UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN

CHRIMAR SYSTEMS, INC., Plaintiff, v. POWERDSINE, LIMITED, Defendant,	Case No. 01-74081 Hon. AVERN COHN
CHRIMAR SYSTEMS, INC., Plaintiff, v. POWERDSINE CORP., Defendant,	Case No. 06-13937 Hon. AVERN COHN
CHRIMAR SYSTEMS, INC., Plaintiff, v. D-LINK SYSTEMS, INC., Defendant.	

EXPERT REPORT OF RICH SEIFERT
RE: INVALIDITY OF CLAIMS 14, 16, AND 17 OF U.S. PATENT 5,406,260

ASSIGNMENT

1. I am an expert in the field of computer networks, and have been retained by Orrick, Herrington & Sutcliffe representing PowerDsine, Ltd. and D-Link Systems, Inc. (collectively "Defendants") to provide expert testimony in the above-captioned case.

2. I am being paid $350 per hour for the time spent by me in preparing this report. I have personal knowledge of the facts set forth in this report and, if called to testify as a witness, could and would competently testify to them under oath.

BACKGROUND/QUALIFICATIONS

3. I am currently the President of Networks & Communications Consulting in Los Gatos, California. I received a Bachelor of Engineering (Electrical Engineering) degree from the City College of New York in 1976. I received a Master of Science (Electrical Engineering) degree in 1979 from the Worcester Polytechnic Institute, a Master of Business Administration degree in 1984 from Clark University, and a Juris Doctor degree in 2006 from Santa Clara University. I have over 40 years of experience in computer and communications technology, and have worked for the past 30 years on the architecture and design of computer networks and networking products. My curriculum vitae is attached hereto as Exhibit A, which includes lists of publications I have authored and legal cases in which I have been involved.

DOCUMENTS AND MATERIALS REFERENCED

4. The following documents are cited in this report:

A. U.S. Patent No. 5,406,260, "Network Security System for Detecting Removal of Electronic Equipment" (issued Apr. 11, 1995) [hereinafter "the '260 Patent"], attached hereto as Exhibit B.

B. Memorandum on Claim Construction, Case Nos. 01-74081 and 06-13937, (July 30, 2008) [hereinafter Markman Memorandum], attached hereto as Exhibit C.

C. Institute for Electrical and Electronics Engineers, IEEE Std. 802.3i-1990, Twisted-Pair Medium Attachment (MAU) and Baseband Medium, Type 10BASE-T [hereinafter IEEE 802.3i], relevant portions attached hereto as Exhibit D.

D. International Business Machines Corporation, IBM Cabling System Technical Specification, 2nd. ed. (Oct. 1987), attached hereto as Exhibit E.

E. Tyco Electronics, 10/100BASE-Tx Impedance Matching Adapter Datasheet, *available at* http://ampnetconnect.com/product_groups.asp?path=0,1687,1747,1801&grp_id=1895, attached hereto as Exhibit F.

F. Institute for Electrical and Electronics Engineers, IEEE Std. 802.3-1998, Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications [hereinafter IEEE 802.3].

G. International Standards Organization, Fibre Distributed Data Interface (FDDI) Part 1: Token Ring Physical Layer Protocol (PHY), ISO 9314-1 (1989) [hereinafter ISO 9314-1].

H. International Standards Organization, Fibre Distributed Data Interface (FDDI) Part 2: Token Ring Media Access Control (MAC), ISO 9314-2 (1989) [hereinafter ISO 9314-2].

I. International Standards Organization, Fibre Distributed Data Interface (FDDI) Part 3: Physical Layer Medium Dependent (PMD), ISO 9314-3 (1990) [hereinafter ISO 9314-3].

J. U.S. Patent No. 202,495, "Improvement in Telephone Call-Signal Apparatus" (issued Apr. 16, 1878), attached hereto as Exhibit G.

K. "An Interoperable Solution for FDDI Signaling over Shielded Twisted Pair", submission to the ANSI X3T9.5 Task Force, Version 1.0 (May 21, 1991) [hereinafter IOS], attached hereto as Exhibit H.

L. Gershon, Eugen, "FDDI on Copper with AMD PHY Components" (Advanced Micro Devices, 1991) [hereinafter "AMD Application Note"], attached hereto as Exhibit I.

M. SynOptics Communications, Inc., "LattisNet System 3000 Ethernet Connectivity Guide", attached hereto as Exhibit J.

N. SynOptics Communications, Drawing No. 920-002-F0-C, "Unshielded Twisted Pair Transceiver" (Jan. 17, 1990), attached hereto as Exhibit K.

O. SynOptics Communications, Drawing No. 920-017-B0-C, "Model 505chip UTP Transceiver" (Jun. 27, 1988), attached hereto as Exhibit L.

P. SynOptics Communications, Drawing No. 920-030-B0-C, attached hereto as Exhibit M.

Q. SynOptics Communications, "LattisNet Product Overview" (Apr. 1990), attached hereto as Exhibit N.

R. Institute for Electrical and Electronics Engineers (IEEE), "Standard Dictionary of Electrical and Electronics Terms", IEEE Standard 100 (1996), relevant excerpts attached as Exhibit O.

S. U.S. Patent No. 5,365,515, "Network Monitor and Test Apparatus" (issued Nov. 15, 1994) [hereinafter Graham], attached hereto as Exhibit P.

T. U.S. Patent No. 5,144,544, "Power Feed System for Telephone and/or Information Technology Terminals" (issued Sep. 1, 1992) [hereinafter Jenneve], attached hereto as Exhibit Q.

U. Network World, "Proposed groups eye alternate FDDI media" (Nov. 12, 1990), attached hereto as Exhibit R.

V. Network World, "DEC to show new FDDI, E-mail wares" (Jan. 28, 1991), attached hereto as Exhibit S.

W. Network World, "Spec details use of FDDI over shielded twisted pair" (May 27, 1991), attached hereto as Exhibit T.

X. Network World, "Firms integrate efforts" (May 27, 1991), attached hereto as Exhibit U.

Y. Communications Week, "FDDI Spec Consortium" (May 27, 1991), attached hereto as Exhibit V.

Z. Network World, "SynOptics touts FDDI products' affordability" (Sep. 9, 1991, attached hereto as Exhibit W.

AA. Declaration of Clyde Boenke, *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, Civil Action No. 01-71113 (E.D. Mich.) (Mar. 21, 2002), attached hereto as Exhibit X.

BB. Rebuttal Report of Dr. Yang Zhao, *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, Civil Action No. 01-71113 (E.D. Mich.) (Nov. 5, 2002), attached hereto as Exhibit Y.

CC. U.S. Patent No. 5,164,960, "Medium Attachment Unit for Use with Twisted Pair Local Area Network" (issued Nov. 17, 1992), attached hereto as Exhibit Z.

DD. Electronic Industries Association, Commercial Building Telecommunications Wiring Standard EIA/TIA 568 (July 1991) [hereinafter EIA 568], attached hereto as Exhibit AA.

EE. U.S. Patent No. 4,551,671, "Terminal Disconnect and Media Wire Fault Detect Mechanism" (issued Nov. 5, 1985), attached hereto as Exhibit BB.

FF. Deposition of Thomas Stammely (Aug. 11, 2009), attached hereto as Exhibit CC.

GG. U.S. Patent No. 4,733,389, "Drop Cable for a Local Area Network" (issued Mar. 22, 1988) [hereinafter Puvogel], attached hereto as Exhibit DD.

HH. Digital Equipment Corp., Intel Corp., Xerox Corp., "The Ethernet: A Local Area Network; Data Link Layer and Physical Layer Specifications", Version 2.0, November, 1982, attached hereto as Exhibit EE.

II. Digital Equipment Corp., "H4000 Ethernet Transceiver Technical Manual", Document EK-H4000-TM-PRE, November, 1982, attached hereto as Exhibit FF.

JJ. *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, 318 F.Supp.2d 476 (E.D. Mich. 2004).

KK. Huurdeman, Anton A., The Worldwide History of Telecommunications (IEEE Press, 2003), relevant excerpts attached as Exhibit GG.

LL. Noll, A. Michael, Introduction to Telephones & Telephone Systems (Artech House, 2nd ed. 1991), relevant excerpts attached as Exhibit HH.

MM. Declaration of Mark Miller in Support of Cisco's Motion for Summary Judgment of Invalidity of Claim 1 of U.S. Patent No. 5,406,260, *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, Civil Action No. 01-71113 (E.D. Mich.) (Nov. 22, 2002), attached hereto as Exhibit II.

NN. Deposition Transcript of Mark Miller, *Chrimar Systems, Inc. v. PowerDsine, Ltd., et. al.* (Dec. 18, 2008), attached hereto as Exhibit JJ.

OO. Declaration of Ronald V. Schmidt, *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, Civil Action No. 01-71113 (E.D. Mich.) (Nov. 22, 2002), attached hereto as Exhibit KK.

PP. Deposition Transcript of Ronald V. Schmidt, Ph.D., *Chrimar Systems, Inc. v. PowerDsine, Ltd., et. al.* (Mar. 4, 2009), attached hereto as Exhibit LL.

QQ. Carlo, James T., *et. al.*, Understanding Token Ring Protocols and Standards (Artech House, 1998), relevant portions attached hereto as Exhibit MM.

RR. Supplemental Declaration of Alan Truman, *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, Civil Action No. 01-71113 (E.D. Mich.) (Dec. 12, 2002), attached hereto as Exhibit NN.

SS. Deposition transcript of Alan Truman (Dec. 15, 2008), attached hereto as Exhibit OO.

5. My previous Expert Report of Rich Seifert re: Validity of Claim 1 of U.S. Patent No. 5,406,260, *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, Civil Action No. 01-71113 (E.D. Mich.) (Oct. 15, 2002) [hereinafter Seifert Report], including all exhibits and citations therein, is hereby incorporated by reference into the current Expert Report. Similarly, all declarations in support of Cisco's motions regarding invalidity and non-infringement of Claim 1 of the '260 patent are hereby incorporated by reference.

PERSON OF ORDINARY SKILL

6. The '260 patent relates to a theft-prevention system implemented through the wiring of a local area network (LAN) communications link. I have been informed and understand that the following criteria are useful in determining the level of ordinary skill in the art: (a) the type of problems encountered in the art; (b) prior art solutions to those problems; (c) rapidity with which innovations are made; (d) sophistication of the technology in the art; and (e) the educational level of active workers in the field.

7. A person of ordinary skill in the art of the '260 patent would have had a B.S. or M.S. degree in electrical engineering or computer science, or the equivalent, and at least five years experience in the design of network communications products. Specifically, such a person would be familiar with, *inter alia*, the design and operation of electrical and electronic circuits, the characteristics and uses of electrical and electronic components, instruments for detecting and measuring direct and alternating electrical currents and voltages, data communications methods and equipment, digital and analog signaling, computer networks, and computer equipment. Such a person would be familiar with the relevant LAN standards (and standards under development) at the time of the filing of the '260 patent, including both the IEEE 802.3 and FDDI (ISO 9314) standards, as well as many of the popular components used to implement commercial LAN products.

8. During the *Markman* phase of the prior *Chrimar Systems, Inc. v. Cisco Systems, Inc.* litigation (hereinafter "the Cisco litigation"), Chrimar's expert, Mr. Clyde Boenke, proposed a somewhat different and less restrictive definition of one of ordinary skill in the art of the '260 patent, namely:

> [A] person having a basic knowledge of electrical engineering concepts and computer networks. Generally, though not necessarily, such a person would have a bachelors degree in electrical engineering and be generally familiar with computer networks, such as local area networks (LANs), including Ethernet and Token Ring networks, as described in the IEEE 802.3 and IEEE 802.5 standards.

Exhibit X at 3.

9. Later in that same litigation, Chrimar's other expert, Dr. Yang Zhao, stated in his rebuttal expert report that a person a person of ordinary skill has:

> a basic knowledge of electrical engineering concepts and computer networks. Generally, though not necessarily, such a person would have a bachelors degree in electrical engineering and be generally familiar with computer networks, such as local area networks (LANs), including at least "star" networks, such as Ethernet networks.

Exhibit Y at 10.

10. While I consider Chrimar's proffered definitions to be overly lax, the opinions expressed in this declaration would be applicable to one of ordinary skill in the art under all of the above definitions.

THE '260 PATENT

11. Claims 14, 16, and 17 of the '260 patent are being asserted against the Defendants in this case.

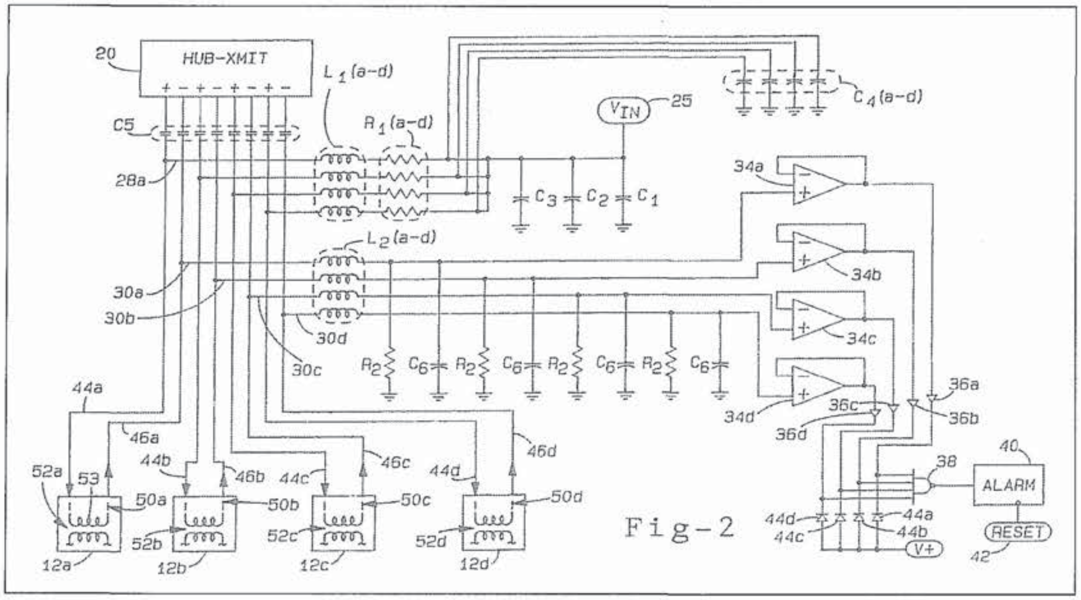
Claim 14

12. Claim 14 of the '260 patent recites:

> A method for detecting unauthorized disconnection of remotely located electronic equipment which has existing data communication lines connecting the equipment to a network, said method comprising:
>
> selecting respective pairs of the existing data communication lines for associated pieces of monitored equipment so that each of said selected pairs of data communication lines forms a current loop through the associated pieces of monitored equipment, wherein said respective pairs of data communication lines are associated with different ones of the associated pieces of equipment;
>
> supplying a low DC current signal to each current loop so as to achieve continuous current flow through each current loop while each of said associated pieces of equipment is physically connected to said network via the data communication lines; and
>
> sensing said DC current signal in each of said current loops so as to detect a change in current flow indicative of disconnection of one of said pieces of associated equipment.

'260 Patent at 8:17-38.

13. The method for detecting unauthorized disconnection of electronic equipment recited in Claim 14 is best described with reference to Figure 2 from the '260 patent which is reproduced as Figure A below:



Id. at Figure 2. **Figure A**

14. The Court has previously analyzed this circuit using a modified version of this figure, reproduced below as Figure A-1, displaying the circuit path for one of the pieces of remote electronic equipment in isolation. *Chrimar Systems, Inc. v. Cisco Systems, Inc.*, 318 F.Supp.2d 476, 484 (E.D. Mich. 2004).

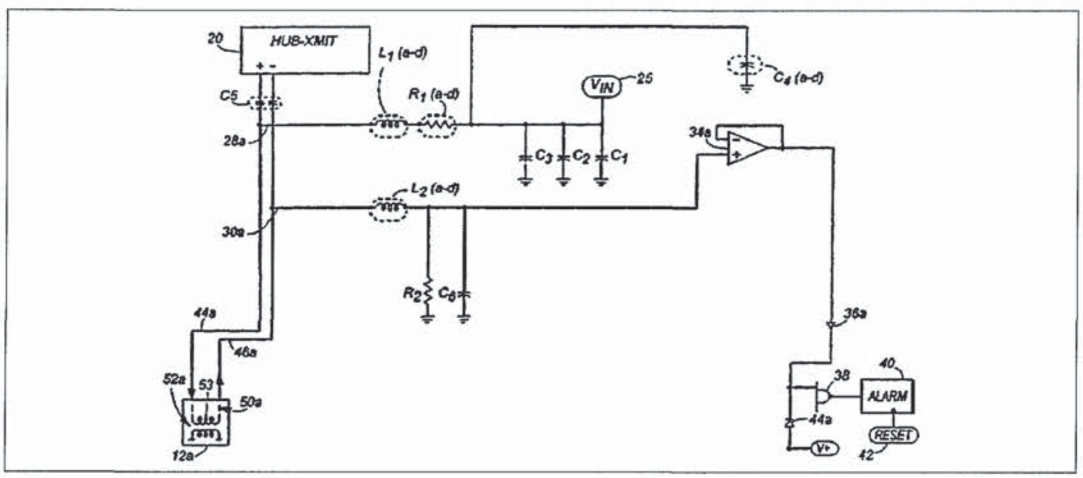


Figure A-1

15. The claimed method operates over existing data communication lines (elements 44a and 46a in Figure A-1) that connect remote electronic equipment (element 12a) to a network. In addition to the data communication signals normally present in those lines, the method additionally supplies a low DC current that continuously flows through a given pair of lines whenever the remote equipment is physically connected to the network. The current flow is continuously sensed; disconnection of the remote equipment is detected by noting a change in the supplied low DC current indicative of such disconnection.

16. Each piece of remote equipment must be individually monitored for disconnection. The claimed method provides for such individual monitoring by selecting pairs of data communication lines such that each selected pair is associated with a different piece of remote electronic equipment. A current loop (carrying the low DC current) is formed through the monitored equipment itself, along with its associated pair of data communication lines.

17. The data communication lines of the '260 patent comprise the connections between the remote electronic equipment and a network hub (element 20). *See id.* at 3:22-30.

18. The supplied low DC current signal of the '260 patent must be sufficiently low so that it does not interfere with or adversely affect the operation of the monitored electronic equipment or the computer network. *Id.* at 4:36–40.

