user data messages.

35. (Currently amended) The master communication device ~~method~~ as in claim 34, wherein each of the plurality of user data messages comprises message-specific first information and message-specific second information, and for each of the plurality of user data messages:

the message-specific first information is modulated according to the first modulation method and the message-specific first information is indicative of ~~indicates~~ whether the message-specific second information will be modulated using a different type of modulation method than is used for the message-specific first information; and

the user data message ~~indicates that~~ is indicative of a message-specific slave transceiver from among the one or more slave transceivers ~~is~~ being an intended destination of the message-specific second information.

36. (Currently amended) The master communication device ~~method~~ as in claim 35, wherein:

for the first message, the message-specific first information comprises the first information and the message-specific second information comprises the second information; and

for the second message, the message-specific first information comprises the third information and the message-specific second information comprises the fourth information.

37. (Currently amended) The master communication device ~~method~~ as in claim 35, wherein the message-specific first information is indicative of whether the message-specific second information will be modulated according to the first modulation method or the second modulation method.

38. (Currently amended) The master communication device ~~method~~ as in claim 21, wherein the master transceiver is configured to transmit ~~further comprising transmitting~~ a third message ~~of the plurality of data messages~~, wherein ~~transmitting~~ the third message comprises:

~~transmitting~~ fifth information~~, the fifth information being transmitted as part of the third message and being~~ modulated according to the first modulation method, wherein the fifth information is indicative of an impending change in modulation to the second modulation method ~~for transmission of sixth information that is included the third message~~; ~~and~~

~~transmitting the~~ sixth information, including a payload portion, ~~the sixth information being transmitted as part of the third message and being~~ transmitted after the fifth information and ~~transitioning from the first modulation method to the second modulation method, the sixth information~~ being modulated according to the second modulation method, wherein the sixth information comprises additional ~~higher data rate~~ data intended for an individual slave transceiver of the one or more slave transceivers, and

third message address information that is indicative of ~~the third message indicates an identity of~~ the individual slave transceiver of the one or more slave transceivers ~~as~~ being an intended destination of the sixth information ~~that is included in the third message using third message address data included in the third message~~.

39. (Currently amended) The <u>master communication device</u> ~~method~~ as in claim 38, <u>wherein the master transceiver is configured to transmit</u> ~~where the transmitting~~ ~~of~~ the third message ~~occurs~~ after the transmitting of the first message and after the transmitting of the second message.

40. (Currently amended) The <u>master communication device</u> ~~method~~ as in claim 38, wherein the single slave transceiver and the individual slave transceiver are the same slave transceiver.

41. (Currently amended) The <u>master communication device</u> ~~method~~ as in claim 21, wherein the first information that is included in the first message comprises the first message address data.

42-61. (Cancelled).

62. (New) A communication device configured to communicate 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 that is configured to send at least a plurality of communications, wherein each communication from among said plurality of communications comprises at least a respective first portion and a respective payload portion, wherein each communication from among said plurality of communications is addressed for an intended destination of the respective payload portion of that communication, and wherein for each communication from among said plurality of communications:

said respective first portion is modulated according to a first modulation method from among at least two types of modulation methods, wherein the at least two types of modulation methods comprise the first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,

said respective first portion comprises an indication of which of the first modulation method and the second modulation method is used for modulating respective payload data in the respective payload portion, and

the payload data is modulated according to at least one of the first modulation method or the second modulation method in accordance with what is indicated by the respective first portion;

the transceiver further configured to send at least a first communication of the plurality of communications such that payload data included in a payload portion of the first communication is modulated according to the second modulation method based on a first portion of the first communication indicating that the second modulation method will be used for modulating the payload data in the payload portion of the first communication, wherein the payload data is included in the first communication after the first portion of the first communication;

the transceiver further configured to send at least a second communication of the plurality of communications such that payload data included in a payload portion of the second communication is modulated according to the first modulation method based on a first portion of the second communication indicating that the first modulation method will be used for modulating the payload data in the payload portion of the second communication.

63. (New) The communication device as in claim 62, wherein the transceiver is further configured to receive at least a first response from a slave transceiver based on sending the first communication, and the first response comprises at least first response data that modulated according to the second modulation method.

64. (New) The communication device as in claim 63, wherein the first response was explicitly requested in the first communication.

65. (New) The communication device as in claim 63, wherein the transceiver is further configured to receive at least a second response based on sending the second communication, and the second response comprises at least second response data that is modulated according to the first modulation method.

66. (New) A master communication device configured to communicate 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:

a transceiver configured to transmit signals over a communications medium to a slave device using at least two different types of modulation methods and to receive one or more responses over the communication medium that comprise at least respective response data that is modulated according to one of the at least two different types of modulation methods, the at least two different types of modulation methods comprising a first modulation method and a second modulation method, wherein the transmitted signals comprise first transmitted signals and second transmitted signals, the first transmitted signals comprise at least two transmission sequences, the at least two transmission sequences include a first transmission sequence and a second transmission sequence, the transceiver is configured to transmit the first transmission sequence using the first modulation method, and the transceiver is configured to transmit the second transmission sequence using the second modulation method wherein:

the first transmission sequence includes information that is indicative of an impending change in modulation method from the first modulation method to the second modulation method,

the second transmission sequence includes a payload portion that is transmitted after the first transmission sequence,

the first transmitted signals include first address information that is indicative of the slave device being an intended destination of the payload portion,

the second transmitted signals comprise at least a third transmission sequence and a fourth transmission sequence, the transceiver is configured to transmit the third transmission sequence using the first modulation method,

the transceiver is configured to transmit the fourth transmission sequence using the first modulation method,

the third transmission sequence includes information indicative that the fourth transmission sequence will be transmitted using the first modulation method,

the fourth transmission sequence includes a second payload portion that is transmitted after the third transmission sequence, and

the second transmitted signals include second address information that is indicative of a specified slave device being an intended destination of the second payload portion .

67. (New) The master communication device as in claim 66, wherein the first transmission sequence also includes information that is indicative of the type of modulation method used for the second transmission sequence.

68. (New) The master communication device as in claim 66, wherein the master communication device is configured to implement a polled multipoint protocol.

69. (New) The master communication device as in claim 66, wherein the first transmission sequence includes a training signal.

70. (New) The master communication device as in claim 69, wherein the training signal confirms that a slave may communicate using a particular type of modulation method.

71. (New) The master communication device as in claim 69, wherein the training signal establishes signal level compensation.

72. (New) The master communication device as in claim 69, wherein the training signal establishes a recovery time.

73. (New) The master communication device as in claim 69, wherein the training signal permits channel equalization.

74. (New) The master communication device as in claim 69, wherein the training signal permits echo cancellation.

75. (New) The master communication device as in claim 69, wherein the training signal includes parameters for optimizing performance.

76. (New) The master communication device as in claim 69, wherein the training signal includes parameters for the selection of optional features.

77. (New) The master communication device as in claim 66, wherein the transceiver comprises a modulator configured to modulate information according to one or more of the first modulation method or the second modulation method.

78. (New) The master communication device as in claim 77, wherein the transceiver further comprises a demodulator, the demodulator is configured to demodulate information from a signal transmitted by a slave, and the signal transmitted by the slave is modulated according to the first modulation method or the second modulation method.

79. (New) The master communication device as in claim 78, wherein the transceiver further comprises a central processing unit (CPU) operably coupled to the modulator, said CPU configured to operate according to programmed instructions to select either said first modulation method or said second modulation method.

80. (New) The master communication device as in claim 79, wherein the transceiver further comprises a memory device operably coupled to said CPU, and wherein said memory device is configured to store said programmed instructions.

81. (New) The master communication device as in claim 66, wherein the second modulation method communicates at a data rate that is higher than that of the first modulation method.

82. (New) The master communication device as in claim 81, wherein said second modulation method is used for an application requiring Internet access.

83. (New) The master communication device as in claim 66, wherein at least one of said first or second modulation methods implements phase modulation.

84. (New) The master communication device as in claim 83, wherein said at least one of said first or second modulation methods also implements amplitude modulation.

85. (New) The master communication device as in claim 66, wherein at least one of said first or second modulation methods implements quadrature amplitude modulation.

86. (New) The master communication device as in claim 66, wherein at least one of said first or second modulation methods implements discrete multitone modulation.

87. (New) The master communication device as in claim 66, wherein said master communication device is configured to communicate with a first slave using said first modulation method and to communicate with a second slave using said second modulation method.

88. (New) The master communication device as in claim 66, wherein said transceiver is configured to receive transmission signals from a slave device according to one or more of said first modulation method or said second modulation method.

89. (New) The master communication device as in claim 87, wherein said transceiver is configured to transmit data in a third payload portion according to said first modulation method, and wherein said transceiver is configured to receive a slave response from a slave device with a received payload portion modulated using the first modulation method .

90. (New) The master communication device as in claim 66, wherein said master communication device is configured to operate in a multipoint network with a plurality of slave devices.

91. (New) The master communication device as in claim 66, wherein the master communication device is configured to transmit a trailing signal to complete the master communication transmission.

92. (New) The master communication device as in claim 66, wherein the master transceiver is configured to transmit a plurality of user data messages, wherein each of the plurality of user data messages comprises message-specific first information and message-specific second information, and for each of the plurality of user data messages:

the message-specific first information is modulated according to the first modulation method and the message-specific first information is indicative of whether the message-specific second information will be modulated using a different type of modulation method than is used for the message-specific first information; and

the user data message is indicative of a message-specific slave transceiver from among one or more slave transceivers being an intended destination of the message-specific second information.

REMARKS

Upon entering the foregoing amendments, claims 21-41 and 62-92 will be pending in the present application, of which claims 21, 62 and 66 are independent. Claims 21-41 have been amended, Claims 42-61 have been cancelled without prejudice. Claims 62-92 are new. Support for the amendments and new claims can be found throughout the application, for example in at least paragraphs [0029] – [0040].

New and Amended Claims

Applicant has amended claims 21-41 to clarify their respective embodiments. Additionally, Applicant has added new claims 62-92. Applicant respectfully submits that both amended claims 21-41 and new claims 62-92 are allowable for at least similar reasons as those applicable to the claims that were the subject of the Supplemental Notice of Allowability mailed November 14, 2012. As such, a subsequent Notice of Allowance is requested for pending claims 21-41 and 62-92.

Conclusion

In light of the above amendments and remarks, Applicant respectfully submits that the present application is in condition for allowance, and Applicant respectfully requests a Notice of Allowance for the pending claims 21-41 and 62-92. Should Examiner Ha identify any outstanding issues that would prevent such an allowance, he is urged to contact Applicant's undersigned representative using the contact information below.

Date: February 5, 2013

/Joseph R. Klinicki/
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Electronic Patent Application Fee Transmittal

Application Number:	13198568
Filing Date:	04-Aug-2011
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon F. Bremer
Filer:	Joseph R. Klinicki/Cassandra Katz
Attorney Docket Number:	REMB_0109_USCON2

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1202	11	62	682
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	930	930
		Total in USD ($)		**1612**

Electronic Acknowledgement Receipt

EFS ID:	14878209
Application Number:	13198568
International Application Number:	
Confirmation Number:	8059
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon F. Bremer
Customer Number:	15027
Filer:	Joseph R. Klinicki/Cassandra Katz
Filer Authorized By:	Joseph R. Klinicki
Attorney Docket Number:	REMB_0109_USCON2
Receipt Date:	05-FEB-2013
Filing Date:	04-AUG-2011
Time Stamp:	14:55:28
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1612
RAM confirmation Number	1268
Deposit Account	505519
Authorized User	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	REMB_0109_USCON2_RCETransmittal.pdf	697792 3cfb5ced1a96acc7dbf1f452c490d537f45909e0	no	3
Warnings:					
Information:					
2		REMB_0109_USCON2_Amendment_to_be_filed_with_RCE_after_NOA_dtd_11_5_12.pdf	123293 c967d9f4d1ca21dfb8244dfde5d01390bc9a46e6	yes	14

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Claims	2	13
Applicant Arguments/Remarks Made in an Amendment	14	14

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32221 de3ffeeb50ad7de370d2a819631a6342cb847d2a	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	853306	

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PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/198,568	Filing Date 08/04/2011	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
			TOTAL			TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

AMENDMENT

	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT

02/05/2013	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 52	Minus	** 41	= 11	X $ =		OR	X $62 =	682
Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	X $ =		OR	X $250 =	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	**682**

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/THERESA LINDSAY/

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NOTICE OF ALLOWANCE AND FEE(S) DUE

15027 7590 04/11/2013

Condo Roccia LLP
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EXAMINER	
HA, DAC V	
ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 04/11/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

TITLE OF INVENTION: System and Method of Communication Using at Least Two Modulation Methods

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	07/11/2013

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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15027 7590 04/11/2013

Condo Roccia LLP
1650 Market Street
Suite 2200
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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

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(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

TITLE OF INVENTION: System and Method of Communication Using at Least Two Modulation Methods

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	07/11/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
HA, DAC V	2633	375-261000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

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1 ____________________

2 ____________________

3 ____________________

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies ____________________

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number ____________ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ☐ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ☐ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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Authorized Signature ____________________ Date ____________________

Typed or printed name ____________________ Registration No. ____________________

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

15027 7590 04/11/2013

Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

EXAMINER	
HA, DAC V	
ART UNIT	**PAPER NUMBER**
2633	

DATE MAILED: 04/11/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/198,568	Applicant(s) BREMER, GORDON F.	
	Examiner DAC HA	Art Unit 2633	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *02/05/13*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on______.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are *21-41, 62-87, 89, 88, 90-92, renumbered as 1-52, respectively*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

   Interim copies:

   a) ☐ All b) ☐ Some c) ☐ None of the: Interim copies of the priority documents have been received.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Dac V. Ha/
Primary Examiner, Art Unit 2633

Rembrandt Wireless
Ex. 2012

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	123	(gordon near1 bremer).in.	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L2	43	L1 and modula$5.clm.	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L3	227	("5537398" | "20040013183" | "20040213170" | "20050180545" | "20070286187" | "3970926" | "4091422" | "4381546" | "4464767" | "4677625" | "4924516" | "5008903" | "5168535" | "5251328" | "5280503" | "5311578" | "5355362" | "5537436" | "5550881" | "5684825" | "5764699" | "5844944" | "5881047" | "5940438" | "6212227" | "6320879" | "6330275" | "6348986" | "6445733" | "6580785" | "6658096" | "6690849" | "6715124" | "6782096" | "6885730" | "7046798" | "20010022836" | "20060193465" | "20080013608" | "4663766" | "5239607" | "5345332" | "5475713" | "5521942" | "5559792" | "5570295" | "5602869" | "5642379" | "5711012" | "5719923" | "5748811" | "5825517" | "5828657" | "5859877" | "5999563" | "6011814" | "6021158" | "6072779" | "6108347" | "6252644" | "6272154" | "6347008" | "6771740" | "6782094" | "7020266" | "7707446" | "20020041662" | "20020167949" | "20030039348" | "20030210779" | "20050025153" | "20050147158" | "20060195712" | "20090262912" | "20100183055" | "20100246598" | "4335464" | "4645871" | "5050536" | "5070536" | "5099478" | "5239306" | "5311557" | "5392154" | "5412651" | "5436930" | "5513212" | "5513213" | "5548222" | "5651114" | "5805669" | "5805755" | "6061392" | "6175436" | "6236481" | "6243391" | "6307653" | "6480645" | "6493475" | "6597827" | "6690644" | "7289610" | "7711109" | "6614838" | "20030210773" | "20040052361" | "20040081233" | "20040258236" | "20050163303" | "20080019432" | "20090262911" | "3761840" | "4630286" | "4862464" | "4939748" | "5414540" | "5473675" | "5530718" | "5629992" | "5812537" | "5841500" | "5881142" | "5960400" | "6097858" | "6335992" | "6591029" |	US-PGPUB; USPAT	OR	OFF	2013/04/07 21:45

