

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARISTA NETWORKS, INC.
Petitioner

v.

CORRIGENT CORPORATION,
Patent Owner.

Case No. IPR2023-00837

U.S. Patent No. 6,957,369

**Declaration of Paul Min, Ph.D.
In Support of Arista's Petition
for *Inter Partes* Review of U.S. Patent No. 6,957,369**

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Exhibit No.	Description
1001	U.S. Patent No. 6,957,369 (“the ’369 patent”)
1002	Prosecution History of the ’369 patent
1003	[Intentionally left blank]
1004	Curriculum Vitae of Dr. Paul Min
1005	[Intentionally left blank]
1006	[Intentionally left blank]
1007	[Intentionally left blank]
1008	U.S. Patent No. 5,841,788 to Ke (“Ke”)
1009	U.S. Patent No. 4,685,102 to Lewis et al. (“Lewis”)
1010	U.S. Patent No. 4,074,352 to Cook et al. (“Cook”)
1011	U.S. Patent Pub. No. 2003/0101426 to Sarkinen (“Sarkinen”)
1012	Braden, R., Ed., “Requirements for Internet Hosts – Communication Layers,” STD 3, RFC 1122, DOI 10.17487/RFC1122, October 1989, < https://www.rfc-editor.org/info/rfc1122 >.
1013	Excerpt of William Stallings, Data & Computer Communications 236 (6 th ed. 2000)
1014	[Intentionally left blank]
1015	[Intentionally left blank]
1016	[Intentionally left blank]
1017	<i>Corrigent Corp. v. Cisco Systems, Inc.</i> , No. 6:22-cv-00396 (W.D. Tex.) Dkt No. 69
1018	Declaration of Dr. Nader Mir

1. I, Paul Min, have been retained on behalf of Petitioner Arista Networks, Inc. (“Arista”), as an expert to submit a declaration in connection with a petition for inter partes review (“IPR”) of U.S. Patent No. 6,957,369 (“the ’369 patent”) before the United States Patent and Trademark Office.

2. I have been retained to offer technical opinions as to whether the inventions claimed in claims 1-26 (“the Challenged Claims”) of the ’369 patent would have been obvious to a person of ordinary skill in the art (“POSITA”) at the time of the alleged invention, considering the prior art.

3. I am being compensated for my work in this matter at my standard hourly rate. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

I. BASIS FOR OPINIONS

A. Qualifications and Experience

4. I received a B.S. degree in Electrical Engineering in 1982, an M.S. degree in Electrical Engineering in 1984, and a Ph.D. degree in Electrical Engineering in 1987 from the University of Michigan in Ann Arbor. I received several academic honors, including my B.S. degree with honors, a best graduate student award and a best teaching assistant award during my M.S. study, and a best paper award from a major international conference for reporting results from my Ph.D. thesis.

5. After receiving my Ph.D., I worked at Bellcore in New Jersey from August 1987 until August 1990. At Bellcore, I was responsible for evolving the public switched telephone network (PSTN) into a multi-services voice and data network that incorporated packet switches, optical technologies, and wireless technologies, which included the deployment of the Synchronous Optical Network (SONET) as part of the digital backbone networks.

6. In September 1990, I joined the faculty at Washington University in St. Louis. In July 1996, I was promoted to an Associate Professor of Electrical Engineering with tenure. I am currently a Senior Professor at Washington University in the Department of Electrical and Systems Engineering. I have also served as the Chair of the Graduate Curriculum (2000-2002) and the Chair of the Undergraduate Curriculum (2011-2014) for the Department of Electrical and Systems Engineering.

7. At Washington University, I have conducted research in communication, computing, and related electronic hardware and software. I have received several grants from the U.S. Federal Agencies, including the National Science Foundation and the Defense Advanced Research Project Agency, and numerous contracts from companies and organizations around the world. I have researched a variety of communication, computing, and electronic technologies, including wireless communication, broadband communication, transmission and

switching, integrated circuit design, software application and protocol design, and system prototype. I have an extensive background and experience in each of these technologies. Specifically related to the technology matters in this proceeding, I have designed several packet switches and routers that can address the speed and processing mismatch between the optical transport networks and the switching infrastructure in data communication.

8. As a faculty member at Washington University, I have taught several courses in electronics, communication, and computing at both the undergraduate and graduate levels. For example, I have taught electronic circuits (Washington University ESE 232), communication theory (Washington University ESE 471), transmission and multiplexing (Washington University ESE 571), and signaling and control of communication networks (Washington University ESE 572).

9. I have supervised numerous graduate and undergraduate students, many of whom received a doctoral degree under my guidance. The doctoral theses that I have supervised relate to wireless communication, broadband communication, transmission and switching, integrated circuit design, software application and protocol design, and system prototype. My students and I have published several peer-reviewed articles on transmission and switching, electronic circuit and integrated circuit design, resource allocation, scheduling, modulation, mobility management, switching and transmission, and multiplexing. Several of these

articles received accolades in the field. For example, in 2011, we received a best paper award in 3G WCDMA-related mobility and resource management at the prestigious Mobility 2011 international conference.

10. In addition to my responsibilities as a university faculty member, I have founded two companies. In May 1997, I founded MinMax Technologies, Inc., a fabless semiconductor company that developed switch fabric integrated circuit chips for the Internet. In March 1999, I founded Erlang Technology, Inc., a fabless semiconductor company that focused on the design and development of integrated circuit chips and software for the Internet. One of Erlang's products received a best product of the year award in 2004 from a major trade journal for the electronics industry. In these companies, I have designed several circuits and software protocols, including switch fabric, network processor, high speed interface devices with transmission media, a key technology aspect of this litigation.

11. In addition to starting my own companies, I have also served in various technology and business advisor roles for other companies and organizations around the world. I was the main technical author for one of two winning proposals to the Korean government for CDMA wireless service licenses (1996). I was responsible for designing a commercial scale IS-95 CDMA cellular network, which I understand to be one of the earliest such networks deployed in the world. I worked with numerous engineers and scientists around the world to implement this commercial-

scale cellular network before IS-95 CDMA was widely accepted. This provided me with extensive insight into various components of CDMA technology, which extensively use various transmission technologies incorporating packet framing techniques. I have also been involved in a semiconductor company that specializes in semiconductor memories such as flash EEPROMs as a board member and as a technical advisor (2007-2011).

12. I am a member of and have been actively involved in a number of professional organizations. For example, I have served as the Chair of the Saint Louis Section of the IEEE with more than 3,000 members (2014), and a member of the Eta Kappa Nu Honor Society for electrical engineers. I have also been an Ambassador of the McDonnell International Scholars Academy (2007 – 2013).

13. In my 30+ years of experience with telecommunications technology, I have acquired significant knowledge about telecommunications systems industry standards, standard setting organizations such as Bellcore, IEEE, ATM Forum, IETF, ITU, 3GPP, and the rules and document policies that those organizations have in place to develop industry standards.

14. I am a named inventor on eleven U.S. patents, many of which focus on algorithm and device designs. I have extensively published technical papers in international conferences and journals, technical memoranda and reports, and given

a number of seminars and invited talks. I have organized several international conferences and served as an international journal editor.

15. I have served as an expert in multiple civil litigation matters and *inter partes* reviews.

16. Provided as Exhibit 1004 is my *curriculum vitae* (“CV”), which includes a more detailed list of my qualifications. My CV also contains a list of all other cases in which, during the previous four years, I testified as an expert at trial or by deposition.

B. Documents and Information Considered

17. I have reviewed the ’369 patent, including the claims of the patent in view of the specification. In addition, I have reviewed the ’369 patent’s prosecution history, the prior art discussed, and exhibits listed herein. I understand that Cisco Systems Inc. and Dell Technologies Inc. (“Dell”), who were also sued by Corrigent Corporation have also filed an IPR challenging the validity of the ’369 patent. I have reviewed the petition filed by Dell. I have also reviewed the declaration by Dell’s expert Dr. Nader F. Mir. Ex. 1018. I incorporate in its totality Dr. Mir’s declaration, with exceptions to certain aspects of the invalidity analysis. There is substantial overlap in our analysis of the prior art but slight differences with respect to what is perceived as the disclosures within the prior art that provide the most persuasive invalidity case.

18. The opinions that I state in this declaration are based upon my own personal knowledge and professional judgment. If called upon to testify as a witness during any proceeding, I am willing and able to competently testify as to anything contained in this declaration.

C. Level of Ordinary Skill in the Art

19. In my opinion, as it relates to the '369 patent, a person of ordinary skill in May 2002 would have had at least a bachelor's degree in computer science, computer engineering, or electrical engineering and two to three years of work experience related to administering distributed computing environments. This experience might have included, for example, designing and testing switches, experience in network and switch design and analysis, design and functionality of electronic and communication devices, including devices with backplanes, client-server, communication analysis and evaluation, and load balancing. A master's degree or higher would have been acceptable in place of the work experience described above.

20. I meet the criteria described above and believe myself to be a person with at least ordinary skill in the art pertaining to the '369 patent. I qualified as such a person by at least May 30, 2002, which I understand is the earliest priority date of the '369 patent.

II. LEGAL STANDARDS TO BE APPLIED

21. I am a technical expert and do not offer any legal opinions. However, counsel has informed me about certain legal principles regarding patentability and related matters under United States patent law, which I have applied in performing my analysis and arriving at my technical opinions.

A. A Person of Ordinary Skill in the Art

22. It is my understanding that a person of ordinary skill in the art (“POSITA”) is a hypothetical person who is used to analyze the prior art without the benefit of hindsight. A person of ordinary skill in the art is presumed to be one who uses conventional wisdom in the art, but does not undertake to innovate, either by extraordinary insights or by systematic research.

23. I further understand that the hypothetical POSITA is presumed to have knowledge of all references that are sufficiently related to one another and to the pertinent art, and to have knowledge of all arts reasonably pertinent to the particular problem that the claimed invention purports to address.

B. Legal Standard for Prior Art

24. It is my understanding that a patent, published patent application, or other publication, must first qualify as prior art before it can be used to invalidate a patent claim.

25. I further understand that a U.S. or foreign patent qualifies as prior art to the claim of a patent if the date of application, issuance, and/or publication of the prior art patent is prior to the purported date of invention of the patent claim.

26. I understand that a printed publication, such as a technical publication, a magazine article, or newsgroup post, qualifies as prior art to a patent claim so long as the date of publication is prior to the purported date of invention of the patent claim.

27. It is my understanding, moreover, that a U.S. patent qualifies as prior art to a patent claim if the application for the prior art patent was filed in the United States before the purported date of invention of the patent claim.

C. Claim Construction

28. I understand that the USPTO recently issued a new final rule addressing the claim construction standard applied during *inter partes* review (“IPR”). The new rule replaces the “broadest reasonable interpretation” standard with the same standard that is used during claim construction in district court civil actions, with which I am familiar. I understand that this new rule applies to the IPR petition filed concurrently herewith, which means that claim construction in this IPR will be governed by the same claim construction standards utilized in district court.

29. I understand that, in the district court context and in this IPR, the words of a claim are generally given their ordinary and customary meaning. This is the

meaning the term would have to a person of ordinary skill in the art in question at the time of the invention, which generally means the time the application was filed.

30. I further understand that the specification informs the proper interpretation of a claim. This is because a POSITA is deemed to have read the claim term not only in the context of the particular claim in which the disputed term appears, but also in the context of the entire patent, including the specification. I understand that the prosecution history and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art are also considered in ascertaining the meaning of claim terms.

D. Legal Standard for Anticipation

31. I understand that, once the claims of a patent have been construed, the second step in determining anticipation of a patent claim requires a comparison of the construed claim language to the prior art on a limitation-by-limitation basis.

32. It is my understanding that a prior art reference anticipates a claim, and thus renders the claim invalid, if all elements of the claim are disclosed in the prior art reference, either explicitly or inherently.

33. I further understand that, under Section 102 of the Patent Act, claims of a patent are invalid for lack of novelty if they are anticipated by a single prior art reference. I have been informed by counsel that a claimed invention is invalid as anticipated and hence lacks novelty if all of the limitations of the claim, as construed

by the Court, are present in a prior art reference. It is my understanding, however, that a limitation of the claim need not be shown directly in a reference so long as a POSITA would have understood the limitation to be inherent or necessarily present in the reference.

E. Legal Standard for Obviousness

34. I understand that an invention may also be obvious, even though the invention is not identically disclosed or described in a single prior art reference, which is required for anticipation. This is true if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the relevant art.

35. I understand the Supreme Court has urged caution in granting a patent based on the combination of elements found in the prior art. This is because a patent for a combination that only unites old elements with no change in their respective functions withdraws what already is known from the public, giving it exclusively to the patentee. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.

36. I further understand that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement

a predictable variation, the invention is likely obvious. For the same reason, if a technique has been used to improve one device, and a POSITA would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. Put another way, a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. I understand that this is a flexible standard and it is not confined to any particular formalistic conception.

37. I understand that, when conducting an obviousness inquiry, the analysis should consider the scope and content of the prior art, differences between the prior art and the claims of the challenged patent, and the level of ordinary skill in the art. Secondary considerations of nonobviousness can also be considered. Secondary considerations include commercial success enjoyed by devices practicing the patented invention, industry praise for the patented invention, copying by others, and the existence of a long-felt but unsatisfied need for the invention. I understand that there must be a nexus between these factors and the claims themselves for these secondary considerations to impact the analysis of obviousness.

38. I understand that there generally must be a motivation to combine the references in order to find obviousness. This motivation or reason to combine can arise from the references themselves, changing market dynamics, or from simple common sense.

39. I understand that a single reference can render a patent claim obvious, even if that reference does not fully anticipate the claim. To determine whether there was an apparent reason to combine the known elements in the way a patent claims, it will often be necessary to look to interrelated teachings of multiple patents; to the effects of demands known to the design community or present in the marketplace; and to the background knowledge possessed by a person having ordinary skill in the art.

III. TECHNOLOGY BACKGROUND

40. To put in context my opinions on the validity of the claims of the '369 patent, in this section I provide a brief discussion of the relevant technological background, which relates to testing electronic systems on failure, network switches, and device backplanes.

41. Network switches in May 2002 were broadly available for a wide range of communication services including for use in self-testing systems. With switches, data units known as “packets” can be forwarded from an input port to an output port of a switch so that the associated links attached to physical ports can exchange data. A packet consists of a “payload” containing an application’s information being carried by the packet and a “header” consisting of routing and control information. A switch can then be deployed for any application included in its payload. One can forward, for example, test packets to various parts of an electronic system and

receive a response packet containing the information that detects a failing or idle part of the electronic system while the rest of the system is in use.

42. The process of switching and forwarding of a test packet by a switch is essentially identical to the switching and forwarding process of any other types of packets such as email packets. The process of packet switching requires performing a lookup table operation for each incoming packet to find a matching output port number for the packet. This operation was well known by the priority date for the '369 patent and the process was independent of the application carried by a packet whether the purpose of the packet switching was for testing electronic components or a typical known Internet application such as email.

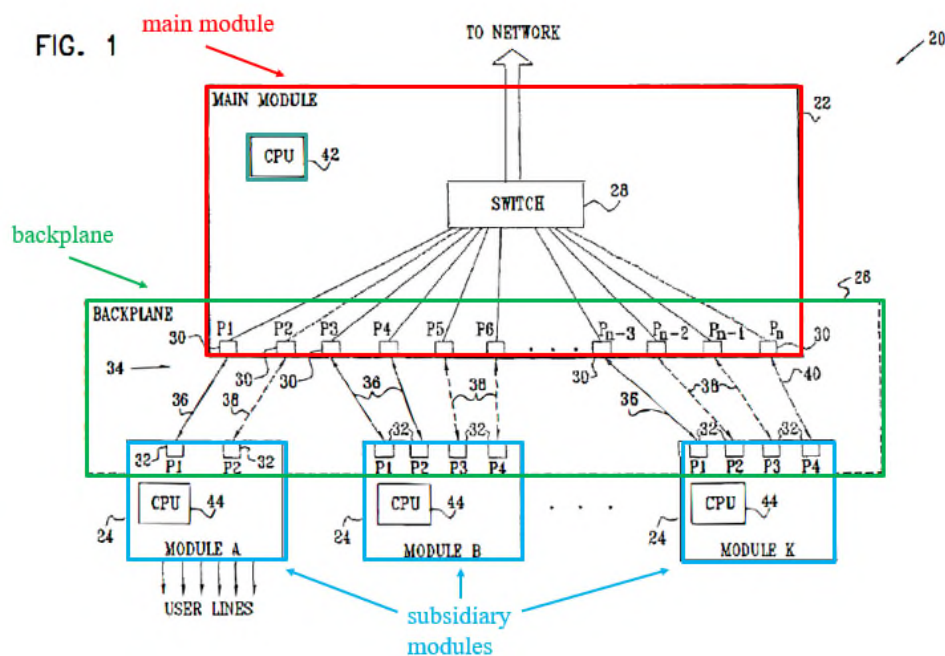
43. Systems with backplane configurations were also well known in May 2002. During this time frame, it arose from the demand by computer and communication manufacturing companies for better system maintenance that led to a backplane-based structure. In a backplane-based structure, a main module called backplane is interconnected by a core network to several other modules (boards) making the system maintenance and fault detection more convenient. A line card-based internal organization of an Internet router that was widely available in May 2002 can be a good example of such a system structure. U.S. Patent No. 5,841,788 ("Ke"), filed in 1996 is another exemplary prior art disclosing methods for backplane interconnect to various modules. See Ex. 1008. Ke describes that a system

structured with a backplane may be dynamically configurable, “the position of boards on the backplane can change and boards can be removed or added.” Ex. 1008, 1:37–39.

44. All of the concepts discussed in this section were well known and widely used prior to the May 30, 2002 priority date for the ’369 patent.

IV. THE ’369 PATENT

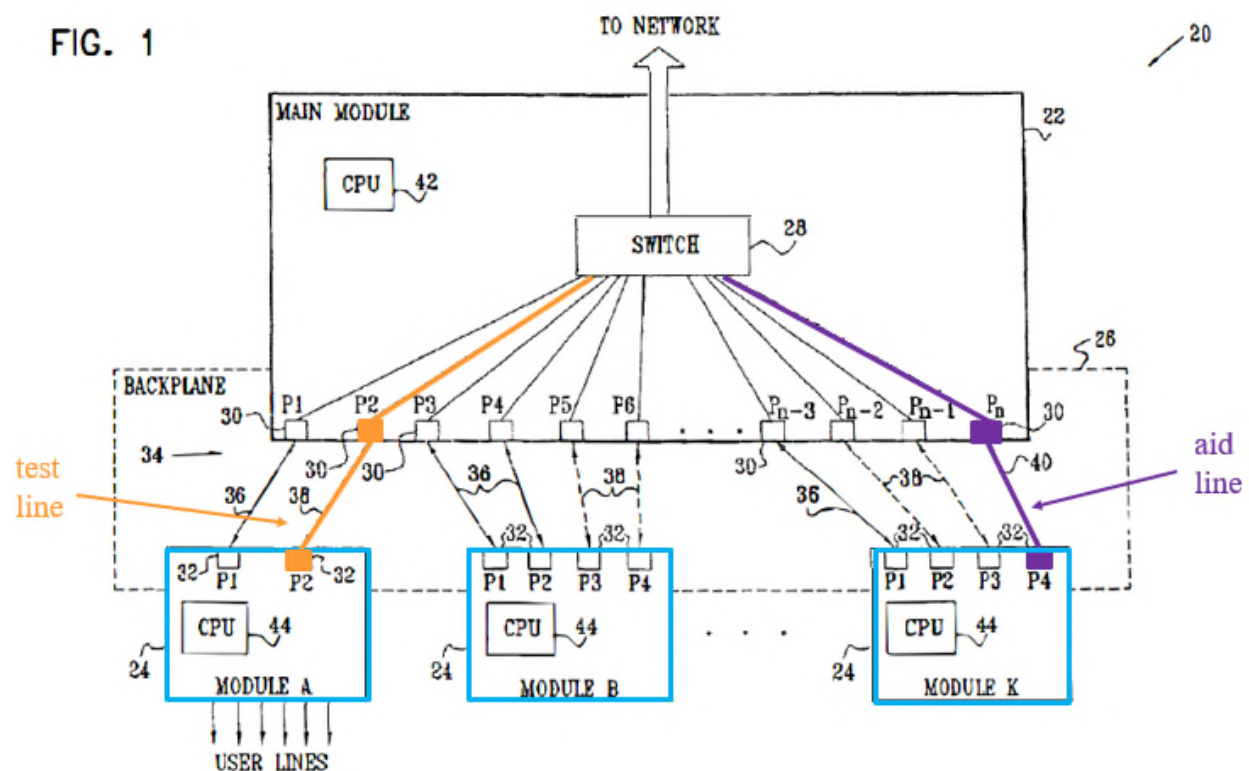
45. The ’369 patent describes an electronic system which comprises of a “main module” and two or more “subsidiary modules.” Ex. 1001, 4:54–67. Each subsidiary module is connected via a backplane to the main module. Ex. 1001, 4:54–67. The main module contains a switch, multiple ports, and a system control processor. Ex. 1001, 4:54–67; 5:41–45. Figure 1 (annotated below) depicts this arrangement:



46. The patent describes a method (and apparatus) to test the electronic system’s idle lines. Ex. 1001, 5:55–6:39. The patent explains that testing idle lines is important because failures in these idle lines will go undetected until the line is needed. Ex. 1001, 1:11–24. The patent also explains that testing idle lines is ideal because the test will not interrupt normal operation of the active components. Ex. 1001, 1:11–24.