19. In the '260 patent, separate current loops (element 50a) are associated with different pieces of monitored equipment. *See id.* at 5:65–68. Each current loop comprises a single twisted-pair communication line into which the low DC current is supplied. *See id.* at 3:31-42. This supplied DC current is superimposed onto the data communication

signals normally present in those lines, hence the need to keep the DC current level low. *See* '260 Patent at 4:15-27.

20. These separate current loops flow through internal circuitry within each associated piece of monitored equipment. *See id.* at 6:3-8. In the preferred embodiment, the current loop flows through coupling transformers present within the monitored equipment (element 52a). *See id.* at 3:31-45.

21. In the preferred embodiment of the '260 patent, a resistor R_2 is placed between the return side of the wire pair comprising each current loop and the reference point of the power supply ("ground"). *See id.* at 4:49-52, Figure 2. If the associated equipment is properly connected to the data communication lines, the DC current supplied to the loop will produce a 5 volt DC voltage across resistor R_2. If the associated equipment is disconnected from the data communication lines, the DC voltage across R_2 will change from 5 volts DC to zero. The voltage change across the resistor is detected by the combination of an operational amplifier (element 34a) and Schmitt trigger (element 36a), and fed to the input of a NAND gate (element 38). *See id.* at 4:61-5:3, Figure 2.

<u>Claim 16</u>

22. Claim 16 recites, "The method as defined in claim 14 further comprising the step of: selectively tapping into each of said selected pairs of existing data communication lines at a location which is remote from said associated pieces of equipment." *Id.* at 8:39-42. This claim therefore limits Claim 14 to situations where the electrical connection from the device implementing the recited method for detecting unauthorized disconnection (from Claim 14) to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of

equipment, is made outside the associated equipment itself. Markman Memorandum at 11.

23. In the preferred embodiment, "the network security system is preferably located in a secure area separate from [the pieces of associated equipment]." '260 Patent at 5:46-48. "This further ensures against unwanted tampering with the network security system." *Id.* at 5:48-50. "The network security system is substantially enclosed within a housing which is connected between [the] data communication link and hub." *Id.* at 5:35-38, Figure 3. Within this housing, the power supply feed together with the return lead for the low DC current signal (comprising the electrical connection to each piece of associated equipment) "are easily tapped into selected pairs of existing transmit wires ... found in [the] data communication link." *Id.* at 5:61-65, Figure 3, Figure 2.

<u>Claim 17</u>

24. Claim 17 recites, "The method as defined in claim 14 wherein said existing data communication lines comprise 10BaseT [sic] wiring."[1] *Id.* at 8:49-51. Thus, this claim narrows the application of Claim 14 to systems that use 10BASE-T wiring for the data communications lines.

25. The Court has construed 10BASE-T wiring as "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes Category 3 or better wiring." Exhibit C to Markman Memorandum at 7. A complete discussion of the application of this construction to the prior art is provided in the section titled "Asserted Claims and Claim Construction," *infra*.

[1] The IEEE standard never uses the term "10BaseT," but rather refer always to "10BASE-T." IEEE 802.3i, *passim*. In this declaration, the terms "10BaseT," "10Base-T," and "10BASE-T" are used interchangeably, due to the numerous spelling variations of these terms in the '260 patent and previous submissions to the Court.

BACKGROUND OF THE PRIOR ART

A. Differential vs. Phantom Current Loops

26. There are two fundamentally different methods of injecting DC currents into communications lines. A *differential current loop* superimposes the DC current on top of the normal data communications signal in a single wire pair. This is the method disclosed in the '260 patent. A simplified schematic diagram of the differential current loop method used in that patent is depicted in Figure B:

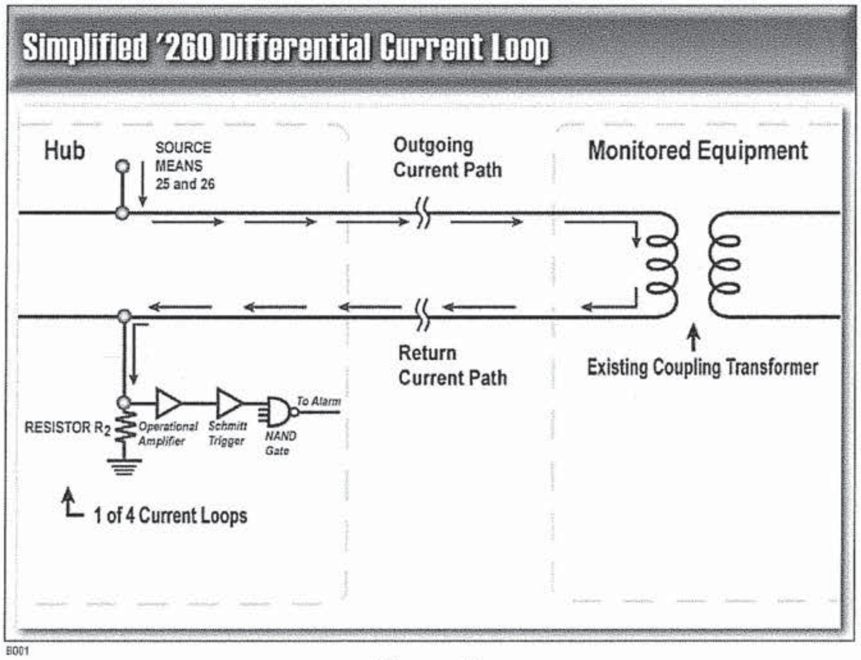


Figure B

27. Alternatively, a *phantom current loop* uses two wire pairs. Each wire pair is used for normal data communications, in the differential mode. A third "phantom" circuit carries the DC current between the two pairs (i.e., in the common mode). A simplified schematic diagram of a phantom current loop is depicted Figure C, below.

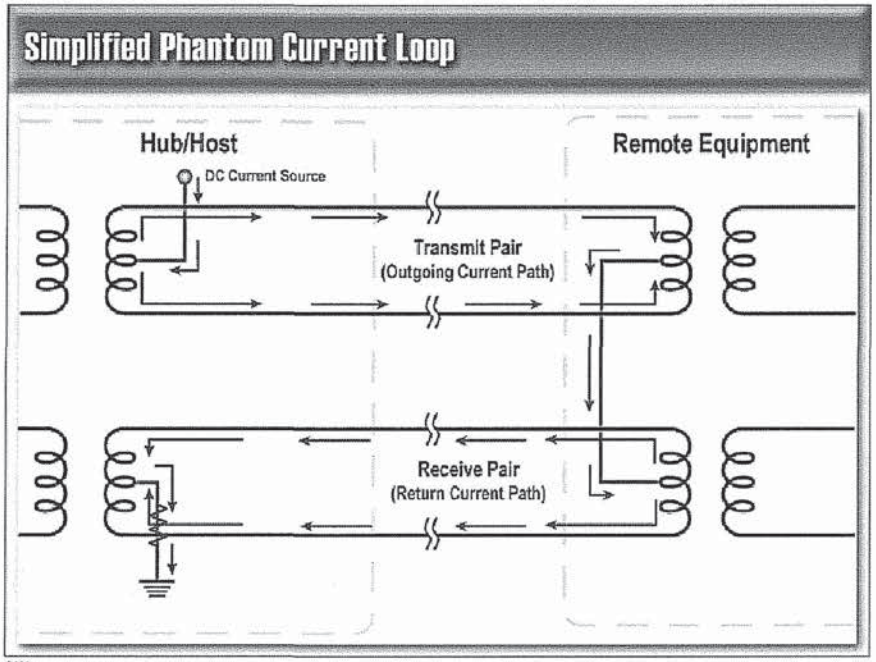


Figure C

28. There are a number of important distinctions between the differential current loop and the phantom current loop:

- A phantom current loop requires two pairs rather than the single pair of the differential current loop.

- In a differential current loop, the DC current flows in opposite directions on each wire in the pair. Within any given pair of the phantom current loop, the DC current flows in the *same direction on both wires of the pair*. As a result, the DC current in a phantom circuit does not ordinarily interfere with the normal data signals present within each wire pair. This is in direct contrast with the differential current loop, where the DC current can interfere with the normal data communications signal. As a result, the level of DC current can be much greater in a phantom current loop; there is no particular need to maintain a low

DC current, since the DC current does not interfere with the data. In many cases, the phantom DC current level is greater than the normal data signals, often by an order of magnitude or more.

- Similarly, in a differential current loop the DC current flows in a single direction through the transformer located within the remote, monitored equipment. In a phantom current loop, the transformers are *center-tapped*, i.e., in addition to the two terminals used for passing data signals through the transformer, a third terminal is provided that is precisely in the center of the coil of wire comprising the transformer winding. The phantom DC current is injected and removed via this center tap. As a result, the DC current flows in equal amounts and opposite directions in every transformer winding. This cancels out the adverse effects of DC current through the transformer.

29. These significant differences make phantom loops much more attractive than differential loops for passing DC currents through communications lines. When using a phantom loop, the designer does not need to be overly concerned about the DC current interfering with the data signals, nor is there a problem with signal distortion due to DC current flowing through the line transformers. Thus, the vast majority of systems that send DC signals across communications pairs use phantom current loops.

30. The only negative aspects to the use of phantom circuits are: (1) they require two communications pairs instead of one; and (2) they require center-tapped transformers at both ends of the link. The first issue is rarely a problem; many common communications systems employ multiple communications pairs, including LANs, wide-area data networks (WANs), and others. Furthermore, while center-tapped transformers may be slightly more expensive than noncenter-tapped transformers, the

tiny cost difference is more than offset by the convenience afforded in the transmission of DC signals.[2]

31. The real problem with requiring center-tapped transformers arises when one is trying to add a DC signal to an existing communications system that does not already employ such center-tapped transformers. It would be prohibitively expensive to retrofit a large installed base of existing equipment with new, center-tapped transformers just for the purpose of injecting a DC signal. In this situation, it may be preferable to use a differential current loop for the DC signal, instead of a phantom current loop. While less attractive from a technical standpoint, it offers the potential for compatibility with the installed base of equipment to be monitored. The '260 patent recognizes this situation, noting that the invention is "adapted to be easily implemented in conjunction with an existing computer network without the need for substantial modifications." '260 Patent at 3:6-9. Thus, the need for compatibility with the existing base of 10BASE-T networks that did not use center-tapped transformers drove the inventors to choose a differential current loop for the '260 patent.

32. Once the differential current loop method is chosen, then the designer must necessarily deal with the problems of interference with the data signals, and distortion due to the line transformers, as discussed earlier. This is precisely the approach taken in the '260 patent, and accounts for the care required in selecting and maintaining a low DC current. If a phantom current loop were used instead, there would be no need to use a particularly low DC current signal. However, if the designers of the '260 patent had chosen a phantom current loop approach, their system would not

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[2] Besides providing the ability to use a phantom DC current loop, center-tapped transformers offer additional advantages that outweigh their slightly increased cost, including increased immunity to common-mode noise and reduction of electromagnetic interference. Thus, many communications systems employ center-tapped transformers even when there is no need to pass DC current along with the data communications signals.

have been compatible with the huge installed base of 10BASE–T equipment that did not use center-tapped transformers.

33. Phantom circuits have been widely used in telephony systems since the late 1800s. *See* Exhibit GG at 316-17. More recently, phantom current loops have been incorporated into numerous data communications systems, including digital telephones, Ethernet, and FDDI Local Area Networks as discussed in the prior art analysis, *infra*.

B. Combining Communications Signals (AC) and Power (DC) on a Common Wiring System

34. There is almost always an engineering motivation to combine multiple functions into a single circuit (known as "multiplexing") so as to reduce overall system cost. This is particularly true in the case of communications systems that operate over installed wiring, since the cost of the wiring (especially the cost to *install* the wire) can often be a dominant factor.

35. Furthermore, it is relatively easy to separate DC signals from AC signals when both are present simultaneously on the same communications link. In one common method, a transformer (e.g., element 52a in Figure A-1, *supra*) allows AC communications signals to pass while restricting any DC currents to the communications wiring itself. In another method, capacitors may be used to block the flow of DC current without similarly restricting AC communications signals. *See* Exhibit BB at 4:45-49; Exhibit HH at 17; Figures O, V, *infra*.

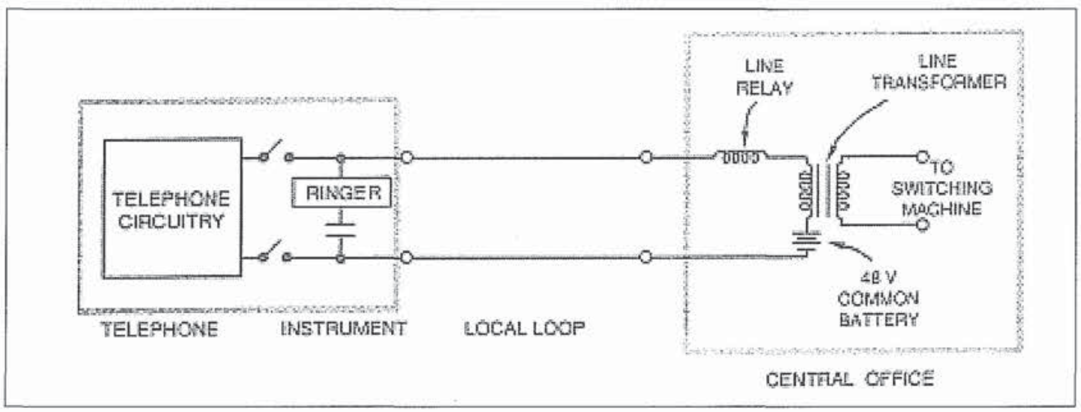
36. The high cost of installed wiring combined with the relative ease of combining AC and DC signals on the same wires (and separating them at the other end) leads almost inevitably to the idea of providing power for a remote communications device over the same wire pair(s) as are used for the communications signals. This natural combination eliminates the need either to install separate wires for remote

power, or to provide local power at each remote device location. As can be seen in the extensive prior art (some of which is discussed in greater depth, *infra*), numerous schemes for providing power for remote communications devices over the same wiring as is used to carry the signaling information were deployed before the filing of the '260 patent.

37. One example of combining multiple functions onto a single communications wiring system goes back more than 130 years. In 1878, Thomas Watson[3] was issued a patent for an improvement in telephone call signaling. Exhibit G. Prior to this invention, "difficulty has been experienced in calling the attention of the operator at a distant station, and it has been found advisable and necessary to combine with such telephones instruments specially adapted for the purpose of signaling." *Id.* at 1. That is, while the telephone could convey sound information, it could not indicate to the person at the other end that a call was coming in. Thus, Mr. Watson invented the telephone ringer. "The object of the present invention is to produce an audible signal at a distant station of sufficient loudness to attract the attention of the operator at a considerable distance from the instrument." *Id.* Of course, he could have simply run an additional pair of wires for the ring signal, but this would have added significantly to the expense. Instead, he "combine[d] with a telephonic circuit a magneto-electric inductor of ordinary or suitable construction." *Id.* He also "combine[d] with the telephones at the receiving end … a bell or other contrivance specially adapted for calling attention." *Id.* Thus, Mr. Watson multiplexed the ring circuit onto the same wire pair as was used for the telephone audio signal. Engineers both before and after Mr. Watson have similarly achieved system cost efficiencies using this same multiplexing idea, applied in a variety of different ways on numerous systems; it is an ancient concept.

[3] This is the same person who was famously summoned by Alexander Graham Bell in the first telephone call. ("Mr. Watson, come here. I want to see you.")

38. Even the most basic telephone operation from the 19th century required the superimposition of DC power onto the same wires as were used to communicate information, much like the '260 patent. A telephone, as the name implies, allows voice information to be communicated over long distances using interconnecting wires (communications lines). In addition to carrying the voice information, however, "[a] telephone is powered by *direct current* (DC)." Exhibit HH at 17 (emphasis in original). "In 1894, a common battery at the central exchange was used … to power all the telephone instruments connected to the exchange." *Id.* As depicted in Figure V below, "The circuitry in a telephone instrument that operates the instrument draws direct current from the local loop …. A transformer connects the local loop to the switching equipment so that only the AC speech signal continues. The ringer in the telephone instrument is always connected across the line, and a capacitor prevents direct current from flowing through it." *Id.*



Id. **Figure V**

39. Thus, more than 125 years ago, engineers had already superimposed DC current onto a communications line such that it did not interfere with or adversely affect the operation of the remote equipment or the communications network. Indeed, that age-old system employs the very same differential current loop method disclosed

in the '260 patent. To this day, telephone systems are designed to provide DC operating power over the communications lines. Among other benefits, this system allows telephones to continue operating even if there is a local power failure.

ASSERTED CLAIMS AND CLAIM CONSTRUCTION

40. Claims 14, 16, and 17 of the '260 Patent have been asserted against the Defendants in this case. While the Court has ruled on the construction of all disputed terms in those claims, there may be some disagreement between the Plaintiff and the Defendants on the whether the cited prior art meets the Court's stated criteria.

A. Selecting Respective Pairs

41. In Claim 14, the Court has construed "selecting respective pairs" to mean "choosing a pair of data communications lines for each associated piece of monitored equipment that is different than any of the pairs associated with other pieces of monitored equipment." Markman Memorandum at 7. Under one interpretation, "choosing a pair of data communications lines" means that only a *single pair* of wires can be used to form the current loop; under an alternative interpretation, *multiple pairs* of wires can be used to form a single current loop and still fall within the scope of the claim. The first option creates a differential current loop; the latter results in a phantom current loop, as discussed earlier.

42. Regardless of the interpretation chosen, it is my opinion that Claim 14 is invalid in light of the prior art. In the analysis of the prior art presented later in this report, each piece of cited art supplies a low DC current, whereby a change in current flow is sensed that is indicative of disconnection of pieces of remote monitored equipment. The "Network Monitor and Test Apparatus" of U.S. Patent No. 5,365,515 (Graham) and the "Ethernet Transceiver Cable Interface" each disclose the use of a

single wire pair and a differential current loop; the "Terminal Disconnect and Media Wire Fault Detect Mechanism" of U.S. Patent No. 4,551,671 discloses the use of two differential current loops operating through two wire pairs. The remaining cited prior art discloses the use of multiple wire pairs and phantom current loops that achieve the same result.

B. 10BASE-T Wiring

43. In Claim 17, the Court has construed 10BASE-T wiring as "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes Category 3 or better wiring." Markman Memorandum at 4, Exhibit C to Markman Memorandum at 7. The requirements of the IEEE 802.3i standard with respect to the wiring are generally set forth in Section 14.4 of that document. IEEE 802.3i at 49-51.

44. It is important to note that the IEEE standard does not contain any requirements for the *wire alone*, but rather specifies only the characteristics of the complete twisted-pair link between two 10BASE-T devices, which may include "one or more twisted pairs joined serially with appropriate connection devices, for example, patch fields and wall plates." *Id*. at 23. 10BASE-T wiring can comprise a variety of different types of twisted pair cable, connection devices, and other components, as long as the complete link segment used to attach a pair of communicating devices meets the specification for the system as a whole.