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L4	78	L3 and (modulat$5 map$4).clm.	US-PGPUB; USPAT	OR	OFF	2013/04/07 21:45
L5	75	L4 and (modulat$5).clm.	US-PGPUB; USPAT	OR	OFF	2013/04/07 21:45
L6	167872	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L7	106198	L6 and (modulat$4 cod$4).clm.	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L8	34193	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1 (method scheme technique level type))	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L9	9517	L7 and L8	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L10	923	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4).ab. and L9	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L11	5	L5 and L10	US-PGPUB; USPAT	OR	ON	2013/04/07 21:45
L12	70	L5 not L11	US-PGPUB;	OR	ON	2013/04/07 21:45

			USPAT			
L28	5	("5563883" | "5936949" | "5999563" | "6021158" | "6067297").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/04/07 22:09
L29	31	("6671328").URPN.	USPAT	OR	OFF	2013/04/07 22:10
L37	75	("5982819").URPN.	USPAT	OR	OFF	2013/04/07 22:11
L39	73	("5533004").URPN.	USPAT	OR	OFF	2013/04/07 22:12
L40	653	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4).clm. and L10	US-PGPUB; USPAT	OR	ON	2013/04/07 22:13
L41	237	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1 (method scheme technique level type)).clm. and 40	US-PGPUB; USPAT	OR	ON	2013/04/07 22:14
L42	114	41 and ("375"/$.ccls. "455"/$.ccls. "332"/$.ccls.)	US-PGPUB; USPAT	OR	ON	2013/04/07 22:15
L43	31	42 and (transceiv$4 modem)	US-PGPUB; USPAT	OR	ON	2013/04/07 22:16
L44	83	42 not 43	US-PGPUB; USPAT	OR	ON	2013/04/07 22:17
S11	1	"6445733".pn. and ((test$3 adj signal) with (noise interference antenuat$4 character$5 condition fad$3 distortion))	USPAT	OR	ON	2009/02/03 14:35
S12	5111	((test$3 adj signal) with (noise interference antenuat$4 character$5 condition fad$3 distortion))	US-PGPUB; USPAT	OR	ON	2009/02/03 14:37
S13	19	S12 with ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:38
S14	4	S13 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:38
S15	4	S14 and (test$3 near1 signal)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:41
S17	33	S12 same ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:45
S18	8	S17 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:45
S20	113	(test$3 adj signal) with ((error near1 ratio) ber)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:48
S21	15	S20 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 14:49
S22	11	S21 not (S14 S18)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:49

S23	97	(test$3 adj signal) with (data adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:59
S24	130	(test$3 adj signal) with ((transmi$6 data) adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 14:59
S25	201	(test$3 adj signal) with ((transmi$6 data frame symbol bit) adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:00
S26	47	S25 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 15:00
S29	6176	(channel adj (parameter character$6 condition)) with ((rate ratio impedance power))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:05
S32	1392	S29 with (data adj rate)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:06
S33	50	S32 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 15:06
S36	85	S29 with (impedance)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:08
S38	6	S29 with (impedance adj (match$3 mismatch$3))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:09
S40	10	S29 same (impedance adj (match$3 mismatch$3))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:10
S49	716	(channel adj (parameter character$6 condition)) with ((noise near1 ratio))	US-PGPUB; USPAT	OR	ON	2009/02/03 15:43
S54	7803	(cross adj talk) with (noise interference)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:52
S57	1785	(channel adj (parameter character$6 condition estimat$4)) with ((feed$3 adj back) feedback)	US-PGPUB; USPAT	OR	ON	2009/02/03 15:59
S62	6251	((feed$3 adj back) feedback) with ((central adj office) (base adj station) master)	US-PGPUB; USPAT	OR	ON	2009/02/03 16:12
S63	255	S57 same S62	US-PGPUB; USPAT	OR	ON	2009/02/03 16:13
S64	3	S63 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2009/02/03 16:13
S70	56	(test$3 adj signal) with (group$3 near1 delay$3)	US-PGPUB; USPAT; USOCR	OR	ON	2009/02/03 17:46
S90	125714	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2010/08/03 15:59
[illegible]	[illegible]	S90 and (modulat$4 cod$4).clm.	US-PGPUB;	OR	ON	2010/08/03 15:59

			USPAT			
S92	24337	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1 (method scheme technique level type))	US-PGPUB; USPAT	OR	ON	2010/08/03 16:02
S93	6900	S91 and S92	US-PGPUB; USPAT	OR	ON	2010/08/03 16:02
S94	651	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4).ab. and S93	US-PGPUB; USPAT	OR	ON	2010/08/03 16:02
S95	278	S94 and "375"/$.ccls.	US-PGPUB; USPAT	OR	ON	2010/08/03 16:03
S96	25	S95 and 375/295.ccls.	US-PGPUB; USPAT	OR	ON	2010/08/03 16:03
S97	1	S96 not @ad>="19971205"	US-PGPUB; USPAT	OR	ON	2010/08/03 16:04
S100	22	("5537398").URPN.	USPAT	OR	OFF	2010/08/06 14:22
S104	125899	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2010/08/06 14:27
S106	125899	(plural$5 multi$5 among differen$4) near1 (modulat$4 cod$4)	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S107	81583	S106 and (modulat$4 cod$4).clm.	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S108	24381	(identif$5 indicat$5 notif$6 inform$4 ask$3 let$4) with ((modulat$4 cod$4) near1 (method scheme technique level type))	US-PGPUB; USPAT	OR	ON	2010/08/06 14:31
S142	120	(gordon near1 bremer).in.	US-PGPUB; USPAT	OR	ON	2012/04/12 15:43
S143	42	S142 and modula$5.clm.	US-PGPUB; USPAT	OR	ON	2012/04/12 15:45
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4/ 7/ 2013 10:17:32 PM
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2633

CPC				
Symbol			**Type**	**Version**
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US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
375	261

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
375	295				
455	102				

INTERNATIONAL CLASSIFICATION

CLAIMED					NON-CLAIMED				
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NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 52
/DAC HA/ Primary Examiner.Art Unit 2633 (Primary Examiner)	04/07/2013 (Date)	O.G. Print Claim(s): 1 / O.G. Print Figure: 8

Issue Classification	**Application/Control No.**	**Applicant(s)/Patent Under Reexamination**
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2633

332	108	119	151													

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 52	
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2633

☐ **Claims renumbered in the same order as presented by applicant** ☒ **CPA** ☐ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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Index of Claims	Application/Control No. 13198568	Applicant(s)/Patent Under Reexamination BREMER, GORDON F.
	Examiner DAC HA	Art Unit 2633

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
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☒ Claims renumbered in the same order as presented by applicant ☒ CPA ☐ T.D. ☐ R.1.47

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Index of Claims	Application/Control No. 13198568	Applicant(s)/Patent Under Reexamination BREMER, GORDON F.
	Examiner DAC HA	Art Unit 2633

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	Examiner	Art Unit
	DAC HA	2633

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13198568	BREMER, GORDON F.
	Examiner	**Art Unit**
	DAC HA	2633

CPC- SEARCHED

Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED

Symbol	Date	Examiner

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner
375	261, 269, 285, 222, 298, 298, 302, 305, 308	4/16/2012	DH
455	102, 110	4/16/2012	DH
332	108, 119, 120, 151	4/16/2012	DH
	Update	11/1/2012	DH
	Update	4/7/2013	DH

SEARCH NOTES

Search Notes	Date	Examiner
BRS and Inventor's search	4/16/2012	DH
Update	11/1/2012	DH

INTERFERENCE SEARCH

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	PGPUB text search	4/16/2012	DH
	Update	11/1/2012	DH
	Update	4/7/2013	DH

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

15027 7590 04/11/2013
Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	08/04/2011	Gordon F. Bremer	REMB_0109_USCON2	8059

TITLE OF INVENTION: System and Method of Communication Using at Least Two Modulation Methods

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	07/11/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
HA, DAC V	2633	375-261000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Condo Roccia LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 50-5519 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Joseph R. Klinicki/ Date May 6, 2013

Typed or printed name Joseph R. Klinicki Registration No. 68,505

Electronic Patent Application Fee Transmittal

Application Number:	13198568
Filing Date:	04-Aug-2011
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon F. Bremer
Filer:	Joseph R. Klinicki/Darleen Yacovone
Attorney Docket Number:	REMB_0109_USCON2

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	1780	1780
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
	Total in USD ($)			**2080**

Electronic Acknowledgement Receipt

EFS ID:	15704292
Application Number:	13198568
International Application Number:	
Confirmation Number:	8059
Title of Invention:	System and Method of Communication Using at Least Two Modulation Methods
First Named Inventor/Applicant Name:	Gordon F. Bremer
Customer Number:	15027
Filer:	Joseph R. Klinicki/Darleen Yacovone
Filer Authorized By:	Joseph R. Klinicki
Attorney Docket Number:	REMB_0109_USCON2
Receipt Date:	06-MAY-2013
Filing Date:	04-AUG-2011
Time Stamp:	17:56:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$2080
RAM confirmation Number	5754
Deposit Account	505519
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	REMB_0109_USCON2_Issue_Fee_Transmittal_filed_5_6_13.pdf	1999707 4bc8dd5c24c4e590c41061cb8f7374f594253fd9	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32500 86ed4fc68552b205d6303eb7ebca2d46b38eada3	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	2032207	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/198,568	06/04/2013	8457228	REMB_0109_USCON2	8059

15027 7590 05/15/2013

Condo Roccia LLP
1650 Market Street
Suite 2200
Philadelphia, PA 19103

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Gordon F. Bremer, Clearwater, FL;

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:13-cv-00213	3/15/2013	Eastern District of Texas

PLAINTIFF	DEFENDANT
Rembrandt Wireless Technologies, LP	Samsung Electronics Co., Ltd., et al

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY
	☑ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,457,228	6/4/2013	Rembrandt Wireless Technologies, LP
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., SAMSUNG ELECTRONICS AMERICA, INC., SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, and SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner,

v.

REMBRANDT WIRELESS TECHNOLOGIES, LP,
Patent Owner.

Case IPR2014-00889
Patent 8,457,228 B2

Before JAMESON LEE, HOWARD B. BLANKENSHIP, and JUSTIN BUSCH, *Administrative Patent Judges.*

BLANKENSHIP, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. BACKGROUND

Samsung Electronics Co. Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Austin

Semiconductor, LLC (collectively, "Petitioner") request *inter partes* review of claims 1–3, 5, 10 and 11–21 of U.S. Patent No. 8,457,228 B2 ("the '228 patent") (Ex. 1001) under 35 U.S.C. §§ 311–319. Paper 2 (Petition, or "Pet."). Rembrandt Wireless Technologies, LP (Patent Owner) filed a preliminary response (Paper 6, "Prelim. Resp.") provided by 37 C.F.R. § 42.107. We have jurisdiction under 35 U.S.C. § 314.

For the reasons that follow, we do not institute an *inter partes* review as to any of the challenged claims of the '228 patent.

Related Proceeding

According to Petitioner, the '228 patent is involved in the following lawsuit: *Rembrandt Wireless Technologies, LP v. Samsung Electronics Company*, No. 2:13-cv-00213 (E.D. Tex. 2013). Pet. 1. The '228 patent has also been challenged in the following cases: IPR2014–00890; IPR2014–00891; IPR2014–00892; IPR2014–00893; and IPR2014–00895.

The '228 Patent

The '228 patent issued from an application filed August 4, 2011, which claimed priority, through a chain of intervening applications, under 35 U.S.C. § 120 to an application filed December 4, 1998, and which claimed priority under 35 U.S.C. § 119 to a provisional application filed December 5, 1997.

The technical field of the patent relates to data communications and modulators/demodulators (modems), and in particular to a data communications system in which a plurality of modems use different types of modulation in a network. Ex. 1001, col. 1, ll. 21–25; col. 1, l. 58–col. 2, l. 23.

Illustrative Claim

Claim 1 is illustrative.

1. 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:

a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers, 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

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

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

second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and

wherein the second modulation method results in a higher data rate than the first modulation method.

Prior Art and Other Evidence Included with Petition

Boer et al. ("Boer")	US 5,706,428	Jan. 6, 1998 (Ex. 1006)
Siwiak	US 5,537,398	July 16, 1996 (Ex. 1007)

IEEE P802.11, *Draft Standard for Wireless LAN, Medium Access Control (MAC) and Physical Layer (PHY) Specification*, P802.11D4.0, May 20, 1996 (Ex. 1004) ("Draft Standard")

Declaration of Robert O'Hara, Mar. 11, 2014 (Ex. 1023).

Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability (Pet. 2–3):

Evidence	Basis (35 U.S.C.)	Claims
Draft Standard	§ 102(b)/103(a)	1–3, 5, 10, and 11–20
Draft Standard and Boer	§ 103(a)	1–3, 5, 10, and 11–20

Evidence	Basis (35 U.S.C.)	Claims
Draft Standard and APA[1] or Siwiak	§ 103(a)	21
Draft Standard and APA, Siwiak, or Boer	§ 103(a)	21

II. ANALYSIS

A. Asserted Anticipation and Obviousness Grounds Based on Draft Standard

The dispositive issue in this proceeding is whether Draft Standard, on which both of Petitioner's asserted grounds of unpatentability rely, is a printed publication.

B. Overview of Draft Standard (Ex. 1004)

Draft Standard is an unapproved draft of a proposed IEEE (Institute of Electrical and Electronics Engineers) Standard. Ex. 1004, i.[2] The purpose of the proposed standard was "[t]o provide wireless connectivity to automatic machinery, equipment [, or] stations that require rapid deployment, which may be portable, or hand-held or which may be mounted on moving vehicles within a local area" and "[t]o offer a standard for use by regulatory bodies to standardize access to one or more frequency bands for the purpose of local area communication." *Id.* at 1.

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[1] Admitted prior art.

[2] In this Decision, we refer to the original pagination of Draft Standard rather than the Exhibit page number.

C. Declaration of Robert O'Hara (Ex. 1023)

Mr. Robert O'Hara was an editor of the IEEE 802.11-1997 standard. Ex. 1023 ¶ 1; Ex. 1004, iii. Mr. O'Hara states that drafts of the 802.11-1997 standard, including Draft Standard, were available to members of the 802.11 Working Group for download from the 802.11 Working Group's server. Ex. 1023 ¶ 9. According to Mr. O'Hara, announcements were sent to the Working Group's e-mail list when drafts became available, and a person could be added to the Working Group's e-mail list by providing an e-mail address to the chair of the Working Group. *Id.* ¶¶ 9–10. Mr. O'Hara states that there "were no restrictions on who could attend the 802.11 Working Group's meetings [or] on who could provide an e-mail address" and that, according to his "recollection," anyone who made a request to be added to the e-mail list would be added. *Id.* ¶ 10.