47. The ’369 patent discloses a six-step method. First, the system control processor of the main module selects an idle line that connects a subsidiary module to a port of the switch of the main module in order to loop the test traffic through. Ex. 1001, 5:61–67. This line is called an “aid line” 40. Ex. 1001, 5:61–67. Next, the system control processor instructs the subsidiary module to loop back all traffic

via the aid line. Ex. 1001, 5:63–6:9. Then, the system control processor selects another idle line connected to a different subsidiary module to be the test line 38. Ex. 1001, 6:10–13. Then, the system control processor configures the switch to connect the aid line and the test line. Ex. 1001, 6:14–17. Next, the system control processor tells the second subsidiary module to send test traffic. Ex. 1001, 6:18–22. Finally, it is reported if the test traffic did not return in a timely manner or intact. Ex. 1001, 6:23–39. This loop is demonstrated below:



A. Summary of the Prosecution History of the '369 Patent

48. The '369 patent's application was filed on May 30, 2002. Ex. 1001, [22]. The examiner rejected claims 1–20 under 35 U.S.C. §112 for failing to

distinctly claim the subject matter. Ex. 1002, 67. The Examiner also rejected claims 1 and 8 for “omitting essential steps” and claims 1 and 15 for the being “unclear on whether the limitations following the phrase [were] part of the claimed invention.” Ex. 1002, 67–68. The Examiner also rejected claims 1–4, 6–9, and 11–14 as anticipated by U.S. Patent No. 6,028,845 (“Serikawa”) and over Serikawa in view of U.S. Patent No. 5,541,862 (“Bright”). Ex. 1002, 68, 72.

49. The Applicant requested in an interview and it was discussed that an amendment of “wherein the test traffic is conveyed via the switch to the aid line connecting to the first subsidiary module” would overcome the prior art challenge. Ex. 1002, 85–95. In addition, the Applicant argued the prior art did not disclose a loopback test via a switch. Ex. 1002, 98–99. In the Applicant’s remarks, the Applicant argued that the invention was innovative because it allowed to test subsidiary modules of different types and different formats. The Applicant also removed the “may be” and “adapted” language to overcome §112 objections. Ex. 1002, 87–95. The Examiner allowed the claims, and the patent issued on October 18, 2005. Ex. 1002, 111; Ex. 1001, [45].

B. Overview of the Challenged Claims

50. There are four independent claims in the ’369 patent: claims 1, 8, 15, and 21.

51. I have analyzed all the claims of the '369 patent (the "Challenged Claims").¹

52. For the reasons I detail below, it is my opinion that each of these claims is unpatentable over the prior art discussed below.

V. PRIOR ART CONSIDERED

53. In this declaration, I provide four prior art references (among others) with exemplary citations identifying the relevant features related to the claim language of the Challenged Claims. I have also described combinations of these prior art references that, when combined, render the Challenged Claims obvious. It is my opinion that the Challenged Claims are anticipated and/or rendered obvious in light of the prior art specifically discussed in this declaration.

54. The citations presented in the body of this declaration correspond to the teachings disclosed in exemplary items of prior art that identify: (1) the problem(s) confronted by one of ordinary skill in the art; (2) an express suggestion to make one or more of the combinations; (3) an implicit suggestion to make one or more of the combinations; or (4) the knowledge of those skilled in the art as to the applicable field of technology.

¹ The claim language for the Challenged Claims of the '369 patent can be found in Appendix A of this petition.

A. Identification of the Primary Prior Art References

55. It is my opinion that a person of ordinary skill would consider at least the prior art references below:

Prior Art Reference	Qualifying Date	Exhibit No.
U.S. Patent No. 5,841,788 ("Ke")	11/24/1998	1008
U.S. Patent No. 4,685,102 ("Lewis")	08/04/1987	1009
U.S. Patent No. 4,074,352 ("Cook")	02/14/1978	1010
U.S. Patent Pub. No. 2003/0101426 ("Sarkinen")	11/27/2001	1011

56. Other references and knowledge described earlier in this declaration are relevant to show the state of the art – i.e., what a person of ordinary skill would have known when using the references identified above, or to use in combination with the references above to render the Challenged Claims invalid. The references include, but are not limited to:

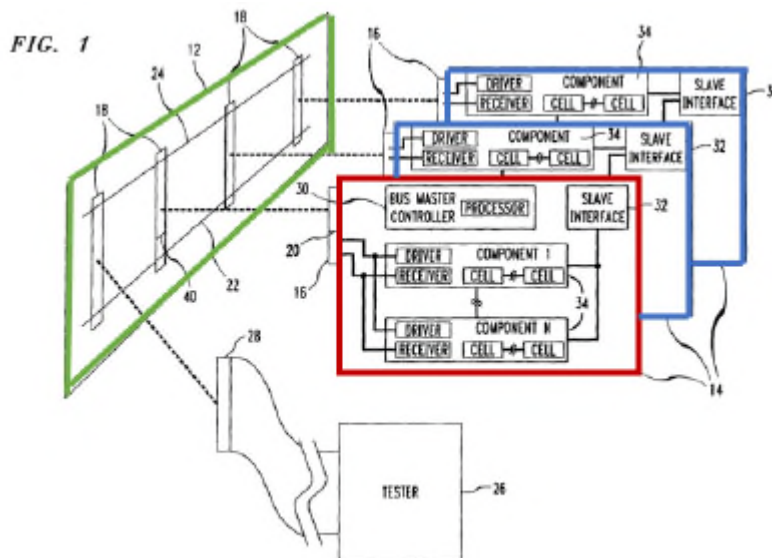
- Braden, R., Ed., "Requirements for Internet Hosts - Communication Layers" STD 3, RFC 1122, DOI 10.17487/RFC1122, October 1989, <<https://www.rfc-editor.org/info/rfc1122>>. ("RFC 1122") (Ex. 1012).
- William Stallings, "Data & Computer Communications" 236 (6th ed. 2000) (Ex. 1013)

B. General Overview of the Primary Prior Art References

57. The following sections provide a brief description of the anticipating prior art systems and software that invalidate the '369 patent. This discussion is not meant to be exhaustive, and my full element-by-element analysis is provided in more detail below in the analysis section. I have personally reviewed the references cited in this declaration. It is my opinion that Ke, Lewis, Cook, and Sarkinen each disclose or suggest the features of the Challenged Claims.

1. Ke

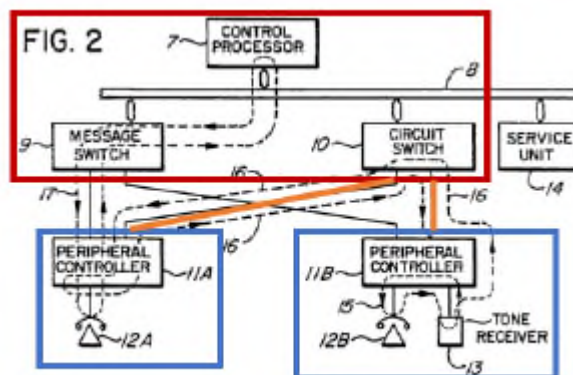
58. Ke involves a method for testing traces in a backplane. Ex. 1008, Abstract. The invention in Ke “relates to methods for testing backplane interconnects . . .” Ex. 1008, 1:7-8. The electronic system in Ke has a **master board** with bus master controller 30, and **other boards** with slave interfaces 32 which are all plugged into a **backplane**. Ex. 1008, 3:16–36. The bus master controller 30 performs a test of the backplane by driving the other boards through their slave interfaces. Ex. 1008, 3:24–36.



59. Ke states that there are different ways to test backplanes. Ex. 1008, 1:30–2:19. However, Ke discloses a new way a connection is tested one way at a time by toggling the connections on and off to test one connection at a time. Ex. 1008, 3:61–4:40. After an error is detected, it is reported. Ex. 1008, 4:1–12.

2. Lewis

60. Lewis discloses switching system testing which utilizes a circuit loop to test switches, loops, and links. Ex. 1009, Abstract, 1:25–35. Lewis discloses a test in which **circuit switch 10**, which is able to communicate with **a control processor 7** and **message switch 9**, sets up a loop to test **peripherals 12A** and **13**. Ex. 1009, 3:47–53, 4:42–54. For example, the circuit switch sets up a **loop 16** that connects **peripheral 12A** with **peripheral 13** through the circuit switch 10.



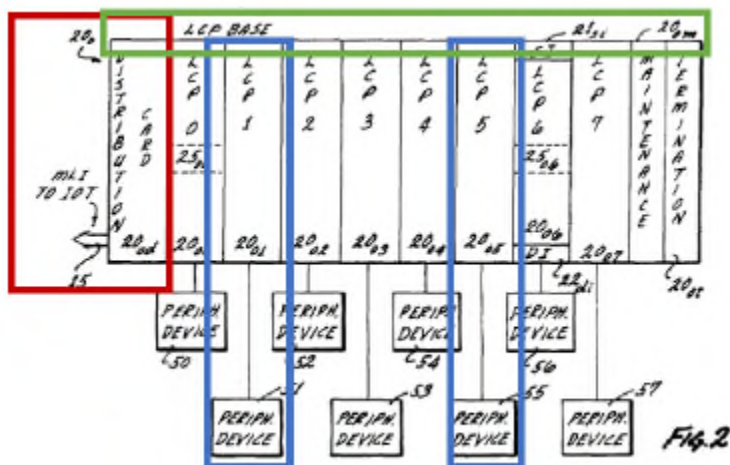
61. The control processor sends a message to peripheral 12A. This triggers a loopback test, which then travels via loop 16 to circuit switch 10 to peripheral 13. Peripheral 13 is configured to loop back the message to circuit switch 10 and then back to peripheral 12A. Ex. 1009, 4:42–54. The results are then reported back to the message switch. Ex. 1009, 4:49–54, 4:34–41 (earlier description of return signal). Further, Lewis explains that it is optimal to perform the loopback test when the links are idle as to not impede on the normal traffic. Ex. 1009, 2:19–20, 14:31–34.

3. Cook

62. Cook discloses a “digital data processing system” which contains several “line control processors” (“LCPs”). Ex. 1010, 4:39–45. The LCPs are connected to each other via a “backplane.” Ex. 1010, 28:62–29:7. In the digital data processing system there are one or more LCP Base Modules consisting of eight LCPs. Ex. 1010, 4:39–52. The LCP Base Module contains a “distribution card unit” (“DCU”). Ex. 1010, 5:5–10. The DCU sends and receives data with the Input-

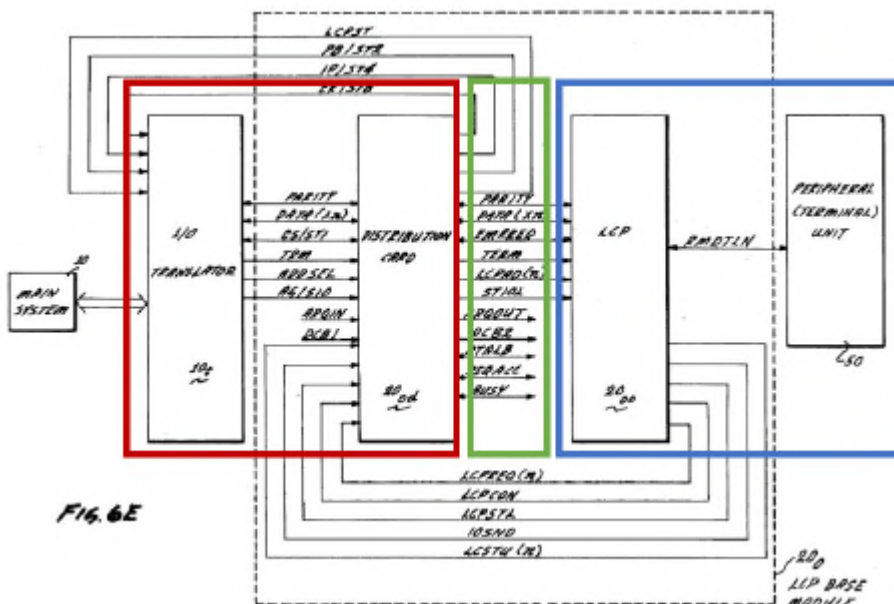
Output Translator (“IOT”) including data from the peripheral devices to the LCPs.

Ex. 1010, 5:5–10, 5:20–31. Figure 2 depicts this structure.



63. Each LCP, and their corresponding peripheral device, are connected to each other and the distribution card unit through a backplane. Ex. 1010, 28:62–29:7.

Figure 6E provides the same structure from a different viewpoint:



64. The DCU and IOT work together to act as a switch between the LCPs. Ex. 1010, 31:63–32:47. Cook discusses testing the connections between the DCU and the LCPs to identify errors. Ex. 1010, 23:43–24:27.

4. Sarkinen

65. Sarkinen discloses a system and method with a network switch or router which includes a backplane or midplane. Ex. 1011, ¶12. The backplane or midplane has multiple lines and is able to be connected to multiple fabric cards. Ex. 1011, ¶12. This is demonstrated in Figure 3 which discloses a fabric interface (316), multiple line cards (304, 306), and fabric cards (310, 312) plugged into a midplane 314. Ex. 1011, ¶55.

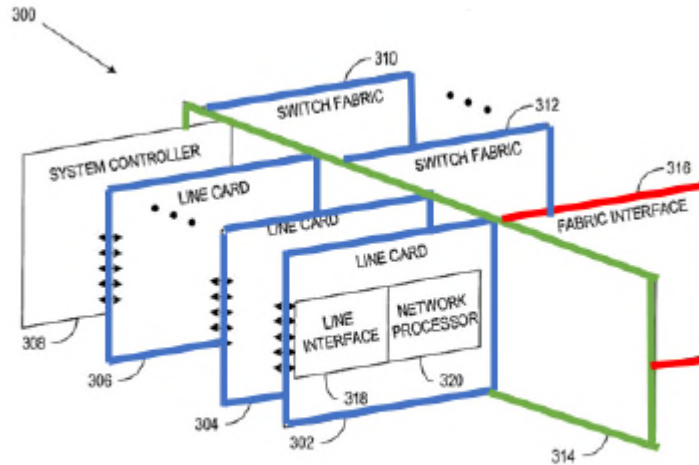


FIG. 3

66. Sarkinen discloses that the midplane depicted in the diagrams can also be a backplane. Ex. 1011, ¶¶12, 54. In fact, the claims of Sarkinen disclose a backplane. See, e.g., Ex. 1011, cl. 1.

67. “The fabric interface card includes fabric interface connectors and fabric interface circuitry to manage transfers of information between the line cards and switch cards.” Ex. 1011, ¶12. “A backplane (or midplane) is provided having connections to receive the line cards, switch cards, and fabric interface card.” *Id.* The invention “discloses a system and method for interfacing network elements using an isolated fabric interface module, which is facilitated through the exploitation of standards . . .” Ex. 1011, ¶11. “Signal traces of the standard interface are routed according to predetermined routing rules through circuit board and backplane connectors . . .” Ex. 1011, ¶14. Sarkinen discloses that the system may include a traffic manager to support multiple standards Ex. 1011, ¶15. The system also includes fabric processors that can convert data from one format to another to distribute the data over the fabric interface. Ex. 1011, ¶49. The various standards supported by the system specify the data format to be used by the traffic manager in transmitting the data. Ex. 1011, ¶¶66, 69, 71, 74.

VI. ANALYSIS OF THE CHALLENGED CLAIMS AGAINST THE PRIOR ART

A. Claim Construction

68. Unless specifically noted otherwise below, I have accorded claim terms their ordinary and customary meaning as understood by a POSITA and in light of the patent specification and prosecution history.

69. I have been informed by counsel and understand that claim terms need not be construed when there is no dispute as to the meaning of a term that could affect the outcome of the proceeding. For the purposes of this *Inter Partes* petition, it is my opinion that no formal claim construction is necessary. However, I understand that Cisco Systems, Inc., another party that was also sued by the Patent Owner, has gone through the process of claim construction in the Western District of Texas, where litigation involving the '369 patent was filed.

70. I understand that the meanings of several terms were adopted by the court. The terms “idle line,” which can be found in claims 1, 3, and 7; “idle trace,” which can be found in claims 15, 18, and 20; and “subsidiary module,” which can be found in claims 1-3, 5, 8-12, 15-17, 17, and 21-24 were given their plain and ordinary meaning by the court in that case. Ex. 1017. I understand that the term “backplane,” which appears in claims 5, 10, 15, and 21, was construed as having a plain and ordinary meaning which was construed as being “hardware used to establish interconnections between modules.” Ex. 1017. I understand that the order in which the claim limitations appear in claims 1, 8, 15 and 21 was construed to require that “[t]he instruct[ing] step must be performed after the completion of the first selection; the configure[ing/e] step must be performed after the completion of both selections; and the transmit[ing] step must be performed after both selections.” Ex. 1017.

71. The prior art teaches and/or renders obvious these limitations under the existing claim construction from the district court. As such, these constructions at best support the case for unpatentability of the Challenged Claims, or have no impact on the patentability of the Challenged Claims.

72. I understand that there has not been any claim construction in Arista's district court case.

B. Application of the Prior Art to the Claims

73. Based upon my review of the prior art, particularly the references detailed in this declaration, it is my opinion that the subject matter of each of the Challenged Claims would have been obvious to one of ordinary skills in the art in view of the known prior art references.

74. It is my understanding that each of the prior art references analyzed in this declaration meets the legal requirements for prior art to the '369 patent. I have performed my analysis with this understanding.

75. Based upon my analysis, it is my opinion that the Challenged Claims of the '369 patent are rendered obvious by the following prior art grounds:

Ground	'369 Patent Claims	Basis for Rejection ²
1	1–26	Obvious over Ke and Lewis
2	3, 6, 8, 13, 14, 17, 21, 25, and 26	Obvious over Ke, Lewis, and Sarkinen
3	1–26	Obvious over Cook and Lewis

² All obviousness grounds include the knowledge of a POSITA.