45. "The medium for 10BASE-T is twisted-pair wiring." *Id* at 49. Two twisted pairs are used between a pair of devices; bidirectional communication is achieved by having each pair carry data in only one direction between the devices (i.e., two simplex link segment). *See id*. at 24.

46. A twisted pair comprises "[t]wo continuous insulated conductors helically twisted around one another." *Id.* at 23. Thus, the mechanical requirement for IEEE 802.3i wiring is that it comprises four insulated conductors, arranged as two helically twisted pairs. The IEEE standard provides no other mechanical specifications for the wiring. Any size, length, wire gauge, or shielding may be used as long as the complete link segment between a pair of communicating devices meets the overall electrical specifications, including limitations on insertion loss, impedance, jitter, etc. *Id.* at 49-51.

47. For example, due to stricter electromagnetic interference (EMI) regulations, it was common practice in Europe to operate 10BASE-T over 120 Ω screened (i.e., moderately shielded) twisted pair. In addition, Token Ring systems worldwide employed 150 Ω shielded twisted pair as the wiring medium. *See generally*, Exhibit E. It was common practice to operate 10BASE-T over that 150 Ω shielded twisted pair in installations that needed to support both Ethernet and Token Ring attachments.

48. To accommodate such uses, various products were (and still are) available to perform the impedance transformation necessary to allow the 120/150 Ω cables to be used in a link segment that presents a 100 Ω impedance to the attached devices, as required by the IEEE 802.3i standard. Exhibit F; IEEE 802.3i at 49. Thus, both shielded and unshielded twisted pair, with a characteristic impedance of 100 Ω, 120 Ω, or 150 Ω can be part of a wiring system that meets the electrical and mechanical requirements of IEEE 802.3i, thereby meeting the Court's construction of "10BASE-T wiring".

49. Due to the widespread deployment of 10BASE-T equipment operating over such a variety of cables, the standard itself was amended to expressly include operation over 120/150 Ω twisted pair (shielded or unshielded). IEEE 802.3 at Annex D.5, D.6.

WRITTEN DESCRIPTION AND ENABLEMENT

50. I have been informed and understand that a patent specification must contain a "written description" of the invention, which must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, the applicant was in possession of the invention claimed. To the extent that Claims 14, 16, and 17 are somehow construed to read on the use of a phantom circuit configuration to deliver DC operating power to a remote device, it is my opinion that the specification of the '260 patent fails to provide a written description of that invention.

51. The '260 patent "is particularly adapted to be used in conjunction with a computer network having an *existing communication wiring scheme* coupling each piece of equipment to the network, and which may be used to form the current loops." '260 Patent at 2:41-45 (emphasis added). Since the inventors were trying to add a security feature to an already-installed system (e.g., 10BASE-T Ethernet), they recognized that their invention must "be easily implemented in conjunction with an existing computer network without the need for substantial modifications …." *Id.* at 3:6-9.

52. As discussed *supra*, the security system of the '260 patent operates by superimposing a low DC current onto the data communications lines connecting each piece of remote monitored equipment. "The low current power signal flows through an internal path provided by existing circuitry in [each] personal computer." *Id.* at 4:27-29. In particular, "[t]he low current power signal flows through … existing circuitry such as isolation transformers within each of the remote personal computers … being monitored." *Id.* at 6:3-8. That is, the inventors had to make their invention work with the *existing* isolation transformers located within the devices that connected to the network. They were not in a position to make substantial modifications to that equipment, such as changing the transformers.

53. At the time of the filing of the '260 patent, 10BASE-T equipment ordinarily used isolation transformers that lacked a center-tap.[4] Exhibit Z at Figure 4. As such, it was not possible to use the phantom circuit technique to pass the low DC current through the remote monitored equipment. It was precisely this restriction that motivated the inventors to use a differential current loop. Of course, once a differential loop is chosen, the DC current must be set quite low so that it does not interfere with or adversely affect the operation of the monitored electronic equipment or the computer network.

54. No other scenario appears to have been envisioned or contemplated by the inventors. Nowhere does the specification describe, or even infer that the inventors possessed the idea that a much higher level of current (in particular, a level sufficient to provide operating power for the remote device) could be delivered using the well-known phantom circuit approach and still be within the scope of their invention. The crux of their invention was the superimposition of a low DC current onto a differential current loop in a network comprising existing communications lines and equipment with existing internal circuitry, and ensuring that the superimposed low DC current did not interfere with or adversely affect the operation of the monitored electronic equipment or the computer network. Indeed, it would hardly be inventive to perform that function using a phantom current loop technique since, as discussed *supra*, DC current of any practical level in a phantom current loop would *inherently* not interfere with the equipment or the network. Therefore, to the extent that the asserted claims are construed to include the use of a phantom current loop to deliver DC operating power to a remote device, it is my opinion that the specification of the '260 patent lacks a written description of such an invention.

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[4] Even on equipment that may have used a center-tapped transformer, the center tap was not accessible from outside the equipment, and could not have been used by the system disclosed in the '260 patent.

55. I have also been informed and understand that in addition to providing a written description of a claimed invention, the specification must also convey the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to make and use same.

56. Every diagram, discussion, and explanation in the '260 patent specification is adapted towards delivering a low DC current through a differential current loop. Nowhere do the inventors teach how to employ the claimed invention on a phantom current loop, or how to supply operating power for a remote device over the communications lines. There is no description of a phantom circuit, no explanation or depiction of the use of center-tapped transformers (as would be required for a phantom current loop), and no discussion of the much higher levels of DC current which can be used on a phantom current loop. If the asserted claims of the '260 patent are somehow construed to include the use of a phantom circuit configuration to deliver DC operating power to a remote device, it is my opinion that the specification of the '260 patent fails to enable one skilled in the art to make and use such an invention.

ANALYSIS OF THE PRIOR ART

A. Anticipatory Prior Art

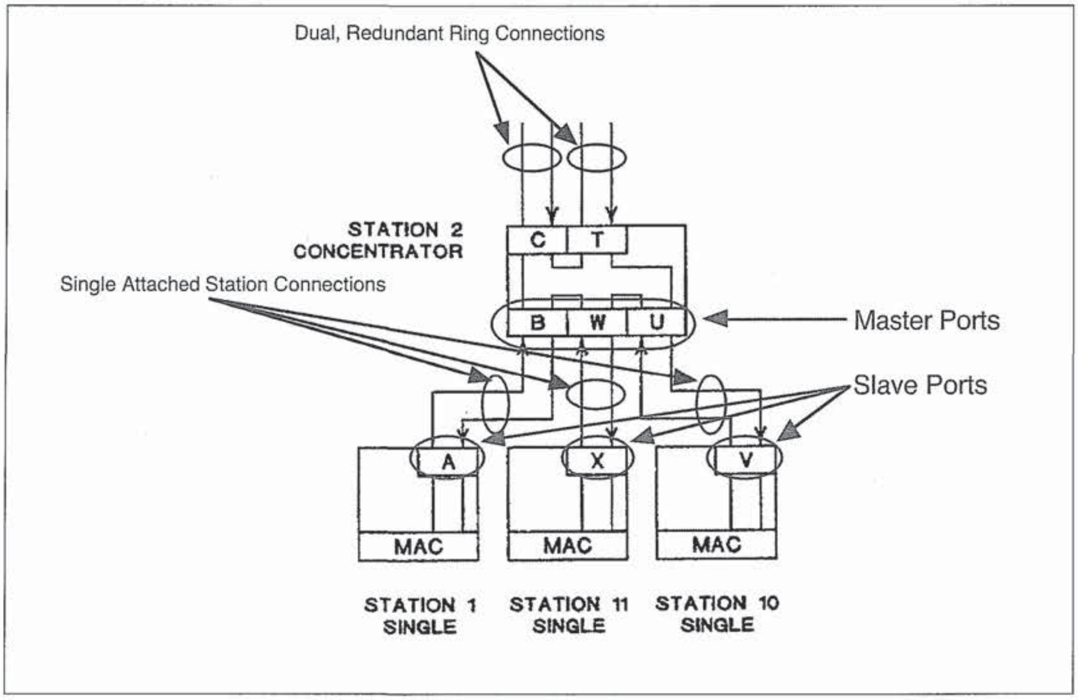
57. The sections below analyze a number of prior art systems that, in my opinion, anticipate Claims 14, 16, and 17 of the '260 patent. It should be noted that the art cited herein were selected from a much larger set of available art, some of which was previously analyzed to show invalidity of Claim 1 in the Cisco litigation. In the interest of brevity, I have focused here on just a few, highly relevant systems.

(1) FDDI Over Shielded Twisted Pair

58. During the late 1980s, technology was developed for a LAN that could operate at 100 million bits-per-second (100 Mb/s) over optical fiber media, known as the Fiber Distributed Data Interface (FDDI). By 1990, international standards were already approved for such a system. ISO 9314-1; ISO 9314-2; ISO 9314-3. Numerous manufacturers provided equipment conforming to these standards, and many such networks were already in commercial use.

59. As originally designed, the FDDI topology comprised a dual redundant ring of optical fibers. This configuration provided both high performance and reliability: (1) The use of optical fiber media provided nearly error-free communication at very high data rates; and (2) Because of the inherent redundancy of the dual ring, failure of any single component in the network could not cause a catastrophic network outage. Such performance and reliability came at a high price; optical fiber components were considerably more expensive than their twisted pair (copper) counterparts, and dual redundancy required replication of many such optical (and electronic) components.

60. In some application environments (particularly desktop computing), cost is often a more important consideration than either performance or reliability. The developers of the original standard recognized this tradeoff, and provided a means for non-critical devices (desktop computers) to connect to an FDDI network in a more cost-effective manner. Rather than requiring dual-redundant optical fiber connections (Dual Attached Stations, or DAS), the standard supported non-redundant Single Attached Stations (SAS) that could connect to the FDDI network through an FDDI Concentrator. Figure D below depicts an FDDI network configuration that includes a concentrator and associated SAS devices.



See ISO 9314-3 at Figure 2. **Figure D**

61. The FDDI concentrator comprised multiple *Master Ports* (M ports), that connected through a single pair of optical fibers to a *Slave Port* (S Port) on a SAS (e.g., a desktop computer). The concentrator itself connected to the main FDDI network through a standard, dual-redundant connection as shown. In this way, a single concentrator allowed numerous low cost SAS devices to connect to a dual-redundant FDDI network without having to incorporate dual redundancy into every desktop computer.

62. In an effort to further reduce the cost of connecting desktop devices, a number of companies were working on methods to use lower-cost, shielded twisted pair cables as the communications medium, instead of optical fibers. Toward this end, in May 1991 a proposal was put forth to the ANSI X3T9.5 Working Group, which was developing a standard for the use of FDDI equipment over shielded twisted pair cable. The proposal was jointly presented by five companies: Advanced Micro Devices

(AMD), Chipcom Corp., Digital Equipment Corp. (DEC), Motorola, Inc., and SynOptics Communications. The proposal is embodied in the so-called "Greenbook" document: "An Interoperable Solution for FDDI Signaling over Shielded Twisted Pair", Version 1.0, May 21, 1991 (hereinafter IOS). Exhibit H. Soon after the submission of this proposal, AMD published an Application Note written by Eugen Gershon, titled, "FDDI on Copper with AMD PHY Components". Exhibit I. This latter document shows the incorporation of the IOS proposal in a practical system implementation and provides full circuit schematics and preliminary test results of that implementation. Figure E below depicts an FDDI concentrator implemented with shielded twisted pair cable (copper) in accordance with IOS.

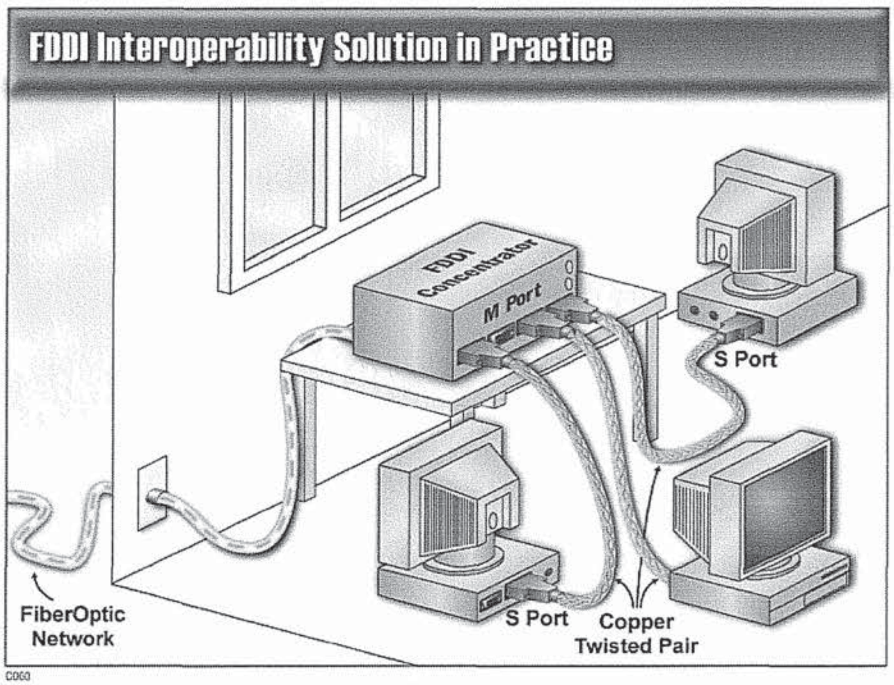


Figure E

63. IOS was designed to "[m]eet the topology and distance requirements of the building wiring standard, EIA 568." IOS at 3. Under that standard, the wiring (called "horizontal wiring" because it runs mostly horizontal on a single floor of a

building) from the telecommunications closet (i.e., the typical location for hub devices such as an FDDI wiring concentrator) to the individual work areas was arranged in a star topology. EIA 568 at 9-10. "Each work area telecommunications outlet [is] connected to a telecommunications closet." *Id*. By design, therefore, IOS provided for each attached device to connect to its associated concentrator through a dedicated twisted pair link, arranged in a physical star.

64. The building wiring standard specified "four types of cables that are recognized in the horizontal wiring system," including "two-pair 150-ohm shielded twisted pair (STP) cables." *Id*. This is precisely the cabling environment in which IOS and the AMD Application note were designed to operate.

65. The IOS signaling proposal and the AMD Application Note each included a *Cable Detect Function*, and both documents gave examples of circuitry suitable for implementing this function. The Cable Detect Function detected whether a remote piece of electronic equipment (typically a workstation) and its associated communications cable were properly connected to the FDDI concentrator (hub). The port on the hub associated with that particular communications line would be enabled only if there was a properly connected cable and device at the other end. The circuitry shown in the IOS and the AMD Application Note injected a DC current signal onto the communications line for this purpose, using the classic phantom current loop technique. A simplified schematic diagram of the Cable Detect circuitry is shown in Figure F, below. A later section in this report, "Correlation of Simplified Schematic Diagrams," shows how the simplified schematic below was derived from the original circuitry. The simplified schematic more clearly shows the relationship of this prior art to the asserted claims of the '260 patent.

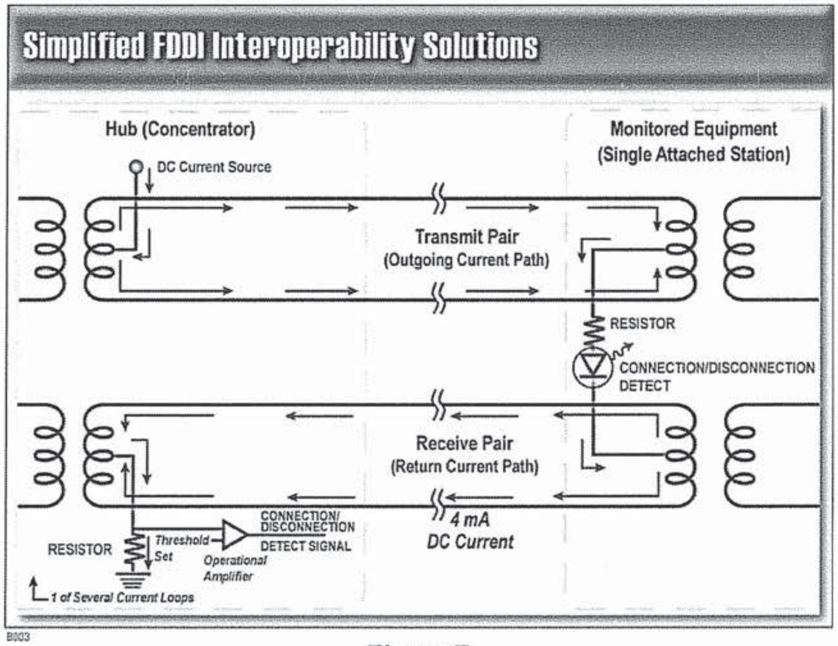


Figure F

66. The hub device on the left is an FDDI concentrator (discussed above), which comprises multiple Master Ports (M-ports, of which only one is shown). Each M-port connects through two shielded twisted pair cables to a single Slave Port (S-port) contained within an associated piece of monitored electronic equipment (typically, a desktop workstation). Since the cable between a remote device and the concentrator is dedicated to that remote device, the data communications lines used to connect each associated piece of monitored equipment is different than any of the pairs associated with other pieces of monitored equipment.

67. Each current loop comprises two pairs of communications lines, specifically two shielded twisted pair cables connected in a phantom loop arrangement as shown. A round-trip path for the current loop is provided from the concentrator through the selected pair of shielded twisted-pair communications lines and each associated piece of monitored equipment (e.g., desktop computer).

68. The concentrator contains a 5 VDC power supply (shown as "DC Current Source" in the figure) which supplies the low DC current. The low DC current in each loop is determined by the 5 VDC power supply, together with the two resistors and the light-emitting diode (LED), and is nominally 4 mA. By virtue of the phantom current loop technique, the DC current does not interfere with, or adversely affect the operation of the monitored electronic equipment or the computer network. The low DC current flows continuously through the loop whenever the associated piece of monitored equipment is physically connected to the network concentrator through the data communications lines.