Mr. O'Hara states that the copies of the drafts of the Standard available on the Working Group's servers were password-protected files, and that the members of the e-mail list were provided with passwords to access the documents, either as part of an announcement of a new draft or via "another way." *Id.* ¶ 11. According to Mr. O'Hara, the passwords were intended to limit distribution to "interested individuals, as opposed to the entire [I]nternet." *Id.* Mr. O'Hara also states that attending an 802.11 Working Group meeting or asking for access prior to a meeting demonstrated sufficient interest such that that person would receive the password necessary to access the drafts on the Working Group's server. *Id.*

Further, according to Mr. O'Hara, each of the 802.11 standard drafts, including Draft Standard, would have been discussed at the Working Group meetings and made available to all attendees. *Id.* ¶ 12. Mr. O'Hara also states that the meetings were not limited to IEEE members but were open to the general public. *Id.*

D. Analysis of Whether Draft Standard Is a Printed Publication

We look to the underlying facts to make a legal determination as to whether a document is a printed publication. *Suffolk Techs., LLC v. AOL Inc.*, 752 F.3d 1358, 1364 (Fed. Cir. 2014). The determination of whether a document is a "printed publication" under 35 U.S.C. § 102(b) involves a case-by-case inquiry into the facts and circumstances surrounding its disclosure to members of the public. *In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004). Public accessibility is a key question in determining whether a document is a printed publication and is determined on a case-by-case basis. *Suffolk Techs.*, 752 F.3d at 1364. To qualify as a printed publication, a document "must have been sufficiently accessible to the public interested in the art." *In re Lister*, 583 F.3d 1307, 1311 (Fed. Cir. 2009).

The O'Hara Declaration is the only extrinsic evidence that Petitioner submits in support of its position that Draft Standard is a printed publication. *See* Pet. 14–15. Petitioner asserts that Draft Standard "was completed on May 20, 1996, and was available to *anyone who wanted to view it* on May 23, 1996." Pet. 14–15 (citing Ex. 1023 ¶¶ 4, 5, 10, and 12) (emphasis added). Petitioner indicates, initially, that this availability resulted in a publication date of May 23, 1996. Pet. 14. Petitioner also argues that Draft Standard "was available to any interested parties" no later than July 8, 1996, because it "was available to all members of the 802.11 Working Group's email list" and discussed and distributed at an 802.11 Working Group meeting held July 8–12, 1996. *Id.* at 15. Thus, Petitioner concludes that this alleged distribution and availability to any interested parties by July 8, 1996 renders Draft Standard a "printed publication" under 35 U.S.C. § 102(b). *Id.* at 15–16.

Notably absent, however, from the Petition and Mr. O'Hara's declaration are any assertions or evidence in support of the availability of Draft Standard to the public interested in the art. We do not find sufficient argument or evidence to indicate that the July 8–12 meeting of the 802.11 Working Group (or any other 802.11 Working Group meeting) was advertised or otherwise announced to the public. Nor do we find sufficient argument or evidence that any individual who was interested in the art would have known about Draft Standard such that he or she would have known to request a copy or ask to be added to an email list for access to the document.

"A given reference is 'publicly accessible' upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it." *SRI Int'l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1194 (Fed. Cir. 2008) (quoting *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006)). Although Mr. O'Hara declares that "[t]here were no restrictions on who could attend the 802.11 Working Group's meetings" (Ex. 1023 ¶ 10) and that the meetings "were open to the general public" (*id.* ¶ 12), Petitioner has not presented persuasive argument or evidence regarding how members of the potentially interested public would have been made aware of these meetings. Similarly, although Mr. O'Hara declares that an individual could provide the chair with an e-mail address to be added to the Working Group's e-mail list (*id.* ¶ 10), the Petition has not established how an individual would have known to attend a meeting or contact the chair in order to be added to the e-mail list.

Based on the evidence before us, we find that the purpose of the 802.11 Working Group's storage of drafts of the standard on a server is similar to the placement of a file on an "FTP server solely to facilitate peer review in preparation for later publication," which the U.S. Court of Appeals for the Federal Circuit found weighed against public accessibility of the file. *SRI Int'l*, 511 F.3d at 1197. In *SRI*, even though the "paper was 'posted' on an open FTP server and might have been available to anyone with FTP know-how and knowledge of the" subdirectory in which it resided, the Federal Circuit found the fact that the paper was not publicized suggested an absence of public availability. *Id.* In this case, the submitted evidence does not show that the 802.11 Working Group's server was an open server and, to the extent that it was, the evidence shows that the documents were password protected. Ex. 1023 ¶ 11.

Moreover, notwithstanding Mr. O'Hara's statement that passwords were distributed to the 802.11 Working Group e-mail list (*id.*), the fact that an interested individual needed to contact IEEE in order to obtain a password or other means of accessing Draft Standard (and needed to know who to contact in the first place) weighs against public accessibility. *Cf. Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1351 (Fed. Cir. 2008) (finding facts weighed towards public accessibility because "[t]he specifications themselves were visible to any member of the interested public without requesting them from an ETSI member"). Mr. O'Hara states that the drafts of the 802.11 standards, including Draft Standard, were (and still are) protected by passwords in order to limit distribution to "interested individuals, as opposed to the entire [I]nternet." Ex. 1023 ¶ 11. However, as previously discussed, the record does not contain persuasive evidence showing how an individual outside the 802.11 Working Group would have known of the existence of the Draft Standard, the 802.11 Working Group meetings, or the 802.11 Working Group itself. Therefore, we are not persuaded that such an individual, exercising reasonable diligence, would be able to change his status from an anonymous member of "the entire [I]nternet" to an "interested individual." Moreover, the Working Group created Draft Standard. *See* Ex. 1023 ¶ 2. Provision of a document to co-authors of the document does not constitute dissemination, or availability, of the document to the public.

Therefore, based on the evidence Petitioner provided, we conclude Petitioner has not made a sufficient showing that Draft Standard was a printed publication as of July 1996 or earlier, as alleged, i.e., that Draft Standard was available as of July 1996 or earlier to an ordinarily skilled individual, exercising reasonable diligence, who might have been interested in the subject matter of Draft Standard.

E. Asserted Grounds of Unpatentability

Because Petitioner has not met its burden in establishing that Draft Standard is a "printed publication" and, thus, prior art, Petitioner has not shown a reasonable likelihood of prevailing on the grounds asserted.

III. CONCLUSION

The Petition fails to demonstrate a reasonable likelihood of prevailing on the grounds that the challenged claims are anticipated by, or obvious over, Draft Standard or obvious over Draft Standard and prior art references.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that the petition is denied as to all challenged claims and no trial is instituted.

For Petitioner:

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Daniel Cardy
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For Patent Owner:

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., SAMSUNG ELECTRONICS AMERICA, INC., SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, and SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner,

v.

REMBRANDT WIRELESS TECHNOLOGIES, LP,
Patent Owner.

Case IPR2014-00890
Patent 8,457,228 B2

Before JAMESON LEE, HOWARD B. BLANKENSHIP, and JUSTIN BUSCH, *Administrative Patent Judges.*

BLANKENSHIP, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. BACKGROUND

Samsung Electronics Co. Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Austin

Semiconductor, LLC (collectively, "Petitioner") request *inter partes* review of claims 22, 23, and 25 of U.S. Patent No. 8,457,228 B2 ("the '228 patent") (Ex. 1101) under 35 U.S.C. §§ 311–319. Paper 2 (Petition, or "Pet."). Rembrandt Wireless Technologies, LP (Patent Owner) filed a preliminary response (Paper 6, "Prelim. Resp.") provided by 37 C.F.R. § 42.107. We have jurisdiction under 35 U.S.C. § 314.

For the reasons that follow, we do not institute an *inter partes* review as to any of the challenged claims of the '228 patent.

Related Proceeding

According to Petitioner, the '228 patent is involved in the following lawsuit: *Rembrandt Wireless Technologies, LP v. Samsung Electronics Company*, No. 2:13-cv-00213 (E.D. Tex. 2013). Pet. 1. The '228 patent has also been challenged in the following cases: IPR2014–00889; IPR2014–00891; IPR2014–00892; IPR2014–00893; and IPR2014–00895.

The '228 Patent

The '228 patent issued from an application filed August 4, 2011, which claimed priority, through a chain of intervening applications, under 35 U.S.C. § 120 to an application filed December 4, 1998, and which claimed priority under 35 U.S.C. § 119 to a provisional application filed December 5, 1997.

The technical field of the patent relates to data communications and modulators/demodulators (modems), and in particular to a data communications system in which a plurality of modems use different types of modulation in a network. Ex. 1101, col. 1, ll. 21–25; col. 1, l. 58–col. 2, l. 23.

Illustrative Claim

Claim 22 is illustrative.

> 22. A communication device configured to communicate 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 that is configured to send at least a plurality of communications, wherein each communication from among said plurality of communications comprises at least a respective first portion and a respective payload portion, wherein each communication from among said plurality of communications is addressed for an intended destination of the respective payload portion of that communication, and wherein for each communication from among said plurality of communications:
>
> said respective first portion is modulated according to a first modulation method from among at least two types of modulation methods, wherein the at least two types of modulation methods comprise the first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,
>
> said respective first portion comprises an indication of which of the first modulation method and the second modulation method is used for modulating respective payload data in the respective payload portion, and
>
> the payload data is modulated according to at least one of the first modulation method or the second modulation method in accordance with what is indicated by the respective first portion;
>
> the transceiver further configured to send at least a first communication of the plurality of communications such that

payload data included in a payload portion of the first communication is modulated according to the second modulation method based on a first portion of the first communication indicating that the second modulation method will be used for modulating the payload data in the payload portion of the first communication, wherein the payload data is included in the first communication after the first portion of the first communication;

the transceiver further configured to send at least a second communication of the plurality of communications such that payload data included in a payload portion of the second communication is modulated according to the first modulation method based on a first portion of the second communication indicating that the first modulation method will be used for modulating the payload data in the payload portion of the second communication.

Prior Art and Other Evidence Included with Petition

Boer et al. ("Boer") US 5,706,428 Jan. 6, 1998 (Ex. 1106)

IEEE P802.11, *Draft Standard for Wireless LAN, Medium Access Control (MAC) and Physical Layer (PHY) Specification*, P802.11D4.0, May 20, 1996 (Ex. 1104) ("Draft Standard")

Declaration of Robert O'Hara, Mar. 11, 2014 (Ex. 1122).

Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability (Pet. 2–3):

Evidence	Basis (35 U.S.C.)	Claims
Draft Standard	§ 102(b)/103(a)	22, 23, and 25
Draft Standard and Boer	§ 103(a)	22, 23, and 25

II. ANALYSIS

A. Asserted Anticipation and Obviousness Grounds Based on Draft Standard

The dispositive issue in this proceeding is whether Draft Standard, on which both of Petitioner's asserted grounds of unpatentability rely, is a printed publication.

B. Overview of Draft Standard (Ex. 1104)

Draft Standard is an unapproved draft of a proposed IEEE (Institute of Electrical and Electronics Engineers) Standard. Ex. 1104, i.[1] The purpose of the proposed standard was "[t]o provide wireless connectivity to automatic machinery, equipment [, or] stations that require rapid deployment, which may be portable, or hand-held or which may be mounted on moving vehicles within a local area" and "[t]o offer a standard for use by regulatory bodies to standardize access to one or more frequency bands for the purpose of local area communication." *Id.* at 1.

C. Declaration of Robert O'Hara (Ex. 1122)

Mr. Robert O'Hara was an editor of the IEEE 802.11-1997 standard. Ex. 1122 ¶ 1; Ex. 1104, iii. Mr. O'Hara states that drafts of the 802.11-1997 standard, including Draft Standard, were available to members of the 802.11 Working Group for download from the 802.11 Working Group's server. Ex. 1122 ¶ 9. According to Mr. O'Hara, announcements were sent to the Working Group's e-mail list when drafts became available, and a person

[1] In this Decision, we refer to the original pagination of Draft Standard rather than the Exhibit page number.

could be added to the Working Group's e-mail list by providing an e-mail address to the chair of the Working Group. *Id.* ¶¶ 9–10. Mr. O'Hara states that there "were no restrictions on who could attend the 802.11 Working Group's meetings [or] on who could provide an e-mail address" and that, according to his "recollection," anyone who made a request to be added to the e-mail list would be added. *Id.* ¶ 10.

Mr. O'Hara states that the copies of the drafts of the Standard available on the Working Group's servers were password-protected files, and that the members of the e-mail list were provided with passwords to access the documents, either as part of an announcement of a new draft or via "another way." *Id.* ¶ 11. According to Mr. O'Hara, the passwords were intended to limit distribution to "interested individuals, as opposed to the entire [I]nternet." *Id.* Mr. O'Hara also states that attending an 802.11 Working Group meeting or asking for access prior to a meeting demonstrated sufficient interest such that that person would receive the password necessary to access the drafts on the Working Group's server. *Id.*

Further, according to Mr. O'Hara, each of the 802.11 standard drafts, including Draft Standard, would have been discussed at the Working Group meetings and made available to all attendees. *Id.* ¶ 12. Mr. O'Hara also states that the meetings were not limited to IEEE members but were open to the general public. *Id.*

D. Analysis of Whether Draft Standard Is a Printed Publication

We look to the underlying facts to make a legal determination as to whether a document is a printed publication. *Suffolk Techs., LLC v. AOL Inc.*, 752 F.3d 1358, 1364 (Fed. Cir. 2014). The determination of whether a document is a "printed publication" under 35 U.S.C. § 102(b) involves a case-by-case inquiry into the facts and circumstances surrounding its disclosure to members of the public. *In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004). Public accessibility is a key question in determining whether a document is a printed publication and is determined on a case-by-case basis. *Suffolk Techs.*, 752 F.3d at 1364. To qualify as a printed publication, a document "must have been sufficiently accessible to the public interested in the art." *In re Lister*, 583 F.3d 1307, 1311 (Fed. Cir. 2009).

The O'Hara Declaration is the only extrinsic evidence that Petitioner submits in support of its position that Draft Standard is a printed publication. *See* Pet. 14–15. Petitioner asserts that Draft Standard "was completed on May 20, 1996, and was available to *anyone who wanted to view it* on May 23, 1996." Pet. 13–14 (citing Ex. 1122 ¶¶ 4, 5, 10, and 12) (emphasis added). Petitioner indicates, initially, that this availability resulted in a publication date of May 23, 1996. Pet. 14. Petitioner also argues that Draft Standard "was available to any interested parties" no later than July 8, 1996, because it "was available to all members of the 802.11 Working Group's email list" and discussed and distributed at an 802.11 Working Group meeting held July 8–12, 1996. *Id.* at 14–15. Thus, Petitioner concludes that this alleged distribution and availability to any interested parties by July 8, 1996 renders Draft Standard a "printed publication" under 35 U.S.C. § 102(b). *Id.* at 15.

Notably absent, however, from the Petition and Mr. O'Hara's declaration are any assertions or evidence in support of the availability of Draft Standard to the public interested in the art. We do not find sufficient argument or evidence to indicate that the July 8–12 meeting of the 802.11 Working Group (or any other 802.11 Working Group meeting) was advertised or otherwise announced to the public. Nor do we find sufficient argument or evidence that any individual who was interested in the art would have known about Draft Standard such that he or she would have known to request a copy or ask to be added to an email list for access to the document.

"A given reference is 'publicly accessible' upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it." *SRI Int'l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1194 (Fed. Cir. 2008) (quoting *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006)). Although Mr. O'Hara declares that "[t]here were no restrictions on who could attend the 802.11 Working Group's meetings" (Ex. 1122 ¶ 10) and that the meetings "were open to the general public" (*id.* ¶ 12), Petitioner has not presented persuasive argument or evidence regarding how members of the potentially interested public would have been made aware of these meetings. Similarly, although Mr. O'Hara declares that an individual could provide the chair with an e-mail address to be added to the Working Group's e-mail list (*id.* ¶ 10), the Petition has not established how an individual would have known to attend a meeting or contact the chair in order to be added to the e-mail list.