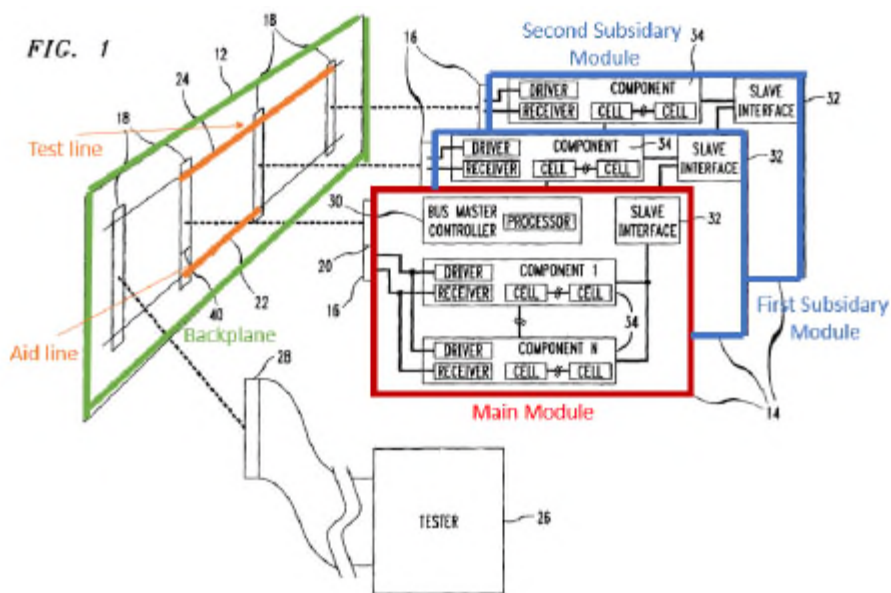
Ground	'369 Patent Claims	Basis for Rejection ²
4	3, 6, 8, 13, 14, 17, 21, 25, and 26	Obvious over Cook, Lewis, and Sarkinen

C. Ground 1

76. In my opinion, claims 1–26 of the '369 patent would have been obvious over Ke in view of Lewis.

1. Motivations to Combine Ke and Lewis

77. In my opinion, a POSITA would have been motivated to combine Ke's backplane testing with Lewis's loopback.



78. In the above diagram, it is my opinion that a POSITA would be motivated to test the Ke system with the Lewis test. As depicted above, this could be accomplished by setting up an aid line on Ke's backplane which connects the first subsidiary module and a test line on Ke's backplane which connects the second subsidiary module to the main module, as disclosed in Lewis. The modules would

then be able to route the test packet through the aid and test lines to perform Lewis's loopback test. Ex. 1009, 4:42–54.

79. In my opinion, a POSITA would be motivated to combine Ke and Lewis because both references discuss testing connections in a system which contains multiple components. Specifically, Ke discusses a master controller that directs testing in other boards plugged into a backplane (Ex. 1008, 3:24–37), while Lewis discusses testing peripheral controllers via a control processor/circuit (Ex. 1009, 3:47–53). In my opinion, a POSITA would have understood the benefits of a loopback test in the context of a backplane with a master controller and thus would have been motivated to combine the testing protocol in Lewis in the structure disclosed in Ke.

80. Further, Ke states:

If a system is dynamically configurable, the position of boards on the backplane can change and boards can be removed or added. . . . **Individual circuit boards can be tested using a multi-drop test bus configuration, in which multiple boards are connected to a common test bus.** Each board is provided with a **slave interface** that **monitors** communications from a **bus master**. **With this configuration, boards can be individually addressed**

for testing. However, multi-drop configurations have not been used for testing backplanes. . . Further, most backplanes are dynamically reconfigurable. Various board types (e.g., memory, input/output, etc.) may be inserted into the backplane. The total number of boards may vary, and the boards may be inserted into the backplane in different orders. Because the type, number, and order of the boards in the backplane are not fixed, thousands or millions of different system configurations may be possible.

Ex. 1008, 1:36–2:4. Based on this disclosure, a POSITA would have been motivated to look at other testing configurations, like the one disclosed in Lewis. A POSITA would know that a backplane could be tested by a loopback test. A POSITA would also know that a loopback test would be ideal to test a backplane-based system because a loopback test could test the connections between the different boards connected to the backplane. In my opinion, a POSITA would also have known that testing between peripheral units would be essential because sometimes data needs to be transferred to and from different boards on the backplane. A POSITA therefore would have been motivated to apply the loopback testing between two peripherals

in Lewis to the structure in Ke to test the connection between two boards in the backplane.

81. Lewis further discloses “[b]oth message and circuit switches are connected via serial links to one or more peripheral controllers 11A and 11B, the peripheral controllers being connected to peripherals 12A, 12B, 13 etc. via peripheral interface units.” Ex. 1009, 3:53–60. Specifically, a POSITA would have been motivated to apply the loopback testing between two peripheral interfaces in Lewis to the input/outputs structure of board-pins in Ke since the input/outputs structure consist of bidirectional input/outputs acting as interfaces and participating in testing the connection between two boards in the backplane.

82. Additionally, a POSITA would have been motivated to test the lines of the backplane in Ke while they were idle as disclosed in Lewis. Ex. 1009, 2:19–20. Ke discusses testing the backplane traces by disabling certain parts of the system to avoid damage to circuit components. Ex. 1008, 2:29–35. A POSITA would understand that waiting until those lines are idle would be the ideal time to test as that would avoid disrupting traffic when the lines were in use.

83. Also, POSITA would have known there was a reasonable expectation of success to implement the testing in Lewis in the structure in Ke because, as explained above, Ke acknowledged that there were multiple possible techniques for

testing backplanes. Ex. 1008, 1:30–2:18. A POSITA would therefore have a reasonable expectation of success of the testing from Lewis. Specifically, Ke states:

Boards 14 each have a **slave interface 32 driven by tester 26 or bus master 30**. Boundary scan test data is loaded into a scan chain that passes serially through each of the components 34 on a given board. **To load a test vector** into the boundary scan cells in the scan chain on a particular board, **the slave 32 for that board is addressed using protocols communicated in test bus 24**. **Test vector data is then loaded via test bus 24**.

Ex. 1008, 3:28–35. A POSITA would understand that this disclosure implies that the bus master could have been used to control the test.

84. Finally, the system in Ke includes a backplane testing method in which test vectors are applied to circuit boards individually, while the remaining boards in the system are disabled, and in which the signals on all receivers in the system are observed after each vector is applied. Ex. 1008, 2:24-28. Ke identifies testing techniques including the walking enable technique and the intraboard counting technique. *Id.*, 2:29-49. Ke also discusses the fact that, though the intraboard testing is less comprehensive, it could be completed more quickly. *Id.*, 7:15-20. The desire for a quick test vector is likely present so as to enable the other boards and restart

the system after testing as quickly as possible. A POSITA would be motivated to consider another testing method, especially a method like the loopback test method disclosed by Lewis, as that method could be done while the rest of the system was still working as opposed to disabled. One of the selling points for the system described in Lewis is its ability to enable the testing of individual switches in the most efficient method while the system is still active. Ex. 1009, 2:3-26.

85. A POSITA would have therefore understood that the loopback testing between specific peripherals in Lewis could be employed in Ke by using the master bus controller to control testing between specific boards.

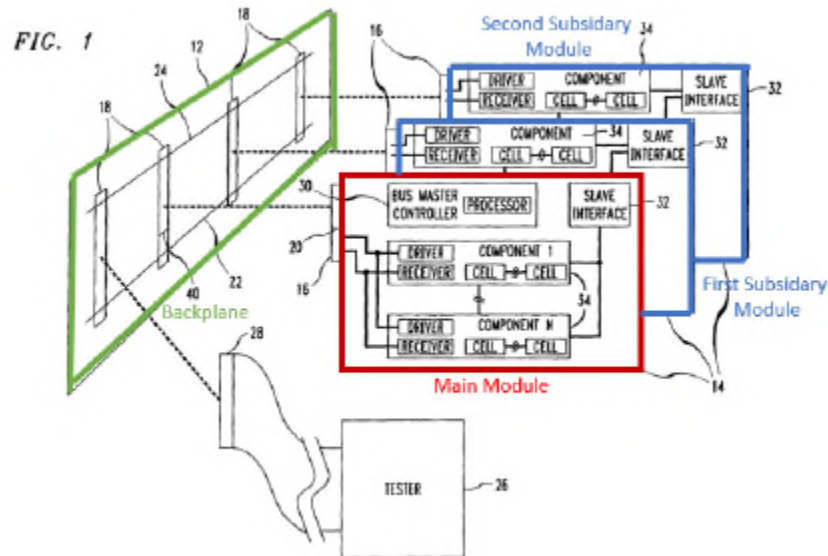
2. Claim 1[pre]: In an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data, at least some of which lines are sometimes idle, the main module including a switch having ports connected to the lines, a method for self-testing the system, comprising:

86. In my opinion, to the extent the preamble is limiting, Ke in view of Lewis discloses 1[pre]. Ke discloses an electronic system that includes a main module and at least a first and second subsidiary module:

Electrical system 10 is formed from **backplane 12** and **circuit boards 14**, as shown in FIG. 1. In operation, **boards 14** are mounted on **backplane 12** by inserting edge connectors 16 into slot connectors 18. Pins on edge

connectors 16, such as pin 20, are electrically connected to interconnect traces (interconnects) 22 on backplane 12 via slot connectors 18. Interconnects 22 provide communication pathways for data and control signals between boards 14.

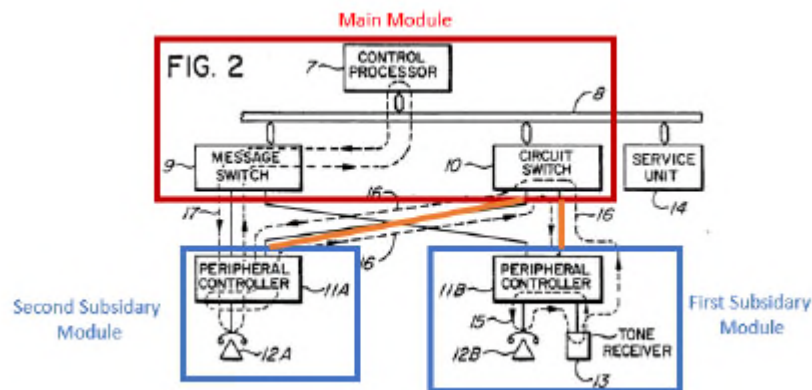
Ex. 1008, 3:15–23. Each of these circuit boards have “a slave interface 32 driven by a tester 26 or a bus master 30.” Ex. 1008, 3:28–29. In my opinion, a POSITA, would understand that the card which has the bus master controller 30 is akin to the **main module**. Similarly, a POSITA would understand at least two other cards would be akin to the **subsidiary modules**. This depiction is demonstrated below.



Ex. 1008, Fig.1.

87. Similarly, Lewis also has a **circuit switch**, a **control processor** 7, and **message switch** 9. Ex. 1009, 3:47–60. It would be obvious to a POSITA to view

one or more switching units together with the control processor as akin to the **main module** in the '369 patent. The system in Lewis is also described as having multiple **peripheral controllers (11A, 11B)** which are connected to **peripherals (12A, 12B, 13)**. Ex. 1009, 3:47–60. It would be obvious to a POSITA to view these peripherals as subsidiary modules.



Ex. 1009, Fig. 2.

88. The Ke-Lewis combination discloses one or more lines carrying data that connect the main module to the first and second subsidiary module. Ke discloses:

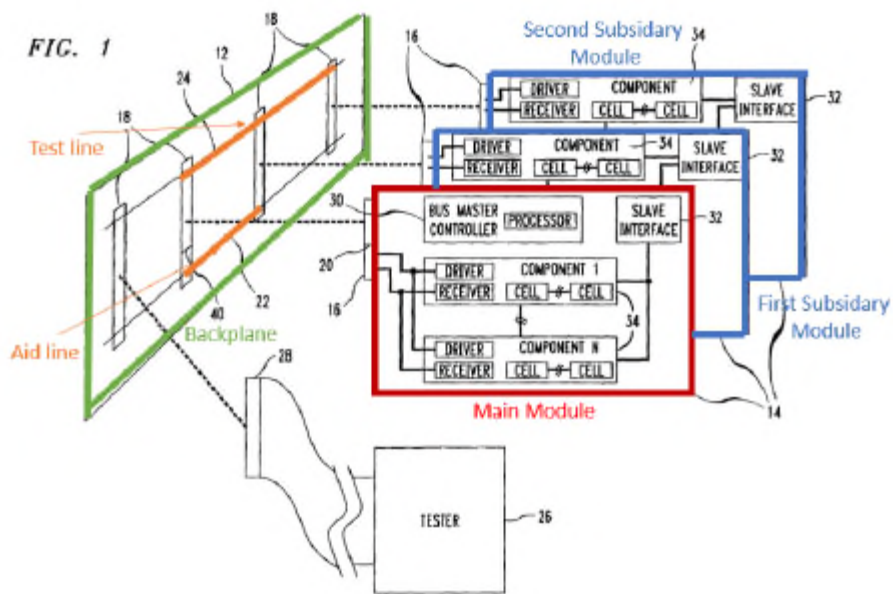
Pins on edge connectors 16, such as pin 20, are electrically connected to interconnect traces (interconnects) 22 on **backplane 12** via slot connectors 18. Interconnects 22 provide communication pathways for data and control signals between **boards 14**.

Ex. 1008, 3:20-23. Lewis discloses:

a control processor 7 communicates via a high speed parallel bus 8 with two kinds of switching networks: a switching network 9 referred to below as a message switch and a switching network 10 referred to below as a circuit switch. Both message and circuit switches are **connected via serial links** to one or more peripheral controllers 11A and 11B, the peripheral controllers **being connected** to peripherals 12A, 12B, 13 etc. **via peripheral interface units . . .**

Ex. 1009, 3:48-57.

89. Due to their similarities, it is my opinion that Lewis would have been obvious to a POSITA to combine with Ke. The below figure demonstrates Lewis on top of Ke. Specifically, the module in Ke with the bus master controller would be the main module, while the other two modules are subsidiary modules. The lines connecting the modules would be the test and aid lines. Ex. 1009, 4:32–54.



90. The Ke-Lewis combination discloses idle lines. Ke discloses:

In accordance with the present invention, a group of primitive vectors (disable, enable 0, and enable 1 vectors) are precomputed prior to testing for each board 14. The enable 0 and enable 1 vectors allow drivers in system 10 to be individually toggled. Individual drivers on a board 14 are toggled while the circuitry on other boards 14 is disabled, which avoids contentions between drivers.

Ex. 1008, 3:61–67. In my opinion, a POSITA would understand that based on this disclosure about toggling between 0 and 1, drivers or lines in the backplane would sometimes be idle or not in use. Lewis also discloses that “[t]esting is also preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19–

20. A POSITA would have understood the Ke-Lewis combination as disclosing a system in which “some of [the] lines are sometimes idle . . .”

91. Ke-Lewis also discloses a main module including a switch having ports connected to the lines, and a method for self-testing the system. Ke discloses a switch having ports connected to the lines:

Electrical system 10 is formed from backplane 12 and circuit boards 14, as shown in FIG. 1. In operation, boards 14 are mounted on backplane 12 by inserting edge connectors 16 into slot connectors 18. Pins on edge connectors 16, such as pin 20, are electrically connected to interconnect traces (interconnects) 22 on backplane 12 via slot connectors 18. Interconnects 22 provide communication pathways for data and control signals between boards 14.

Ex. 1008, 3:16-23. Lewis also discloses a system with a switch having ports connected to the lines carrying data between the main module and subsidiary modules:

According to the present invention, individual switches can be tested, as well as loops which are as long or as short as desirable.

. . .

a system implementing the present invention, a control processor 7 communicates via a high speed parallel bus 8 with two kinds of switching networks: a switching network 9 referred to below as a message switch and a switching network 10 referred to below as a circuit switch. Both message and circuit switches are connected via serial links to one or more peripheral controllers 11A and 11B, the peripheral controllers being connected to peripherals 12A, 12B, 13 etc. via peripheral interface units (not shown). Each peripheral controller includes a switching network.

Ex. 1009, 3:39-41, 3:49-59.

92. Finally, Ke-Lewis disclose a method for self-testing the system. The invention described by Ke is “[a] backplane testing method [] provided in which test vectors are applied to individual circuit boards in a system while remaining circuit boards in the system are disabled.” Ex. 1008, Abstract. Ke discloses that the main module tests the connections of the backplane:

Backplanes have slot connectors into which the edge connectors of circuit boards are inserted and have

interconnects for providing communication pathways between boards. Backplane testing involves testing the interconnects to ensure that the assembled backplane is functioning properly. Faults can arise due to misplugged boards, bent, broken or shorted board pins, or interconnect traces on the backplane that are open or shorted. Testing while the boards are inserted into the backplane is required to detect these various faults.

Ex. 1008, 1:23–32. A POSITA would have understood this to be a self-testing method. Lewis also discloses that the invention “relates to a switching system testing arrangement which uses a looparound circuit, into which a test signal is injected and received to determine whether the loop is functioning properly.” Ex. 1009, Abstract. Lewis also discloses that “[a]ccording to the present invention, individual switches can be tested, as well as loops which are as long or as short or desirable.” Ex. 1009, 3:39-41. Ke-Lewis discloses a self-testing method.

93. Therefore, it is my opinion that Ke in view of Lewis discloses “an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data, at least some of which lines are

sometimes idle, the main module including a switch having ports connected to the lines, a method for self-testing the system.”

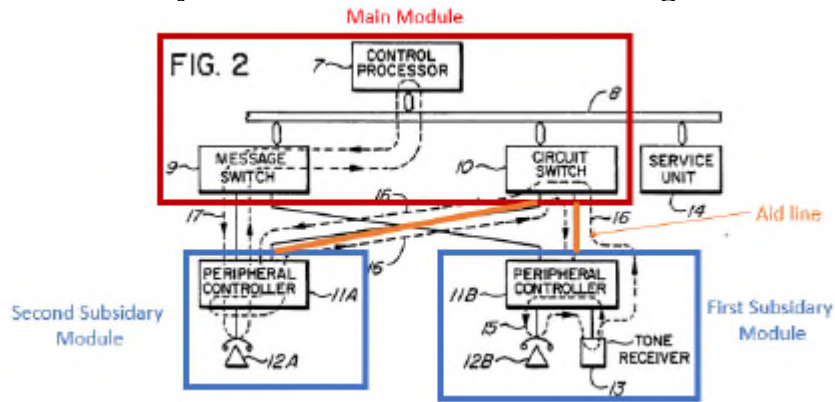
3. Claim 1[a]: selecting a first idle line among idle lines connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid line;

94. In my opinion, Ke in view of Lewis discloses 1[a]. Lewis discloses “a loop around arrangement in a switching system whereby transmission paths of the system can be tested.” Ex. 1009, 1:4–7. Further, Lewis discloses that “[t]esting is also preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19–20. Lewis states that:

In a similar manner other forms of loops can be set up and tested. For example **the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14** and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or

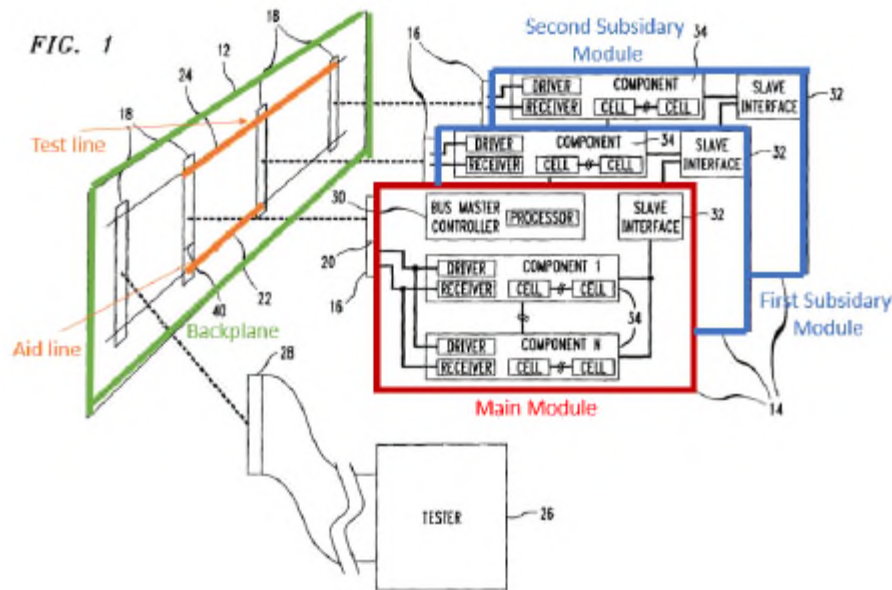
long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:42–54. This system is demonstrated in the diagram below:



Ex. 1009, Fig. 2.