69. The FDDI IOS provides two mechanisms for sensing changes in the low DC current that indicate disconnection of the associated equipment. At the concentrator end, a resistor monitors the voltage generated by the low DC current through the current loop. This voltage is used as the input to an operational amplifier, whose output signal is used to control the operation of the instant Master Port; the port is disabled unless the Cable Detect circuitry indicates a properly connected device and cable. This detector means is structurally equivalent to that disclosed in the preferred embodiment of the '260 patent; both the FDDI IOS and the '260 patent use a current sense resistor whose output voltage is applied to an operational amplifier that compares that voltage to a preset threshold and provides a signal indicative of disconnection of the associated monitored equipment. If the cable and associated monitored equipment are properly connected, there will be a high voltage across the resistor; upon disconnection of the remote monitored equipment, the voltage across the resistor will drop to zero. The operational amplifier informs the concentrator logic of the disconnection so that it can disable the associated concentrator port.

70. A second detector is also provided at the other end of the communications line, i.e., at the remote monitored equipment. The low DC current passes through a resistor and is used to illuminate an LED. If the cable and monitored equipment are

properly connected, the low DC current will generate a voltage (approximately 2 VDC) across the LED and it will be illuminated; upon disconnection, the voltage across the LED will drop to zero and it will extinguish. A user at the workstation can thus tell from the LED whether or not the equipment is properly connected to both the communications line and the FDDI concentrator.

71. Thus, the Cable Detect Function disclosed in the IOS proposal and the AMD Application Note includes all of the limitations of Claim 14 of the '260 patent: (1) Respective pairs of communications lines are selected so that each pair forms a current loop through a different associated piece of monitored equipment; (2) A low DC current signal is supplied that achieves continuous current flow through each current loop while the associated pieces of equipment are physically connected to the network via the data communications lines; and (3) The DC current signal is sensed to detect a change in current flow indicative of disconnection of the associated piece of equipment.

72. As discussed *supra*, Claim 16 limits Claim 14 to situations where the *selective tapping*, i.e., the electrical connection from the device implementing the recited method for detecting unauthorized disconnection to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of equipment, is made outside the associated equipment itself. In both IOS and the AMD Application Note, the low DC current is injected and sensed in the FDDI concentrator. The electrical connection to the pairs of communications lines in each current loop from both the source of the low DC current and the sense resistor used to detect disconnection of each piece of associated equipment is made in the concentrator, which is remote from those pieces of associated equipment. Thus, both IOS and the AMD Application Note include all of the limitations of Claim 16 of the '260 patent.

73. Claim 17 limits Claim 14 to situations where the data communications lines comprise 10BASE-T wiring, which is "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes

Category 3 or better wiring." Exhibit C to Markman Memorandum at 7. "The medium [for IOS] is the 150 Ω shielded twisted pair cable as used for IEEE 802.5 Token Ring, i.e. Types 1 and 2." IOS at 10; *see also* AMD Application Note at 1.

74. The specified attenuation of the shielded twisted pair cable used in IOS and the AMD Application note is 12 dB (maximum) at 82.5 MHz, which far exceeds the IEEE 802.3i requirement of 11.5 dB (maximum) at 10 MHz.[5] IOS at 10; IEEE 802.3i at 49. The specified near-end crosstalk of this cable is -42 dB (maximum), which far exceeds the IEEE 802.3i requirement of -26 dB (maximum).[6] IOS at 10; IEEE 802.3i at 50.

75. The IEEE 802.3i standard does not exclude shielded twisted pair wiring. As discussed *supra*, the shielded twisted pair cable specified for IOS and the AMD Application Note has significantly better electrical characteristics for attenuation, crosstalk, etc. than either Category 3 unshielded twisted pair or the IEEE 802.3i specification. Thus, the cable disclosed in IOS and the AMD Application Note qualifies as 10BASE-T wiring under the Court's construction, and those prior art disclosures therefore include all of the limitations of Claim 17 of the '260 patent.

76. As I stated in my Expert Report from the previous Cisco litigation, products that performed the Cable Detect Function as disclosed in IOS and the AMD Application Note were demonstrated to be operational on or about May 21, 1991. *See* Seifert Report at ¶¶ 46, 131. Also stated in that report, and confirmed from personal discussions with Peter Tarrant (among others) at the time, SynOptics shipped to customers their Model 3902 Host Module on or before July 1991, and that Host Module incorporated the IOS Cable Detect Function. *Id.* The SynOptics 3902 Host Modules were

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[5] Cable attenuation varies with the square-root of frequency. A cable with an attenuation of 12 dB at 82.5 MHz will have approximately $\frac{12}{\sqrt{\frac{82.5}{10}}} = 4.17$ dB of attenuation at 10 MHz, which easily meets the IEEE 802.3i requirement. For attenuation, lower numbers indicate better performance.

[6] The -26 db figure represents the most stringent requirement of IEEE 802.3, applicable to cables with few pairs in close proximity. As with attenuation, lower numbers (more negative) indicate better performance.

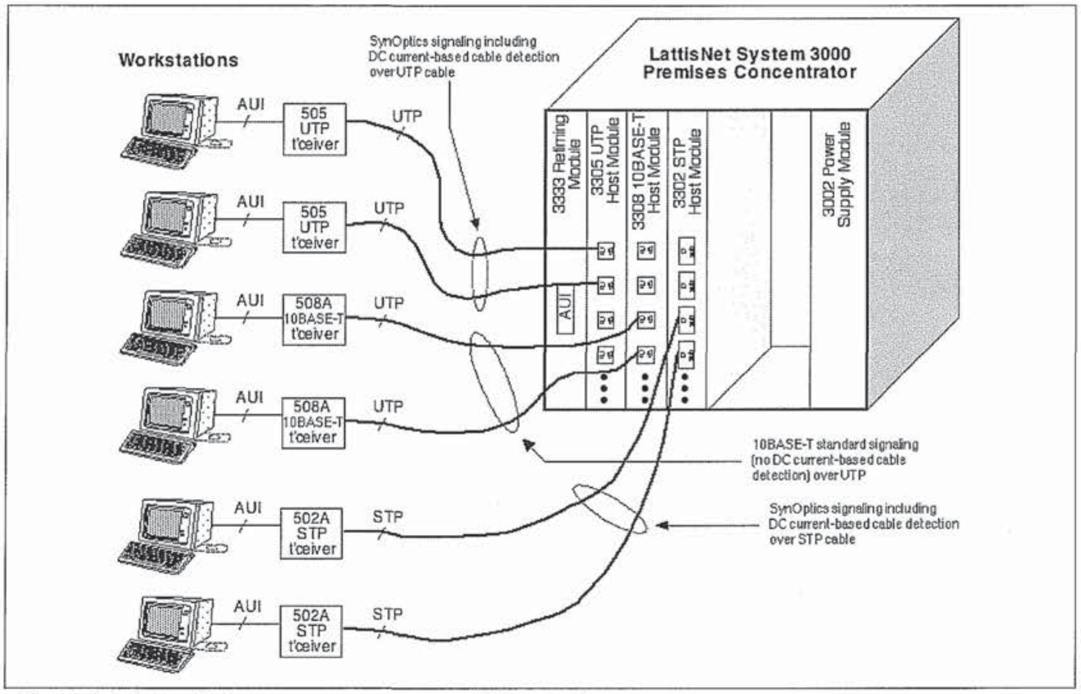
in fact sold and operational by October 1991. *See e.g.*, Exhibit NN at ¶¶ 1-3; Exhibit OO at 49-50, 59-61. As discussed *supra*, when a device (e.g., the SynOptics 3902 Host Module) that implements the Cable Detect Function disclosed in IOS or the AMD Application Note operates as designed, it performs and practices each and every limitation of claims 14, 16, and 17 of the '260 patent.

(2) SynOptics LattisNet

77. Both before and after the popular acceptance of 10BASE-T (IEEE 802.3i), SynOptics Communications developed and sold a proprietary line of products under the trade name "LattisNet" that provided for Ethernet operation over both shielded and unshielded twisted pair cable comprising two twisted wire pairs (hereinafter, STP and UTP cable, respectively). LattisNet is described in the "LattisNet System 3000 Ethernet Connectivity Guide", and in the LattisNet Hub and Unshielded Twisted Pair Transceiver schematics diagrams. *See* Exhibits J–M.

78. Figure G below depicts a valid, practical LattisNet configuration.[7]

[7] Exhibit J (the LattisNet System 3000 Ethernet Connectivity Guide) provides guidance for the design and configuration of LattisNet networks. Each element in Figure G, and their use in the manner depicted, is fully taught in that guide.



See Exhibit J at 3-1. **Figure G**

79. The depicted configuration includes, *et alia*:

- A LattisNet 3000 Premises Concentrator. Used to house and interconnect the various modules in the system configuration; *See* Exhibit J at 2-4.

- A LattisNet 3305 UTP Host Module. Used to connect to user workstations equipped with a Model 505 transceiver. The 3305 module communicates with the Model 505 transceivers using SynOptics LattisNet signaling, which includes a DC-current-based cable detection scheme (discussed *infra*). Physical connection is made via UTP cable and RJ-45 connectors. *See id.* at 2-8.

- Two user workstations connected to the Model 3305 UTP Host Module via Model 505 transceivers. *See id.* at 2-3.

- A LattisNet 3302 STP Host Module. Used to connect to user workstations equipped with a Model 502A transceiver. The 3302 module communicates with the Model 502A transceivers using SynOptics LattisNet signaling, which includes a DC-current-based cable detection scheme (discussed *infra*). Physical connection is made via STP cable and D-subminiature connectors. *See* Exhibit 7 at 2-8.

- Two user workstations connected to the Model 3302 STP Host Module via Model 502A transceivers. *See id*. at 2-3.

80. For the same reasons put forth for the FDDI IOS (and using similar circuit techniques), the LattisNet system incorporated a method to detect whether a remote piece of electronic equipment (typically, a LattisNet transceiver) and its associated communications cable were properly connected to a LattisNet hub. The port on the hub associated with that particular communications line would be enabled only if there was a properly connected cable and transceiver at the other end. The circuitry disclosed in Exhibits J-M injected a low DC current signal onto the communications line for this purpose, using the classic phantom current loop technique. A simplified schematic diagram of this circuitry is shown below. A later section in this report, "Correlation of Simplified Schematic Diagrams," shows how the simplified schematic below was derived from the original circuitry. The simplified schematic more clearly shows the relationship of this prior art to the asserted claims of the '260 patent.

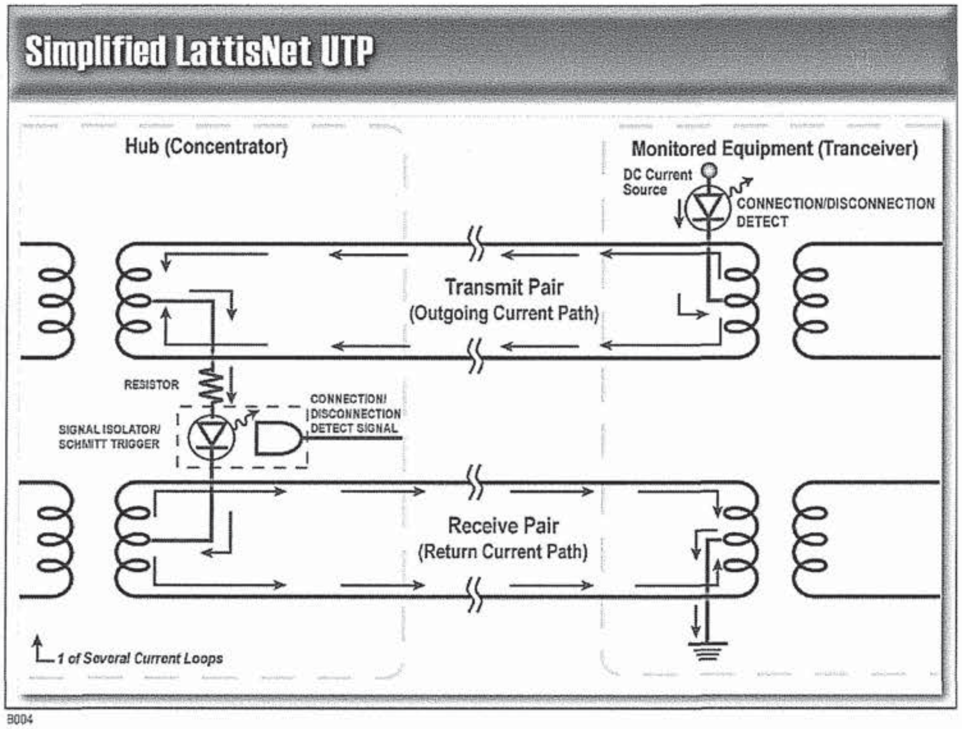


Figure H

81. The hub device on the left is a SynOptics LattisNet System 3000 family concentrator, which comprises multiple ports (of which only one is shown). Each port connects through a cable comprising two shielded or unshielded twisted pairs to an associated piece of monitored electronic equipment (a LattisNet transceiver). Since the twisted pair cable between a remote transceiver and the LattisNet concentrator is dedicated to that transceiver, the data communications lines used to connect each associated piece of monitored equipment is different than any of the pairs associated with other pieces of monitored equipment.

82. Each current loop comprises two pairs of communications lines, specifically two twisted pair cables connected in a phantom loop arrangement as shown. A round-trip path for the current loop is provided from the concentrator

through the selected pair of UTP or STP communications lines and each associated piece of monitored equipment (i.e., a transceiver).

83. Each transceiver contains a 7.5 VDC power supply (shown as "DC Current Source" in the figure) which provides the low DC current. The low DC current in each loop is determined by the 7.5 VDC power supply, together with the LED, optical signal isolator, and resistor, and is nominally 20 mA. By virtue of the phantom current loop technique, the DC current does not interfere with, or adversely affect the operation of the monitored electronic equipment or the computer network. The low DC current flows continuously through the loop whenever the associated piece of monitored equipment is physically connected to the LattisNet concentrator through the data communications lines.

84. In the preferred embodiment of the '260 patent, the source of the low DC current is located in the device implementing the network security system. *See* '260 Patent at 3:53-60, Figure 2, Figure 3. In contrast, LattisNet incorporates the source of the low DC current into the remote monitored electronic equipment, i.e. the transceiver. While this distinction may have been relevant to the earlier Cisco litigation, which concerned Claim 1 (a so-called "means-plus-function" claim that I have been informed imposes a particular structure on the invention), the current litigation asserts only Claims 14, 16, and 17, which are method claims that I have been informed do not impose any particular structure on the invention. *See generally*, 318 F.Supp.2d 476. Therefore, LattisNet constitutes invalidating prior art despite the different location of the source of the low DC current.

85. As in the FDDI IOS system discussed *supra*, LattisNet provides two mechanisms for sensing changes in the low DC current that indicate disconnection of the associated equipment. At the concentrator end, a resistor and optical signal isolator monitor the low DC current through the current loop. If the cable and remote monitored equipment are properly connected to the concentrator, the current in the

loop will be sufficient to generate a 2 VDC signal across the optical isolator. The output of the optical isolator is processed by an internal Schmitt trigger, and provides a Connection/Disconnection Detect signal; this signal is used by the concentrator to disable the associated port when the remote equipment is disconnected.

86. A second detector is also provided at the other end of the communications line, i.e., at the remote monitored equipment. The low DC current is used to illuminate an LED. If the cable and monitored equipment are properly connected to the concentrator, the low DC current will generate a voltage (approximately 2 VDC) across the LED and it will be illuminated; upon disconnection, the voltage across the LED will drop to zero and it will extinguish. A user observing the transceiver can thus tell from the LED whether the transceiver is properly connected to both the communications line and the LattisNet concentrator.

87. Thus, the system disclosed in the LattisNet documents includes all of the limitations of Claim 14 of the '260 patent: (1) Respective pairs of communications lines are selected so that each pair forms a current loop through a different associated piece of monitored equipment; (2) A low DC current signal is supplied that achieves continuous current flow through each current loop while the associated pieces of equipment are physically connected to the network via the data communications lines; and (3) The DC current signal is sensed to detect a change in current flow indicative of disconnection of the associated piece of equipment.

88. As discussed *supra*, Claim 16 limits Claim 14 to situations where the *selective tapping*, i.e., the electrical connection from the device implementing the recited method for detecting unauthorized disconnection to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of equipment, is made outside the associated equipment itself. In LattisNet, the low DC current is sensed in the LattisNet concentrator. The electrical connection to the pairs of communications lines in each current loop from the sense resistor and optical isolator

used to detect disconnection of each piece of associated equipment is made in the concentrator, which is remote from the piece of associated equipment (i.e., the transceiver). Thus, LattisNet includes all of the limitations of Claim 16 of the '260 patent.

89. Claim 17 limits Claim 14 to situations where the data communications lines comprise 10BASE-T wiring, which is "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes Category 3 or better wiring." Exhibit C to Markman Memorandum at 7. As discussed in Exhibit J and depicted in Figure G, above, LattisNet can operate over a variety of twisted pair media, including both the same shielded twisted pair cabling used and discussed for FDDI IOS, as well as the unshielded twisted pair medium specified by IEEE 802.3i (10BASE-T wiring). In fact, LattisNet expressly supports the use of 10BASE-T wiring. As shown in Figure G, the same 10BASE-T wiring configuration (including connectors and any intermediary devices, such as patch panels) is supported with either the Model 505 transceiver (which incorporates the DC-current-based cable detection scheme as described), or the Model 508A transceiver (which implements the IEEE 802.3i 10BASE-T standard exactly). Thus, SynOptics LattisNet operates over 10BASE-T wiring, and therefore includes all of the limitations of Claim 17 of the '260 patent.

90. I have been informed and understand that the LattisNet family of products, including the Model 1000, 3000, and 3030 concentrators, the Model 3305 UTP Host Module, the Model 3323S Local Bridge Module, the Model 3333 Retiming Module, the Model 502A STP Transceiver, and the Model 505 UTP Transceiver were all fully operational and demonstrated to the public prior to 1990. Exhibit KK at ¶ 28-32, 41; Exhibit LL at 85-88. As discussed *supra,* when the LattisNet system operates as designed, it performs and practices each and every limitation of Claims 14, 16, and 17 of the '260 patent.

(3) Network Monitor and Test Apparatus, incorporated into Tutankhamen Electronics MagicNet Hub

91. U.S. Patent No. 5,365,515 (Graham), discloses a method whereby a low DC current signal is injected into an Ethernet LAN for the purpose of detecting that a connecting cable and remote associated equipment are properly connected to a port on a hub device. The teachings of Graham were incorporated into a product manufactured and sold by Tutankhamen Electronics (subsequently changed to "Tut Systems") under the trade name "MagicNet". A simplified schematic diagram of the system disclosed in Graham is shown in Figure I, below. A later section in this report, "Correlation of Simplified Schematic Diagrams," shows how the simplified schematic below was derived from the original circuitry. The simplified schematic more clearly shows the relationship of this prior art to the asserted claims of the '260 patent.