Based on the evidence before us, we find that the purpose of the 802.11 Working Group's storage of drafts of the standard on a server is similar to the placement of a file on an "FTP server solely to facilitate peer review in preparation for later publication," which the U.S. Court of Appeals for the Federal Circuit found weighed against public accessibility of the file. *SRI Int'l*, 511 F.3d at 1197. In *SRI*, even though the "paper was 'posted' on an open FTP server and might have been available to anyone with FTP know-how and knowledge of the" subdirectory in which it resided, the Federal Circuit found the fact that the paper was not publicized suggested an absence of public availability. *Id.* In this case, the submitted evidence does not show that the 802.11 Working Group's server was an open server and, to the extent that it was, the evidence shows that the documents were password protected. Ex. 1122 ¶ 11.

Moreover, notwithstanding Mr. O'Hara's statement that passwords were distributed to the 802.11 Working Group e-mail list (*id.*), the fact that an interested individual needed to contact IEEE in order to obtain a password or other means of accessing Draft Standard (and needed to know who to contact in the first place) weighs against public accessibility. *Cf. Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1351 (Fed. Cir. 2008) (finding facts weighed towards public accessibility because "[t]he specifications themselves were visible to any member of the interested public without requesting them from an ETSI member"). Mr. O'Hara states that the drafts of the 802.11 standards, including Draft Standard, were (and still are) protected by passwords in order to limit distribution to "interested individuals, as opposed to the entire [I]nternet." Ex. 1122 ¶ 11. However, as previously discussed, the record does not contain persuasive evidence showing how an individual outside the 802.11 Working Group would have known of the existence of the Draft Standard, the 802.11 Working Group meetings, or the 802.11 Working Group itself. Therefore, we are not persuaded that such an individual, exercising reasonable diligence, would be able to change his status from an anonymous member of "the entire [I]nternet" to an "interested individual." Moreover, the Working Group created Draft Standard. *See* Ex. 1023 ¶ 2. Provision of a document to co-authors of the document does not constitute dissemination, or availability, of the document to the public.

Therefore, based on the evidence Petitioner provided, we conclude Petitioner has not made a sufficient showing that Draft Standard was a printed publication as of July 1996 or earlier, as alleged, i.e., that Draft Standard was available as of July 1996 or earlier to an ordinarily skilled individual, exercising reasonable diligence, who might have been interested in the subject matter of Draft Standard.

E. Asserted Grounds of Unpatentability

Because Petitioner has not met its burden in establishing that Draft Standard is a "printed publication" and, thus, prior art, Petitioner has not shown a reasonable likelihood of prevailing on the grounds asserted.

III. CONCLUSION

The Petition fails to demonstrate a reasonable likelihood of prevailing on the grounds that the challenged claims are anticipated by, or obvious over, Draft Standard or obvious over Draft Standard and Boer.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that the petition is denied as to all challenged claims and no trial is instituted.

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Paper 8
Date Entered: December 10, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., SAMSUNG ELECTRONICS AMERICA, INC., SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, and SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner,

v.

REMBRANDT WIRELESS TECHNOLOGIES, LP,
Patent Owner.

Case IPR2014-00892
Patent 8,457,228 B2

Before JAMESON LEE, HOWARD B. BLANKENSHIP, and JUSTIN BUSCH, *Administrative Patent Judges.*

BLANKENSHIP, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. BACKGROUND

Samsung Electronics Co. Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Austin

Semiconductor, LLC (collectively, "Petitioner") request *inter partes* review of claims 1–3, 5, and 10–21 of U.S. Patent No. 8,457,228 B2 ("the '228 patent," Ex. 1301) under 35 U.S.C. §§ 311–319. Paper 2 (Petition or "Pet."). Rembrandt Wireless Technologies, LP (Patent Owner) filed a Preliminary Response (Paper 6, "Prelim. Resp.") as permitted by 37 C.F.R. § 42.107. We have jurisdiction under 35 U.S.C. § 314. Section 314 provides that an *inter partes* review may not be instituted "unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

For the reasons that follow, we institute an *inter partes* review of claims 1–3, 5, and 10–20 of the '228 patent. We do not institute review as to challenged claim 21.

Related Proceedings

According to Petitioner, the '228 patent is involved in the following lawsuit: *Rembrandt Wireless Technologies, LP v. Samsung Electronics Co*, No. 2:13-cv-00213 (E.D. Tex. 2013). Pet. 1–2. The '228 patent also has been challenged in the following cases: *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00889; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00890; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00891; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00893; and *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00895.

The '228 Patent

The '228 Patent issued from an application filed August 4, 2011, which claimed priority under 35 U.S.C. § 120 through a chain of intervening applications to an application filed December 4, 1998, and which further claimed priority under 35 U.S.C. § 119 to a provisional application filed December 5, 1997.

The technical field of the patent relates to data communications and modulators/demodulators (modems), and in particular to a data communications system in which a plurality of modems use different types of modulation in a network. Ex. 1301, col. 1, ll. 21–25; col. 1, l. 58 – col. 2, l. 23.

Illustrative Claim

Of the challenged claims, only claim 1 is independent.

> 1. 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:
>
> a master transceiver configured to transmit a first message over a communication medium from the master transceiver to the one or more slave transceivers, 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

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

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

second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and

wherein the second modulation method results in a higher data rate than the first modulation method.

Prior Art

Boer	US 5,706,428	Jan. 6, 1998	(Ex. 1304)

Asserted Ground of Unpatentability

Petitioner asserts the following ground of unpatentability as to claims 1–3, 5, and 10–21 (Pet. 2): obviousness under 35 U.S.C. § 103(a) over Admitted Prior Art ("APA")[1] and Boer.

II. ANALYSIS

Claim Interpretation

In an *inter partes* review, the Board construes claim terms in an unexpired patent using their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012). The claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). The Office must apply the broadest reasonable meaning to the claim language, taking into account any definitions presented in the specification. *Id.* (citing *In re Bass*, 314 F.3d 575, 577 (Fed. Cir. 2002)). There is a "heavy presumption" that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). The "ordinary and customary meaning" is that which the term would have to a person of ordinary skill in the art in question. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

[1] We discuss the asserted APA *infra*.

Types of Modulation Methods

Claim 1 recites a master transceiver configured to transmit messages modulated according to a first and a second modulation method, "the second modulation method being of a different type than the first modulation method . . . ."

Petitioner submits that the ordinary meaning of "modulation" is "'[t]he process by which some characteristic of a carrier [wave] is varied in accordance with a modulating wave.'" Pet. 13 (citing Declaration of David Goodman (Ex. 1323) ¶ 88; Ex. 1320, 3 (technical dictionary)). Petitioner contends that a "first modulation method" should be interpreted as "*a process of varying characteristic(s) of a carrier wave that is different from a second modulation method,*" and a "second modulation method" should be interpreted as "*a process of varying characteristic(s) of a carrier wave that is different from a first modulation method.*" Pet. 13. Petitioner submits that different "types" of modulation methods extend to methods that are merely incompatible with one another. *Id.* at 9–10.

Patent Owner submits that "the second modulation method being of a different type than the first modulation method" should be construed as "the second modulation method being of a different family of modulation techniques than the first modulation method." Prelim. Resp. 11. Further, "a different type of modulation method" should be construed as "a different family of modulation techniques." *Id.* Patent Owner argues that the broadest reasonable interpretation of "types" of modulation methods does not extend to modulation methods that are known merely to be incompatible with each other, but is limited to different "families" of modulation techniques, e.g., the FSK (frequency shift keying) "family" of modulation methods and the QAM (quadrature amplitude modulation) "family" of modulation methods. *Id.* at 6–11. Patent Owner's position is thus contrary to Petitioner's position, in that Petitioner contends that different "types" of modulation methods require no more than that the first and second modulation methods be incompatible with one another. Pet. 9–10.

For purposes of this decision, we need not, and do not, determine the scope of the above-noted terms in controversy. We are persuaded that elements in the prior art are within the scope of the relevant terms under any reasonable construction. *See* § II.D, *infra*.

Proposed Ground of Unpatentability

A. "Prior Art"

Section 103 of Title 35 U.S.C., which makes nonobviousness of the invention a prerequisite to patentability, requires a determination of the differences between the subject matter sought to be patented and "[t]he prior art." *In re Bergy*, 596 F.2d 952, 965 n.7 (CCPA 1979), *aff'd sub nom. Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (citations omitted). However, Title 35 nowhere defines the term "prior art." *Id.*

> Its exact meaning is a somewhat complex question of law which has been the subject of legal papers and whole chapters of books. . . . Basically, the concept of prior art is that which is publicly known, or at least known to someone who has taken steps which do make it known to the public, . . . or known to the inventor against whose application it is being applied.

Id. (citations omitted).

> "The term 'prior art' as used in section 103 refers at least to the statutory material named in 35 U.S.C. § 102. . . . However,

> section 102 is not the only source of section 103 prior art. Valid prior art may be created by the admissions of the parties."

Riverwood Int'l Corp. v. R.A. Jones & Co., Inc., 324 F.3d 1346, 1354 (Fed. Cir. 2003) (citations omitted). Although a reference can become prior art by admission, that doctrine is inapplicable when the subject matter at issue is the inventor's own work. *Id.*

B. Admitted Prior Art

Petitioner contends that the '228 patent contains material that may be used as prior art against the patent under 35 U.S.C. § 103(a). Figure 1 of the patent is labeled as "Prior Art." Pet. 5; Ex. 1301, Fig. 1. Further, the '228 patent's specification refers to "prior art" multipoint communication system 22 comprising master modem or transceiver 24, which communicates with a plurality of tributary modems ("tribs") or transceivers 26. Pet. 6; Ex. 1301, col. 3, l. 64 – col. 4, l. 1. Further, the '228 patent describes Figure 2 as illustrating the operation of the multipoint communication system of (prior art) Figure 1. Pet. 6; Ex. 1301, col. 3, ll. 33–34.

Patent Owner argues that Petitioner has not shown that the "alleged admitted prior art" is the work of another — i.e., not the inventor's own work. Prelim. Resp. 17–21. Petitioner has met its initial burden, however, in demonstrating that the subject matter of the '228 patent's Figure 1, and accompanying description, constitutes "prior art" by pointing out that the patent expressly describes the subject matter as such. *See In re Nomiya*, 509 F.2d 566, 570–71 (CCPA 1975) ("We see no reason why appellants' representations in their application should not be accepted at face value as admissions that Figs. 1 and 2 may be considered 'prior art' for any purpose, including use as evidence of obviousness under [§] 103.").

Patent Owner's argument that Figures 1 and 2 of the '228 patent represent the inventor's identification of a "source of a problem" (Prelim. Resp. 21–23) is, similarly, inapposite. Petitioner does not rely on the face-value admissions in the patent as a problem to be solved or as identifying a problem in the prior art. *See, e.g.*, Pet. 20.

For the foregoing reasons, we are persuaded that, on this record, the subject matter of Figures 1 and 2 of the '228 patent, and the text of the patent that further describes those Figures, may be applied as prior art in this proceeding.

C. Boer

Boer describes a wireless LAN that includes first stations that operate at 1 or 2 Mbps (Megabits per second) data rate and second stations that operate at 1, 2, 5, or 8 Mbps data rate. Ex. 1304, Abstract.

Figure 1 of Boer is reproduced below.

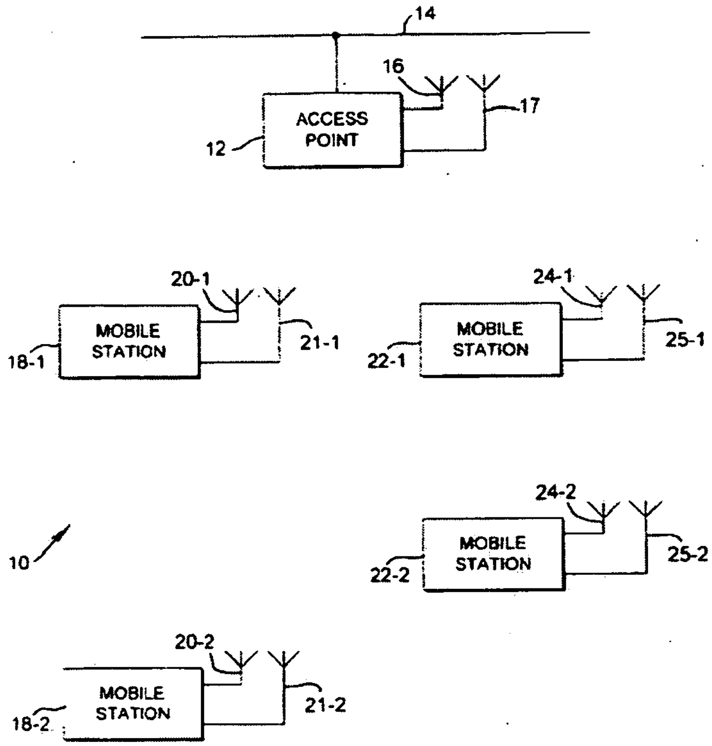

FIG.1

Figure 1 is said to be a block diagram of a wireless LAN embodying Boer's invention. Ex. 1304, col. 1, ll. 53–54. LAN 10 includes access point 12, serving as a base station. The network includes mobile stations 18-1 and 18-2 that are capable of transmitting and receiving messages at a data rate of 1 or 2 Mbps using DSSS (direct sequence spread spectrum) coding. When operating at 1 Mbps, a station uses DBPSK (differential binary phase shift keying) modulation. When operating at 2 Mbps, a station uses DQPSK (differential quadrature phase shift keying) modulation. *Id.* at col. 2, ll. 6–27. Mobile stations 22-1 and 22-2 are capable of operating at the 1 and 2 Mbps data rates using the same modulation and coding as stations 18-1 and 18-2. In addition, stations 22-1 and 22-2 can operate at 5 and 8 Mbps data rates using PPM/DQPSK (pulse position modulation–differential quadrature phase shift keying) in combination with the DSSS coding. *Id.* at col. 2, ll. 34–44.

D. Claims 1–3, 5, and 10–20

Petitioner applies the teachings of APA and Boer to demonstrate obviousness of the subject matter of claim 1, relying on APA for teaching of master/slave communication systems. Pet. 20–29, 40–48 (claim chart). Petitioner submits that a person having ordinary skill in the art would have been motivated to combine Boer with APA because the combination would increase the flexibility and efficiency of prior art master/slave communication systems, thus allowing the APA master/slave network to adapt to the needs of applications. *Id.* at 19 (referring to the Goodman Declaration, Ex. 1323 ¶¶ 121–122).

Patent Owner responds that Petitioner fails to explain how Boer's statement that "it may be advantageous to provide systems operating at higher data rates, which are not in accordance with the [draft 802.11] standard" would motivate one of ordinary skill to implement the teachings of Boer with APA. Ex. 1304, col. 1, ll. 16–25; Prelim. Resp. 31–32. We agree with Patent Owner. Petitioner, however, submits an alternative reason for the combination that is founded on simplicity and determinacy. Pet. 19–20; Ex. 1323 ¶¶ 124–125. In particular, Mr. Goodman testifies that polled multiport master/slave communications systems were well known to those of ordinary skill in the art for simplicity and determinacy, referring to Exhibit 1322. Ex. 1323 ¶ 124. Petitioner submits Exhibit 1322 is a November 1994 publication that compares various strengths and weaknesses for communication protocols for embedded systems. Ex. 1322, 7. The document states that polling is one of the more popular protocols for embedded systems "because of its simplicity and determinacy." *Id.* In that protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network. *Id.* The protocol "is ideal for a centralized data-acquisition system where peer-to-peer communication and global prioritization are not required." *Id.* On this record, we are persuaded that Petitioner has identified sufficient motivation from the prior art for the combination proposed.