95. As per above, the modules in Ke are connected via a port on the backplane. Ex. 1008, 3:15–23. It would be obvious to a POSITA that the modules in Lewis could be connected to the main module via a port on backplane as they are in Ke. A POSITA would also know that the modules in Lewis could be connected to the main module via a port on a backplane. Such a combination is depicted, below.



96. Therefore, it is my opinion that Ke in view of Lewis discloses “selecting a first idle line among idle lines connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid line.”

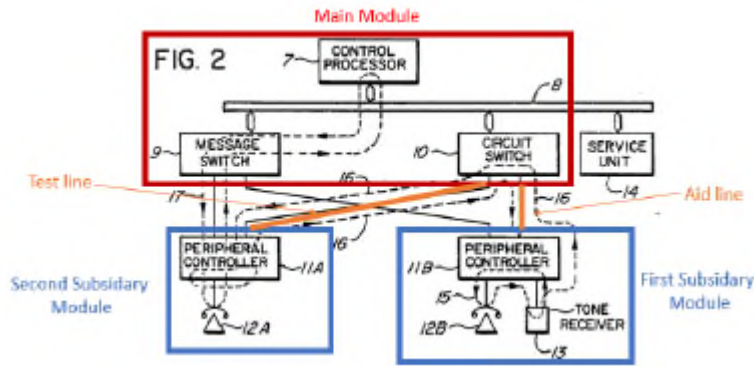
4. Claim 1[b]: instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line;

97. In my opinion, Ke in view of Lewis discloses 1[b]. Lewis discloses “instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line.” Specifically, Lewis states:

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone

12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:42–54. A POSITA would have understood this disclosure as requiring instructing a first subsidiary module to loop back traffic it receives back to the circuit switch in the main module. A POSITA would have understood that the first subsidiary module must be instructed to loop back the traffic or else the traffic would not be returned as described in Lewis: “the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface.” Ex. 1009, 4:42-49; Ex. 1003, ¶97.



Ex. 1009, Fig. 2. Alternatively, it would have been obvious to a POSITA that the main module would instruct the subsidiary module to loop back traffic. Ex. 1009, 4:42–54.

98. Therefore, it is my opinion that Ke in view of Lewis disclose “instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line.”

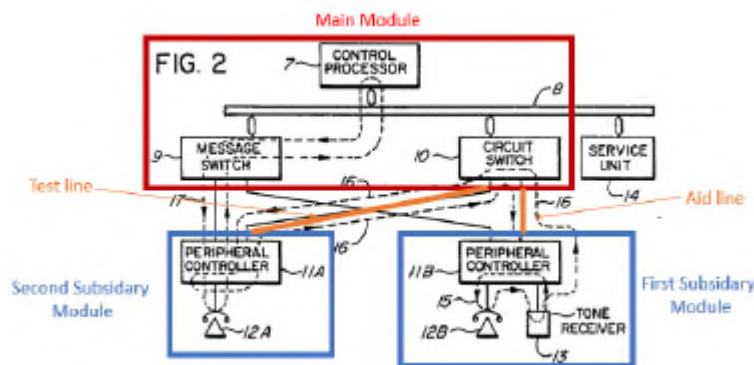
5. Claim 1[c]: selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module;

99. In my opinion, Ke in view of Lewis discloses 1[c]. Lewis discloses “selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module.” Specifically, Lewis states:

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send

messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:42–54. As described above, the system selects a line between the second subsidiary module and the circuit switch (“test line”) for testing.



100. As I stated in 1[a], a POSITA would have understood or found it obvious that the second subsidiary module is connected via a port to the circuit switch.

101. Therefore, it is my opinion that Ke in view of Lewis disclose “selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module.”

6. Claim 1[d]: configuring the switch to link the first and second ports;

102. Claim element 1[d] refers to configuring the switch to link the first and second ports, to create a loop. Lewis discloses “[a]ccording to the present invention local supervisory loops of virtually any length can be set up to test virtually any switch or link in the system.” Ex. 1009, 4:23-25. Lewis also discloses:

One of the techniques used for testing the transmission paths and switches is to set up a transmission path loop through the switching network and to connect a matrix testing apparatus to the loop to inject a signal into the path and to receive the resulting signal which has passed through the loop, and to compare it with the signal which was transmitted.

. . .

The above-noted system for testing transmission paths requires loops to be set up between peripheral units through the main switching network in order to properly test each available transmission path.

Ex. 1009, 1:28-35, 1:39-42.

103. Ke in view of Lewis discloses 1[d]. It would have been obvious to a POSITA that when the loopback is set up as described, it is done by configuring a link between the first and second ports to form the loopback circuit. In view of Ke, it would have been obvious to a POSITA that the main module would link the first and second ports to close the loop between the subsidiary modules. Ex. 1009, 1:28-35, 1:39-42.

104. Therefore, it is my opinion that Ke in view of Lewis discloses “configuring the switch to link the first and second ports.”

7. Claim 1[e]: transmitting test traffic over the second idle line from the second subsidiary module to the main module, wherein the test traffic is conveyed via the switch to the aid line connecting to the first subsidiary module; and

105. In my opinion, Ke in view of Lewis discloses 1[e]. Lewis discloses: According to the present invention local supervisory loops of virtually any length can be set up to test virtually any switch or link in the system.

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit

switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:42–54. A POSITA would understand that this discloses transmitting test data to the subsidiary modules. Similarly, Ke discloses:

Electrical system 10 is formed from backplane 12 and circuit boards 14, as shown in FIG. 1. In operation, boards 14 are mounted on backplane 12 by inserting edge connectors 16 into slot connectors 18. Pins on edge connectors 16, Such as pin 20, are electrically connected to interconnect traces (interconnects) 22 on backplane 12 via slot connectors 18. Interconnects 22 provide communication pathways for data and control Signals between boards 14. Test bus 24 is connected between connectors 18. Boundary Scan testing may be performed by a central processing unit (CPU) in tester 26 connected to test bus 24 with connector 28 or may be performed by a

CPU in master bus controller 30 on one of boards 14. Boards 14 each have a slave interface 32 driven by tester 26 or bus master 30. Boundary Scan **test data is loaded into a Scan chain that passes Serially through each of the components 34 on a given board. To load a test vector into the boundary** scan cells in the scan chain on a particular board, the slave 32 for that board is addressed using protocols communicated in test bus 24.

Ex. 1008, 3:16–35. A POSITA would have recognized this disclosure in Ke as transmitting test traffic to the subsidiary modules.

106. Therefore, it is my opinion that Ke in view of Lewis discloses “transmitting test traffic over the second idle line from the second subsidiary module to the main module, wherein the test traffic is conveyed via the switch to the aid line connecting to the first subsidiary module.”

8. Claim 1[f]: reporting that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time.

107. In my opinion, Ke in view of Lewis discloses 1[f]. Lewis discloses:

The main controller, **having received a message signal via the system described above of the returned test signal, formulates a message and transmits it to the**

service unit 214, of the test signal, and also formulates a message signal to be returned to the peripheral acknowledging that it has received the message. This signal is downloaded via parallel bus 212 into COMRAM BUFFER 214, which operates in the reverse direction in the same way as described earlier.

Ex. 1009, 14:3–11. In my opinion, a POSITA would have understood that this discloses “reporting a failure has occurred.” Further, a POSITA would understand that a failure constitutes the main module not receiving a test message from the second subsidiary module within a predetermined period of time. This sort of “time out” result is common and well understood. For example, Internet Control Message Protocol (“ICMP”) messages, or ping, which have been commonplace in the field since at least 1989, sends a timeout message if the ICMP message was not returned in a reasonable amount of time. Ex. 1012 (RFC 1122), 57–58.

108. As another example, Stallings discloses the ICMP messages and shows two examples of such messages, echo messages and timestamp messages, that carry out the timeout function:

The echo and echo-reply messages provide a mechanism for testing that communication is possible between entities. The recipient of an echo message is obligated to

return the message in an echo-reply message. An identifier and sequence number are associated with the echo message to be matched in the echo-reply message. The identifier might be used like a service access point to identify a particular session, and the sequence number might be incremented on each echo request sent.

The timestamp and timestamp reply messages provide a mechanism for sampling the delay characteristics of the internet. The sender of a timestamp message may include an identifier and sequence number in the parameters field and include the time that the message is sent (originate timestamp). The receiver records the time it received the message and the time that it transmits the reply message in the timestamp-reply message. If the timestamp message is sent using strict source routing, then the delay characteristics of a particular route can be measured.

Ex. 1013, 549.

109. Ke discloses that the claimed invention involves:

providing a backplane testing method in which test vectors are applied to circuit boards individually, while the

remaining boards in the system are disabled, and **in which the signals on all receivers in the System are observed after each test vector is applied.**

Ex. 1008, 2:24-28. Ke also discloses that “[t]he behavior of the receivers in response to test vectors applied to the drivers allows backplane faults to be detected and characterized.” Ex. 1008, 2:37-39.

110. Therefore, it is my opinion that Ke in view of Lewis discloses “reporting that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time,” as it would have been obvious to a POSITA.

9. Claim 2: A method according to claim 1, wherein instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.

111. In my opinion, Ke in view of Lewis discloses claim 2 for the same reasons discussed in claim 1[b], as well as additional disclosures. Specifically, Lewis discloses:

For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface,

through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. **A test tone signal** is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15.

Ex. 1009, 4:43-54. Lewis further discloses:

In addition, a test message is sent from service unit 14 via bus 8, message switch 9 and peripheral controller 11B into the loop, and the resulting signal **having passed through the loop passes back through the message switch link system just described for receipt by the service unit 14.**

In this manner a small, isolated transmission loop is established and tested.

Ex. 1009, 4:35–41 (emphasis added). In my opinion, a POSITA would have understood that this disclosure represents the idea that test traffic goes through the first subsidiary module without substantial processing. The idea of the “test message” or a “test tone signal” indicates that the data is not regular data for use in the system but is data being used to test the system. In addition, the term “passes back through” indicates that the data passes through and is not processed.

112. Therefore, in my opinion, Ke in view of Lewis discloses “instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.”

10. Claim 3: A method according to claim 2, wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.

113. In my opinion, Ke in view of Lewis discloses claim 3 for the same reasons discussed in claim 2, as well as additional disclosures. Additionally, Ke discloses:

Boundary scan test data is loaded into a scan chain that passes serially through each of the components 34 on a given board. To load a test vector into the boundary scan cells in the scan chain on a particular board, the slave 32 for that board is addressed using protocols communicated in test bus 24. Test vector data is then loaded via test bus 24. Preferably, system 10 supports the Test Access Port (TAP) and Boundary Scan Architecture defined in IEEE Std. 1149.1.

Ex. 1008, 3:30–37. This explains that test traffic is sent via protocols communicated over the bus and that test vector data is specifically loaded into the message for test traffic transmitted to the subsidiary modules (second format). Ex. 1008, 3:30–37. In my opinion, it would be obvious to a POSITA that a different format of message (without the test vector data) would have been used for normal messages (first format).

114. Alternatively, it would have been obvious to a POSITA that the subsidiary modules could send and receive data in multiple formats because different messages passed between the modules may require different formats and would have been organized differently.

115. Lewis also discloses that “[s]ince the links are dedicated for each peripheral, the particular scan signal format and peripheral state message signal format can be set to suit the design.” Ex. 1009, 12:18-20.

116. Therefore, it is my opinion that Ke in view of Lewis discloses “wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.”

11. **Claim 4: A method according to claim 1, further comprising: selecting one or more further idle lines for testing among the idle lines in the system, wherein the further idle lines connect to further ports of the switch on the main module; and**

repeating the configuring the switch, transmitting the test traffic, and reporting that the failure has occurred with respect to the further idle lines until all the idle lines have been tested.

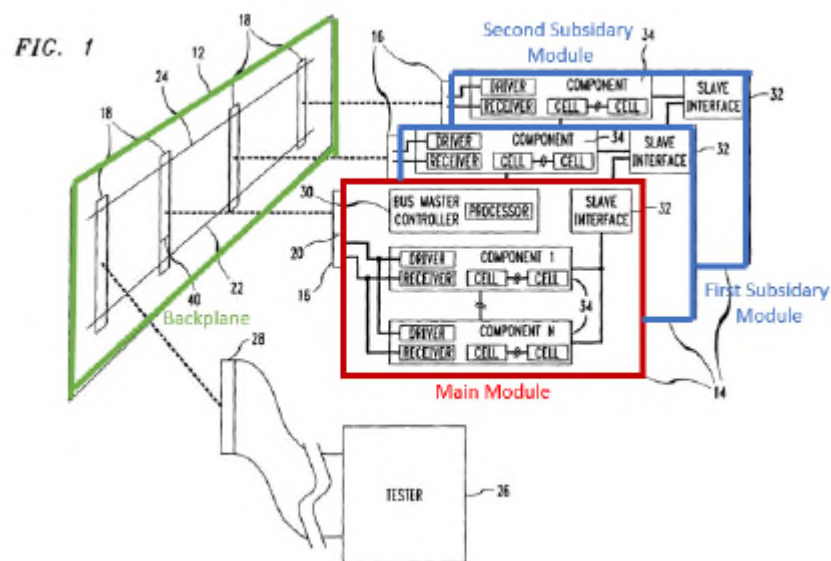
117. In my opinion, Ke in view of Lewis discloses claim 4, for the same reasons as claims 1[a], 1[c] and 1[f]. Lewis also discloses that “local supervisory loops of virtually any length can be set up to test virtually any switch or link in the system.” Ex. 1009, 4:23–25. Lewis also provides multiple exemplary loops created for testing. Ex. 1009, 4:25-41, 4:43-54. Noting that “[i]n a similar manner other forms of loops can be set up and tested.” Ex. 1009, 4:49-50. Lastly, it advises that “[t]esting is also preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19-20. Further, it would have been obvious to a POSITA that the same process for choosing idle lines, creating a loop and initiating a loop back test could be repeated until all the idle lines have been tested. In fact, it would have been obvious to a POSITA to run the test repeatedly until all the idle lines were tested. A POSITA would also have been motivated to repeat the test in order to make sure that all potential hidden failures were discovered.

118. Therefore, it is my opinion that Ke in view of Lewis discloses “selecting one or more further idle lines for testing among the idle lines in the system, wherein the further idle lines connect to further ports of the switch on the main module; and repeating the configuring the switch, transmitting the test traffic, and reporting that

the failure has occurred with respect to the further idle lines until all the idle lines have been tested.”

12. **Claim 5: A method according to claim 1, wherein the main module and said at least first and second subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane.**

119. In my opinion, Ke in view of Lewis discloses claim 5 for the same reasons as discussed for 1 [pre]. As I explained above, Ke describes a card with the bus master controller 30 (main module) and two or more other cards (first and second subsidiary modules), and a backplane 12 with traces. Ex. 1008, 3:16-23, 5:4-9.



Ex. 1008, Fig. 1.

120. It would be clear to a POSITA that the modules in Ke are plugged into the backplane, as is commonly practiced. Ke also refers to the modules being

plugged in when it says cards can be misplugged. Ex. 1008, 1:23–32. It would be obvious to a POSITA that something that can be misplugged can also be plugged.

121. Therefore, it is my opinion that Ke in view of Lewis discloses “wherein the main module and said at least first and second subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane.”

13. Claim 6: A method according to claim 1, wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.

122. In my opinion, claim 6 would have been obvious to a POSITA over Ke in view of Lewis.

123. Lewis discloses that “[a] typical system is formed of a switching network may have several stages, peripheral interface circuits such as line circuits, trunk circuits, etc. which are connected to the switching network, and a common control.” Ex. 1009, 1:11-15. Lewis also discloses that “[t]runk circuits are connected in some cases as peripherals or in some cases via a further switching matrix . . .” Ex. 1009, 3:4-7.

124. The Ke-Lewis combination discloses systems that can be connected to a network communication trunk.

125. Ke discloses:

Electrical system 10 is formed from backplane 12 and circuit boards 14, as shown in FIG. 1. In operation, boards 14 are mounted on backplane 12 by inserting edge connectors 16 into slot connectors 18. Pins on edge connectors 16, Such as pin 20, are electrically connected to interconnect traces (interconnects) 22 on backplane 12 via slot connectors 18. Interconnects 22 provide **communication pathways** for data and control Signals between boards 14.

Ex. 1008, 3:16-23.

126. Lewis further disclose traffic that comprises communication traffic. It describes the system claimed by Lewis as a “communication circuit system.” Ex. 1009, Abstract. Lewis further discloses that:

Further, due to the use of an unique form of switching system, in which control messages are switched and routed separately from **communication messages**, **communication message paths** are not required to carry supervisory signals for the testing procedure.

Ex. 1009, 2:14-19. Lewis discloses a system where “[a]ctual **communication signals** between peripherals pass through circuits set up via links connected from a

peripheral, a peripheral controller, circuit switch 10, a peripheral controller to another peripheral.” Ex. 1009, 4:1-4. Lewis further discloses that:

The free time available to the switches and links are used to test the switches and links, and since entire transmission paths between peripherals need not be set up to effect the testing, a substantial increase in the elements available for carrying normal **communication traffic** is made available.

Ex. 1009, 16:8-13.

127. Therefore, it is my opinion that Ke in view of Lewis discloses “wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.”

14. Claim 7: A method according to claim 6, wherein transmitting the test traffic comprises testing the second idle line while continuing to use the lines that are not idle for carrying the data to the network communication trunk.

128. In my opinion, Ke in view of Lewis discloses claim 7. Specifically, Lewis refers to idle lines when it says:

Assuming that the location of an idle path has been determined, the main controller sends a message signal to the peripheral controllers, and to the circuit switch processor 218 to set up the circuit path.

Ex. 1009, 14:30–34. Lewis also states that “[t]esting is preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19–20. A POSITA would have known that these disclosures mean that the test could occur on idle lines, while the non-idle lines continue carrying normal traffic.

129. While Ke suggests temporarily disabling boards that are not currently being tested (Ex. 1008, 3:61–67), Lewis discloses a method for testing the communication system with a backplane while the system is still active (Ex. 1009, Abstract).

130. Therefore, it is my opinion that Ke in view of Lewis discloses “transmitting the test traffic comprises testing the second idle line while continuing to use the lines that are not idle for carrying the data to the network communication trunk.”