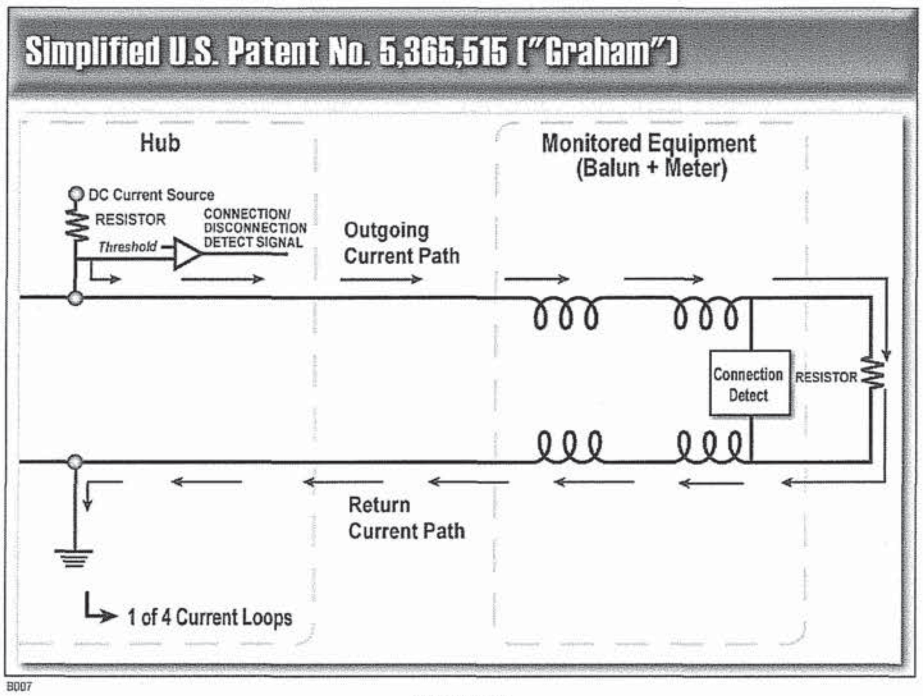


Figure I

92. Graham uses a low DC current loop in conjunction with an Ethernet LAN. To avoid possible confusion, it should be noted that the Ethernet LAN system used in Graham is *not* 10BASE-T (which is the preferred embodiment of the '260 patent); Graham uses an earlier Ethernet technology known as 10BASE2, applied to twisted pair wiring. Like the '260 patent, Graham uses a differential current loop; since the communications link in Graham uses only a single twisted pair, it is not possible to construct a phantom current loop.

93. The device on the left is a MagicNet hub, which contains four identical ports (of which only one is shown) connecting to four independent communication lines. Each such communication line comprises a single twisted pair cable which connects to an associated piece of monitored equipment (i.e., a *Balun+Meter*)[8]. The Balun+Meter is a remote device at the end of the communication line that connects the MagicNet twisted pair cable to a conventional 10BASE2 coaxial cable. That coaxial cable is terminated in a 50 Ω resistor, shown at the far right of the schematic diagram. Since the cable between the remote Balun+Meter and the MagicNet hub is dedicated to that remote device, the data communications lines used to connect each associated piece of monitored equipment is different than any of the pairs associated with other pieces of monitored equipment.

94. Each current loop comprises a single pair of communications lines, specifically two unshielded twisted pair wires connected in a differential loop arrangement as shown. A round-trip path for the current loop is provided from the hub through the selected twisted-pair communications lines and each associated piece of monitored equipment (i.e., Balun+Meter).

95. The Balun+Meter is used to connect the MagicNet hub and twisted pair communication line to an existing, coaxial cable-based 10BASE2 Ethernet LAN. A *balun*

[8] A MagicNet hub can also connect to another MagicNet hub using a separate twisted pair cable with the same cable arrangement, but that configuration is not relevant to this discussion.

is a transformer designed to convert the *balanced*, twisted pair communications line to an *unbalanced* coaxial cable communications line, hence "**bal**anced-to-**un**balanced" network, or balun. Exhibit O. The meter, as discussed below, is used to monitor the DC voltage on the communications line. The two devices, along with associated circuitry, were packaged in a single housing and sold with the hub as part of the MagicNet system.

96. The hub contains a power supply (shown as "DC Current Source") which supplies the low DC current. The low DC current in each loop is determined by the power source, together with the two resistors, and is nominally 4 mA when connected to a Balun+Meter. By design, the DC current does not interfere with, or adversely affect the operation of the monitored electronic equipment or the computer network. The low DC current flows continuously through the loop whenever the associated piece of monitored equipment is physically connected to the MagicNet hub through the data communications lines.

97. As in the FDDI IOS and SynOptics LattisNet art discussed earlier, Graham provides two mechanisms for sensing changes in the low DC current that indicate disconnection of the associated equipment. At the hub end, a resistor monitors the voltage generated by the low DC current through the current loop. This voltage is used as the input to an operational amplifier, whose output signal is used to control the operation of the instant port; the port is disabled unless the voltage detected indicates a properly connected cable and remote monitored equipment. This detector means is structurally equivalent to that disclosed in the preferred embodiment of the '260 patent; both Graham and the '260 patent use a current sense resistor whose output voltage is applied to an operational amplifier that compares that voltage to a preset threshold and provides a signal indicative of disconnection of the associated monitored equipment. The voltage across the resistor will assume different values depending on whether the remote monitored equipment is connected or disconnected from the communication

line. The operational amplifier will inform the hub logic of any disconnection so that it can disable the associated port.

98. A second detector is also provided at the other end of the communications line, i.e., at the remote monitored equipment (Balun+Meter). The low DC current generates a voltage across the resistor that terminates the coaxial cable (shown at the far right of the simplified schematic diagram). A voltmeter within the monitored equipment (shown as "Connection Detect" in the schematic diagram) continuously monitors and displays this voltage. If the cables and monitored equipment are properly connected, the meter will indicate a voltage of approximately 133 mV. Upon disconnection of the monitored equipment from the communication line, the meter will indicate zero volts. A user observing the monitored equipment can thus tell from the meter reading whether the equipment is properly connected to both the communications line and the MagicNet hub.

99. Thus, the system disclosed in the Graham patent and embodied in the MagicNet system includes all of the limitations of Claim 14 of the '260 patent: (1) Respective pairs of communications lines are selected so that each pair forms a current loop through a different associated piece of monitored equipment; (2) A low DC current signal is supplied that achieves continuous current flow through each current loop while the associated pieces of equipment are physically connected to the network via the data communications lines; and (3) The DC current signal is sensed to detect a change in current flow indicative of disconnection of the associated piece of equipment.

100. As discussed *supra*, Claim 16 limits Claim 14 to situations where the *selective tapping*, i.e., the electrical connection from the device implementing the recited method for detecting unauthorized disconnection to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of equipment, is made outside the associated equipment itself. In Graham, the low DC current is both injected and sensed in the MagicNet hub. The electrical connection to the

pair of communications lines in each current loop from both the source of the low DC current and the sense resistor used to detect disconnection of each piece of associated equipment is made in the hub, which is remote from those pieces of associated equipment. Thus, Graham includes all of the limitations of Claim 16 of the '260 patent.

101. Claim 17 limits Claim 14 to situations where the data communications lines comprise 10BASE-T wiring, which is "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes Category 3 or better wiring." Exhibit C to Markman Memorandum at 7. I have been informed and understand that the MagicNet hub was actually installed and operated using Category 3 or better wiring. Exhibit JJ at 110-18. Thus, the MagicNet hub, incorporating the teachings of the Graham patent, operates over 10BASE-T wiring and therefore includes all of the limitations of Claim 17 of the '260 patent

102. I have also been informed and understand that the MagicNet hub, incorporating the teachings of the Graham patent, was fully operational and demonstrated to the public prior to August, 1991. Exhibit II at ¶¶ 12-14; Exhibit JJ at 69-71, 110-18. In addition, I was given a personal demonstration and evaluated the MagicNet hub myself prior to July 13, 1992. As discussed *supra*, when the MagicNet hub operates as designed, it performs and practices each and every limitation of Claims 14, 16, and 17 of the '260 patent.

(4) Power Feed System for Telephone and/or Information Technology Terminals

103. U.S. Patent No. 5,144,544 (Jenneve) discloses a system for controlling the DC power delivered over a pair of data communications lines for use by digital telephones and/or data terminals (workstations). Jenneve does not claim invention of the method of injecting DC current onto the communications lines; rather it cites such a method as known prior art and claims a novel way to prevent problems that may be caused by the use of switch-mode power supplies within the digital telephones and/or

data terminals that derive their power from the prior art DC current delivery system. Exhibit Q at 2:18–23, Figure 1.

104. A simplified schematic diagram of the system disclosed in Jenneve is shown in Figure J, below. A later section in this report, "Correlation of Simplified Schematic Diagrams," shows how the simplified schematic below was derived from the original circuitry. The simplified schematic more clearly shows the relationship of this prior art to the asserted claims of the '260 patent.

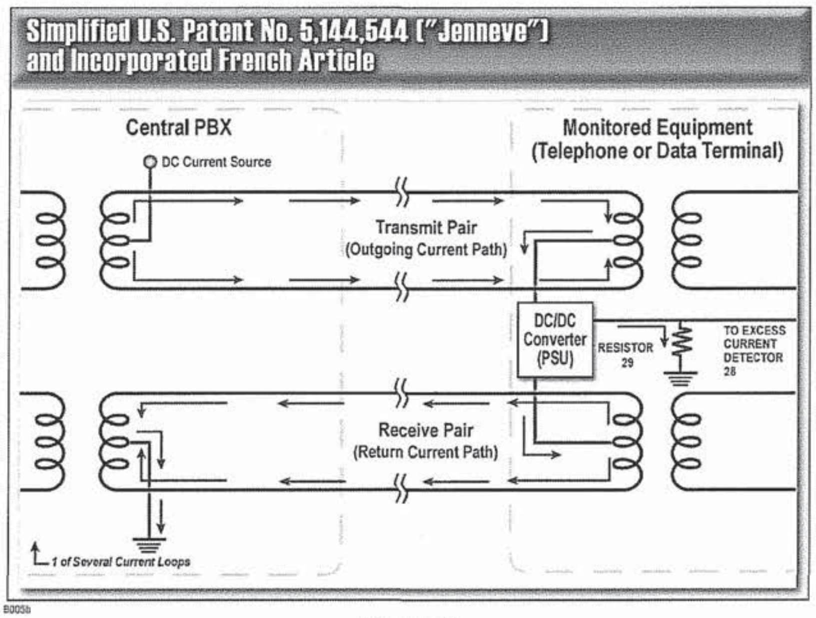


Figure J

105. The device on the left is a central, digital Private Branch eXchange (PBX), i.e., a telephone switch typically located in the telephone center of a medium-to-large corporate enterprise. The method disclosed in Jenneve is specifically designed to operate over Integrated Services Digital Network (ISDN) systems. As depicted, the Central PBX comprises numerous ports, each of which connects through two twisted pair communication lines to an associated piece of monitored electronic equipment (i.e., a digital telephone or information terminal). Since the cable between a remote device

and the PBX is dedicated to that remote device, the data communications lines used to connect each associated piece of monitored equipment is different than any of the pairs associated with other pieces of monitored equipment.

106. Each current loop comprises two pairs of communications lines, specifically two twisted pair cables connected in a phantom loop arrangement as shown. A round-trip path for the current loop is provided from the PBX through the selected pair of twisted-pair communications lines and each associated piece of monitored equipment (i.e., a digital telephone or information terminal).

107. To avoid having to supply operating power to each digital telephone separately, the Central PBX provides 40 VDC (nominal) power through the communications lines, using the phantom current loop technique described earlier and specifically cited as prior art in Jenneve. The DC current level in the phantom circuit will vary depending on the particular needs of the monitored equipment. As explained in Jenneve, a device requiring 1 watt of power will draw 25 mA of DC current from the 40 VDC power supplied. Exhibit Q at 4:38–41. By virtue of the phantom current loop technique, the DC current does not interfere with, or adversely affect the operation of the monitored electronic equipment or the communications network. The DC current flows continuously through the loop whenever the associated piece of monitored equipment is physically connected to the PBX through the data communications lines.

108. Jenneve discloses the use of a switched-mode Power Supply Unit in the monitored equipment (shown as "DC/DC Converter (PSU)" in Figure J). The problem addressed by Jenneve is that switched-mode PSUs often draw excess current (called "inrush current") when first connected to the power source. In an ISDN network comprising multiple telephones and information terminals, the inrush current drawn by a switched-mode power supply in a given telephone could affect communications in other telephones, by disrupting the 40 VDC current source common to all of the

telephones. Jenneve therefore introduces a current monitor and current regulator circuit to limit the inrush current drawn by a device upon connection to the ISDN network.

109. Current-sensing resistor 29 monitors the level of current being drawn by the PSU. If the piece of monitored equipment is disconnected from the communications line, the voltage across the resistor will be zero. If the piece of monitored equipment is connected to the communications line and the PSU is not drawing excessive current, the voltage across the resistor will be greater than zero, but less than 700 mV. If the piece of monitored equipment is connected to the communications line and the PSU is drawing excessive inrush current, the voltage across the resistor increases to 700 mV and triggers an excess current detector circuit, which controls and reduces the current drawn by the PSU. Exhibit Q at 4:36–64. Thus, the PSU is limited in its ability to draw excessive inrush current; therefore, its capability to disrupt the power supplied to other telephones or information terminals on the ISDN network is eliminated.

110. If the piece of monitored equipment is disconnected from the ISDN network, the voltage across the current sensing resistor will reduce from its non-zero operating value to zero. By monitoring the voltage across the current sensing resistor, one can tell whether the remote monitored equipment is connected or disconnected from the communications network.

111. Thus, Jenneve includes all of the limitations of Claim 14 of the '260 patent: (1) Respective pairs of communications lines are selected so that each pair forms a current loop through a different associated piece of monitored equipment; (2) A low DC current signal is supplied that achieves continuous current flow through each current loop while the associated pieces of equipment are physically connected to the network via the data communications lines; and (3) The DC current signal is sensed to detect a change in current flow indicative of disconnection of the associated piece of equipment.

112. As discussed *supra*, Claim 16 limits Claim 14 to situations where the *selective tapping*, i.e., the electrical connection from the device implementing the recited

method for detecting unauthorized disconnection to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of equipment, is made outside the associated equipment itself. In Jenneve, the low DC current is injected at the PBX. The electrical connection to the pairs of communications lines in each current loop from the source of the low DC current is made in the concentrator, which is remote from the pieces of associated equipment. Thus, Jenneve includes all of the limitations of Claim 16 of the '260 patent.

(5) Drop Cable for a Local Area Network

113. United States Patent 4,733,389 (Puvogel), discloses a system for providing DC power from a host computer to an Ethernet transceiver over two data communications lines, using the classic phantom current loop technique. A simplified schematic diagram of the phantom current loop used in Puvogel is shown in Figure R below. A later section in this report shows how the simplified schematic was derived from the original circuitry. The simplified schematic more clearly shows the relationship of this prior art to the asserted claims of the '260 patent.

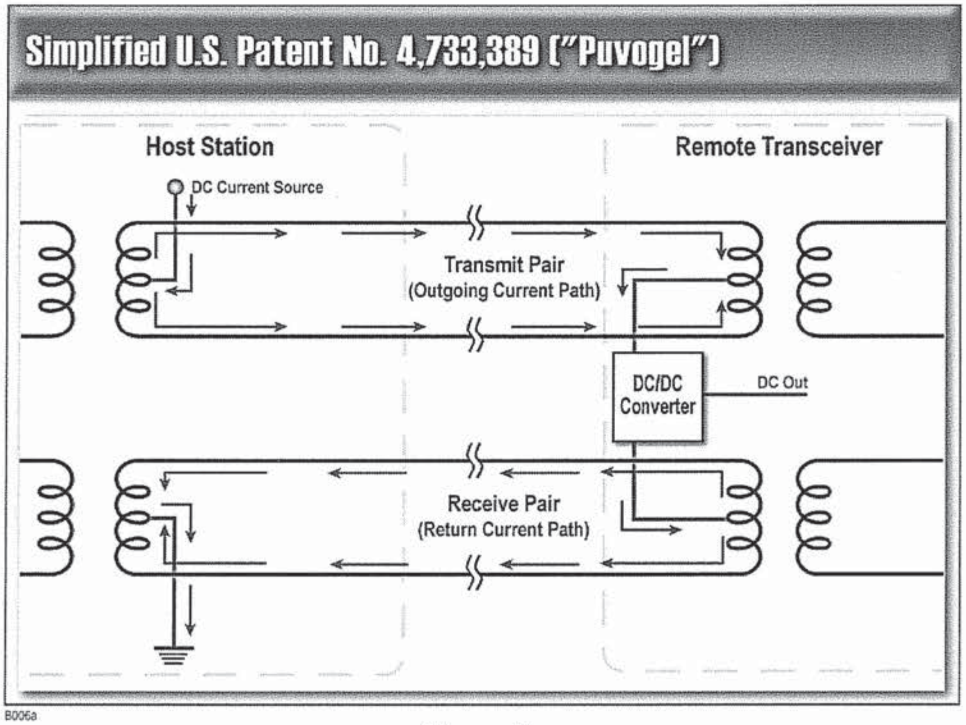


Figure R

114. Puvogel uses a low DC current loop in conjunction with an Ethernet LAN. To avoid possible confusion, it should be noted that the Ethernet LAN system used in Puvogel is *not* 10BASE-T (which is the preferred embodiment of the '260 patent); Puvogel uses an earlier Ethernet technology known as an Attachment Unit Interface (AUI). *See* IEEE 802.3 at § 7.

115. The device on the left is a host station, typically a workstation or a server. A single station may connect to two or more associated pieces of monitored equipment (i.e., Ethernet transceivers), although only one such connection is shown for simplicity. The transceiver is a remote device that connects the host to a conventional 10BASE2 coaxial cable Ethernet. *See* IEEE 802.3 at § 8. Each transceiver is connected to the host through two shielded twisted pair cables, as shown in the figure. Since the cable

between a remote transceiver and the host is dedicated to that transceiver, the pair of data communications lines used to connect each associated piece of monitored equipment is different than any of the pairs associated with other pieces of monitored equipment.

116. Each current loop comprises two pairs of communications lines, specifically two twisted pair cables connected in a phantom loop arrangement as shown. A round-trip path for the current loop is provided from the host through the selected pair of twisted-pair communications lines and each associated piece of monitored equipment (i.e., a transceiver).