Turning to the requirements of claim 1, the claim recites two types of modulation methods, "the second modulation method being of a different type than the first modulation method." Petitioner contends that Boer's DBPSK modulation corresponds to the claimed "first" modulation method. *E.g.*, Pet. 26. Petitioner submits that either of Boer's DQPSK modulation and PPM/DQPSK modulation corresponds to the claimed "second" modulation method. *Id.*

Patent Owner argues that neither of DQPSK and PPM/DQPSK can be considered a modulation method of a type different from DBPSK. Prelim. Resp. 37–38. For purposes of this decision, we need not determine the breadth of a different "type" of modulation method as claimed, and need not determine whether one of ordinary skill in the art would regard DQPSK to be a "type" of modulation method different from DBPSK. Boer's description of PPM/DQPSK modulation falls within the meaning of a "different type" of modulation method under any reasonable construction of the terms. *Cf.* Ex. 1323 ¶ 159 ("Five Mbps PPM/DQPSK and eight Mbps PPM/DQPSK are different 'types' of modulation than DBPSK under any possible claim construction."). According to Mr. Goodman, phase is not used in PPM, unlike in DBPSK and DQPSK modulation. *Id.* ¶ 160. In PPM, the start and stop time of a transmission is varied in response to the information to be transmitted, with the time shift being indicative of data bits. *Id.*

Patent Owner submits that "varying the start and stop time of a transmission of a carrier wave does not result in varying any characteristic of the carrier wave." Prelim. Resp. 36. Patent Owner does not explain, however, how the "start and stop time" of a transmission of a carrier wave cannot be considered one or more "characteristic[s]" of the carrier wave. We acknowledge there is *some* support in Boer for Patent Owner's position, in Boer's reference to PPM as "PPM type coding." *Id.*; Ex. 1304, col. 4, ll. 45–48. The fact remains, however, that the term "modulation" is part of the descriptive name for PPM — pulse position *modulation.* Patent Owner has not explained sufficiently, given the other evidence of record, why pulse position *modulation* cannot be considered a type of modulation method, even if the method might be applied for "coding" in Boer. *Id.*

We have reviewed the information presented in the Petition and Patent Owner's Preliminary Response. We are persuaded there is a reasonable likelihood that Petitioner would prevail in its challenge of claims 1–3, 5, and 10–20 for obviousness over APA and Boer and APA.

E. Claim 21

Claim 21, which depends directly from claim 1, recites that the first information that is included in the first message "comprises the first message address data." Petitioner maps the claimed "first information" as corresponding to header 218 of message 200 depicted in Figure 4 of Boer.

Pet. 39, 41; Ex. 1304, col. 3, ll. 42–55. Petitioner admits that Boer does not teach placing its address information in header 218 (Ex. 1304, Fig. 4). Pet. 39. Boer teaches that DATA field 214 (Fig. 4), which is deemed to correspond to the "second information," contains a destination address. Pet. 38–39; Ex. 1304, col. 6, ll. 28–31.

Petitioner submits that the '228 patent "admits" that placing address information in the training sequence of a message is prior art. Pet. 39. Petitioner does not indicate how such an admission might be relevant to claim 21. The '228 patent teaches that in a multipoint system the address of the trib with which the master is establishing communication is also transmitted during the training interval. Ex. 1301, col. 4, ll. 19–22. The "training signals" that are exchanged during the training interval, however, are "sequences of signals of particular subsets of all signals that can be communicated via the agreed upon common modulation method." *Id.* at col. 4, ll. 5–10. Petitioner does not identify any teaching of placing address data in the message header.

Petitioner concludes that "[a] person having ordinary skill in the art would have been motivated to combine the APA with Boer due to the similarities between the packet structures and because where the address fields are placed is a matter of design choice." Pet. 39, citing Ex. 1323 ¶ 212. Petitioner has not identified a teaching in the applied prior art of placing address data in the header of a message. Nor has Petitioner provided evidence sufficient to demonstrate that the ordinary artisan would have considered placing the address data as claimed to be a mere matter of "design choice." Petitioner's conclusory allegation of "design choice" does not provide the required "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007).

For the foregoing reasons we are not persuaded that Petitioner has established a reasonable likelihood that it would prevail in its challenge of claim 21.

III. CONCLUSION

The Petition demonstrates a reasonable likelihood of prevailing on the obviousness grounds of unpatentability as to claims 1–3, 5, and 10–20 based on APA and Boer. The Petition does not demonstrate a reasonable likelihood of prevailing on the obviousness ground of unpatentability as to claim 21 based on APA and Boer.

The Board has not made a final determination on the patentability of any challenged claim.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that an *inter partes* review is instituted as to claims 1–3, 5, and 10–20 of the '228 patent on the obviousness ground based on APA and Boer;

FURTHER ORDERED that the Petition is denied as to all other grounds set forth in the Petition;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '228 patent is instituted with trial commencing on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the institution of the trial; and

FURTHER ORDERED that the trial is limited to the grounds identified immediately above and no other ground is authorized for the '580 patent claims.

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Paper 8
Date Entered: December 10, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., SAMSUNG ELECTRONICS AMERICA, INC., SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, and SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner,

v.

REMBRANDT WIRELESS TECHNOLOGIES, LP,
Patent Owner.

Case IPR2014-00893
Patent 8,457,228 B2

Before JAMESON LEE, HOWARD B. BLANKENSHIP, and JUSTIN BUSCH, *Administrative Patent Judges.*

BLANKENSHIP, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. BACKGROUND

Samsung Electronics Co. Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Austin

Semiconductor, LLC (collectively, "Petitioner") request *inter partes* review of claims 22, 23, and 25 of U.S. Patent No. 8,457,228 B2 ("the '228 patent," Ex. 1401) under 35 U.S.C. §§ 311–319. Paper 2 (Petition or "Pet."). Rembrandt Wireless Technologies, LP (Patent Owner) filed a preliminary response (Paper 6, "Prelim. Resp.") as permitted by 37 C.F.R. § 42.107. We have jurisdiction under 35 U.S.C. § 314. Section 314 provides that an *inter partes* review may not be instituted "unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

For the reasons that follow, we institute an *inter partes* review of claims 22, 23, and 25 of the '228 patent.

Related Proceedings

According to Petitioner, the '228 patent is involved in the following lawsuit: *Rembrandt Wireless Technologies, LP v. Samsung Electronics Co,* No. 2:13-cv-00213 (E.D. Tex. 2013). Pet. 1–2. The '228 patent also has been challenged in the following cases: *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00889; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00890; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00891; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00892; and *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00895.

The '228 Patent

The '228 Patent issued from an application filed August 4, 2011, which claimed priority under 35 U.S.C. § 120 through a chain of intervening applications to an application filed December 4, 1998, and which further claimed priority under 35 U.S.C. § 119 to a provisional application filed December 5, 1997.

The technical field of the patent relates to data communications and modulators/demodulators (modems), and in particular to a data communications system in which a plurality of modems use different types of modulation in a network. Ex. 1401, col. 1, ll. 21–25; col. 1, l. 58 – col. 2, l. 23.

Illustrative Claim

Of the challenged claims, only claim 22 is independent.

> 22. A communication device configured to communicate 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 that is configured to send at least a plurality of communications, wherein each communication from among said plurality of communications comprises at least a respective first portion and a respective payload portion, wherein each communication from among said plurality of communications is addressed for an intended destination of the respective payload portion of that communication, and wherein for each communication from among said plurality of communications:
>
> said respective first portion is modulated according to a first modulation method from among at least two types of modulation methods, wherein the at least two types of

modulation methods comprise the first modulation method and a second modulation method, wherein the second modulation method is of a different type than the first modulation method,

said respective first portion comprises an indication of which of the first modulation method and the second modulation method is used for modulating respective payload data in the respective payload portion, and

the payload data is modulated according to at least one of the first modulation method or the second modulation method in accordance with what is indicated by the respective first portion;

the transceiver further configured to send at least a first communication of the plurality of communications such that payload data included in a payload portion of the first communication is modulated according to the second modulation method based on a first portion of the first communication indicating that the second modulation method will be used for modulating the payload data in the payload portion of the first communication, wherein the payload data is included in the first communication after the first portion of the first communication;

the transceiver further configured to send at least a second communication of the plurality of communications such that payload data included in a payload portion of the second communication is modulated according to the first modulation method based on a first portion of the second communication indicating that the first modulation method will be used for modulating the payload data in the payload portion of the second communication.

Prior Art

Boer	US 5,706,428	Jan. 6, 1998	(Ex. 1404)

Asserted Ground of Unpatentability

Petitioner asserts the following ground of unpatentability as to claims 22, 23, and 25 (Pet. 2): obviousness under 35 U.S.C. § 103(a) over Admitted Prior Art ("APA")[1] and Boer.

II. ANALYSIS

Claim Interpretation

In an *inter partes* review, the Board construes claim terms in an unexpired patent using their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012). The claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). The Office must apply the broadest reasonable meaning to the claim language, taking into account any definitions presented in the specification. *Id.* (citing *In re Bass*, 314 F.3d 575, 577 (Fed. Cir. 2002)). There is a "heavy presumption" that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). The "ordinary and customary meaning" is that which the term would have to a person of ordinary skill in the art in question. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

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[1] We discuss the asserted APA *infra*.

Types of Modulation Methods

Claim 22 recites that 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.

Petitioner submits that the ordinary meaning of "modulation" is "'[t]he process by which some characteristic of a carrier [wave] is varied in accordance with a modulating wave.'" Pet. 14 (citing Declaration of David Goodman (Ex. 1423) ¶ 91; Ex. 1420, 3 (technical dictionary)). Petitioner contends that a "first modulation method" should be interpreted as "*a process of varying characteristic(s) of a carrier wave that is different from a second modulation method,*" and a "second modulation method" should be interpreted as "*a process of varying characteristic(s) of a carrier wave that is different from a first modulation method.*" Pet. 13. Petitioner submits that different "types" of modulation methods extend to methods that merely are incompatible with one another. *Id.* at 9–10.

Patent Owner submits that the broadest reasonable construction of the phrase "at least two types of modulation methods" is "at least two families of modulation techniques." Prelim. Resp. 10. Patent Owner argues that the broadest reasonable interpretation of "types" of modulation methods does not extend to modulation methods that are known merely to be incompatible with each other, but is limited to different "families" of modulation techniques, e.g., the FSK (frequency shift keying) "family" of modulation methods and the QAM (quadrature amplitude modulation) "family" of modulation methods. *Id.* at 6–11. Patent Owner's position is thus contrary to Petitioner's position, in that Petitioner contends that different "types" of modulation methods require no more than that the first and second modulation methods be incompatible with one another. Pet. 9–10.

For purposes of this decision, we need not, and do not, determine the scope of the above-noted terms in controversy. We are persuaded that elements in the prior art are within the scope of the relevant terms under any reasonable construction. *See* § II.D, *infra*.

Proposed Ground of Unpatentability

A. "Prior Art"

Section 103 of Title 35 U.S.C., which makes nonobviousness of the invention a prerequisite to patentability, requires a determination of the differences between the subject matter sought to be patented and "[t]he prior art." *In re Bergy*, 596 F.2d 952, 965 n.7 (CCPA 1979), *aff'd sub nom. Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (citations omitted). However, Title 35 nowhere defines the term "prior art." *Id.*

> Its exact meaning is a somewhat complex question of law which has been the subject of legal papers and whole chapters of books. . . . Basically, the concept of prior art is that which is publicly known, or at least known to someone who has taken steps which do make it known to the public, . . . or known to the inventor against whose application it is being applied.

Id. (citations omitted).

> "The term 'prior art' as used in section 103 refers at least to the statutory material named in 35 U.S.C. § 102 . . . . However, section 102 is not the only source of section 103 prior art. Valid prior art may be created by the admissions of the parties."

Riverwood Int'l Corp. v. R.A. Jones & Co., Inc., 324 F.3d 1346, 1354 (Fed. Cir. 2003) (citations omitted). Although a reference can become prior art by admission, that doctrine is inapplicable when the subject matter at issue is the inventor's own work. *Id.*

B. Admitted Prior Art

Petitioner contends that the '228 patent contains material that may be used as prior art against the patent under 35 U.S.C. § 103(a). Figure 1 of the patent is labeled as "Prior Art." Pet. 5; Ex. 1401, Fig. 1. Further, the '228 patent's specification refers to "prior art" multipoint communication system 22 comprising master modem or transceiver 24, which communicates with a plurality of tributary modems ("tribs") or transceivers 26. Pet. 6; Ex. 1401, col. 3, l. 64 – col. 4, l. 1. Further, the '228 patent describes Figure 2 as illustrating the operation of the multipoint communication system of (prior art) Figure 1. Pet. 6; Ex. 1401, col. 3, ll. 33–34.

Patent Owner argues that Petitioner has not shown that the "alleged admitted prior art" is the work of another — i.e., not the inventor's own work. Prelim. Resp. 17–20. Petitioner has met its initial burden, however, in demonstrating that the subject matter of the '228 patent's Figure 1, and accompanying description, constitutes "prior art" by pointing out that the patent expressly describes the subject matter as such. *See In re Nomiya*, 509 F.2d 566, 570–71 (CCPA 1975) ("We see no reason why appellants' representations in their application should not be accepted at face value as admissions that Figs. 1 and 2 may be considered 'prior art' for any purpose, including use as evidence of obviousness under [§] 103.").

Patent Owner's argument that Figures 1 and 2 of the '228 patent represent the inventor's identification of a "source of a problem" (Prelim. Resp. 21–23) is, similarly, inapposite. Petitioner does not rely on the face-value admissions in the patent as a problem to be solved or as identifying a problem in the prior art. *See, e.g.*, Pet. 20.

For the foregoing reasons, we are persuaded that, on this record, the subject matter of Figures 1 and 2 of the '228 patent, and the text of the patent that further describes those Figures, may be applied as prior art in this proceeding.

C. Boer

Boer describes a wireless LAN that includes first stations that operate at 1 or 2 Mbps (Megabits per second) data rate and second stations that operate at 1, 2, 5, or 8 Mbps data rate. Ex. 1404, Abstract.

Figure 1 of Boer is reproduced below.