15. Claim 8[pre]: In an electronic system that includes a main module and multiple subsidiary modules, each of said multiple subsidiary modules being connected to the main module by one or more lines for carrying data, a method for self-testing the system, comprising:

131. It is my opinion that Ke in view of Lewis discloses 8[pre] for the same reasons as 1[pre].

16. Claim 8[a]: selecting first and second subsidiary modules of different types for testing among the multiple subsidiary modules, the first and second subsidiary modules being configured to transmit and receive the data in different, respective first and second formats;

132. It is my opinion that Ke in view of Lewis discloses 8[a] for the same reasons as 1[a], 1[c], and claim 3. In addition, Ke also states that “most backplanes are dynamically reconfigurable. Various board types (e.g., memory, input/output, etc.) may be inserted into the backplane.” Ex. 1008, 1:65–67. A POSITA would understand that this was disclosing that the first and second subsidiary modules could be different types. Similarly, Lewis states:

According to the present invention local supervisory loops of virtually any length can be set up to test virtually any switch or link in the system. For example, to test a short transmission path between a telephone set 12B interface and the tone receiver 13 through peripheral controller 11B, the control processor 7 sends control messages via bus 8 and message switch 9 to peripheral controller 11B to set up a communication loop between the telephone set interface and tone receiver 13 through the switching matrix (e.g. time division switching matrix) in peripheral controller 11B, but excluding links to the circuit switch 10, in this case. In addition, a test message is sent from service unit 14 via bus 8, message switch 9 and peripheral controller 11B into the loop, and the resulting signal

having passed through the loop passes back through the message switch link system just described for receipt by the service unit 14. In this manner a small, isolated transmission loop is established and tested.

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:23-54, Fig. 2. A POSITA would have understood that this disclosure means that the first and second modules could be different.

133. Therefore, it is my opinion that Ke in view of Lewis discloses “selecting first and second subsidiary modules of different types for testing among the multiple

subsidiary modules, the first and second subsidiary modules being configured to transmit and receive the data in different, respective first and second formats.”

17. Claim 8[b]: instructing the first subsidiary module to loop back traffic reaching the first subsidiary module from the main module;

134. In my opinion, Ke in view of Lewis discloses 8[b] for the same reasons as 1[a] and 1[b].

18. Claim 8[c]: configuring the main module to connect the first and second subsidiary modules, so that the traffic transmitted by the second subsidiary module is conveyed to the first subsidiary module via the main module and is then looped back via the main module to the second subsidiary module; and

135. In my opinion, Ke in view of Lewis discloses 8[c] for the same reasons as 1[c], 1[d], and 1[e].

19. Claim 8[d]: testing the system by causing the second subsidiary module to transmit test traffic in the second format to the main module, and assessing whether the test traffic is returned intact from the first module.

136. In my opinion, Ke in view of Lewis discloses 8[d] for the same reasons as 1[e], 1[f] and claim 3. Specifically, Lewis states:

The main controller, **having received a message signal via the system described above of the returned test signal, formulates a message and** transmits it to the service unit 214, of the test signal, and also formulates a message signal to be returned to the peripheral

acknowledging that it has received the message. This signal is downloaded via parallel bus 212 into COMRAM BUFFER 214, which operates in the reverse direction in the same way as described earlier.

Ex. 1009, 14:3–11. This passage describes the main module acknowledging to have received the return signal if the test message was returned successfully. Ex. 1009, 14:3–11. A POSITA would understand that the main module confirm that the test message returned intact before it acknowledged receipt because the test would fail if the message did not return intact or did not return.

137. Therefore, it is my opinion that Ke in view of Lewis discloses “testing the system by causing the second subsidiary module to transmit test traffic in the second format to the main module, and assessing whether the test traffic is returned intact from the first module.”

20. Claim 9: A method according to claim 8, wherein instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.

138. In my opinion, Ke in view of Lewis discloses claim 9 for the same reasons as claim 2.

21. Claim 10: A method according to claim 8, wherein the main module and subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane.

139. In my opinion, Ke in view of Lewis discloses claim 10 for the same reasons as claim 5.

22. Claim 11: A method according to claim 8, wherein the main module comprises a switch, which is coupled to connect the lines to a network communication trunk, and wherein configuring the main module comprises configuring the switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module.

140. In my opinion, Ke in view of Lewis discloses claim 11 for the same reasons as claims 6, 1[a], 1[c] and 1[d]. Further, a POSITA would know that linking the first and second ports is equivalent to the switch connecting lines of the first and second subsidiary modules. Alternatively, it would have been obvious to a POSITA that the switch could connect lines of the first and second subsidiary modules so they can send the test traffic to each other.

141. Therefore, it is my opinion that Ke in view of Lewis discloses “A method according to claim 8, wherein the main module comprises a switch, which is coupled to connect the lines to a network communication trunk, and wherein configuring the main module comprises configuring the switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module.”

23. Claim 12: A method according to claim 11, wherein testing the system comprises testing one or more of the lines of the second subsidiary module while continuing to use at least some of the lines that are not under test for carrying the data

from the subsidiary modules to the network communication trunk.

142. In my opinion, Ke in view of Lewis discloses claim 12 for the same reasons as claim 7.

24. Claim 13: A method according to claim 8, wherein the traffic comprises communication traffic, and wherein the first and second formats are determined respectively by different first and second communication protocols.

143. In my opinion, Ke in view of Lewis discloses claim 13 for the same reasons as claim 3 and 6.

144. In addition, Ke discloses that the test methodology is dictated by the protocol implemented in the test framework. It further discloses an exemplary standard or protocol:

To load a test vector into the boundary scan cells in the scan chain on a particular board, the slave 32 for that board is addressed **using protocols communicated in test bus**

24. Test vector data is then loaded via test bus 24.

Preferably, system 10 supports the Test Access Port (TAP) and **Boundary Scan Architecture defined in IEEE Std.**

1149.1.

Ex. 1008, 3:32-37.

145. Lewis discloses that “[a]ctual communication signals between peripherals pass through circuits set up via links connected from a peripheral, a peripheral controller, circuit switch 10, a peripheral controller to another peripheral.” Ex. 1009, 4:1-4. Lewis also discloses the use of two test loops. Ex. 1009, 4:23-54. In the first loop, a test message is used for the test traffic. *Id.*, 4:34-39. In the second loop, a test signal is used as the test traffic. *Id.*, 4:49-52.

146. Lewis also discloses that “[i]n case intelligent peripherals are used, having a signal path loopback capability, a loop can be set up between only the peripheral, or via any link right back to the circuit switch. Since the links are dedicated for each peripheral, the particular **scan signal format** and peripheral **state message signal format** can be set to suit the design.” Ex. 1009, 12:14-20.

147. Further, it would have been obvious to a POSITA that the test traffic in the subsidiary modules could have a different protocol. A POSITA would have been motivated to use a different protocol so the module would know how to handle the test traffic because the test traffic is handled by the modules differently than normal traffic.

148. Therefore, it is my opinion that Ke in view of Lewis discloses “traffic comprises communication traffic, and wherein the first and second formats are determined respectively by different first and second communication protocols.”

25. Claim 14: A method according to claim 13, wherein one of the first and second protocols is a time domain multiplexing

(TDM) protocol, while the other of the first and second protocols is a packet data protocol.

149. In my opinion, Ke in view of Lewis discloses claim 14.

150. Lewis discloses that “general functions are provided whether the system operates as a space division switching network or as a **time division** switching network.” Ex. 1009, 1:19-21.

151. Lewis further discloses:

system for testing transmission paths requires loops to be set up between peripheral units through the main switching network in order to properly test each available transmission path. Consequently it utilizes significant numbers of switching network crosspoints (both space division forms of crosspoints or equivalent **time division equipment**) for significant periods of time, which crosspoints (or **time division** equivalents) and their associated links are unavailable for use during the testing interval.

Ex. 1009, 1:39-48. An embodiment of the system in Lewis to which the loopback testing is applied is “described with reference to a PCM time division multiplex switching network.” Ex. 1009, 3:42-43. More specifically, in describing setting up the loop for loopback testing, it is noted in Lewis:

the control processor 7 sends control messages via bus 8 and message switch 9 to peripheral controller 11B to set up a communication loop between the telephone set interface and tone receiver 13 through the switching matrix (e.g. **time division** switching matrix) in peripheral controller 11B . . .

Ex. 1009, 4:28-33. Lewis discloses “input lines carrying time division multiplexed.”

Ex. 1009, 7:5-6.

152. In my opinion, it would have been obvious to a POSITA that the modules could utilize different protocols, including TDM protocols and packet data protocols, because the type of signal does not matter. Additionally, a POSITA would know that a TDM protocol is used for communications with other modules, while a packet data protocol is used to communicate with other devices over an IP-based network. For example, a textbook which predates the patents states that “two common forms of multiplexing are frequency-division multiplexing (FDM) and time division multiplexing (TDM).” Ex. 1013, 236. The textbook also discusses packet switching which utilizes the packet data protocol. *See* Ex. 1013, 10.

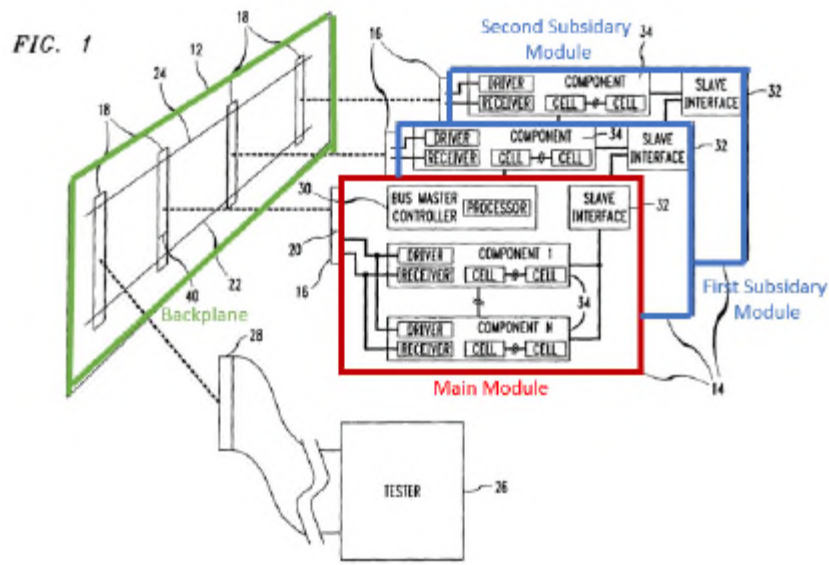
153. Ke discloses a system that provides “communication pathways for data and control signals between boards 14.” Ex. 1008, 3:22-23. Ke also discloses that “[v]arious data structures may be used to define the configuration of the system 10

prior to performing a walking enable test.” Ex. 1008, 4:66-5:1. Ke also uses the term “network” to describe the system being tested. Ex. 1008, 2:63-67. A POSITA would consider the term network to suggest a system that uses data packet for transmission. Data sent through networks are usually sent in packets and as Ke notes various protocols can be used for enabling the testing functionality. A POSITA would thus consider a packet data protocol in the Ke-Lewis combination.

154. Therefore, it is my opinion that Ke in view of Lewis discloses “a method according to claim 13, wherein one of the first and second protocols is a time domain multiplexing (TDM) protocol, while the other of the first and second protocols is a packet data protocol.”

26. Claim 15[pre]: Modular electronic apparatus, comprising:

155. In my opinion, and to the extent the preamble is limiting, Ke and Lewis render 15[pre] obvious for the same reasons as 1[pre]. Specifically, Ke discloses “a multiboard electronic system having a backplane to be tested.” Ex. 1008, 2:55–56, Fig.1. A POSITA would have understood that cards, or modules, could be inserted or removed, making the disclosure in Ke a modular electronic apparatus.



156. Therefore, it is my opinion that Ke in view of Lewis renders obvious a “modular electronic apparatus.”

27. Claim 15[a]: a backplane, which comprises traces for carrying data between modules that are plugged into the backplane;

157. In my opinion, Ke in view of Lewis discloses 15[a] for the same reasons as 1[pre] and claim 5.

28. Claim 15[b]: a main module, plugged into the backplane, the main module comprising a switch having ports for connection to the traces of the backplane;

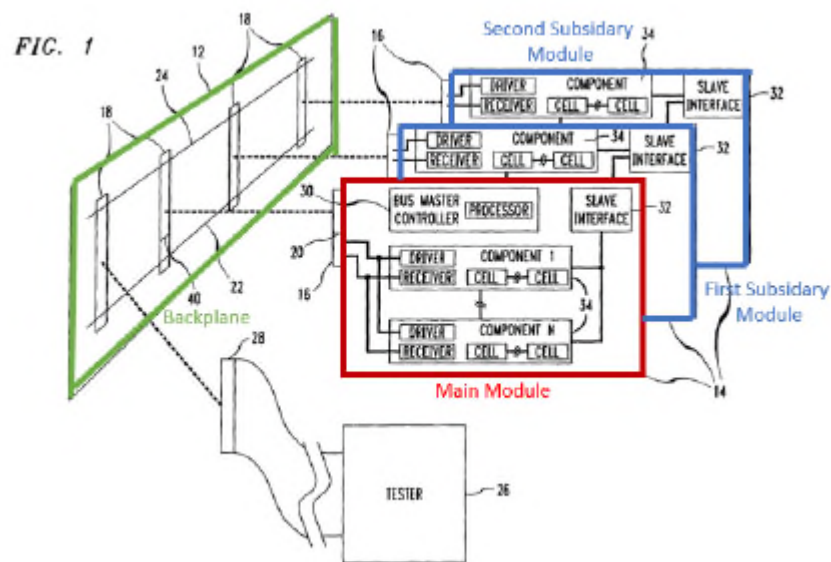
158. In my opinion, Ke in view of Lewis discloses 15[b] for the same reasons as 1[pre] and claim 5.

29. Claim 15[c]: at least first and second subsidiary modules, plugged into the backplane so as to be connected to the main module by the traces, at least some of which traces are sometimes idle; and

159. In my opinion, Ke in view of Lewis discloses 15[c] for the same reasons as 1[pre] and claim 5.

30. **Claim 15[d]: a system control processor, which is operative to select a first idle trace among idle traces connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid trace,**

160. In my opinion, Ke in view of Lewis discloses 15[d] for the same reasons as 1[a]. Additionally, Ke also discloses a processor in the master controller of the main module which is operable to control the testing. Ex. 1008, Fig.1.



161. Therefore, it is my opinion that Ke in view of Lewis discloses “a system control processor, which is operative to select a first idle trace among idle traces connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid trace.”

31. **Claim 15[e] to instruct the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid trace,**

162. In my opinion, Ke in view of Lewis discloses 15[e] for the same reasons as 1[b].

32. **Claim 15[f] to select for testing a second idle trace among the idle traces connecting the second subsidiary module to a second port of the switch on the main module, and**

163. In my opinion, Ke in view of Lewis discloses 15[f] for the same reasons as 1[c].

33. **Claim 15[g] to configure the switch to link the first and second ports,**

164. In my opinion, Ke in view of Lewis discloses 15[g] for the same reasons as 1[d].

34. **Claim 15[h] the system control processor being further operative to cause test traffic to be transmitted over the second idle trace from the second subsidiary module to the main module,**

165. In my opinion, Ke in view of Lewis discloses 15[h] for the same reasons as 1[e].

35. **Claim 15[i] wherein the test traffic is conveyed via the switch to the aid trace connecting to the first subsidiary module, and to report that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time.**

166. In my opinion, Ke in view of Lewis discloses 15[i] for the same reasons as 1[e] and 1[f].

- 36. Claim 16: Apparatus according to claim 15, wherein the first subsidiary module is configured, under control of the system control processor, to loop back the traffic on the aid trace to the main module substantially without processing data comprised in the test traffic.**

167. In my opinion, Ke in view of Lewis discloses claim 16 for the same reasons as claim 2.

- 37. Claim 17: Apparatus according to claim 16, wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.**

168. In my opinion, Ke in view of Lewis discloses claim 17 for the same reasons as claim 3.

- 38. Claim 18: Apparatus according to claim 15, wherein the system control processor is operative to select one or more further idle traces for testing among the idle traces in the system, wherein the further idle traces connect to further ports of the switch on the main module, and to repeatedly configure the switch, cause the test traffic to be transmitted, and report the failure when it occurs with respect to the further idle traces until all the idle lines have been tested.**

169. In my opinion, Ke in view of Lewis discloses claim 18 for the same reasons as claim 4.

- 39. Claim 19: Apparatus according to claim 15, wherein the switch is configured to connect the traces to a network communication trunk, and wherein the traffic comprises communication traffic.**

170. In my opinion, Ke in view of Lewis discloses claim 19 for the same reasons as claim 6.

40. Claim 20: Apparatus according to claim 19, wherein the test traffic is transmitted over the second idle trace while continuing to use the trace that are not idle for carrying the data to the network communication trunk.

171. In my opinion, Ke in view of Lewis discloses claim 20 for the same reasons as claim 7.

41. Claim 21[pre]: Modular electronic apparatus, comprising:

172. In my opinion, Ke in view of Lewis discloses 21[pre] for the same reasons as 15[pre].

42. Claim 21[a]: a backplane, which comprises traces for carrying data between modules that are plugged into the backplane;

173. In my opinion, Ke in view of Lewis discloses 21[a] for the same reasons as 15[a].

43. Claim 21[b]: a main module, plugged into the backplane;

174. In my opinion, Ke in view of Lewis discloses 21[b] for the same reasons as 15[b].

44. Claim 21[c]: a plurality of subsidiary modules, plugged into the backplane so as to be connected to the main module by the traces; and

175. In my opinion, Ke in view of Lewis discloses 21[c] for the same reasons as 15[c].

45. **Claim 21[d]: a system control processor, which is operative to select first and second subsidiary modules of different types for testing among the multiple subsidiary modules, the first and second subsidiary modules being configured to transmit and receive the data in different, respective first and second formats, and which is further operative to test the modules by causing the first subsidiary module to loop back traffic reaching the first subsidiary module from the main module, by configuring the main module to connect the first and second subsidiary modules, so that a traffic transmitted by the second subsidiary module is conveyed to the first subsidiary module via the main module and is then looped back via the main module to the second subsidiary module, and by causing the second subsidiary module to transmit test traffic in the second format to the main module, and assessing whether the test traffic is returned intact from the first module.**

176. In my opinion, Ke in view of Lewis discloses 21[d] for the same reasons as 8[a] and 15[d]–15[i].

46. **Claim 22: Apparatus according to claim 21, wherein the first subsidiary module is configured to loop back the traffic to the main module substantially without processing the data comprised in the test traffic.**

177. In my opinion, Ke in view of Lewis discloses claim 22 for the same reasons as claim 2.

47. **Claim 23: Apparatus according to claim 21, wherein the main module comprises a switch, which is coupled to connect the traces to a network communication trunk, and wherein the system control processor is operative to configure switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module during the test.**

178. In my opinion, Ke in view of Lewis discloses claim 23 for the same reasons as claim 11.

48. Claim 24: Apparatus according to claim 23, wherein the system control processor is operative to test one or more of the traces connected to the second subsidiary module while at least some of the traces that are not under test continue to be used for carrying the data from the subsidiary modules to the network communication trunk.

179. In my opinion, Ke in view of Lewis discloses claim 24 for the same reasons as claim 12.

49. Claim 25: Apparatus according to claim 21, wherein the traffic comprises communication traffic, and wherein the first and second formats are determined respectively by different first and second communication protocols.

180. In my opinion, Ke in view of Lewis discloses claim 25 for the same reasons as claim 13.

50. Claim 26: Apparatus according to claim 25, wherein one of the first and second protocols is a time domain multiplexing (TDM) protocol, while the other of the first and second protocols is a packet data protocol.

181. In my opinion, Ke in view of Lewis discloses claim 26 for the same reasons as claim 14.

D. Ground 2

182. To the extent that the limitations of claims 3, 6, 8, 13, 14, 17, 21, 25 and 26 are not rendered obvious by Ke and Lewis, it is my opinion that they would have been obvious by Ke, Lewis and Sarkinen.