117. The host station contains a DC power supply, which supplies a voltage between 11.4 and 15.75 VDC (shown as "DC Current Source" in Figure R). Exhibit DD at 1:65–66, Figure 2. The DC current level in the phantom circuit will vary depending on the particular needs of the monitored equipment, but will not exceed 500 mA. IEEE 802.3 at § 7.5.2.5. By virtue of the phantom current loop technique, the DC current does not interfere with or adversely affect the operation of the monitored electronic equipment or the communications network. The DC current flows continuously through the loop whenever the associated piece of monitored equipment is physically connected to the host computer through the data communications lines.

118. The DC/DC converter generates controlled power for the remote transceiver from the raw power provided by the phantom current loop. The output of the DC/DC converter is one or more regulated voltages, shown as "DC Out" in Figure R. If the transceiver and communications lines are properly connected to the host station, the DC Out signal will indicate the proper operating voltage for the transceiver (typically –5 VDC and/or –10 VDC). If the transceiver is disconnected from the communications line, the DC Out signal will become zero. Thus, one can tell by monitoring the DC Out signal whether the transceiver is properly connected to both the communications line and the host station.

119. Thus, Puvogel includes all of the limitations of Claim 14 of the '260 patent: (1) Respective pairs of communications lines are selected so that each pair forms a current loop through a different associated piece of monitored equipment; (2) A low DC current signal is supplied that achieves continuous current flow through each current loop while the associated pieces of equipment are physically connected to the network via the data communications lines; and (3) The DC current signal is sensed to detect a change in current flow indicative of disconnection of the associated piece of equipment.

120. As discussed *supra*, Claim 16 limits Claim 14 to situations where the *selective tapping*, i.e., the electrical connection from the device implementing the recited method for detecting unauthorized disconnection to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of equipment, is made outside the associated equipment itself. In Puvogel, the low DC current is injected at the host computer. The electrical connection to the pairs of communications lines in each current loop from the source of the low DC current is made in the host, which is remote from the pieces of associated equipment. Thus, Jenneve includes all of the limitations of Claim 16 of the '260 patent.

121. Claim 17 limits Claim 14 to situations where the data communications lines comprise 10BASE-T wiring, which is "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes Category 3 or better wiring." Exhibit C to Markman Memorandum at 7. The medium used in Puvogel is the AUI specified in IEEE 802.3. Exhibit DD at 1:39-57; IEEE 802.3 at § 7.

122. The specified attenuation of the shielded twisted pair AUI cable used in Puvogel is 3 dB/50m at a frequency of 10 MHz. IEEE 802.3 at § 7.4.3.5, § 7.1(b). For a length of 100m (the design assumption for the maximum length of 10BASE-T wiring), this equates to 6 dB of attenuation which is far superior to the IEEE 802.3i requirement of 11.5 dB (maximum). IEEE 802.3i at 49, 22. The specified crosstalk of the Puvogel AUI

cable is -40 dB (maximum), which far exceeds the IEEE 802.3i requirement of -26 dB (maximum). IEEE 802.3 at § 7.4.3.2, IEEE 802.3i at 50. The specified timing jitter of the Puvogel AUI cable is 2 ns (maximum) for a 100m length, which is far superior to the IEEE 802.3 requirement of 5 ns (maximum). IEEE 802.3 at § 7.4.3.6; IEEE 802.3i at 49-50.

123. The IEEE 802.3i standard does not exclude shielded twisted pair wiring. The shielded twisted pair cable specified for Puvogel has significantly better electrical characteristics for attenuation, crosstalk, etc. than either Category 3 unshielded twisted pair or the IEEE 802.3i specification. Thus, the cable disclosed in Puvogel qualifies as 10BASE-T wiring under the Court's construction, and Puvogel therefore includes all of the limitations of Claim 17 of the '260 patent.

(6) Terminal Disconnect and Media Wire Fault Detect Mechanism

124. During the late 1970s, International Business Machines Corp. (IBM) developed a network commonly known as the IBM Token Ring. Exhibit MM at 14. Like the FDDI IOS discussed *supra*, the IBM Token Ring was wired in a physical star configuration, with each attached device connected to its associated hub or concentrator through a dedicated twisted pair link. *Id.* at 11-12. The network design called for the use of wiring that met the IBM Cabling System specifications, together with wiring concentrators (access units) that provided the connections for individual attached stations. Id. at 37-41, 11-12; *see generally*, Exhibit E. Initially, the network operated at a data rate of 4 Mb/s. Exhibit MM at 15.

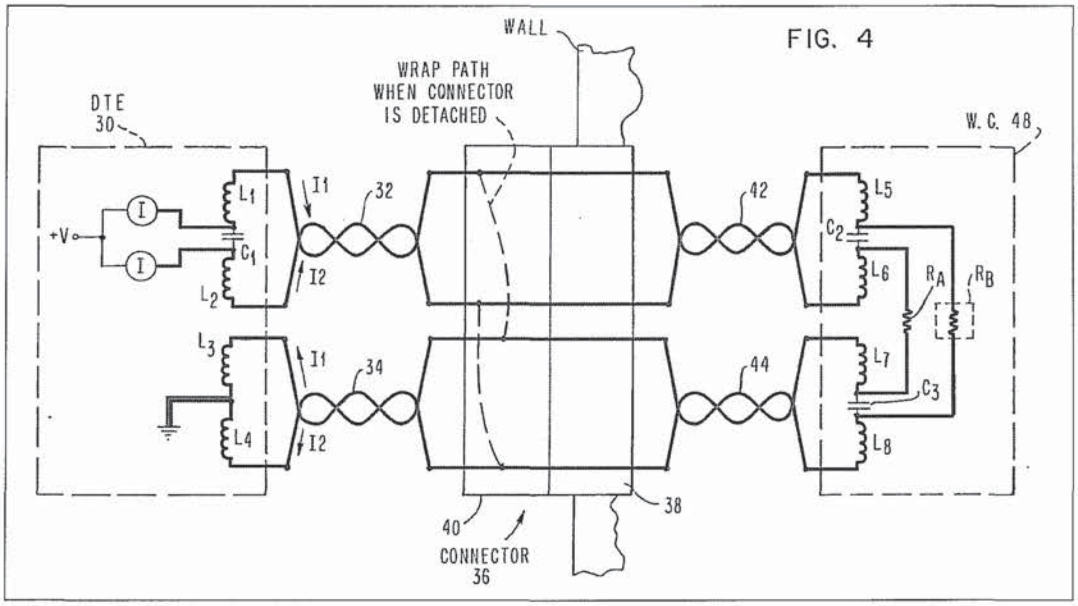
125. The IBM Token Ring network incorporated extensive error-detection and recovery capabilities, with provision for both automatic and manual reconfiguration. *Id.* at 8. Toward this end, IBM engineers Thomas Stammely and Eugene Annunziata designed a wire fault detection circuit that was implemented in the IBM Token Ring network, and on Nov. 5, 1985 were awarded U.S. Pat. No. 4,551,671 (hereinafter "the '671 patent"). Exhibit BB.

126. The '671 patent discloses a system for testing the wiring between an attached device and a local area network. *See* '671 Patent at Abstract. The system supplies a low DC current into the twisted pair wiring used for data communications between a piece of communicating equipment (Data Terminal Equipment, or DTE) and a wiring concentrator. *See id.* at 2:14-16. The low DC current signal in the loop is sensed (i.e., monitored for imbalance) so as to detect a change in current flow indicative of disconnection of the piece of associated equipment (e.g., the wiring concentrator). *See id.* at 16-21.

127. The system of the '671 patent operates over data communication lines comprising twisted pair cable connecting DTEs to wiring concentrators on a data communication network, forming independent current loops running from each DTE through a wiring concentrator connected to that DTE. *See, e.g., id.* at Fig. 4; 3:27-30, 35-68, 4:12-14. Since the cable between a DTE and the concentrator is dedicated to that DTE, the data communications lines used to connect each associated piece of monitored equipment are different than any of the pairs associated with other pieces of monitored equipment.

128. Each DTE contains circuitry that generates a low DC current that is impressed on the twisted pair data communication lines thereby achieving continuous current flow through each current loop while each of the DTEs is physically connected to a wiring concentrator. *See, e.g., id.* at Figure 1, Figure 2, 4:58-59, 7:28.

129. The detailed operation of the circuitry of the '671 patent is best understood by examining Figure 4 from the '671 patent which is reproduced below as Figure O.



Id. at Figure 4 (emphasis added) **Figure O**

130. The wiring path begins at DTE 30 and continues through a connector to wiring concentrator W.C. 48. Twisted pair 32 consists of two wires for carrying data signals from the DTE through a connector and twisted pair 42 into wiring concentrator 48. Similarly, twisted pair 44 consists of two wires for carrying data signals from the wiring concentrator to the DTE through a connector and twisted pair 34. Thus, a round-trip path for each current loop is provided from the DTE through the selected pair of communications lines and the associated piece of monitored equipment (e.g., the wiring concentrator).

131. Two low DC currents are generated at voltage source V+ in the DTE. I1 flows through: (a) inductor L1; (b) one wire of twisted pair 32; (c) the intermediate wiring system; (d) one wire of twisted pair 42; (e) inductor L5; (f) resistor RB; (g) inductor L8; (h) one wire of twisted pair 44; (i) the intermediate wiring system; (j) one wire of twisted pair 34; and (k) inductor L3. Similarly, I2 flows through: (a) inductor L2; (b) one wire of twisted pair 32; (c) the intermediate wiring system; (d) one wire of

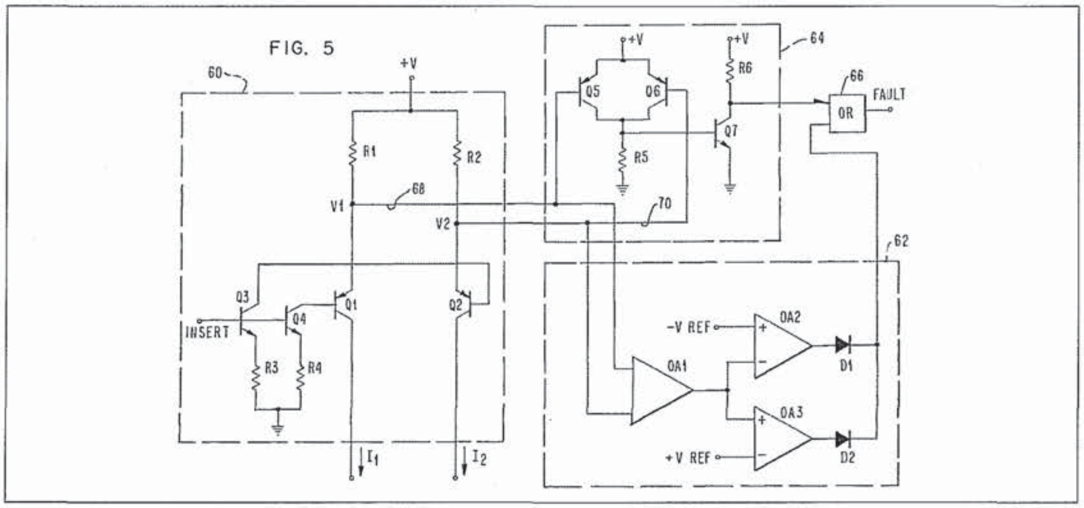
twisted pair 42; (e) inductor L6; (f) resistor RA; (g) inductor L7; (h) one wire of twisted pair 44; (i) the intermediate wiring system; (j) one wire of twisted pair 34; and (k) inductor L4. '671 Patent at Figure 4. The DC currents I1 and I2 are equal in magnitude and preferably less than 1 milliamp. *Id.* at 4:56-59.

132. "[C]apacitors C1, C2, and C3 are isolating capacitors. The isolating capacitors prevent the DC current (I1 and I2) flowing in the respective wires of the twisted pair from combining. In other words, separate and distinct current paths must be provided for I1 and I2, respectively." *Id.* at 4:44-49.

133. The '671 patent teaches an ingenious way of superimposing a low DC current signal onto a data communications line using a differential current loop without incurring the problems ordinarily associated with differential loops, including interference with the data communications signals and introducing a current offset in the coupling transformers, as discussed *supra*. It does this by employing two independent current loops with the same nominal value of current. Under normal conditions (i.e., attached devices and wiring system properly interconnected), I1 and I2 flow in the same direction in each of the twisted pairs (32, 42, 44, and 34 in Figure O), thereby canceling out any effect each current would have individually imposed on the data communications signals carried in those pairs. Similarly, under normal conditions I1 and I2 flow in *opposite* directions in inductors L1/L2, L5/L6, L7/L8, and L3/L4, respectively. "The inductors represent the secondary windings of data transformers." *Id.* at 4:38-39. Thus, the equal values of I1 and I2 also cancel each other out with respect to the adverse effects of having DC current flow through a transformer winding. Thus, the DC current does not interfere with, or adversely affect the operation of the monitored electronic equipment or the computer network. The low DC current flows continuously through the loop whenever the associated piece of monitored equipment is physically connected to the DTE through the data communications lines.

134. Under various extraordinary conditions (including shorts, opens, and disconnection of devices), the values of I1 and I2 will independently change and no longer cancel each other out in the wire pairs and the transformers. However, under such conditions the equipment and network are not functioning anyway, and the problems of interference with the data communications signals are irrelevant.

135. The DTEs connected to the network of the '671 patent contain circuitry that monitors and detects a change in current flow in the DC current loops indicative of disconnection of a wiring concentrator. *See id.* at Figure 5, elements 64 and 62. The operation of this circuitry is best understood by examining Figure 5 from the '671 patent which is reproduced below as Figure P.



Id. at Figure 5. **Figure P**

136. For example, if a wiring concentrator is disconnected from the DTE by unplugging connector 40 from wall connector 38 in Figure O, the circuitry within element 64 in the DTE senses an increase in DC current indicative of this disconnection. *See* '671 patent at 3:50-6:8, Figure 5.

137. Likewise, element 62 in the DTE (Figure P) detects a current imbalance if, for example, there is a disconnection of a wiring concentrator from a DTE arising from a

broken wire in the path from the DTE to the concentrator. The '671 patent therefore discloses fault detection circuitry in each DTE that senses an over current or current imbalance indicative of a disconnection of associated equipment (e.g., a wiring concentrator) from a DTE.

138. Thus, the '671 patent includes all of the limitations of Claim 14 of the '260 patent: (1) Respective pairs of communications lines are selected so that each pair forms a current loop through a different associated piece of monitored equipment; (2) A low DC current signal is supplied that achieves continuous current flow through each current loop while the associated pieces of equipment are physically connected to the network via the data communications lines; and (3) The DC current signal impressed on the twisted pair wires is sensed by circuitry in the DTE to detect a change in current flow indicative of disconnection of the associated piece of equipment.

139. As discussed *supra*, Claim 16 limits Claim 14 to situations where the *selective tapping*, i.e., the electrical connection from the device implementing the recited method for detecting unauthorized disconnection to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of equipment, is made outside the associated equipment itself. In the '671 patent, the low DC current is both injected and sensed in the DTE. The electrical connection to the pair of communications lines in each current loop from both the source of the low DC current and the sensing mechanism used to detect disconnection of each piece of associated equipment is made in the DTE, which is remote from the associated equipment (i.e., the wiring concentrator). Thus, the '671 patent includes all of the limitations of Claim 16 of the '260 patent.

140. Claim 17 limits claim 14 to situations where the data communications lines comprise 10BASE-T wiring, which is "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes Category 3 or better wiring." Exhibit C to Markman Memorandum at 7.

141. According to one of the inventors, the circuitry of the '671 patent was incorporated into the first Token Ring Network adapter cards in the early 1980s, and publicly announced and demonstrated in 1985. Exhibit CC at 68-72. The IBM Token Ring Network adapter cards were designed to operate over data grade cabling conforming to the IBM Cabling System specifications. Exhibit MM at 37-41; *see generally*, Exhibit E. This is the same shielded twisted pair wiring discussed previously with respect to the FDDI IOS and AMD Application Note.

142. The IEEE 802.3i standard does not exclude shielded twisted pair wiring. As discussed *supra*, the shielded twisted pair cable specified in Exhibit E has significantly better electrical characteristics for attenuation, crosstalk, etc. than either Category 3 unshielded twisted pair or the IEEE 802.3i specification. *See* discussion of FDDI IOS, *supra*. Thus, the cable inherently disclosed in the '671 patent qualifies as 10BASE-T wiring under the Court's construction, and the '671 patent therefore includes all of the limitations of Claim 17 of the '260 patent.

(7) Ethernet Transceiver Cable Interface

143. In claims 14, 16, and 17 of the '260 patent, the Court has construed the term "data communications lines" to mean "communication lines typically used for carrying data." Markman Memorandum at 6. "As the special master put it: 'the lines do not have to be used for actually carrying data *at any given time*, but they must be lines of the type that are generally used to carry data.'" *Id.* (emphasis in original) (citations omitted). In the Cisco litigation, Chrimar asserted that the claims of the '260 patent were infringed by a system that delivered DC power to a remote device over wire pairs that were *capable* of carrying data communications signals, but which never actually did so in the accused product. That is, they asserted that the claims read on the use of so-called "spare pairs" within a data communications cable for conveying DC power. In my opinion, a wire pair that never carries data communications signals cannot be

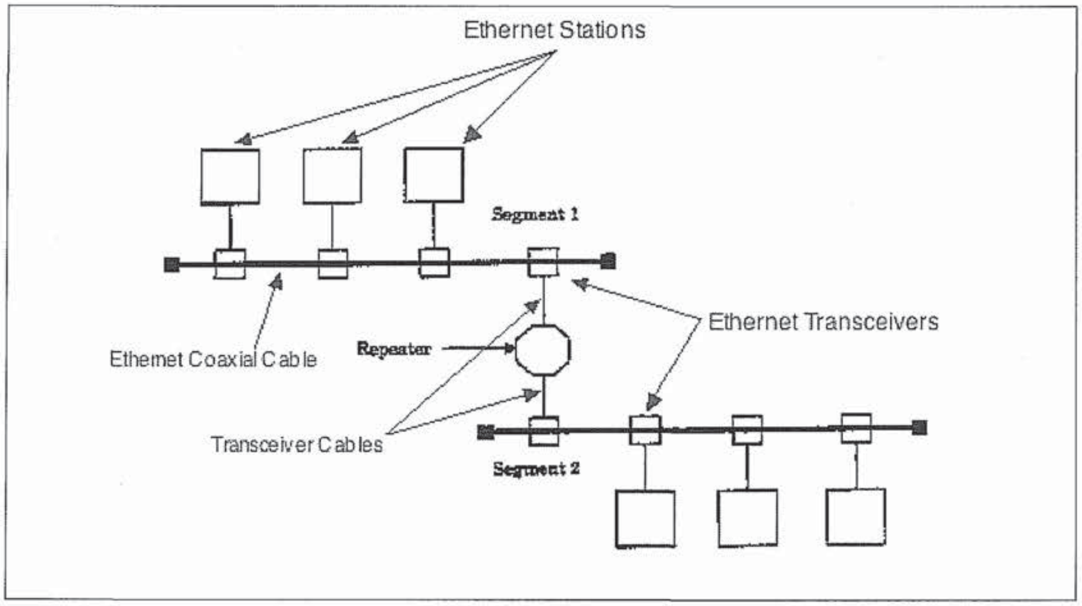
considered a data communication line for the purposes of the '260 patent. Nonetheless, the use of a spare pair within a communications cable for carrying DC power to a remote device is well established in the prior art, as discussed *infra*.