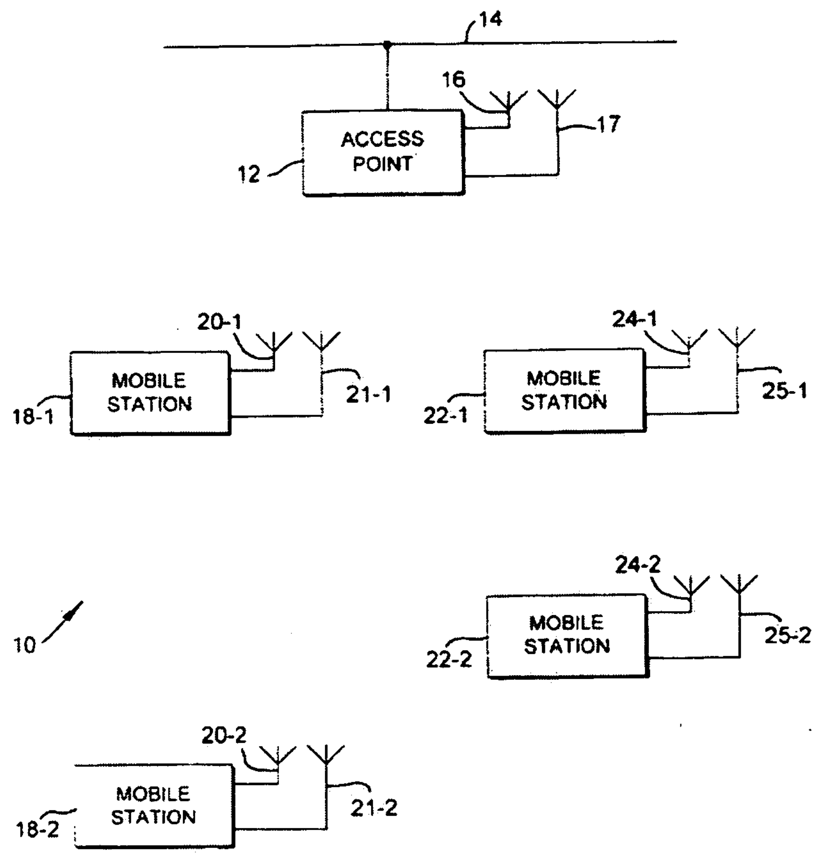

FIG.1

Figure 1 is said to be a block diagram of a wireless LAN embodying Boer's invention. Ex. 1404, col. 1, ll. 53–54. LAN 10 includes access point 12, serving as a base station. The network includes mobile stations 18-1 and 18-2 that are capable of transmitting and receiving messages at a data rate of 1 or 2 Mbps using DSSS (direct sequence spread spectrum) coding. When operating at 1 Mbps, a station uses DBPSK (differential binary phase shift keying) modulation. When operating at 2 Mbps, a station uses DQPSK (differential quadrature phase shift keying) modulation. *Id.* at col. 2, ll. 6–27. Mobile stations 22-1 and 22-2 are capable of operating at the 1 and 2 Mbps data rates using the same modulation and coding as stations 18-1 and

18-2. In addition, stations 22-1 and 22-2 can operate at 5 and 8 Mbps data rates using PPM/DQPSK (pulse position modulation–differential quadrature phase shift keying) in combination with the DSSS coding. *Id.* at col. 2, ll. 34–44.

D. Claims 22, 23, and 25

Petitioner applies the teachings of APA and Boer to demonstrate obviousness of the subject matter of claim 22, relying on APA for teaching of master/slave communication systems. Pet. 20–30, 33–43 (claim chart). Petitioner submits that a person having ordinary skill in the art would have been motivated to combine Boer with APA because the combination would increase the flexibility and efficiency of prior art master/slave communication systems, thus allowing the APA master/slave network to adapt to the needs of applications. *Id.* at 20 (referring to the Goodman Declaration, Ex. 1423 ¶¶ 124–125).

Patent Owner responds that Petitioner fails to explain how Boer's statement that "it may be advantageous to provide systems operating at higher data rates, which are not in accordance with the [draft 802.11] standard" would motivate one of ordinary skill to implement the teachings of Boer with APA. Ex. 1404, col. 1, ll. 16–25; Prelim. Resp. 31–32. We agree with Patent Owner. Petitioner, however, submits an alternative reason for the combination that is founded on simplicity and determinacy. Pet. 20; Ex. 1423 ¶¶ 127–128. In particular, Mr. Goodman testifies that polled multiport master/slave communications systems were well known to those of ordinary skill in the art for simplicity and determinacy, referring to Exhibit 1422. Ex. 1423 ¶ 127. Petitioner submits Exhibit 1422 is a November 1994 publication that compares various strengths and weaknesses for communication protocols for embedded systems. Ex. 1422, 7. The document states that polling is one of the more popular protocols for embedded systems "because of its simplicity and determinacy." *Id.* In that protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network. *Id.* The protocol "is ideal for a centralized data-acquisition system where peer-to-peer communication and global prioritization are not required." *Id.* On this record, we are persuaded that Petitioner has identified sufficient motivation from the prior art for the combination proposed.

Turning to the requirements of claim 22, the claim recites two types of modulation methods, with the second modulation method being of a different type than the first modulation method. Petitioner contends that Boer's DBPSK modulation corresponds to the claimed "first" modulation method. *E.g.*, Pet. 25. Petitioner submits that either of Boer's DQPSK modulation and PPM/DQPSK modulation corresponds to the claimed "second" modulation method. *Id.*

Patent Owner argues that neither of DQPSK and PPM/DQPSK can be considered a modulation method of a type different from DBPSK. Prelim. Resp. 36–37. For purposes of this decision, we need not determine the breadth of a different "type" of modulation method as claimed, and need not determine whether one of ordinary skill in the art would regard DQPSK to be a "type" of modulation method different from DBPSK. Boer's description of PPM/DQPSK modulation falls within the meaning of a "different type" of modulation method under any reasonable construction of the terms. *Cf.* Ex. 1423 ¶ 157 ("5 Mbps or 8 Mbps PPM/DQPSK is a different 'type' of modulation under any possible claim construction."). According to Mr. Goodman, phase is not used in PPM, unlike in DBPSK and DQPSK modulation. *Id.* ¶ 158. In PPM, the start and stop time of a transmission is varied in response to the information to be transmitted, with the time shift being indicative of data bits. *Id.*

Patent Owner submits that "varying the start and stop time of a transmission of a carrier wave does not result in varying any characteristic of the carrier wave." Prelim. Resp. 35. Patent Owner does not explain, however, how the "start and stop time" of a transmission of a carrier wave cannot be considered one or more "characteristic[s]" of the carrier wave. We acknowledge there is *some* support in Boer for Patent Owner's position, in Boer's reference to PPM as "PPM type coding." *Id.* at 35–36; Ex. 1404, col. 4, ll. 45–48. The fact remains, however, that the term "modulation" is part of the descriptive name for PPM — pulse position *modulation*. Patent Owner has not explained sufficiently, given the other evidence of record, why pulse position *modulation* cannot be considered a type of modulation method, even if the method might be applied for "coding" in Boer. *Id.*

We have reviewed the information presented in the Petition and Patent Owner's Preliminary Response. We are persuaded there is a reasonable likelihood that Petitioner would prevail in its challenge of claims 22, 23, and 25 for obviousness over APA and Boer and APA.

III. CONCLUSION

The Petition demonstrates a reasonable likelihood of prevailing on the obviousness grounds of unpatentability as to claims 22, 23, and 25 based on APA and Boer.

The Board has not made a final determination on the patentability of any challenged claim.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that an *inter partes* review is instituted as to claims 22, 23, and 25 of the '228 patent on the obviousness ground based on APA and Boer;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '228 patent is instituted with trial commencing on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the institution of the trial; and

FURTHER ORDERED that the trial is limited to the grounds identified immediately above and no other ground is authorized for the '580 patent claims.

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Paper 8
Entered: December 10, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, and
SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner,

v.

REMBRANDT WIRELESS TECHNOLOGIES, LP,
Patent Owner.

IPR2014-00891
Patent 8,457,228 B2

Before JAMESON LEE, HOWARD B. BLANKENSHIP, and
JUSTIN BUSCH, *Administrative Patent Judges.*

BUSCH, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

A. Background

Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Austin Semiconductor, LLC (collectively, "Petitioner") filed a Petition requesting an *inter partes* review of claims 26–29, 31, 36–41, 43, and 47–52 (the "challenged claims") of U.S. Patent No. 8,457,228 B2 (Ex. 1201, "the '228 patent") on June 4, 2014. Paper 2 ("Pet."). Rembrandt Wireless Technologies, LP ("Patent Owner") filed a Patent Owner Preliminary Response on September 18, 2014. Paper 6 ("Prelim. Resp."). We have jurisdiction under 35 U.S.C. § 314.

An *inter partes* review may be instituted only if "the information presented in the petition . . . and any[preliminary] response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a); *see* 37 C.F.R. § 42.108(c). Upon consideration of the Petition and the Patent Owner Preliminary Response, we conclude Petitioner has not established a reasonable likelihood that it would prevail with respect to the challenged claims of the '228 patent and, accordingly, we do not institute an *inter partes* review.

B. Related Proceedings

Petitioner indicates that the '228 patent was asserted against Petitioner in *Rembrandt Wireless Technologies, LP v. Samsung Electronics*

Co., No. 2:13-cv-00213 (E.D. Tex. 2013). Pet. 1. The same parties and patent are involved in *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00889 (filed June 4, 2014); *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00890 (filed June 4, 2014); *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00892 (filed June 4, 2014); *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00893 (filed June 4, 2014); and *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00895 (filed June 4, 2014).

C. The '228 Patent (Ex. 1201)

The specification of the '228 patent describes "a data communications system in which a plurality of modulation methods are used to facilitate communication among a plurality of modem types." Ex. 1201, 1:23–25. The '228 patent explains that the invention addresses a problem that conventional modem pairs can communicate successfully only when the modems use compatible modulation methods. *Id.* at 1:29–32, 1:47–49.

Of the challenged claims, claim 26 is the only independent claim. Illustrative claim 26 is reproduced below:

> 26. A master communication device configured to communicate 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:
>
> a transceiver configured to transmit signals over a communications medium to a slave device using at least two

different types of modulation methods and to receive one or more responses over the communication medium that comprise at least respective response data that is modulated according to one of the at least two different types of modulation methods, the at least two different types of modulation methods comprising a first modulation method and a second modulation method, wherein the transmitted signals comprise first transmitted signals and second transmitted signals, the first transmitted signals comprise at least two transmission sequences, the at least two transmission sequences include a first transmission sequence and a second transmission sequence, the transceiver is configured to transmit the first transmission sequence using the first modulation method, and the transceiver is configured to transmit the second transmission sequence using the second modulation method wherein:

the first transmission sequence includes information that is indicative of an impending change in modulation method from the first modulation method to the second modulation method,

the second transmission sequence includes a payload portion that is transmitted after the first transmission sequence,

the first transmitted signals include first address information that is indicative of the slave device being an intended destination of the payload portion,

the second transmitted signals comprise at least a third transmission sequence and a fourth transmission sequence,

the transceiver is configured to transmit the third transmission sequence using the first modulation method,

the transceiver is configured to transmit the fourth transmission sequence using the first modulation method,

the third transmission sequence includes information indicative that the fourth transmission sequence will be transmitted using the first modulation method,

the fourth transmission sequence includes a second payload portion that is transmitted after the third transmission sequence, and

the second transmitted signals include second address information that is indicative of a specified slave device being an intended destination of the second payload portion.

D. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability:

Evidence	Basis	Challenged Claims
Draft Standard[1]	§ 102(b)	26–29, 37–41, 43, and 47–52
Draft Standard	§ 103(a)	26–29, 37–41, 43, and 47–52
Draft Standard and Boer[2]	§ 103(a)	26–29, 36–41, 43, and 47–52
Draft Standard and APA[3]	§ 103(a)	29, 31, 36, and 51
Draft Standard, Boer, and APA	§ 103(a)	29, 31, 36, and 51

[1] IEEE, DRAFT STANDARD FOR WIRELESS LAN, MEDIUM ACCESS CONTROL (MAC) AND PHYSICAL LAYER (PHY) SPECIFICATION, P802.11D4.0 (1996) (Ex. 1204) ("Draft Standard").
[2] U.S. Patent No. 5,706,428 (filed Mar. 14, 1996, issued Jan. 6, 1998) (Ex. 1206) ("Boer").
[3] Petitioner alleges that the '228 patent's descriptions of training signals are admitted prior art. Pet. 56–57 (citing Ex. 1201, 4:5–27) ("APA").

II. ANALYSIS

A. *Claim Construction*

Petitioner and Patent Owner each propose a construction of "first modulation method" and "second modulation method." We, however, do not construe any term because no term needs to be construed for purposes of this Decision.

B. *Asserted Anticipation and Obviousness Grounds Based on Draft Standard*

The dispositive issue in this proceeding is whether Draft Standard, on which all of Petitioner's asserted grounds of unpatentability rely, is a printed publication.

1. *Overview of Draft Standard (Ex. 1204)*

Draft Standard is an unapproved draft of a standard proposed by the Institute of Electrical and Electronics Engineers ("IEEE"). Ex. 1204, i.[4] The purpose of the proposed standard was "[t]o provide wireless connectivity to automatic machinery, equipment[,] or[] stations that require rapid deployment, which may be portable, or hand-held or which may be mounted on moving vehicles within a local area" and "[t]o offer a standard for use by regulatory bodies to standardize access to one or more frequency bands for the purpose of local area communication." *Id.* at 1.

[4] In this Decision, we refer to the original pagination of Draft Standard rather than the Exhibit page numbers.

2. Declaration of Robert O'Hara (Ex. 1225)

Mr. Robert O'Hara was an editor of the IEEE 802.11-1997 standard. Ex. 1225 ¶ 1; Ex. 1204, iii. Mr. O'Hara states that drafts of the 802.11-1997 standard, including Draft Standard, were available to members of the 802.11 Working Group for download from the 802.11 Working Group's server. Ex. 1225 ¶ 9. According to Mr. O'Hara, announcements were sent to the Working Group's e-mail list when drafts became available, and a person could be added to the Working Group's e-mail list by providing an e-mail address to the chair of the Working Group. *Id.* ¶¶ 9–10. Mr. O'Hara states that there "were no restrictions on who could attend the 802.11 Working Group's meetings [or] on who could provide an e-mail address" and that, according to his recollection, anyone who made a request to be added to the e-mail list would be added. *Id.* ¶ 10.

Mr. O'Hara states the copies of the drafts of the 802.11 standard available on the Working Group's servers were password-protected files, and that the members of the e-mail list were provided with passwords to access the documents, either as part of an announcement of a new draft or via "another way." *Id.* ¶ 11. According to Mr. O'Hara, the passwords were intended to limit distribution to "interested individuals, as opposed to the entire [I]nternet." *Id.* Mr. O'Hara also states that attending an 802.11 Working Group meeting or asking for access prior to a meeting demonstrated sufficient interest such that that person would receive the password necessary to access the drafts on the Working Group's server. *Id.*

Further, according to Mr. O'Hara, each of the 802.11 standard drafts, including Draft Standard, would have been discussed at the Working Group meetings and made available to all attendees. *Id.* ¶ 12. Mr. O'Hara also states the meetings were not limited to IEEE members but were open to the general public. *Id.*

3. Analysis of Whether Draft Standard Is a Printed Publication

We look to the underlying facts and circumstances surrounding the disclosure of a document to members of the public in order to make a legal determination as to whether a document is a printed publication. *Suffolk Techs., LLC v. AOL Inc.*, 752 F.3d 1358, 1364 (Fed. Cir. 2014); *SRI Int'l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1192 (Fed. Cir. 2008); *In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004). Public accessibility is a key question in determining whether a document is a printed publication and is determined on a case-by-case basis. *Suffolk Techs.*, 752 F.3d at 1364. To qualify as a printed publication, a document "must have been sufficiently accessible to the public interested in the art." *In re Lister*, 583 F.3d 1307, 1311 (Fed. Cir. 2009).