1. Motivations to Combine Ke, Lewis and Sarkinen³

183. It would have been obvious to a POSITA to combine Sarkinen with Ke in view of Lewis. A POSITA looking to expand on the formats available in the Ke-Lewis combination would have looked to Sarkinen because it shares a similar architecture as the Ke-Lewis combination and enables the use of different formats through the use of its fabric and traffic manager. It would have been obvious to a POSITA that Sarkinen discloses one type of backplane device to which the loopback testing system available in the Ke-Lewis combination could apply. Sarkinen discloses that the invention enables “[u]sing [a line-to-switch] interface and isolating such an interface in accordance with the invention, routers and switches can provide multiple service classes, efficiently handle multicast traffic, and instantaneously direct the flow of traffic to other ports should be there be a failure on a link.” Ex. 1011, ¶58. The Ke-Lewis combined system would be a backplane system with subsidiary modules able to implement loopback testing to test specific links, traces or lines. A POSITA would have been motivated to apply the testing from Ke and Lewis to ensure that the line cards traces, or links of Sarkinen were functioning properly so as to know the links available to which traffic could be instantaneously directed to in the event of a failure on a link. A POSITA would have understood

³ This combination does not alter the combination discussed in Ground 1. Claims discussed under this combination continue to map to the Ground 1 claims of relevance for the reasons explained in those sections.

that the fabric interface would act as a switch to help address traffic of different format between line cards and that the fabric interface would operate in between the line cards and could set up the paths between the line cards as shown in Figure 4.

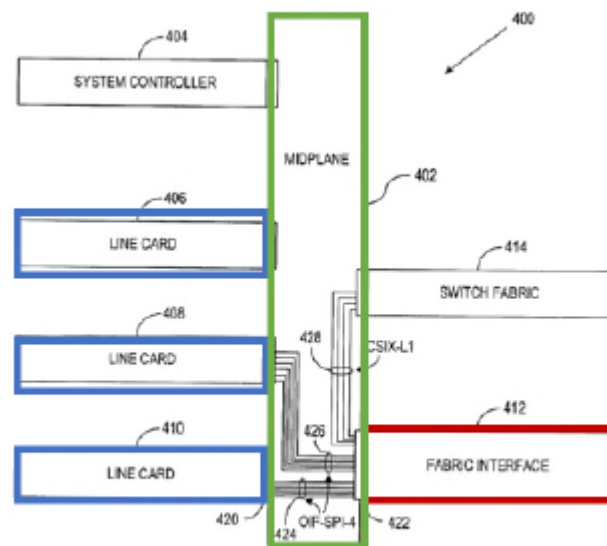


FIG. 4

2. **Claim 6: A method according to claim 1, wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.**

184. To the extent that claim 6 is not rendered obvious by Ke and Lewis, it is my opinion that it is rendered obvious by Ke, Lewis and Sarkinen.

185. Sarkinen discloses:

Network line interface circuitry and switch fabric circuitry is located on one or more printed circuit boards (PCB).
For example, the network line interface circuitry may be

located on one or more line cards, and the switch fabric circuitry may be located on one or more switch cards. A fabric interface circuit which interfaces the network line interface circuitry to the switch fabric circuitry, is separately located on a fabric interface board that is distinct and isolated from the PCBs associated with the network line interface and switch fabric circuits.

Ex. 1011, ¶13. A POSITA would recognize that the backplane in the '369 patent was a (or, the same as the) printed circuit board. The line cards and fabric cards were the same as the subsidiary modules, and the fabric interface board was the main module. Sarkinen also makes clear that the traffic transmitted over the line and fabric cards is communication traffic when it states:

The PCBS are connected to the fabric interface board, and information is communicated between the network line interface circuitry and the switch fabric circuitry via the distinct fabric interface board.

Ex. 1011, ¶13.

186. The architecture of the Ke-Lewis system is similar to the architecture of the embodiments disclosed by Sarkinen. Sarkinen discloses a backplane device, such as a network switch or router, with line cards and fabric cards (subsidiary

modules) controlled by a fabric interface (main module), all of which are plugged into a backplane or midplane 314. Sarkinen further makes it clear that the line cards include a network line interface, which plugs into a network link or trunk to a broader network. Ex. 1011, ¶13. Sarkinen also discloses that the invention relates generally to “communication networks.” Ex. 1011, ¶3. It also notes that one standard that can be utilized in implementing the invention is the “CSIX-L1 standard which defines an interface between a network processor (e.g., traffic manager, or any processor used for packetized information) and a switch fabric in data communications applications.” Ex. 1011, ¶¶66, 106. A POSITA looking to expand the formats supported by the Ke-Lewis combination, would have combined Ke-Lewis with Sarkinen. A POSITA would have understood that the traffic transmitted over the line cards and fabric cards is communication traffic for routing over the network to which the switch/router is connected.

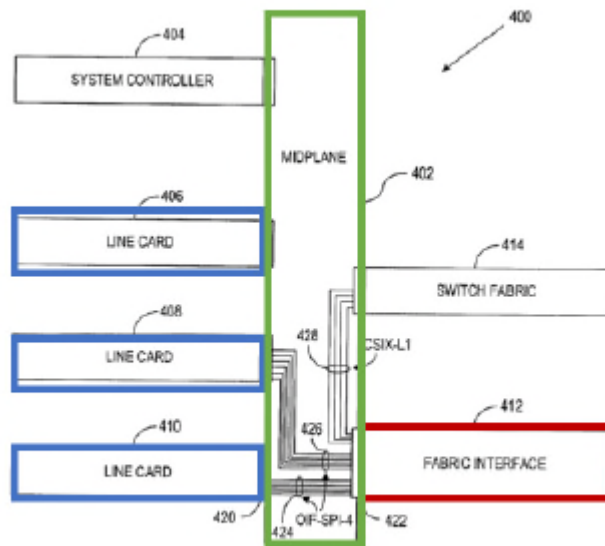


FIG. 4

Ex. 1011, Fig. 4.

187. Therefore, it is my opinion that Ke in view of Lewis and Sarkinen discloses “a method according to claim 1, wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.”

3. Claims 3, 8, 13, 14, 17, 21, 25, and 26

188. To the extent that claims 3, 8, 13, 14, 17, 21, 25, and 26 are not rendered obvious by Ke and Lewis, it is my opinion that they are rendered obvious by Ke, Lewis and Sarkinen.

189. It would have been obvious to combine Ke-Lewis with Sarkinen because Sarkinen is an example of a network switch with the backplane architecture disclosed in Ke as set forth above. Sarkinen makes clear that the switch may support

multiple protocols and multiple data formats. Ex. 1011, ¶¶49, 58, 66. A POSITA would have understood that, for example, each line card may support a different protocol and that each protocol would have a different format associated with the protocol. Ex. 1011, ¶¶49, 58, 66.

190. Sarkinen discloses that protocols and formats are typically defined by a standard. Ex. 1011, ¶¶47, 69.

191. It would have been obvious to a POSITA that the different line cards that support different protocols may support data in different formats. Sarkinen also discloses the use of a traffic manager for different formats. Ex. 1011, ¶68. Sarkinen also discloses the use of a fabric processor to manage traffic of different formats across line cards. Ex. 1011, ¶49. It also would have been obvious to a POSITA that the subsidiary modules would have had to have chosen a common data format to communicate a test message, and it would have been obvious to choose one of the data formats already in use by the line card.

4. Claims 13 and 25

192. Claims 13 and 25 further recite that the different formats are determined by different protocols. Sarkinen discloses that the fabric processor 220 converts the data stream from one format to another, such as from POS frames to Common Switch Interface (CSIX) cells, and distributes the cells over the switch fabric. Ex. 1011, ¶49. Sarkinen also discloses that “the CSIX-L1 specification defines an

interface between a traffic manager and a switch fabric for data communication applications, and specifies certain data formats.” Ex. 1011, ¶66. Sarkinen thus discloses different formats determined by the different standards supported by the switches, or multiple line card system.

5. Claims 14 and 26

193. Claims 14 and 26 recite that one protocol is a TDM protocol and the other is a packet data protocol. Sarkinen discloses the use of “Packet-Over-SONET/SDH (POS) frames” which is “known in the art, [as] a high-speed time division multiplexing (TDM) physical-layer transport technology.” Ex. 1011, ¶47. Sarkinen also discloses that “[t]ypically, the data packet stream is converted to a particular format, such as converted to comply with the CSIX standard.” Ex. 1011, ¶69. A POSITA would have been familiar with both TDM protocols and packet data protocols and would have understood Sarkinen disclosed the use of a TDM and packet data protocol in the Ke-Lewis combination.

194. Therefore, it is my opinion that Ke in view of Lewis and Sarkinen render obvious claims 3, 8, 13, 14, 17, 21, 25, and 26.

E. Ground 3

195. In my opinion, claims 1–26 of the ’369 patent would have been obvious over Cook and Lewis.

1. Motivations to Combine Cook and Lewis

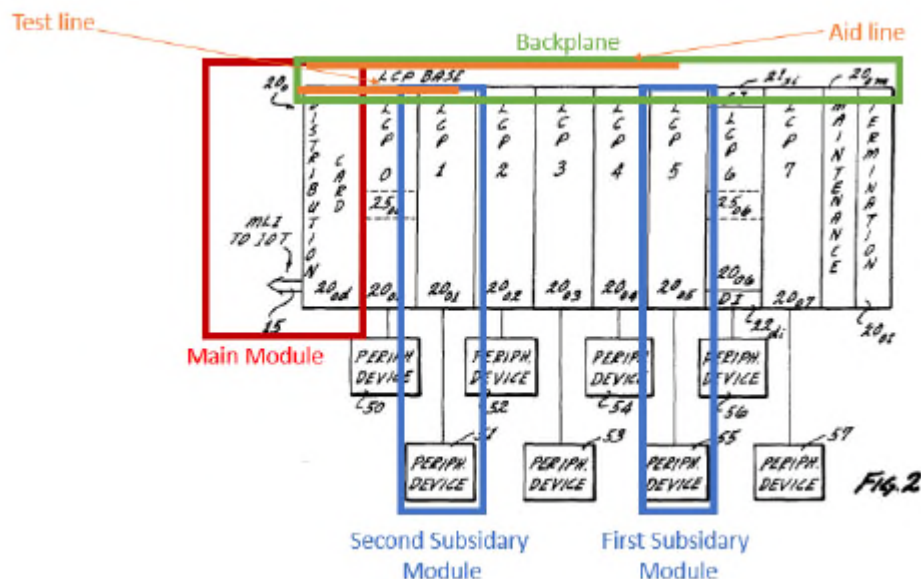
196. A POSITA would be motivated to combine Cook and Lewis because both references discuss testing connections in a system which contains multiple components. Specifically, Cook recites a base module, which manages a group of intelligent I/O Interface Control units (also known as “line control processors” or LCPs) and provides a base module distribution-control interface called a distribution card unit (DCU). Ex. 1010, Abstract, 4:39–45, 5:5–10. The LCPs have a common set of backplane connections to the distribution-control means and to a maintenance unit and termination control unit. Ex. 1010, Abstract, 4:39–45. The maintenance unit permits the exercising and diagnosis of any selected LCPs. Ex. 1010, Abstract. Cook claims as one of its features, a “means for providing on-line diagnostic signals to any selected line control processor and for simulating the peripheral unit corresponding to each line control processor.” Ex. 1010, Claim 7(e2). Like Cook, Lewis also discloses a system with a main module and peripherals that are the subsidiary modules. Ex. 1009, 3:47-61.

197. Due to their similarities, it is my opinion that Lewis would have been obvious to a POSITA to combine with Cook. Specifically, it would be obvious to a POSITA that the backplane in Cook would perform the loopback test from Lewis with connections between the main module and subsidiary modules. Cook makes clear that there are many different types of peripheral devices that can be added to

the LCPs, including “card readers, magnetic tape units, card punches, printers, disk files, supervisory terminals, and so on,” so a POSITA would have understood that the testing configurations must be adaptable and flexible. Ex. 1010, 1:47-49. A POSITA therefore would have been motivated to look at other testing configurations, like the one disclosed in Lewis for the creation of a loop back test.

198. Lewis also discloses a loopback test method that can be deployed while the system is online. Ex. 1009, 2:19-26, 4:23-25. In my opinion, a POSITA would have understood the benefits of a loopback test in the context of a backplane with a DCU and thus would have been motivated to combine the testing protocol in Lewis with the structure disclosed in Cook. It would have been obvious to a POSITA that testing in a backplane could benefit from such a loop back test because there are times when the different boards in a backplane need to communicate with each other.

199. A POSITA would be motivated to test the Cook system with the Lewis loopback test. As depicted below, this could be accomplished by setting up an aid line on Cook’s backplane which connects the first subsidiary module and a test line on Cook’s backplane which connects the second subsidiary module to the main module, as disclosed in Lewis. The modules would then be able to route the test packet through the aid and test lines to perform Lewis’s loopback test. Ex. 1009, 4:42–54.



200. Additionally, a POSITA would have been motivated to test the backplane lines in Cook while they were idle as disclosed in Lewis. Ex. 1009, 2:19–20. Cook states that connections may not be made to LCPs when they are busy. Ex. 1010, 23:61–24:27. A POSITA would understand the value of utilizing the loopback testing in Lewis in the Cook system to minimize any disruptions to the system.

201. Finally, in my opinion, a POSITA would have known there was a reasonable expectation of success to implement the testing in Lewis with the structure in Cook because Cook discusses a “poll test” as one of many possible ways for testing backplanes. Ex. 1010, 23:42–24:27. As Ke acknowledged, there were multiple possible techniques for testing backplanes. Ex. 1008, 1:30–2:18. Further, Cook explains that the DCU and IOT work together to control the communications and testing of individual LCPs, which would indicate to a POSITA that a test like that described in Lewis could be implemented. Ex. 1010, 31:63–32:41. Thus, a

POSITA would therefore have a reasonable expectation of success of the testing from Lewis.

202. Specifically, a POSITA would have found in the I/O Subsystem of Cook using the LCPs, “the Main System (of Processor and Main Memory) is also provided with a unit called an Input-Output Translator unit (IOT) which becomes part of the Main System and provides an interface between the Main System and another distribution-control interface designated as ‘Distribution Card Unit.’” Ex. 1010, 4:64–5:1. Lewis similarly discloses a line interconnected interface when it states “[b]oth message and circuit switches are connected via serial links to one or more peripheral controllers 11A and 11B, the peripheral controllers being connected to peripherals 12A, 12B, 13 etc. via peripheral interface units.” Ex. 1009, 3:53–57.

203. In my opinion, a POSITA would be motivated to combine Cook and Lewis because both references discuss testing connections in a system which contains multiple components. Specifically, Cook recites a DCU coupled to the IOT that directs traffic to the LCPs on a backplane, while Lewis discusses testing peripheral controllers via a control processor/circuit. Ex. 1010, 28:62–29:7; Ex. 1009, 3:47–60. In my opinion, a POSITA would have understood the benefits of a loopback test in the context of a backplane with a DCU and thus would have been motivated to combine the testing protocol in Lewis with the structure disclosed in Cook.

204. Therefore, it is my opinion that a POSITA would have understood that the loopback testing between specific peripherals in Lewis could be employed in Cook by the DCU to control testing between specific LCPs, including two LCPs within a single LCP Base Module.

2. **Claim 1[pre]: In an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data, at least some of which lines are sometimes idle, the main module including a switch having ports connected to the lines, a method for self-testing the system, comprising:**

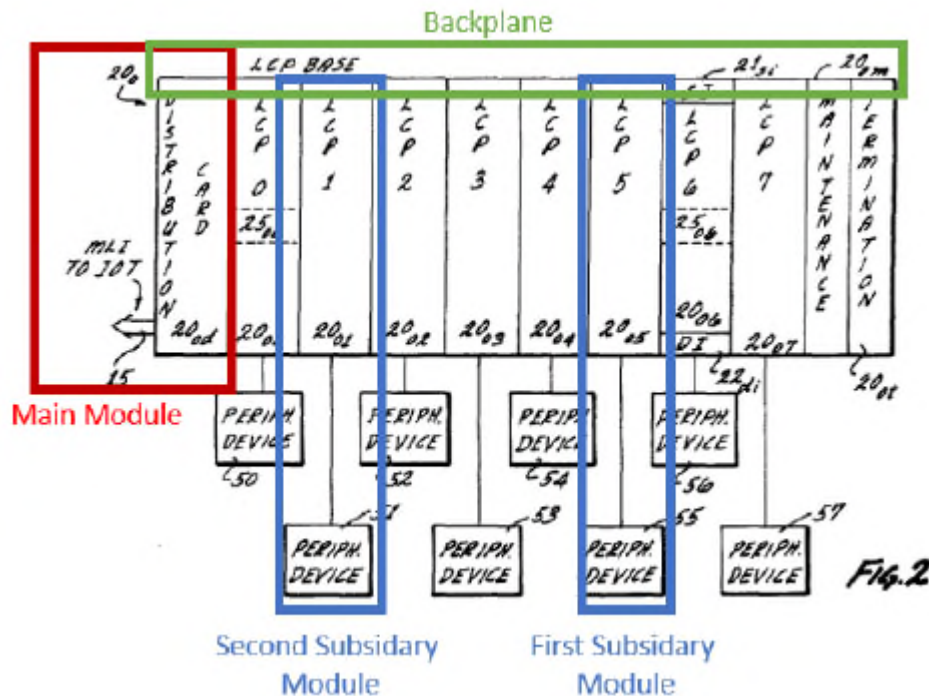
205. In my opinion, to the extent the preamble is limiting, Cook in view of Lewis discloses 1[pre]. Cook in view of Lewis discloses “an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data.” Cook discloses a digital computing and processing system. Cook’s system which contains an LCP Base Module, LCPs, a DCU and an IOT. Ex. 1010, 5:5–19.

The **Line Control Processor’s (LCPs)** are organized in groups of eight called the LCP Base Module each of which has a single **“Distribution Card Unit”** which provides the **interface between the Input-Output Translator, IOT,** of the **Main System** and the **eight LCP** of any given Base

Module. Each Base Module also carries a Maintenance Card unit which can provide all maintenance and checking functions for the group of eight LCPs of the Base Module. Each Base Module is also provided with one common “Termination Card Unit” which provides common clocking functions for all the LCPs of the group and also provides proper terminations for the transmission lines which connect the various LCPs, the Distribution Card, and the Maintenance Card of that particular Base Module.

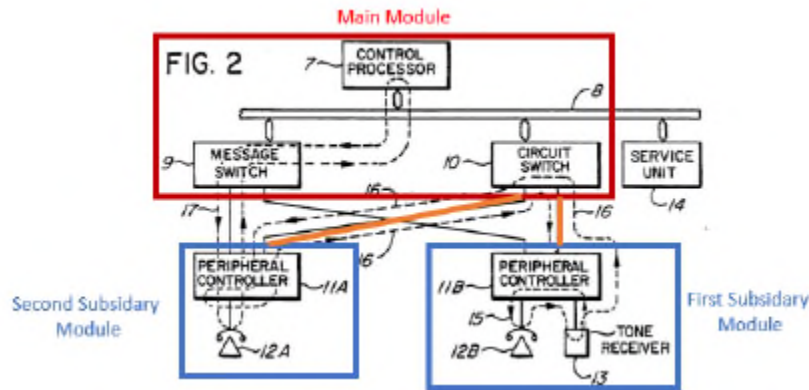
Ex. 1010, 5:5–19. A POSITA would understand that the LCPs are akin to the subsidiary modules, and the DCU (along with the IOT) is akin to the main module.

Ex. 1010, 5:5–19. Further, the LCP Base Modules contain a backplane which connects the LCPs to the DCU. Ex. 1010, 28:62–64. The configuration is detailed in Fig. 2, below.



Ex. 1010, Fig.2.