144. Between 1979 and 1982, Digital Equipment Corp., Intel Corp., and Xerox Corp. worked together to develop the first industry standard for Ethernet; this work culminated in the publication in 1982 of the Ethernet Specification, which was written in large part by me, personally. Exhibit EE. This non-copyrighted, publicly available document contained a complete set of specifications that allowed multiple manufacturers to design interoperable network products. During the 1980s, numerous manufacturers designed, marketed, and sold Ethernet-compatible products.

145. The Ethernet Specification was the foundation for what ultimately became the IEEE 802.3 standard; virtually the entire architecture and design (and much of the actual text) of the first IEEE 802.3 standard was lifted directly from the Ethernet Specification. *See generally,* Exhibit EE, IEEE 802.3 §§ 3, 4, 7, 8. Due to the common content of the specifications, many commercial products were built to be compliant with the requirements of both documents simultaneously.

146. The Ethernet and original IEEE 802.3 standards specified a system that operated over a shared, coaxial cable medium. The IEEE 802.3 standard has continued to evolve for more than two decades, later including variants such as 10BASE-T (for operation over twisted-pair cable) and 100/1000BASE-T (for higher speed operation). As a result, by 1991 (the time of the filing of the '260 patent) the IEEE 802.3 standard had largely supplanted the original Ethernet Specification as the primary reference document for commercial product developers. For the purpose of the discussion in this section, however, the term "Ethernet" refers only to the original design as evidenced by Exhibit EE.

147. Figure S below depicts a typical, medium-scale Ethernet configuration.



See Exhibit EE at Figure 7.1(b) **Figure S**

148. Hosts (e.g., computer workstations or repeaters) attach to transceivers through a transceiver cable. The transceivers connect the hosts to the common, shared coaxial cable medium. Each transceiver cable can be up to 50 meters in length, and comprises four shielded, twisted pairs as follows:

- A *Transmit Pair* that carries data communication signals from the host to the transceiver,
- A *Receive Pair* that carries data communication signals from the transceiver to the host,
- A *Collision Presence Pair* that carries data communication control signals from the transceiver to the host, and
- A *Power Pair* that carries DC power from the host to the transceiver. This latter pair provides the operating voltage and current for the transceiver itself.

See id. at 64.

149. Figure T below depicts the interface between a host and a transceiver through the aforementioned transceiver cable.

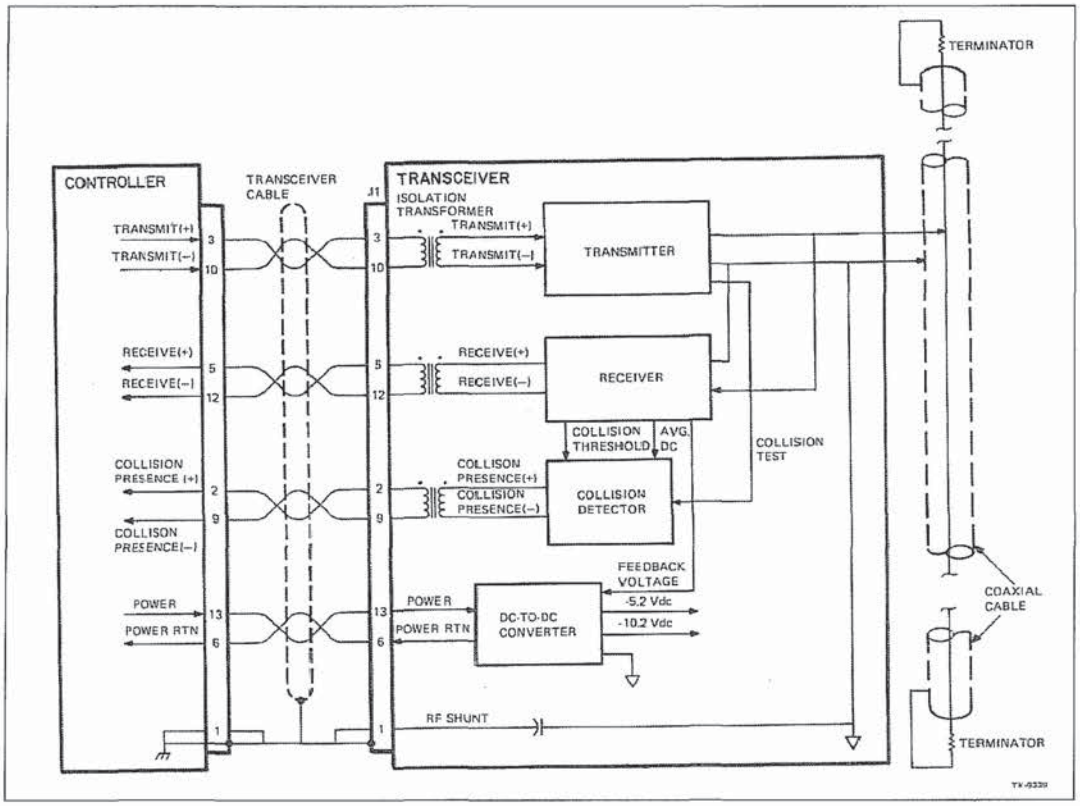


Exhibit FF at Figure 3-1 **Figure T**

150. The Controller shown on the left side of Figure T is the network interface controller located within each host (e.g., workstation or repeater) that may connect to two or more associated pieces of monitored equipment (i.e., Ethernet transceivers), although only one such connection is shown for simplicity. Repeaters (as shown in Figure S) are used to interconnect multiple coaxial cable segments. As a result, a single repeater necessarily connects to multiple transceivers and must provide the DC power for all of them.

151. The transceiver is a remote device that connects the host to a conventional coaxial cable Ethernet network. Each transceiver is connected to the host through four shielded twisted pair cables, as shown in the figure. Since the cable between a remote transceiver and the host is dedicated to that transceiver, the pair of data communications lines used to connect each associated piece of monitored equipment is different than any of the pairs associated with other pieces of monitored equipment.

152. The controller provides DC power for the operation of each transceiver, at a voltage of between 11.4 VDC and 15.75 VDC, through the Power Pair (comprising the Power and Power Rtn signals)—a spare pair provided in the transceiver cable specifically for the purpose of delivering power as shown. While it never actually carries data communications signals, the Power Pair comprises wiring of the type that is generally used to carry data. Each current loop comprises a single pair of communications lines, specifically a shielded twisted pair cable in a differential configuration as shown. A round-trip path for the current loop is provided from the host through the selected twisted-pair communications lines and each associated piece of monitored equipment (i.e., an Ethernet transceiver).

153. The low DC current in each loop is determined by the 11.4–15.75 VDC power source and the requirements of the attached transceiver, and is specified not to exceed 500 mA (Exhibit EE at 64). The low DC current in each loop does not interfere with the data signals on the Transmit, Receive, or Collision Presence pairs of the transceiver cable, as the DC power is provided on the separate Power Pair, i.e., a spare pair of wires in the cable. Since data and power are never present at the same time on any given twisted pair, the low DC current does not interfere with or adversely affect the operation of the monitored electronic equipment or the communications network. The DC current flows continuously through the loop whenever the associated piece of monitored equipment is physically connected to the host through the data communications lines.

154. An example of a commercially available Ethernet transceiver was the H4000 from Digital Equipment Corp. I was the engineer personally responsible for the design of the H4000. Exhibit FF is the technical manual that shipped with the H4000 product beginning in November 1982, and includes complete schematic diagrams of the circuitry and interconnections made to that transceiver. The H4000 was specifically designed to meet the requirements of the Ethernet Specification, and the technical manual cited above incorporates that specification by express reference. Exhibit FF at 1-6. Figure U below depicts the power circuitry within the H4000, and the power connections from the transceiver cable.

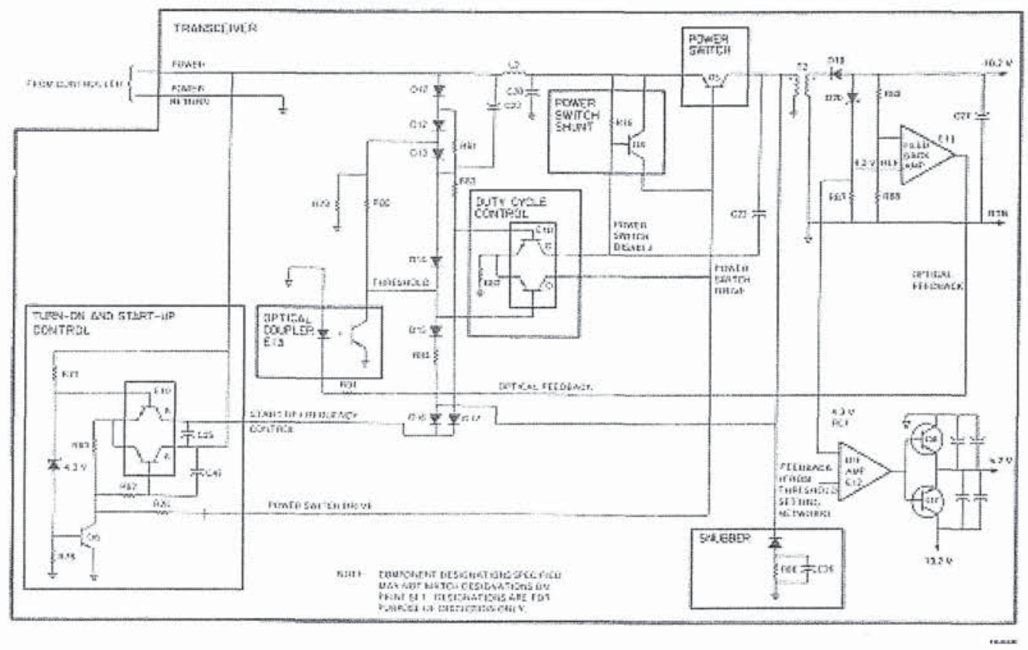


Figure 3-13: DC-to-DC Converter: Functional Schematic Diagram

Exhibit FF at Figure 3-13 **Figure U**

155. As can be seen in the figure, the low DC current passes through diodes D10, D12, and resistor R79. If the transceiver cable and monitored equipment are

properly connected, the low DC current will generate a voltage (approximately 10 VDC) across R79, which will cause a current to flow through that resistor. Upon disconnection, the voltage across R79 will drop to zero and no current will flow through it. Thus, one can tell by monitoring the voltage across R79 whether the transceiver is properly connected to both the communications line and the host.

156. Thus, the system disclosed in the H4000 Ethernet Transceiver Technical Manual (incorporating the Ethernet Specification) includes all of the limitations of Claim 14 of the '260 patent: (1) Respective pairs of communications lines are selected so that each pair forms a current loop through a different associated piece of monitored equipment; (2) A low DC current signal is supplied that achieves continuous current flow through each current loop while the associated pieces of equipment are physically connected to the network via the data communications lines; and (3) The DC current signal is sensed to detect a change in current flow indicative of disconnection of the associated piece of equipment.

157. As discussed *supra*, Claim 16 limits Claim 14 to situations where the *selective tapping*, i.e., the electrical connection from the device implementing the recited method for detecting unauthorized disconnection to each selected pair of each piece of associated equipment, forming the current loop through that selected pair and piece of equipment, is made outside the associated equipment itself. In the H4000, the low DC current is injected onto the Power Pair at the host. The electrical connection to the pair of communications lines in each current loop from the source of the low DC current is made in the host, which is remote from the pieces of associated equipment. Thus, the H4000 includes all of the limitations of Claim 16 of the '260 patent.

158. Claim 17 limits Claim 14 to situations where the data communications lines comprise 10BASE-T wiring, which is "[t]wisted pair wiring that meets the electrical and mechanical requirements of the IEEE 802.3i standard, which includes Category 3 or better wiring." Exhibit C to Markman Memorandum at 7. The medium

used in the H4000 is the transceiver cable specified in the Ethernet Specification, which has exactly the same electrical and mechanical characteristics as the AUI specified in IEEE 802.3.[9] Exhibit EE at 63-68; Exhibit FF at 2.1-2.2; IEEE 802.3 at § 7.

159. The specified attenuation of the shielded twisted pair transceiver cable used in the H4000 is 3 dB/50m at a frequency of 10 MHz. Exhibit EE at 65. For a length of 100m (the design assumption for the maximum length of 10BASE-T wiring), this equates to 6 dB of attenuation which is far superior to the IEEE 802.3i requirement of 11.5 dB (maximum). IEEE 802.3i at 49, 22. The specified timing jitter of the H4000 transceiver cable is 2 ns (maximum) for a 100m length, which is far superior to the IEEE 802.3 requirement of 5 ns (maximum). Exhibit EE at 65; IEEE 802.3i at 49-50.

160. The IEEE 802.3i standard does not exclude shielded twisted pair wiring. The shielded twisted pair transceiver cable specified for the H4000 has significantly better electrical characteristics for attenuation, jitter, etc. than either Category 3 unshielded twisted pair or the IEEE 802.3i specification. Thus, the cable disclosed in the H4000 Technical Manual qualifies as 10BASE-T wiring under the Court's construction, and that document therefore includes all of the limitations of Claim 17 of the '260 patent.

161. I personally installed hundreds of H4000 transceivers, along with their associated cables, controllers, and power connections during the period 1981-84, in the course of my employment at Digital Equipment Corporation. Those installations included, *et alia*, public demonstrations at international trade shows in St. Louis, MO in the spring of 1983 and Las Vegas, NV in the fall of 1984. As discussed *supra*, when the H4000 operates as designed, it performs and practices each and every limitation of Claims 14, 16, and 17 of the '260 patent.

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[9] As discussed *supra*, much of the original IEEE standard was lifted nearly verbatim from the original Ethernet Specification. In the case of the cable between the host and the transceiver, the only practical difference between the two documents is that the name was changed from "Transceiver Cable" to "Attachment Unit Interface" (AUI).

B. Obviousness Prior Art

162. As discussed *supra*, all of the prior art references cited fully disclose each of the limitations of claims 14, 16, and/or 17 of the '260 patent. However, should the Court not find all of the limitations to be present in a single reference, I am prepared to demonstrate why the differences between the inventions of the asserted claims and each of the references discussed above, taken in combination with one or more of the other references, are such that the subject matter of those claims would have been obvious at the time the invention was made to one of ordinary skill in the art. This is particularly true given that the use of DC current on communications lines to detect disconnection of network devices was a common expedient in the prior art, as illustrated by all of the references previously discussed.

163. By way of example, assuming that the Court should find that the FDDI IOS and AMD Application Note (together, "FDDI Publications") do not independently disclose all of the limitations of the asserted claims, it nonetheless is clear that these FDDI Publications teach all of the limitations of those claims when they are combined with one another, when either or both are combined with the existing FDDI standards (ISO 9314-1, ISO 9314-2, ISO 9314-3), and/or when either or both are combined with existing commercial FDDI products from any of the sponsoring companies. Such commercial products include at least SynOptics' FDDI concentrators and workgroup modules, such as the SynOptics Model 3902 FDDI-STP Workgroup Host Module (used in a SynOptics LattisNet 3000 concentrator chassis), any SynOptics 2000 series FDDI concentrator such as the SynOptics Model 2912 FDDI-STP Concentrator, Digital Equipment Corporation (DEC) FDDI concentrators and workstations such a DECconcentrator 500 or DECstation 5000 workstation, Chipcom concentrators such as a Chipcom TPDDI ONline concentrator, or any 1991 commercial FDDI concentrator using chipsets made by Motorola or AMD (such as AMD's SUPERNET 1 and 2 products as

discussed in the AMD Application Note) configured to connect to shielded twisted pair cables in the manner disclosed in the FDDI Publications.

164. There was a motivation to combine the FDDI Publications with one another, with the FDDI standards and with the various commercial products. The FDDI Publications were actually directed towards the enhancement of the existing standards and as such, the combination would have been inescapable to a person of ordinary skill. The motivation to combine is reflected by the fact that SynOptics, DEC, Chipcom, AMD, and Motorola were co-sponsors of the FDDI IOS, and hence one of ordinary skill would expect that their effort was directed to products developed by those companies. Indeed, my understanding is that the five companies joined in the promulgation of one common document precisely because, by early 1991, each had already invested considerable time, research and effort towards developing products designed to provide interoperable FDDI operation over shielded twisted pair media. Moreover, as the documents attached hereto reflect, at least the SynOptics Model 3902 FDDI-STP Workgroup Host Module was actually built, tested, publicly used, and offered for sale by September, 1991, and that it incorporated the Cable Detect circuitry of the FDDI IOS. Clearly, the DEC, Chipcom and SynOptics concentrators used on May 21, 1991 to publicly demonstrate the companies' joint efforts also incorporated the FDDI IOS circuitry. *See* Exhibits R-W.

165. For largely the same reasons, with respect to any of the prior art references, it would have been obvious to one of ordinary skill in the art in 1991 to combine these teachings with the teachings the Tutankhamen Electronics "MagicNet" hub device (hereinafter "Tut Systems hub"). This device teaches a hub for a well-known network system (Ethernet) that supplies a low DC current to multiple current loops comprising data communications lines, and connects to remote monitored equipment for the purpose of detecting disconnection of that equipment. The teachings of the Tut Systems hub can thus be combined with each of the prior art references previously

cited, because one or more of the listed elements of the Tut Systems hub are the same as the elements of the described references. The motivation to combine these references would come both from the importance of Ethernet, and the nature of the problem to be solved. All of the references deal with the common problem of detecting disconnection of remote devices from a network; the importance and widespread use of Ethernet would clearly provide the necessary motivation to combine the teachings of these references.

166. One particular combination of references that discloses each of the limitations of claims 14 and 16 that would have been particularly obvious to one of ordinary skill in the art in 1991 is the combination of Graham and a Tut Systems "MagicNet" hub. The motivation to combine these references was self-evident; the invention of Graham was specifically directed towards its use in the MagicNet hub. The MagicNet hub, comprising four ports, could be used to connect to four baluns and their associated meters. In this combination, the use of a low DC current signal in a differential circuit configuration comprising multiple independent current loops, together with the means to sense a change in current flow indicative of disconnection of associated monitored equipment is the same solution claimed in Claims 14 and 16 of the '260 patent. One of ordinary skill in the art would fully appreciate that fact and the fact that the use of four ports from a single hub, each providing a current loop to multiple baluns and meters through the existing internal circuitry of those devices is an intended use of this combination. Therefore, this combination discloses each limitation of claims 14 and 16.