The O'Hara Declaration is the only extrinsic evidence that Petitioner submits in support of its position that Draft Standard is a printed publication. *See* Pet. 16–17. Petitioner asserts that Draft Standard "was completed on May 20, 1996, and was available to *anyone who wanted to view it* on May 23, 1996." Pet. 16 (citing Ex. 1225 ¶¶ 4, 5, 10, 12) (emphasis added). Petitioner argues that this availability resulted in a publication date of May

23, 1996. *Id.* Petitioner also argues Draft Standard "was available to any interested parties" no later than July 8, 1996, because it "was available to all members of the 802.11 Working Group's email list" and discussed and distributed at an 802.11 Working Group meeting held July 8–12, 1996. *Id.* at 17. Thus, Petitioner concludes that this alleged distribution and availability to any interested parties by July 8, 1996, renders Draft Standard a "printed publication" under 35 U.S.C. § 102(b). *Id.*

Notably absent, however, from the Petition and the O'Hara Declaration are any assertions or evidence in support of the availability of Draft Standard to the public interested in the art. We do not find sufficient argument or evidence to indicate that the July 8–12 meeting of the 802.11 Working Group (or any other 802.11 Working Group meeting) was advertised or otherwise announced to the public. Nor do we find sufficient argument or evidence that any individual who was interested in the art would have known about Draft Standard such that he or she would have known to request a copy or ask to be added to an email list for access to Draft Standard.

"A given reference is 'publicly accessible' upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it." *SRI Int'l*, 511 F.3d at 1194 (quoting *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006)). Although Mr. O'Hara declares that "[t]here were no restrictions on who could attend the 802.11 Working Group's meetings" (Ex. 1225 ¶ 10) and that the meetings "were open to the general public" (*id.* ¶ 12), Petitioner has not presented persuasive argument or evidence regarding how members of the potentially interested public would have been made aware of these meetings. Similarly, although Mr. O'Hara declares that an individual could provide the chair with an e-mail address to be added to the Working Group's e-mail list (*id.* ¶ 10), the Petition has not established how an individual would have known to attend a meeting or contact the chair in order to be added to the e-mail list.

Based on the evidence before us, we find that the purpose of the 802.11 Working Group's storage of drafts of the standard on a server is similar to the placement of a file on an "FTP server solely to facilitate peer review in preparation for later publication," which the U.S. Court of Appeals for the Federal Circuit found weighed against public accessibility of the file. *SRI Int'l*, 511 F.3d at 1197. In *SRI*, even though the "paper was 'posted' on an open FTP server and might have been available to anyone with FTP know-how and knowledge of the" subdirectory in which it resided, the Federal Circuit found the fact that the paper was not publicized suggested an absence of public availability. *Id.* In this case, the submitted evidence does not show that the 802.11 Working Group's server was an open server and, to the extent that it was, the evidence shows that the documents were password protected. Ex. 1225 ¶ 11.

Moreover, notwithstanding Mr. O'Hara's statement that passwords were distributed to the 802.11 Working Group e-mail list (*id.*), the fact that an interested individual needed to contact IEEE in order to obtain a password or other means of accessing Draft Standard (and needed to know who to contact in the first place) weighs against public accessibility. *Cf. Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1351 (Fed. Cir. 2008) (finding facts weighed towards public accessibility because "[t]he specifications themselves were visible to any member of the interested public without requesting them from an ETSI member"). Mr. O'Hara states that the drafts of the 802.11 standards, including Draft Standard, were (and still are) protected by passwords in order to limit distribution to "interested individuals, as opposed to the entire [I]nternet." Ex. 1225 ¶ 11. However, as previously discussed, the record does not contain persuasive evidence showing how an individual outside the 802.11 Working Group would have known of the existence of Draft Standard, the 802.11 Working Group meetings, or the 802.11 Working Group itself. Therefore, we are not persuaded that such an individual, exercising reasonable diligence, would be able to change one's status from an anonymous member of "the entire [I]nternet" to an "interested individual." Moreover, the Working Group created Draft Standard. *See* Ex. 1023 ¶ 2. Provision of a document to co-authors of the document does not constitute dissemination, or availability, of the document to the public.

Therefore, based on the evidence Petitioner provided, we conclude Petitioner has not made a sufficient showing that Draft Standard was a printed publication as of July 1996 or earlier, as alleged, i.e., that Draft Standard was available as of July 1996 or earlier to an ordinarily skilled individual, exercising reasonable diligence, who might have been interested in the subject matter of Draft Standard.

4. *Analysis of Asserted Anticipation and Obviousness Grounds Based on Draft Standard*

We do not determine whether Draft Standard anticipates or renders obvious any of the challenged claims in this case because, as discussed above, Petitioner has not made a sufficient showing that Draft Standard may be relied upon as prior art to demonstrate a reasonable likelihood that Petitioner would prevail in demonstrating the unpatentability of the challenged claims.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has not shown a reasonable likelihood that it would prevail in demonstrating that: (1) claims 26–29, 37–41, 43, and 47–52 of the '228 patent are unpatentable as anticipated or obvious in view of Draft Standard; (2) claims 26–29, 36–41, 43, and 47–52 of the '228 patent are unpatentable as obvious in view of Draft Standard and Boer; (3) claims 29, 31, 36, and 51 of the '228 patent are unpatentable as obvious in view of Draft Standard and APA; or (4) claims

29, 31, 36, and 51 of the '228 patent are unpatentable as obvious in view of Draft Standard, Boer, and APA.

IV. ORDER

For the reasons given, it is ORDERED that the Petition is denied as to all challenged claims and no trial is instituted.

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Paper 8
Entered: December 10, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., SAMSUNG ELECTRONICS AMERICA, INC., SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, and SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner,

v.

REMBRANDT WIRELESS TECHNOLOGIES, LP,
Patent Owner.

IPR2014-00895
Patent 8,457,228 B2

Before JAMESON LEE, HOWARD B. BLANKENSHIP, and JUSTIN BUSCH, *Administrative Patent Judges*.

BUSCH, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

A. Background

Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Austin Semiconductor, LLC (collectively, "Petitioner") filed a Petition requesting an *inter partes* review of claims 26–29, 31, 36–41, 43, and 47–52 (the "challenged claims") of U.S. Patent No. 8,457,228 B2 (Ex. 1501, "the '228 patent") on June 4, 2014. Paper 2 ("Pet."). Rembrandt Wireless Technologies, LP ("Patent Owner") filed a Patent Owner Preliminary Response on September 18, 2014. Paper 6 ("Prelim. Resp."). We have jurisdiction under 35 U.S.C. §§ 6(b) and 314.

An *inter partes* review may be instituted only if "the information presented in the petition . . . and any[preliminary] response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a); *see* 37 C.F.R. § 42.108(c). Upon consideration of the Petition and the Patent Owner Preliminary Response, we conclude Petitioner has established a reasonable likelihood that it would prevail with respect to the challenged claims of the '228 patent and, accordingly, we institute an *inter partes* review.

B. Related Proceedings

Petitioner indicates that the '228 patent was asserted against Petitioner in *Rembrandt Wireless Technologies, LP v. Samsung Electronics*

Co., No. 2:13-cv-00213 (E.D. Tex. 2013). Pet. 1. The same parties and patent are involved in *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00889 (filed June 4, 2014); *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00890 (filed June 4, 2014); *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00891 (filed June 4, 2014); *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00892 (filed June 4, 2014); and *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, Case IPR2014-00893 (filed June 4, 2014).

C. The '228 Patent (Ex. 1501)

The Specification of the '228 patent describes "a data communications system in which a plurality of modulation methods are used to facilitate communication among a plurality of modem types." Ex. 1501, 1:23–25. The '228 patent explains that the invention addresses a problem that conventional modem pairs can communicate successfully only when the modems use compatible modulation methods. *Id.* at 1:29–32, 1:47–49. The '228 Patent describes a multipoint architecture, in which a master "modem communicates with two or more tributary or 'trib' modems using a single modulation method," and that trib modems that are not compatible with the master's modulation method will not be able to receive communications from the master. *Id.* at 1:58–63.

Of the challenged claims, claim 26 is the only independent claim. Illustrative claim 26 is reproduced below:

> 26. A master communication device configured to communicate 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:
>
> a transceiver configured to transmit signals over a communications medium to a slave device using at least two different types of modulation methods and to receive one or more responses over the communication medium that comprise at least respective response data that is modulated according to one of the at least two different types of modulation methods, the at least two different types of modulation methods comprising a first modulation method and a second modulation method, wherein the transmitted signals comprise first transmitted signals and second transmitted signals, the first transmitted signals comprise at least two transmission sequences, the at least two transmission sequences include a first transmission sequence and a second transmission sequence, the transceiver is configured to transmit the first transmission sequence using the first modulation method, and the transceiver is configured to transmit the second transmission sequence using the second modulation method wherein:
>
> > the first transmission sequence includes information that is indicative of an impending change in modulation method from the first modulation method to the second modulation method,
> >
> > the second transmission sequence includes a payload portion that is transmitted after the first transmission sequence,
> >
> > the first transmitted signals include first address

information that is indicative of the slave device being an intended destination of the payload portion,

the second transmitted signals comprise at least a third transmission sequence and a fourth transmission sequence,

the transceiver is configured to transmit the third transmission sequence using the first modulation method,

the transceiver is configured to transmit the fourth transmission sequence using the first modulation method,

the third transmission sequence includes information indicative that the fourth transmission sequence will be transmitted using the first modulation method,

the fourth transmission sequence includes a second payload portion that is transmitted after the third transmission sequence, and

the second transmitted signals include second address information that is indicative of a specified slave device being an intended destination of the second payload portion.

D. *Asserted Grounds of Unpatentability*

Petitioner asserts the following grounds of unpatentability:

Evidence	Basis	Challenged Claims
APA[1] and Boer[2]	§ 103(a)	26–29, 36–41, 43, and 47–52

[1] Petitioner alleges that Figures 1 and 2 of the '228 patent and the accompanying description of those Figures, as well as the '228 patent's descriptions of training signals are admitted prior art. Pet. 5–7 ("APA").
[2] U.S. Patent No. 5,706,428 (filed Mar. 14, 1996, issued Jan. 6, 1998) (Ex. 1504) ("Boer").

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, the Board construes claim terms in an unexpired patent using their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012). The claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). The Office must apply the broadest reasonable meaning to the claim language, taking into account any definitions presented in the specification. *Id.* (citing *In re Bass*, 314 F.3d 575, 577 (Fed. Cir. 2002)). There is a "heavy presumption" that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). The "ordinary and customary meaning" is that which the term would have to a person of ordinary skill in the art in question. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Claim 26 recites a transceiver configured to transmit signals "using at least two different types of modulation methods" ("the at least two different types of modulation methods comprising a first modulation method and a second modulation method"). Petitioner submits that the ordinary meaning of "modulation" is "'[t]he process by which some characteristic of a carrier [wave] is varied in accordance with a modulating wave.'" Pet. 14 (citing

Ex. 1526[3] ¶¶82–88, Ex. 1520, 3 (technical dictionary)). Petitioner contends that a "first modulation method" should be interpreted as "*a process of varying characteristic(s) of a carrier wave that is different from a second modulation method,*" and a "second modulation method" should be interpreted as "*a process of varying characteristic(s) of a carrier wave that is different from a first modulation method.*" Pet. 14. Petitioner submits that different "types" of modulation methods extend to methods that merely are incompatible with one another. *Id.* at 9–10.

Patent Owner submits that "different 'types' of modulation methods" should be construed as "different families of modulation techniques." Prelim. Resp. 9. Patent Owner argues that the broadest reasonable interpretation of "types" of modulation methods does not extend to modulation methods that are known merely to be incompatible with each other, but is limited to different "families" of modulation techniques, e.g., the FSK (frequency shift keying) "family" of modulation methods and the QAM (quadrature amplitude modulation) "family" of modulation methods. *Id.* at 6–11. Patent Owner's position is thus contrary to Petitioner's position, in that Petitioner contends that different "types" of modulation methods require no more than that the first and second modulation methods be incompatible with one another. Pet. 9–10.

[3] Petitioners erroneously refer to the Declaration of Dr. David Goodman as Exhibit 1523 throughout the Petition, when Dr. Goodman's declaration was actually submitted as Exhibit 1526.

For purposes of this decision, we need not, and do not, determine the scope of the above-noted terms in controversy. On this record, we are persuaded that elements in the prior art are within the scope of the relevant terms under any reasonable construction. *See* § II.B.3, *infra.*

B. Asserted Obviousness Grounds Based on APA and Boer

1. Overview of APA

Petitioner argues that Figures 1 and 2, as well as the accompanying descriptions, are admitted prior art because the '228 patent labeled Figure 1 as prior art and provided a description of Figure 2 as "a ladder diagram illustrating the operation of the multipoint communication system of" Figure 1. Pet. 5–7 (citing Ex. 1501, 3:30–34, 3:64–4:1). The system described in Figure 2 "'uses polled multipoint communication protocol.'" Pet. 35 (quoting Ex. 1501, 4:28–30 (emphasis omitted)). Petitioner also argues that, during prosecution of one of the parent applications of the '228 patent, the applicant was required to designate Figure 2 as prior art. *Id.* at 6–7 (citing Ex. 1507).

As discussed above, the '228 Patent discloses a multipoint network architecture using a master and at least two tribs. Ex. 1501, 1:58–63. Petitioner asserts the specification of the '228 Patent uses tribs and slaves interchangeably. Pet. 5 (citing Ex. 1501, 4:28–31; Ex. 1526 ¶ 57). Petitioner further argues the '228 Patent "admits that the use of 'training signals' is in the prior art, noting that even in systems that only used a single modulation method, training signals were used for many purposes." *Id.* at 6 (quoting Ex. 1501, 4:5–19). Therefore, Petitioner asserts that a multipoint communication system using a master and multiple slaves is admitted prior art. *Id.* at 5–7, 16. Petitioner further argues that the use of training signals, data fields, and trailing signals in such a multipoint communication system also is admitted prior art. *Id.* at 5–7, 16–17.

Patent Owner argues Petitioner's allegations of admitted prior art cannot serve as a basis for instituting trial because admitted prior art is not applicable to an inventor's own work and the inventor's identification of a problem that needs to be solved cannot be separated from the invention as a whole (and, thus, cannot be admitted prior art). Prelim. Resp. 17–23. In sum, Patent Owner appears to argue that the identification of a problem leading to the '228 patent cannot be prior art.

Although the inventor of the '228 patent identified a problem for which a system with stations communicating using multiple modulation methods provided a solution, Petitioner does not rely on identification of the problem as admitted prior art. Rather, based on the record, Petitioner merely relies on the '228 patent's disclosure of a multipoint communication system using a master and multiple slaves being well-known at the time of the invention. On the record currently before us, we are not persuaded that anything in the specification of the '228 patent indicates that invention of a multipoint communications system using a master and multiple slaves is the work of the inventor of the '228 patent.

2. Overview of Boer (Ex. 1504)

Boer discloses "a method of operating a wireless local area network station adapted to transmit and receive messages at a plurality of data rates." Ex. 1504, 1:34–36. Boer's local area network stations "may be data processing devices (such as PCs) having a wireless communication capability." *Id.* at 1:13–15. Boer's mobile stations may modulate the carrier signals using differential binary phase shift keying ("DBPSK") modulation when communicating at 1 Megabit per second ("Mbps") and differential quadrature phase shift keying ("DQPSK") modulation when communicating at 2 Mbps. *Id.* at 2:16–27. Boer further discloses that other mobile stations in the system also may be capable of operating at 5 or 8 Mbps by modulating the carrier signals using pulse position modulation—DQPSK ("PPM/DQPSK"). *Id.* at 2:34–43. Boer discloses that a typical message includes various fields, including "signal," "service," "length," and "CRC" fields (collectively referred to as a header) and a "data" field. *Id.* at 3:42–54. Boer further explains that the "header [is] always transmitted at the 1 Mbps rate using DBPSK modulation [and t]he subsequent DATA field . . . 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 3:57–62.