206. Similarly, Lewis also has a circuit switch 10, a control processor 7, and message switch 9. Ex. 1009, 3:47–60. It would be obvious to a POSITA to view these units together as akin to the main module in the '369 patent. The system in Lewis also describes having multiple peripheral controllers (11A, 11B) which are connected to peripherals (12A, 12B, 13). Ex. 1010, 3:47–60. It would be obvious to a POSITA to view these peripherals as subsidiary modules.



Ex. 1009, Fig. 2.

207. Cook discloses that the lines that connect the main module to the subsidiary modules may be inactive or idle. Specifically, Cook discloses that:

An IOSF (I/O Send Flip-Flop) is used and put in a reset state at this time to enable the bidirectional data lines for transfer of data from the System 10 over to the LCP. There are provided multiplexor control levels SLAIN (Select A Input Multiplexor) and SLBIN (Select B Input Multiplexor). **These are both inactive**, connecting the data lines to the input multiplexor network 24_{x1} of FIGS. 6B and 6D. There are other multiplexor control levels SLARAM (Select A Level Terminal Bus Multiplexor) and SLBRAM (Terminal Bus Multiplexor Select B Level). **These also are both inactive**, connecting the input

multiplexor network 24_{x1} to the input of the Terminal Bus

Multiplexor Network 24_{x2}.

Ex. 1010, 52:48–61. A POSITA would have understood based on this disclosure that the lines could be idle or not in use at some point. In addition, Lewis explains that it is optimal to perform the loopback test when the lines are idle as to not impede on the normal traffic. Ex. 1009, 2:19–20, 14:31–34. Therefore, it would have been obvious to a POSITA to combine Cook with Lewis.

208. Lewis also discloses that for the testing loop disclosed, “[t]esting is also preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19-20.

209. Cook discloses a main module including a switch having ports connected to the lines, and a method of testing the system called the Poll Test. Ex. 1010, 23:43–55; 31:63–32:41.

The “Poll Test” is an algorithm used by the LCP Base Module to establish connection between the Base Module and a particular LCP; the Poll Test algorithm is a connection which is initiated by the IOT (as contrasted with an algorithm called “poll request” which is a connection initiated by the LCP). Once the connection between the LCP Base Module and the specific LCP is

established, the Base Module, such as 200 of FIGS. 1A and 2, becomes transparent to data transfers between the LCP and the IOT. The “Poll Test” algorithm also checks for priority, transmission errors, and busy conditions, any one of which, if detected, could abort the connection attempt.

Ex. 1010, 23:43–55. Cook further discloses:

[T]he Processor 10_p starts the chain of input-output operations by the execution of an Initiate I/O Instruction. In this situation, the Processor passes certain information, including the channel number of the desired LCP over to the IOT Initiation Module 10_{ta} of FIG. 5C. The channel number is decoded to determine the Base Module number and the address of the LCP, which are then passed over to the Connection Module 10_{tb}. The Connection Module then selects the proper LCP Base Module and sends a signal (channel select) to the appropriate Distribution Card, as 20_{od}, for that Base Module, as 20_o, requesting that a connection attempt be made. The above described operation is called a “Poll Test” and is a means for the

Main System to seek connection to an LCP; it is, further, a method by which the Distribution Card 20_{0d}, in response to the connection request, also attempts to connect to a specific LCP.

Following the transmission of a “Channel Select”, the IOT sends the address of the desired LCP to the Distribution Card in the selected Base Module. At the same time, the IOT sends “Address Select” to all Base Modules in the system. The Distribution Card that receives both the Address Select and Channel Select begins a “Poll Test” and responds to the IOT with an “LCP Strobe”; the Distribution Cards that received the Address Select only, consider it as a “busy” signal, and they are inhibited from communication with the IOT. When the IOT 10_t receives the LCP Strobe, it drops the Channel Select.

When the Distribution Card receives an “Address Select” and “Channel Select”, a signal is generated which enables the LCP address to be placed into an LCP address register in the Distribution Card. The BCD (Binary Coded Decimal) output of the LCP address register is decoded to

enable one of eight lines. Each line represents one LCP in the Base Module. When an LCP detects that its address line is active, then that LCP responds to the Distribution Card with the signal LCPCON meaning “LCP connected”. When this connected signal is received in the Distribution Card, a connect flip-flop (CONF) is set. Then depending on the state of the I/O send line (IOSND/FIG. 6C) from the connected LCP, this will cause an activation of control lines for either receiving data or sending data as between the LCP and the IOT (FIG. 6C).

Ex. 1010, 31:63–32:41. A POSITA would understand that the DCU and IOT (the main module) are akin to the switch in the ’369 patent as it directs traffic to each of the different LCPs. Cook also discloses that the LCPs and DCU are connected to ports of the backplane. Ex. 1010, 28:62–29:7. Specifically, Cook states:

A local common backplane is provided in each of the LCP Base Modules 20₀, 20₁, 20₂, etc. Each backplane connects to all the eight LCPs in the Base Module. The backplane is constructed so that all signal lines are bussed the length of the backplane, thus making each line available to all LCPs in that Base Module. From the individual position

of a single LCP, these backplane lines fall into two general types: (a) those going to the Distribution Card and on to the IOT; and (b) those going to the Maintenance and Termination Cards. With the exception of the various clock and voltage lines, those lines going to the Maintenance Card, (such as for example, 20_{0m} of FIG. 2) are used for local or off-line maintenance functions.

Ex. 1010, 28:62–29:7. It is my opinion that a POSITA would have understood that the connections with the backplane act as the ports between the LCPs and the backplane.

210. Lewis also discloses a switch mechanism:

According to the present invention, individual switches can be tested, as well as loops which are as long or as short as desirable.

...

Turning to FIG. 2, which illustrates a block diagram of a system implementing the present invention, a control processor 7 communicates via a high speed parallel bus 8 with two kinds of switching networks: a switching network 9 referred to below as a message switch and a

switching network 10 referred to below as a circuit switch.

Both message and circuit switches are connected via serial links to one or more peripheral controllers 11A and 11B, the peripheral controllers being connected to peripherals 12A, 12B, 13 etc. via peripheral interface units (not shown). Each peripheral controller includes a switching network.

Ex. 1009, 3:39-58. Lewis also discloses that the invention “relates to a switching system testing arrangement which uses a looparound circuit, into which a test signal is injected and received to determine whether the loop is functioning properly.” Ex. 1009, Abstract. Lewis also discloses that “[a]ccording to the present invention, individual switches can be tested, as well as loops which are as long or as short or desirable.” Ex. 1009, 3:39-41.

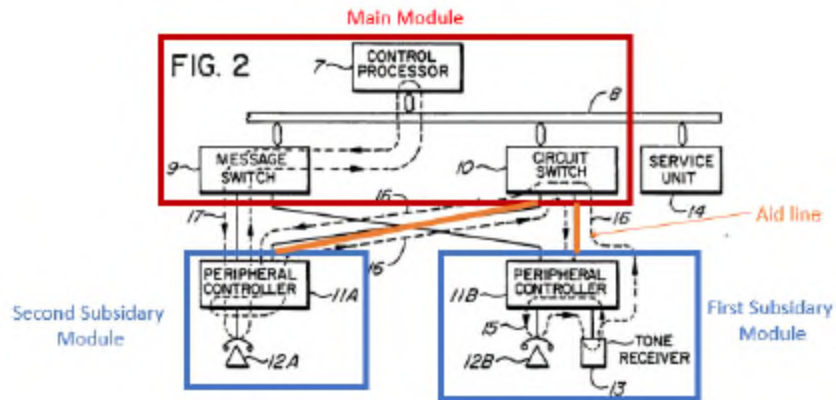
211. Therefore, it is my opinion that Cook in view of Lewis discloses “an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data, at least some of which lines are sometimes idle, the main module including a switch having ports connected to the lines, a method for self-testing the system.”

3. Claim 1[a]: selecting a first idle line among idle lines connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid line;

212. In my opinion, Cook in view of Lewis discloses 1[a]. Lewis discloses a “a looparound arrangement in a switching system whereby transmission paths of the system can be tested.” Ex. 1009, 1:4–6. Further, Lewis discloses that “[t]esting is also preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19–20. Lewis states that:

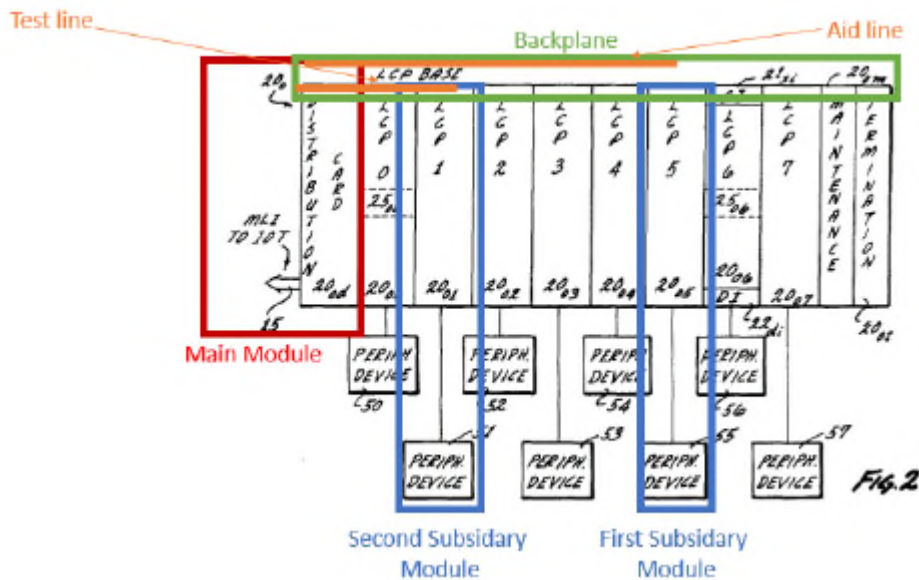
In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:42–54. This system is demonstrated on the diagram below:



Ex. 1009, Fig. 2.

This same set up is mirrored by the structure in Cook as depicted below.



Ex. 1010, Fig. 2.

213. A POSITA would have understood that the first subsidiary module is connected to the circuit switch via a port, which is how connections between the switch and the peripherals would have been made. Alternatively, it would have been

obvious to a POSITA that the peripherals could have been connected to the switch via a port. Therefore, it is my opinion that Cook in view of Lewis discloses “selecting a first idle line among idle lines connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid line.”

4. Claim 1[b]: instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line;

214. In my opinion, Cook in view of Lewis discloses 1[b]. Lewis discloses “instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line.” Specifically, Lewis states:

According to the present invention local supervisory loops of virtually any length can be set up to test virtually any switch or link in the system. For example, to test a short transmission path between a telephone set 12B interface and the tone receiver 13 through peripheral controller 11B, the control processor 7 sends control messages via bus 8 and message switch 9 to peripheral controller 11B to set up a communication loop between the telephone set interface and tone receiver 13 through the switching matrix (e.g. time division switching matrix) in peripheral controller 11B, but excluding links to the circuit switch 10,

in this case. In addition, a test message is sent from service unit 14 via bus 8, message switch 9 and peripheral controller 11B into the loop, and the resulting signal having passed through the loop passes back through the message switch link system just described for receipt by the service unit 14. In this manner a small, isolated transmission loop is established and tested.

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:23–54. A POSITA would have understood this disclosure as instructing the first subsidiary module to loop back traffic it receives back at the circuit switch.

215. Therefore, it is my opinion that Cook in view of Lewis discloses “instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line.”

5. **Claim 1[c]: selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module;**

216. In my opinion, Cook in view of Lewis discloses 1[c]. Lewis discloses “selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module.” Specifically, Lewis states:

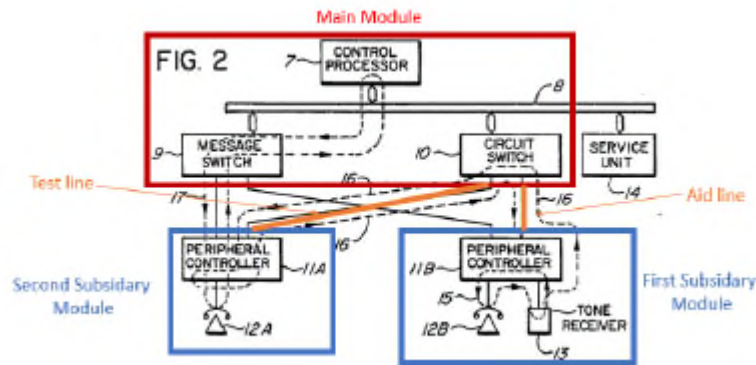
According to the present invention local **supervisory loops of virtually any length can be set up to test virtually any switch or link in the system.** For example, to test a short transmission path between a telephone set 12B interface and the tone receiver 13 through peripheral controller 11B, the control processor 7 sends control messages via bus 8 and message switch 9 to peripheral controller 11B to set up a communication loop between the telephone set interface and tone receiver 13 through

the switching matrix (e.g. time division switching matrix) in peripheral controller 11B, but excluding links to the circuit switch 10, in this case. In addition, a test message is sent from service unit 14 via bus 8, message switch 9 and peripheral controller 11B into the loop, and the resulting signal having passed through the loop passes back through the message switch link system just described for receipt by the service unit 14. **In this manner a small, isolated transmission loop is established and tested.**

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local

loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:23–54. As described above, the system selects a line between the second subsidiary module and the circuit switch (“test line”) for testing.



217. As I stated in 1[a], a POSITA would have understood or found it obvious that the second subsidiary module is connected via a port to the circuit switch.

218. Cook also discloses that “[t]he Distribution Card also works in conjunction with the IOT Connection Module 10_{tb} to establish a data path to a specified LCP.” Ex. 1010, 28:36-38.

219. Therefore, it is my opinion that Cook in view of Lewis discloses “selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module.”

6. Claim 1[d]: configuring the switch to link the first and second ports;

220. In my opinion, Cook in view of Lewis discloses 1[d]. In order to create a loop to be tested the switch would need to be configured to link the first and second ports as disclosed by Lewis:

According to the present invention local **supervisory loops of virtually any length can be set up to test virtually any switch or link** in the system. For example, to test a short transmission path between a telephone set 12B interface and the tone receiver 13 through peripheral controller 11B, the control processor 7 sends control messages via bus 8 and message switch 9 to peripheral controller 11B to set up a communication loop between the telephone set interface and tone receiver 13 through the switching matrix (e.g. time division switching matrix) in peripheral controller 11B, but excluding links to the circuit switch 10, in this case. In addition, a test message is sent from service unit 14 via bus 8, message switch 9 and peripheral controller 11B into the loop, and the resulting signal having passed through the loop passes back through the message switch link system just described for receipt by the service unit 14. In this manner

a small, isolated **transmission loop is established** and tested.

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. A test tone signal is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or **long loop between peripheral interfaces can be set up** and tested.

221. Therefore, it is my opinion that Cook in view of Lewis discloses “configuring the switch to link the first and second ports.”

7. **Claim 1[e]: transmitting test traffic over the second idle line from the second subsidiary module to the main module, wherein the test traffic is conveyed via the switch to the aid line connecting to the first subsidiary module; and**

222. In my opinion, Cook in view of Lewis discloses 1[e]. Lewis discloses transmitting test traffic over the second idle line from the second subsidiary module

to the main module, wherein the test traffic is conveyed via the switch to the aid line connecting to the first subsidiary module:

In a similar manner other forms of loops can be set up and tested. For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. **A test tone signal is injected into the loop** by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15. In this manner a complete or long loop between peripheral interfaces can be set up and tested.

Ex. 1009, 4:42–54. A POSITA would understand that this discloses transmitting test data to the subsidiary modules. Lewis also discloses another example of the loopback test:

For example, to test a short transmission path between a telephone set 12B interface and the tone receiver 13 through peripheral controller 11B, the control processor 7

sends control messages via bus 8 and message switch 9 to peripheral controller 11B to set up a communication loop between the telephone set interface and tone receiver 13 through the switching matrix (e.g. time division switching matrix) in peripheral controller 11B, but excluding links to the circuit switch 10, in this case. In addition, a test message is sent from service unit 14 via bus 8, message switch 9 and peripheral controller 11B into the loop, and the resulting signal having passed through the loop passes back through the message switch link system just described for receipt by the service unit 14. In this manner a small, isolated **transmission loop is established** and tested.

Ex. 1009, 4:25-41.

223. Therefore, it is my opinion that Lewis discloses “transmitting test traffic over the second idle line from the second subsidiary module to the main module, wherein the test traffic is conveyed via the switch to the aid line connecting to the first subsidiary module.”

8. **Claim 1[f]: reporting that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time.**

224. In my opinion, Cook in view of Lewis discloses 1[f]. Lewis discloses:
The main controller, **having received a message signal via the system described above of the returned test signal, formulates a message and** transmits it to the service unit 214, of the test signal, and also formulates a message signal to be returned to the peripheral acknowledging that it has received the message. This signal is downloaded via parallel bus 212 into COMRAM BUFFER 214, which operates in the reverse direction in the same way as described earlier.

Ex. 1009, 14:3–11 (emphasis added). In my opinion, a POSITA would have understood that this discloses “reporting a failure has occurred.” Further, a POSITA would understand that a failure constitutes the main module not receiving a test message from the second subsidiary module within a predetermined period of time. This sort of “time out” result is common and well understood. For example, ICMP messages, which have been commonplace in the field since at least 1989, send a timeout message if the ICMP message was not returned in a reasonable amount of time. Ex. 1012 (RFC 1122), 57–58.

225. Therefore, it is my opinion that Cook in view of Lewis discloses “reporting that a failure has occurred if the test traffic does not return to the second

subsidiary module within a predetermined period of time” or it would have been obvious to a POSITA.

9. **Claim 2: A method according to claim 1, wherein instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.**

226. In my opinion, Cook in view of Lewis discloses claim 2 for the same reasons discussed in claim 1[b], as well as additional disclosures. Specifically, Lewis discloses:

For example the control processor 7 can send messages through bus 8 via the message switch 9 to the peripheral controller 11A, and to circuit switch 10 to set up a circuit switch loop 16 from a peripheral telephone 12A interface, through peripheral controller 11A, circuit switch 10, peripheral controller 11B to the tone receiver 13 interface. **A test tone signal** is injected into the loop by service unit 14 and the return signal received via the message links as described earlier with reference to local loop 15.

Ex. 1009, 4:43-52. Lewis further discloses:

In addition, a test message is sent from service unit 14 via bus 8, message switch 9 and peripheral controller 11B into

the loop, and the resulting signal **having passed through the loop passes back through the message switch link system just described for receipt by the service unit 14.**

In this manner a small, isolated transmission loop is established and tested.

Ex. 1009, 4:34–41 (emphasis added). In my opinion, a POSITA would have understood that this disclosure represents the idea that test traffic goes through the first subsidiary module without substantial processing. The idea of the “test message” or a “test tone signal” indicates that the data is not regular data for use in the system but is data being used to test the system. In addition, the term “passes back through” indicates that the data passes through and is not processed.

227. Therefore, it is my opinion that Cook in view of Lewis discloses “instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.”

10. Claim 3: A method according to claim 2, wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.

228. In my opinion, Cook in view of Lewis discloses claim 3 for the same reasons discussed in claim 2, as well as additional disclosures. Lewis discloses that

“[s]ince the links are dedicated for each peripheral, the particular scan signal format and peripheral state message signal format can be set to suit the design.” Ex. 1009, 12:18-20.

229. Lewis further discloses exemplary loops for testing. Ex. 1009, 4:25–54. In one loop a “test message” is injected into the loop of lines to be tested. Ex. 1009, 4:34-39. The “resulting signal” is received by the service unit. *Id.* Lewis also discloses that one exemplary loop uses a “test message” (Ex. 1009, 25-41), while the other exemplary loop uses a “test tone signal” being used as test traffic and a “test message.” Ex. 1009, 4:43-52. A POSITA would understand Lewis as disclosing two different formats for test traffic to be used in the loop for testing.