167. Similarly, assuming, *arguendo,* that SynOptics LattisNet alone does not contain every limitation recited by claims 14, 16, and 17 of the '260 patent, any such limitation would be satisfied by combining LattisNet with the other references cited previously. All of these references deal with the common problem of detecting disconnection of devices from a network, which clearly establishes the necessary

motivation to combine their teachings. Based on this prior art, the invention of the '260 patent would have been obvious to one of ordinary skill, as these references undeniably disclose each and every limitation of the asserted claims.

168. In addition, assuming, *arguendo,* that the H4000 Ethernet Transceiver Technical Manual alone does not contain every limitation recited by claims 14, 16, and 17 of the '260 patent, any such limitation would be satisfied by combining that document with the other references cited previously, and in particular, with the Ethernet Specification of Exhibit EE. Based on this prior art, the invention of the '260 patent would have been obvious to one of ordinary skill, as these references undeniably disclose each and every limitation of the asserted claims.

169. I provide these combinations as examples, because I believe each of the references discussed in this report, taken individually, fully disclose each of the limitations of the asserted claims. If any limitation is not expressly set forth in any of the references, I believe it is inherent. Nonetheless, I reserve my right to identify additional combinations of references after Chrimar clarifies which limitations it believes are lacking in the prior art disclosed herein, or as discovery produces further information about the references cited (or other references that are currently unknown).

CORRELATION OF SIMPLIFIED SCHEMATIC DIAGRAMS

170. The sections above described the operation of each of the prior art systems using a simplified schematic diagram for reference. In this section, the original schematics of each prior art system is shown, along with a depiction and explanation of how the simplified schematics were generated from those originals.

A. FDDI Over Shielded Twisted Pair

171. Figure K below indicates how the M-Port and S-Port circuit examples from the FDDI IOS document were converted into the simplified schematic shown in Figure F. If so required, the same conversion could be performed from the schematic diagrams contained in the AMD Application Note.

172. The only significant change between the original FDDI IOS diagrams and the simplified schematic relates to the operational amplifier used as the detector means within the FDDI concentrator (M-port). In the '260 patent, only a single threshold is used, i.e., the system can only detect whether the cable and the associated monitored equipment is connected or disconnected. The detector used in the Cable Detect Function of the FDDI IOS system is somewhat more sophisticated. Two operational amplifiers are used, with two corresponding thresholds. As a result, the FDDI Cable Detect Function can detect three conditions: (1) a disconnected cable and associated monitored equipment; (2) a properly connected cable and associated monitored equipment; and (3) a short-circuited cable. These additional detector capabilities do not detract from its ability to perform the function disclosed in the '260 patent.

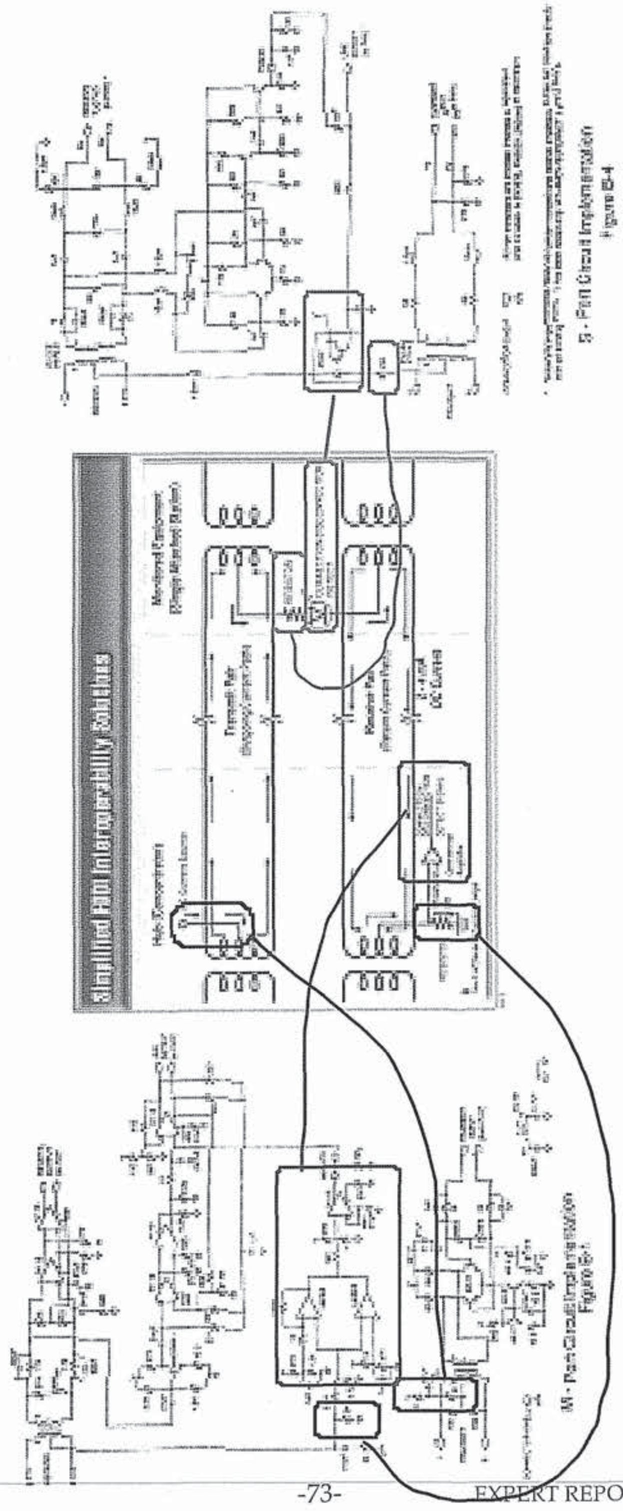

Figure K

B. SynOptics LattisNet

173. Figure L below indicates how the circuit schematics from SynOptics Drawings 920-030-B0-C and 920-002-F0-C were converted into the simplified schematic shown in Figure H.

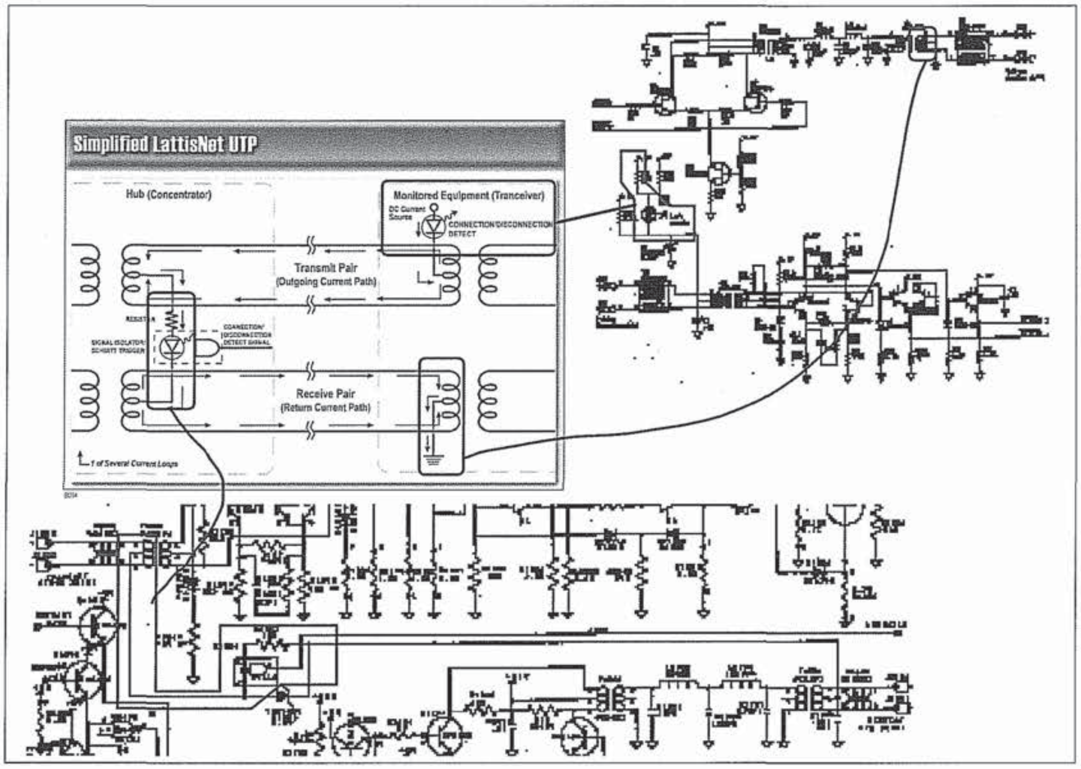

Figure L

174. The low DC current source in the SynOptics drawings comprise the 7.5 VDC power source, connected through the 270 Ω resistor and LED in the transceiver (upper right). A 6.8 V Zener diode is also shown in the schematic (D1). This device protects the LattisNet transceiver from damage if its communications cable is inadvertently plugged into a device presenting unacceptably high voltage at the interface. The additional 7.5 VDC and 5 VDC power connections (and associated

resistors) shown near the source means are used to provide proper operating voltage for the Zener diode; they do not provide the low DC current presented to the current loop associated with the transceiver.

C. Network Monitor and Test Apparatus (Graham)

175. Figure M below indicates how Figures 4 and 7 from U.S. Patent No. 5,365,515 were converted into the simplified schematic shown in Figure I.

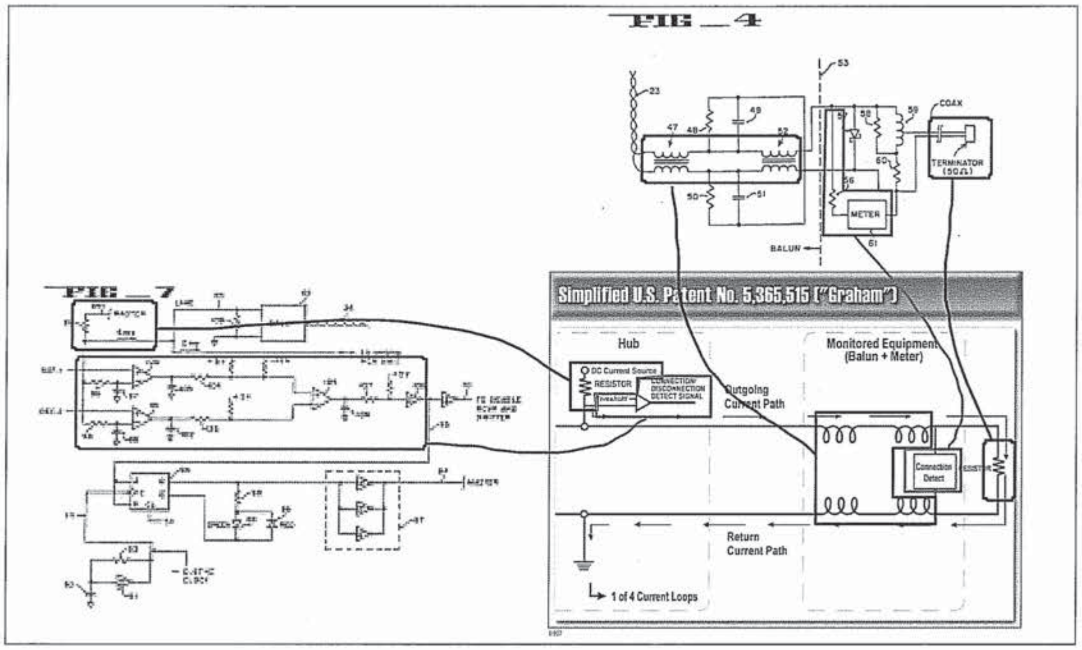

Figure M

176. In Graham, the source for the low DC current does not comprise a simple connection from a power supply to the current loop. Graham uses an integrated circuit (74HC14, element 87 in Figure 7) to produce either a high voltage (5 VDC nominal) or a low voltage (zero Volts). This voltage is present at the "Master" terminal (element 84 in Figure 7). When the Master voltage is 5 VDC, the circuit sources 4 mA of DC current

into the loop, through resistor 86. When the Master voltage is zero Volts, the circuit sources –2 mA of DC current into the loop.

177. Similar to the FDDI IOS discussed earlier, the detector used within the hub in Graham is somewhat more sophisticated than that disclosed in the '260 patent. Two operational amplifiers are used, with two corresponding thresholds. As a result, the detector in Graham can distinguish: (1) a disconnected cable and associated monitored equipment; (2) a properly connected cable and associated monitored equipment; (3) a short-circuited cable; and (4) a cable with the wires reversed from their normal and proper connection. These additional detector capabilities do not detract from its ability to perform the function disclosed in the '260 patent.

178. Also similar to the FDDI IOS discussed earlier, Graham discloses two detectors: one at the hub end of the communications link and one within the remote monitored equipment. The detector within the remote monitored equipment (Balun+Meter) is a conventional voltmeter, connected directly across the wires of the communications link. The injected DC current generates a voltage across these wires, and the meter displays this voltage. By observing the voltage reading on the meter, a user can distinguish among: (1) a disconnected cable and associated monitored equipment; (2) a properly connected cable and associated monitored equipment; (3) a short-circuited cable; (4) a cable with the wires reversed from their normal and proper connection; and (5) a properly connected cable and associated monitored equipment, but with a disconnected terminator resistor. Again, these additional detector capabilities do not detract from its ability to perform the function disclosed in the '260 patent.

D. Power Feed System for Telephone and/or Information Technology Terminals (Jenneve)

179. Figure N below indicates how Figure 1 of the Jenneve patent was converted into the simplified schematic shown in Figure J. There are no significant

functional differences between the figure in the patent and the simplified schematic diagram, as shown.

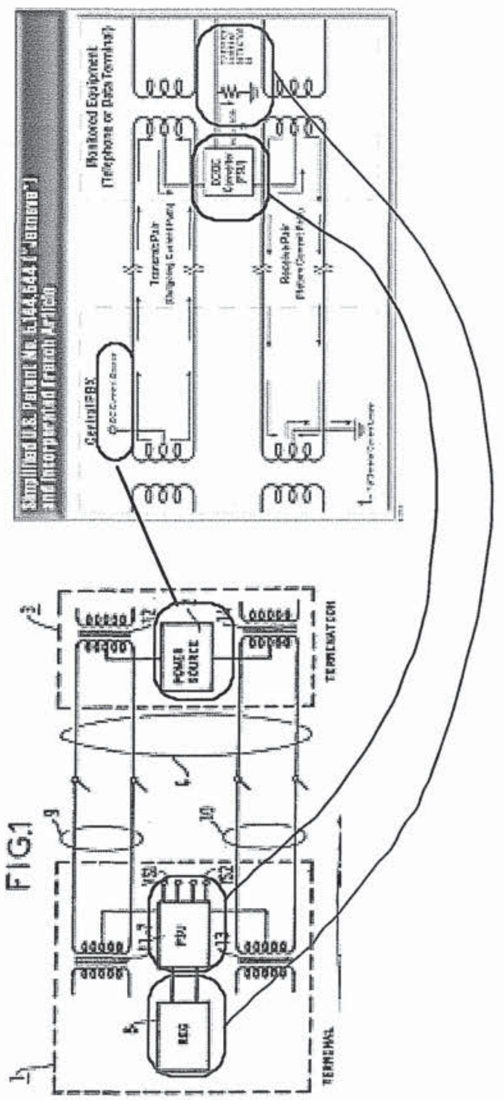

Figure N

E. Drop Cable for a Local Area Network (Puvogel)

180. Figure Q below indicates how Figure 2 of the Puvogel patent was converted into the simplified schematic used earlier. There are no significant functional

differences between the figure in the patent and the simplified schematic diagram, as shown.

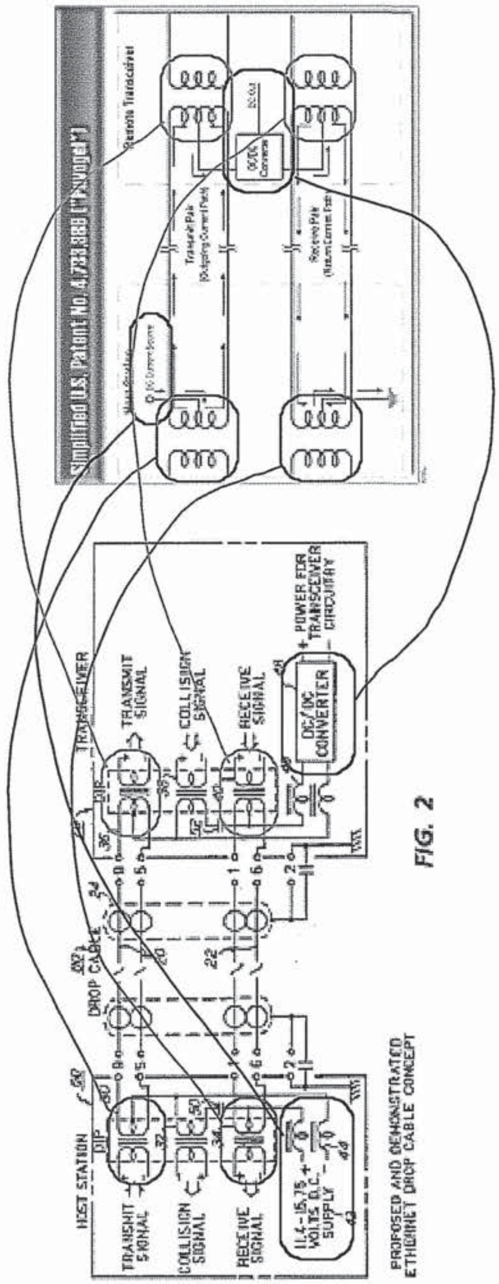

Figure Q

SUPPLEMENTATION

181. As of today, this report represents my best opinion regarding the matters set forth above. In the event such discovery, changes to claim construction, additional data, or testimony are made available, I may find it necessary to revise or supplement my opinions.

182. I am also prepared to testify and express my opinion on related issues or matters: (1) raised on cross-examination; (2) necessary to rebut any other matters testified to by Plaintiff's expert(s) or raised by Plaintiff's expert(s) in expert reports or depositions; and/or (3) otherwise raised at trial, by counsel or by the Court in relation to the matters set forth herein, including any related issues or matters raised.

I declare under the penalty of perjury under the laws of the United States that the foregoing is true and correct.

Dated: 23 October 2009

Rich Seifert