3. Analysis Obviousness Ground Based on APA and Boer

Petitioner asserts that an ordinarily skilled artisan would have combined Boer's teachings with APA (the multipoint (master/slave) communication system) because they would have understood that the access points disclosed by Boer "often operate as a master" and integrating multi-modulation methods would have increased the flexibility and efficiency of a multipoint communication system. Pet. 19–20 (citing Ex. 1526 ¶¶ 121–122).

Patent Owner responds that Petitioner fails to explain how Boer's statement that "it may be advantageous to provide systems operating at higher data rates, which are not in accordance with the [draft IEEE 802.11] standard" would motivate one of ordinary skill to implement the teachings of Boer with APA. Prelim. Resp. 31–32. We agree with Patent Owner. Petitioner, however, submits an alternative reason for the combination that is founded on simplicity and determinacy. Pet. 21; Ex. 1526 ¶¶ 124, 127. In particular, Mr. Goodman testifies that polled multiport master/slave communications systems were well known to those of ordinary skill in the art for simplicity and determinacy, referring to Exhibit A of Exhibit 1522. Ex. 1526 ¶ 124. Petitioner submits Exhibit A of Exhibit 1522 is a November 1994 publication and Exhibit A of Exhibit1522 analyzes tradeoffs in choosing from different embedded networking protocols. Ex. 1522, 1, 4. The document states that polling is one of the more popular protocols for embedded systems "because of its simplicity and determinacy." *Id.* at 7. In that "protocol, a centrally assigned master periodically sends a polling message to the slave nodes, giving them explicit permission to transmit on the network." *Id.* The protocol "is ideal for a centralized data-acquisition system where peer-to-peer communication and global prioritization are not required." *Id.* On this record, we are persuaded that Petitioner has identified sufficient motivation from the prior art for the combination proposed.

Turning to the requirements of independent claim 26, the claim recites "at least two different types of modulation methods comprising a first modulation method and a second modulation method." Petitioner contends that Boer's DBPSK modulation corresponds to the claimed "first modulation method" either of Boer's DQPSK modulation and PPM/DQPSK modulation corresponds to the claimed "second modulation method." Pet. 23.

Patent Owner argues that neither of DQPSK and PPM/DQPSK can be considered a modulation method of a type different from DBPSK. Prelim. Resp. 37–38. For purposes of this decision, we need not determine the breadth of a different "type" of modulation method as claimed, and need not determine whether one of ordinary skill in the art would regard DQPSK to be a "type" of modulation method different from DBPSK. Boer's description of PPM/DQPSK modulation falls within the meaning of a "different type" of modulation method under any reasonable construction of the terms. *Cf.* Ex. 1526 ¶ 149 ("Regardless of which construction the panel adopts for type of modulation method both 5 Mbps and 8 Mbps PPM/DQPSK meet the 'second modulation method' claim limitation."). According to Mr. Goodman, phase is not used in PPM, unlike in DBPSK and DQPSK modulation. *Id.* ¶ 151. In PPM, the start and stop time of a transmission is varied in response to the information to be transmitted, with the time shift being indicative of data bits. *Id.*

Patent Owner submits that "varying the start and stop time of a transmission of a carrier wave does not result in varying any characteristic of the carrier wave." Prelim. Resp. 36. Patent Owner does not explain, however, how the "start and stop time" of a transmission of a carrier wave cannot be considered one or more "characteristic[s]" of the carrier wave. We acknowledge there is *some* support in Boer for Patent Owner's position, in Boer's reference to PPM as "PPM type coding." *Id.*; Ex. 1504, 4:45–48. The fact remains, however, that the term "modulation" is part of the descriptive name for PPM — pulse position *modulation.* Patent Owner has not explained sufficiently, given the other evidence of record, why pulse position *modulation* cannot be considered a type of modulation method, even if the method might be applied for "coding" in Boer.

Dependent claim 51 depends from claim 26 and further recites "wherein said master communication device is configured to transmit a trailing signal to complete the master communication transmission," which Petitioner asserts is taught by Boer's disclosure of a cyclic redundancy check (CRC) that is transmitted at the end of each DATA field. Pet. 55. Petitioner argues that "[a] person having ordinary skill in the art would know that a CRC field would be at the end of a transmission, since it is used to check for errors in the transmission." *Id.* Petitioner asserts that "CRCs are commonly considered to be 'trailer portions' in the prior art." *Id.* (citing Ex. 1524[4], 20:37–54, Fig. 11; Ex. 1525, 3:55–61, 4:1–4, Fig. 2). Petitioner also argues

[4] Petitioner also separately cites to Ex. 1525, 20:49–51 when intending to cite to Ex. 1524, 20:49–51).

APA teaches trailing signals that were known to ensure to reliably end transmission sessions, avoiding delays and disruption. *Id.* at 56; Ex. 1501, 3:64–4:25. Therefore, Petitioner asserts that it would have been obvious to combine APA and Boer, "to the extent [a] trailing signals are not present already by virtue of the CRC field," resulting in the matter recited in claim 51. Pet. 56.

Patent Owner argues that CRC bits "do not necessarily signify the end of message transmission," as indicated by the fact that CRC bits are included at the end of the HEADER filed in the messages described in Boer, which is not the end of a message transmission because the DATA field is transmitted after those CRC bits. Prelim. Resp. 39. Patent Owner also contests Petitioner's assertions that CRCs were known in the prior art to be trailer portions. *Id.* In particular, Patent Owner points out that the references identified by Petitioner merely indicate that CRCs may be a part of trailer portions, and CRCs neither are co-extensive with trailer portions nor indicate the completion of a message. *Id.* at 39–40. Finally, Patent Owner asserts that Boer's use of a LENGTH field, indicating he number of bits present in the DATA field, obviates the need for a trailer signal because Boer can determine when transmission of the message is complete using data it already has. *Id.* at 41.

We agree with Patent Owner that Petitioner has not shown sufficiently that Boer's CRC bits teach transmitting a trailing signal, as recited in claim 51, or that it would have been obvious to incorporate the trailing signals of

APA into Boer because Boer uses the LENGTH field to determine the end of a transmission. However, Petitioner's proposed combination involves modifying APA with certain elements taken from Boer. For example, Petitioner suggests incorporating Boer's multiple modulation methods into APA (Pet. 23–25) and, as part of the modification, suggests that messages may need to "include at least the SIGNAL, SERVICE, and DATA fields of Boer, thereby allowing the response to include data modulated using any of the data rates of Boer." Pet. 26. Therefore, Petitioner's proposed combination already includes the trailing signals described in APA.

We have reviewed the information presented in the Petition and Patent Owner's Preliminary Response. On the evidence submitted, we are persuaded both that a multipoint communications system is admitted prior art in the '228 patent and that a person of ordinary skill in the art would have combined Boer and such a multipoint communications system. Moreover, Petitioner has made a sufficient threshold showing that each of the limitations recited in independent claim 26 and dependent claims 27–29, 36–41, 43, and 47–52 are taught by a combination of APA and Boer. Therefore, on this record, Petitioner has demonstrated a reasonable likelihood that claims 26–29, 36–41, 43, and 47–52 would have been obvious in view of the combination of APA and Boer.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has shown a reasonable likelihood that it would prevail in demonstrating that claims 26–

29, 31, 36–41, 43, and 47–52 of the '228 patent are unpatentable as obvious in view of APA and Boer.

The Board has not made a final determination on the patentability of any challenged claim.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that an *inter partes* review is instituted as to claims 26–29, 31, 36–41, 43, and 47–52 of the '228 patent on the obviousness ground based on APA and Boer;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), inter partes review of the '228 patent is instituted with trial commencing on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the institution of the trial; and

FURTHER ORDERED that the trial is limited to the grounds identified immediately above and no other ground is authorized for the '580 patent claims.

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Paper 20
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., SAMSUNG ELECTRONICS AMERICA, INC., SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, and SAMSUNG AUSTIN SEMICONDUCTOR, LLC,

Petitioner,

v.

REMBRANDT WIRELESS TECHNOLOGIES, LP,
Patent Owner.

Case IPR2015-00555
Patent 8,457,228 B2

Before JAMESON LEE, HOWARD B. BLANKENSHIP, and JUSTIN BUSCH, *Administrative Patent Judges.*

BLANKENSHIP, *Administrative Patent Judge.*

DECISION
Denial of Institution of *Inter Partes* Review
37 C.F.R. § 42.108

Denial of Motion for Joinder
37 C.F.R. § 42.122

I. BACKGROUND

Samsung Electronics Co. Ltd., Samsung Electronics America, Inc., Samsung Telecommunications America, LLC, and Samsung Austin Semiconductor, LLC (collectively, "Petitioner") filed a petition requesting *inter partes* review of claim 21 of U.S. Patent No. 8,457,228 B2 ("the '228 patent") (Ex. 1301) under 35 U.S.C. §§ 311–319. *See* Paper 1 (Petition, or "Pet."). With the Petition, Petitioner filed a motion for joinder (Paper 3, "Mot. Join."), seeking to join with *Samsung Electronics Co.* v. *Rembrandt Wireless Technologies, LP,* Case IPR2014-00892 ("IPR '892"). Patent Owner Rembrandt Wireless Technologies, LP filed an opposition to the motion for joinder (Paper 9, "Opp.") and a preliminary response (*see* Paper 19, "Prelim. Resp."). Petitioner filed a reply to Patent Owner's opposition to the motion for joinder. Paper 10 ("Reply"). We have jurisdiction under 35 U.S.C. § 314.

For the reasons that follow, we deny the motion for joinder and do not institute an *inter partes* review as to the challenged claim of the '228 patent.

A. Related Proceedings

According to Petitioner, the '228 patent is involved in the lawsuit *Rembrandt Wireless Technologies, LP v. Samsung Electronics Co*, No. 2:13-cv-00213 (E.D. Tex. 2013). Pet. 1. The '228 patent also has been challenged in the following cases: *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00889; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP* , IPR2014-00890; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP* , IPR2014-00891; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP* , IPR2014-00892; *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00893; and *Samsung Electronics Co. v. Rembrandt Wireless Technologies, LP*, IPR2014-00895.

B. The '228 Patent

The '228 Patent issued from an application filed August 4, 2011, which claimed priority under 35 U.S.C. § 120 through a chain of intervening applications to an application filed December 4, 1998, and which further claimed priority under 35 U.S.C. § 119 to a provisional application filed December 5, 1997.

The technical field of the patent relates to data communications and modulators/demodulators (modems), and in particular to a data communications system in which a plurality of modems use different types of modulation in a network. Ex. 1301, col. 1, ll. 21–25; col. 1, l. 58 – col. 2, l. 23.

C. Challenged Claim

Claim 21, the sole claim that is challenged, is reproduced below along with base claim 1.

> 1. 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:
>
> a master transceiver configured to transmit a first message over a communication medium from the master

transceiver to the one or more slave transceivers, 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

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

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

second message address information that is indicative of the single slave transceiver being an intended destination of the fourth information; and

wherein the second modulation method results in a higher data rate than the first modulation method.

> 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.

D. Prior Art

Boer	US 5,706,428	Jan. 6, 1998	(Ex. 1304)
Siwiak	US 5,537,398	July 16, 1996	(Ex. 1324)

E. Asserted Ground of Unpatentability

Petitioner asserts the following ground of unpatentability as to claim 21 (Pet. 3): obviousness under 35 U.S.C. § 103(a) over Admitted Prior Art ("APA")[1], Boer, and Siwiak.

II. ANALYSIS

A. Background

In IPR '892, Petitioner asserted that claims 1–3, 5, and 10–21 of the '228 patent were unpatentable over APA and Boer. IPR '892, Paper 2 at 20–70. We did not institute an *inter partes* review of claim 21 based on that ground in IPR '892. We explained as follows:

> Claim 21, which depends directly from claim 1, recites that the first information that is included in the first message "comprises the first message address data." Petitioner maps the claimed "first information" as corresponding to header 218 of message 200 depicted in Figure 4 of Boer. Petitioner admits that Boer does not teach placing its address information in header 218 (Ex. 1304, Fig. 4). Boer teaches that DATA field

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[1] Petitioner asserts that Patent Owner made admissions in the '228 patent disclosure and in the prosecution history of a parent application regarding prior art. Pet. 12–14.

> 214 (Fig. 4), which is deemed to correspond to the "second information," contains a destination address.
>
> Petitioner submits that the '228 patent "admits" that placing address information in the training sequence of a message is prior art. Petitioner does not indicate how such an admission might be relevant to claim 21. The '228 patent teaches that in a multipoint system the address of the trib with which the master is establishing communication is also transmitted during the training interval. The "training signals" that are exchanged during the training interval, however, are "sequences of signals of particular subsets of all signals that can be communicated via the agreed upon common modulation method." Petitioner does not identify any teaching of placing address data in the message header.
>
> Petitioner concludes that "[a] person having ordinary skill in the art would have been motivated to combine the APA with Boer due to the similarities between the packet structures and because where the address fields are placed is a matter of design choice." Petitioner has not identified a teaching in the applied prior art of placing address data in the header of a message. Nor has Petitioner provided evidence sufficient to demonstrate that the ordinary artisan would have considered placing the address data as claimed to be a mere matter of "design choice." Petitioner's conclusory allegation of "design choice" does not provide the required "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007).

IPR '892, slip op. at 13–15 (PTAB Dec. 10, 2014) (Paper 8) (citations to record omitted).

We do not reach the merits of Petitioner's additional reasoning in the instant Petition as to why Petitioner asserts that the subject matter of claim 21 would have been obvious over the combination of APA, Boer, and Siwiak. Instead, for the reasons discussed below, we exercise our discretion under 35 U.S.C. § 325(d) to deny institution of *inter partes* review in this proceeding.

B. Principles of Law

A petitioner is not entitled to multiple challenges against a patent:

> In determining whether to institute or order a proceeding under . . . chapter 31, the Director may take into account whether, and reject the petition or request because, the same or substantially the same prior art or arguments previously were presented to the Office.

35 U.S.C. § 325(d) (titled: "MULTIPLE PROCEEDINGS"). Further, in construing our authority to institute *inter partes* review under 37 C.F.R. § 42.108, we are mindful of the guidance provided in § 42.1(b): "[37 C.F.R. § 42] shall be construed to secure the just, speedy, and inexpensive resolution of every proceeding."

C. Discussion

The difference between what Petitioner presents in this proceeding and what Petitioner presented in IPR '892 with respect to claim 21 of the '228 patent is that Petitioner now offers Siwiak as support for the asserted obviousness of placing address data in a message header as taught by Boer. Pet. 24–57; Mot. Join. 5–6. Petitioner, however, presents no argument or evidence that Siwiak was not known or available to it at the time of filing IPR '892. In fact, Petitioner applied Siwiak in proposed grounds of rejection against claim 21 of the '228 patent in another petition filed the same day as that in the IPR '892 proceeding. *See* IPR2014-00889, Paper 2 at 58–60. On this record, we exercise our discretion and "reject the petition" because "the