230. Alternatively, it would have been obvious to a POSITA that the subsidiary modules could send and receive data in multiple formats because different messages passed between the modules may require different formats and would have been organized differently.

231. Therefore, it is my opinion that Cook in view of Lewis discloses “a method according to claim 2, wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.”

**11. Claim 4: A method according to claim 1, further comprising:
selecting one or more further idle lines for testing among the**

idle lines in the system, wherein the further idle lines connect to further ports of the switch on the main module; and repeating the configuring the switch, transmitting the test traffic, and reporting that the failure has occurred with respect to the further idle lines until all the idle lines have been tested.

232. In my opinion, Cook in view of Lewis discloses claim 4, for the same reasons as claims 1[a], 1[c] and 1[f]. Lewis also discloses that “local supervisory loops of virtually any length can be set up to test virtually any switch or link in the system.” Ex. 1009, 4:23–25. Lewis goes on to disclose multiple loops being set up. Ex. 1009, 4:25-41 (“short transmission path” or “isolated transmission loop”), 4:43-54 (“long loop”), 4:55-63 (“message switch path”). Lewis notes “other forms of loops can be set up and tested” “[i]n a similar manner.” Ex. 1009, 4:42-43. Lewis further discloses that “[t]esting is also preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19-20. Lewis notes that “[a]ssuming that the location of an idle path has been determined, the main controller sends a message signal to the peripheral controllers, and to the circuit switch processor 218 to set up the circuit path.” Ex. 1009, 14:30-34.

233. A POSITA would have understood that any and all of the idle lines could be added to the same loop for testing. Further, it would have been obvious to a POSITA that the same process for choosing idle lines could be repeated until all the idle lines have been tested. In fact, it would have been obvious to a POSITA to run the test repeatedly until all the idle lines were tested. A POSITA would also

have been motivated to repeat the test in order to make sure that all potential hidden failures were discovered.

234. Therefore, it is my opinion that Cook in view of Lewis discloses “selecting one or more further idle lines for testing among the idle lines in the system, wherein the further idle lines connect to further ports of the switch on the main module; and repeating the configuring the switch, transmitting the test traffic, and reporting that the failure has occurred with respect to the further idle lines until all the idle lines have been tested.”

12. Claim 5: A method according to claim 1, wherein the main module and said at least first and second subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane.

235. In my opinion, Cook in view of Lewis discloses Claim 5. Cook discloses a digital computing and processing system. Cook’s system which contains an LCP Base Modules, LCPs, a DCU and an IOT. Ex. 1010, 5:5–19.

The **Line Control Processor’s (LCPs)** are organized in groups of eight called the LCP Base Module each of which has a single **“Distribution Card Unit”** which provides the **interface between the Input-Output Translator, IOT,** of the Main System and the **eight LCPs** of any given Base Module. Each Base Module also carries a Maintenance Card unit which can provide all maintenance and checking

functions for the group of eight LCPs of the Base Module. Each Base Module is also provided with one common “Termination Card Unit” which provides common clocking functions for all the LCPs of the group and also provides proper terminations for the transmission lines which connect the various LCPs, the Distribution Card, and the Maintenance Card of that particular Base Module.

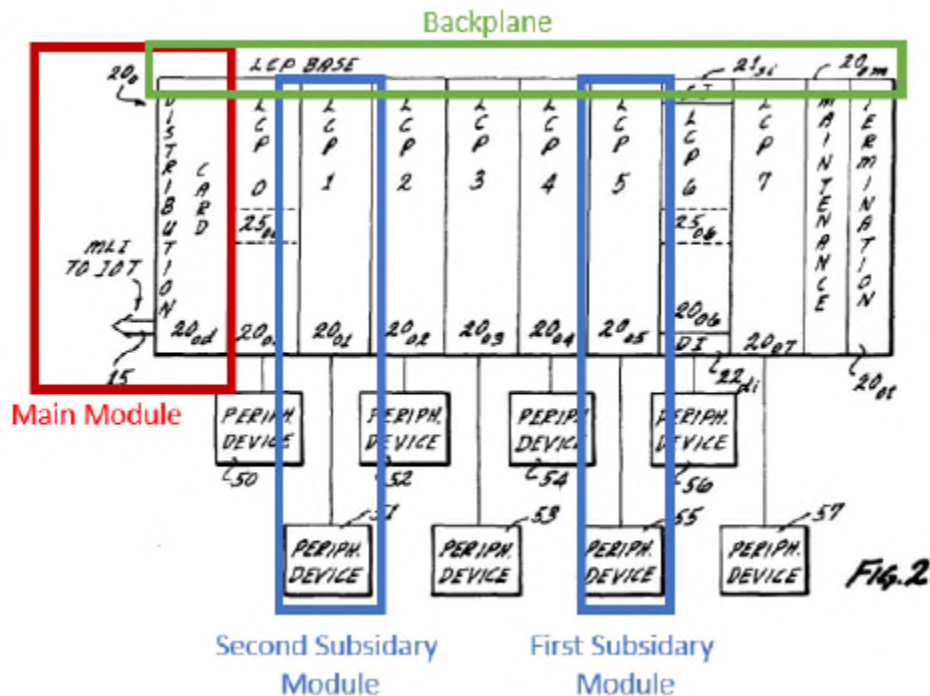
Ex. 1010, 5:5–19. A POSITA would understand that the LCPs are akin to the subsidiary modules, and the DCU (along with the IOT) is akin to the main module.

Ex. 1010, 5:5–19. Further, the LCP Base Modules contains a backplane which connects the LCPs to the DCU. Specifically, Cook discloses that:

A local common backplane is provided in each of the LCP Base Modules 200, 201, 202, etc. Each backplane connects to all the eight LCPs in the Base Module. The backplane is constructed so that all signal lines are bussed the length of the backplane, thus making each line available to all LCPs in that Base Module. From the individual position of a single LCP, these backplane lines fall into two general types: (a) those going to the

Distribution Card and on to the IOT; and (b) those going to the Maintenance and Termination Cards.

Ex. 1010, 28:62–29:3. The configuration is detailed in Fig. 2, below.



Ex. 1010, Fig. 2.

236. It would be obvious to a POSITA that the LCPs and DCU are plugged into the backplane because that is how backplanes operate. Alternatively, it would have been obvious to a POSITA that the DCU and LCPs plug into the backplane. *Id.*

237. Therefore, it is my opinion that Cook in view of Lewis discloses “a method according to claim 1, wherein the main module and said at least first and

second subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane.”

13. Claim 6: A method according to claim 1, wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.

238. Cook in view of Lewis discloses a method according to claim 1, where in the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.

239. Lewis discloses that “[a] typical system is formed of a switching network may have several stages, peripheral interface circuits such as line circuits, trunk circuits, etc. which are connected to the switching network, and a common control.” Ex. 1009, 1:11-15. Lewis also discloses that “[t]runk circuits are connected in some cases as peripherals or in some cases via a further switching matrix.” Ex. 1009, 3:4-6.

240. Lewis further disclose traffic that comprises communication traffic. It describes the system claimed by Lewis as a “communication circuit system.” Ex. 1009, Abstract. Lewis further discloses that:

Further, due to the use of an unique form of switching system, in which control messages are switched and routed separately from **communication messages**,

communication message paths are not required to carry supervisory signals for the testing procedure.

Ex. 1009, 2:17-19. Lewis discloses a system where “[a]ctual **communication signals** between peripherals pass through circuits set up via links connected from a peripheral, a peripheral controller, circuit switch 10, a peripheral controller to another peripheral.” Ex. 1009, 4:1-4. Lewis further discloses that:

The free time available to the switches and links are used to test the switches and links, and since entire transmission paths between peripherals need not be set up to effect the testing, a substantial increase in the elements available for carrying normal **communication traffic** is made available.

Ex. 1009, 16:8-13.

241. Cook discloses that “[t]he units known as Line Control Processors are the devices which establish a communication path from the System (Main Memory and Processor) to a specific peripheral device.” Ex. 1010, 13:8-11. Cook discloses that “[t]he units known as Line Control Processors are the devices which establish a communication path from the System (Main Memory and Processor) to a specific peripheral device.” EX1010, 13:8-11; EX1003, ¶241

242. The Cook-Lewis combination thus discloses the switching functionality connecting peripherals to a trunk circuit or system. Lewis further discloses that the traffic in this system is communication traffic.

243. Therefore, it is my opinion that Cook in view of Lewis would render obvious “wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.”

14. Claim 7: A method according to claim 6, wherein transmitting the test traffic comprises testing the second idle line while continuing to use the lines that are not idle for carrying the data to the network communication trunk.

244. In my opinion, Cook in view of Lewis disclose claim 7. Cook claims as one of its features, a “means for providing on-line diagnostic signals to any selected line control processor and for simulating the peripheral unit corresponding to each line control processor.” Ex. 1010, Claim 7(e2)

245. Lewis discloses the need to identify the idle paths:

Assuming that the location of an idle path has been determined, the main controller sends a message signal to the peripheral controllers, and to the circuit switch processor 218 to set up the circuit path.

Ex. 1009, 14:30–34. Lewis also states that “[t]esting is preferred to be performed during times when the switches or links are idle.” Ex. 1009, 2:19–20. A POSITA

would have known that these disclosures mean that the test could occur on idle lines, while the non-idle lines continue carrying normal traffic.

246. Cook highlights the importance of testing while the system is actively in use or on-line. The teaching of Lewis highlight the need to identify only idle lines so those idle lines can be tested while the rest of the system is on-line. Therefore, it is my opinion that Cook in view of Lewis discloses “transmitting the test traffic comprises testing the second idle line while continuing to use the lines that are not idle for carrying the data to the network communication trunk.”

15. Claim 8[pre]: In an electronic system that includes a main module and multiple subsidiary modules, each of said multiple subsidiary modules being connected to the main module by one or more lines for carrying data, a method for self-testing the system, comprising:

247. In my opinion, Cook in view of Lewis discloses 8[pre] for the same reasons as 1[pre].

16. Claim 8[a]: selecting first and second subsidiary modules of different types for testing among the multiple subsidiary modules, the first and second subsidiary modules being configured to transmit and receive the data in different, respective first and second formats;

248. In my opinion, Cook in view of Lewis discloses 8[a] for the same reasons as 1[a], 1[c], and claim 3. Both Cook and Lewis disclose that the peripherals in their respective systems could be different types. Ex. 1010, 1:47–49; Ex. 1009,

4:42–54. It is my opinion that a POSITA would have understood that the first and second subsidiary modules could be different types.

17. Claim 8[b]: instructing the first subsidiary module to loop back traffic reaching the first subsidiary module from the main module;

249. In my opinion, Cook in view of Lewis discloses 8[b] for the same reasons as 1[a] and 1[b].

18. Claim 8[c]: configuring the main module to connect the first and second subsidiary modules, so that the traffic transmitted by the second subsidiary module is conveyed to the first subsidiary module via the main module and is then looped back via the main module to the second subsidiary module; and

250. In my opinion, Cook in view of Lewis discloses 8[c] for the same reasons as 1[c], 1[d] and 1[e].

19. Claim 8[d]: testing the system by causing the second subsidiary module to transmit test traffic in the second format to the main module, and assessing whether the test traffic is returned intact from the first module.

251. In my opinion, Cook in view of Lewis discloses 8[d] for the same reasons as 1[e], 1[f] and claim 3. Specifically, Lewis states:

The main controller, **having received a message signal via the system described above of the returned test signal, formulates a message and** transmits it to the service unit 214, of the test signal, and also formulates a message signal to be returned to the peripheral

acknowledging that it has received the message. This signal is downloaded via parallel bus 212 into COMRAM BUFFER 214, which operates in the reverse direction in the same way as described earlier.

Ex. 1009, 14:3–11 (emphasis added). This passage describes the main module acknowledging to have received the return signal if the test message was returned successfully. Ex. 1009, 14:3–11. A POSITA would understand that the main module confirms that the test message must be returned intact before it can send an acknowledged receipt because the test would be deemed a failure if the message did not return intact or did not return.

252. Therefore, it is my opinion that Cook in view of Lewis discloses “testing the system by causing the second subsidiary module to transmit test traffic in the second format to the main module, and assessing whether the test traffic is returned intact from the first module.”

20. Claim 9: A method according to claim 8, wherein instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.

253. In my opinion, Cook in view of Lewis discloses claim 9 for the same reasons as claim 2.

21. Claim 10: A method according to claim 8, wherein the main module and subsidiary modules comprise cards, which are

plugged into a backplane, and wherein the lines comprise traces on the backplane.

254. In my opinion, Cook in view of Lewis discloses claim 10 for the same reasons as claim 5.

22. Claim 11: A method according to claim 8, wherein the main module comprises a switch, which is coupled to connect the lines to a network communication trunk, and wherein configuring the main module comprises configuring the switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module.

255. In my opinion, Cook in view of Lewis discloses claim 11 for the same reasons as claim 6, 1[a], 1[c] and 1[d]. Further, a POSITA would know that linking the first and second ports is equivalent to the switch connecting lines of the first and second subsidiary modules. Alternatively, it would have been obvious to a POSITA that the switch could connect lines of the first and second subsidiary modules so they can send the test traffic to each other.

256. Therefore, it is my opinion that Cook in view of Lewis discloses “the main module comprises a switch, which is coupled to connect the lines to a network communication trunk, and wherein configuring the main module comprises configuring the switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module.”

23. Claim 12: A method according to claim 11, wherein testing the system comprises testing one or more of the lines of the second subsidiary module while continuing to use at least

some of the lines that are not under test for carrying the data from the subsidiary modules to the network communication trunk.

257. In my opinion, Cook in view of Lewis discloses claim 12 for the same reasons as claim 7.

24. Claim 13: A method according to claim 8, wherein the traffic comprises communication traffic, and wherein the first and second formats are determined respectively by different first and second communication protocols.

258. In my opinion, Cook in view of Lewis discloses claim 13 for the same reasons as claims 3 and 6. Further, it would have been obvious to a POSITA that the test traffic in the subsidiary modules could have a different protocol. A POSITA would have been motivated to use a method which does not require the same protocol to be used by the modules, because the modules may use different protocols.

259. Therefore, it is my opinion that Cook in view of Lewis discloses “traffic comprises communication traffic, and wherein the first and second formats are determined respectively by different first and second communication protocols.”

25. Claim 14: A method according to claim 13, wherein one of the first and second protocols is a time domain multiplexing (TDM) protocol, while the other of the first and second protocols is a packet data protocol.

260. Cook in view of Lewis discloses claim 14.

261. Lewis discloses that “general functions are provided whether the system operates as a space division switching network or as a **time division**

switching network.” Ex. 1009, 1:19-21. Lewis also discloses “input lines carrying time division multiplexed.” Ex. 1009, 7:5-6.

262. Lewis further discloses:

system for testing transmission paths requires loops to be set up between peripheral units through the main switching network in order to properly test each available transmission path. Consequently it utilizes significant numbers of switching network crosspoints (both space division forms of crosspoints or equivalent **time division equipment**) for significant periods of time, which crosspoints (or **time division** equivalents) and their associated links are unavailable for use during the testing interval.

Ex. 1009, 1:39-48. Lewis also notes that “[a]ccording to the present invention, individual switches can be tested, as well as loops which are as long or short as desirable. The system will be described with reference to a PCM time division multiplex switching network.” Ex. 1009, 3:39-43. In describing another embodiment of the loopback testing, Lewis notes:

the control processor 7 sends control messages via bus 8 and message switch 9 to peripheral controller 11B to set

up a communication loop between the telephone set interface and tone receiver 13 through the switching matrix (e.g. **time division** switching matrix) in peripheral controller 11B . . .

Ex. 1009, 4:28-33.

263. In my opinion, it would have been obvious to a POSITA that the modules could utilize different protocols, including TDM protocols and packet data protocols, because the type of signal does not matter. Additionally, a POSITA would know that a TDM protocol is used for communications with other modules, while a packet data protocol is used to communicate with other devices over an IP-based network. For example, a textbook which predates the patents states that “two common forms of multiplexing are frequency-division multiplexing (FDM) and time division multiplexing (TDM).” Ex. 1013, 236. The textbook also discusses packet switching which utilizes the packet data protocol. See Ex. 1013, 10.

264. Therefore, it is my opinion that Cook in view of Lewis discloses “wherein one of the first and second protocols is a time domain multiplexing (TDM) protocol, while the other of the first and second protocols is a packet data protocol.”

26. Claim 15[pre]: Modular electronic apparatus, comprising:

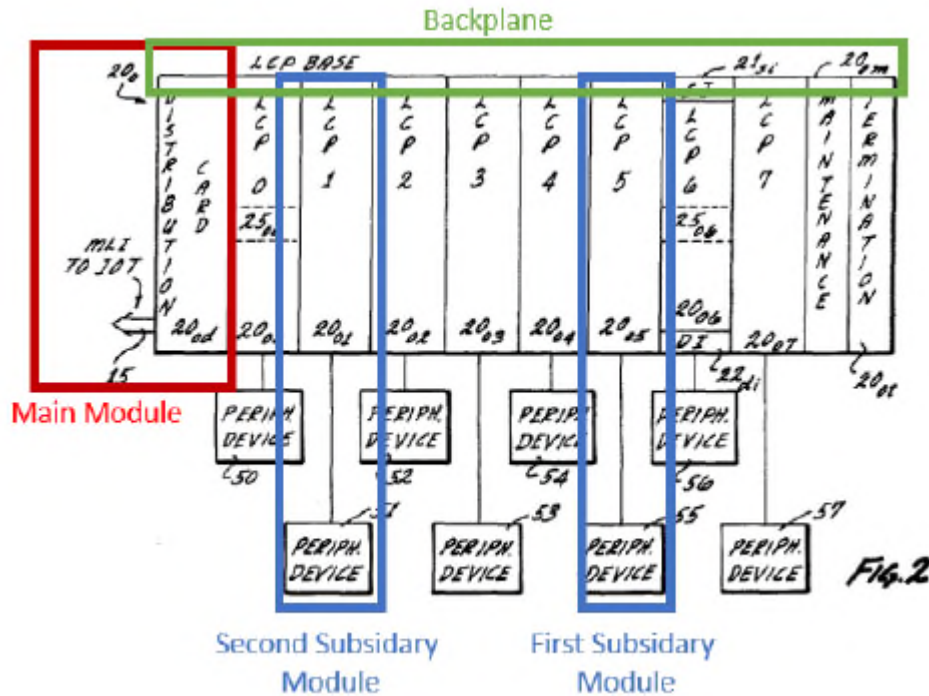
265. In my opinion, to the extent the preamble is limiting, Cook in view of Lewis discloses 15[pre]. Cook discloses a digital computing and processing system.

Cook's system contains an LCP Base Module, LCPs, a DCU and an IOT. Ex. 1010, 5:5–19.

The **Line Control Processor's (LCPs)** are organized in groups of eight called the LCP Base Module each of which has a single **"Distribution Card Unit"** which provides the **interface between the Input-Output Translator, IOT**, of the Main System and the **eight LCPs** of any given Base Module. Each Base Module also carries a Maintenance Card unit which can provide all maintenance and checking functions for the group of eight LCPs of the Base Module. Each Base Module is also provided with one common **"Termination Card Unit"** which provides common clocking functions for all the LCPs of the group and also provides proper terminations for the transmission lines which connect the various LCPs, the Distribution Card, and the Maintenance Card of that particular Base Module.

Ex. 1010, 5:5–19. A POSITA would understand that the **LCPs** are akin to the subsidiary modules, and the **DCU (along with the IOT)** is akin to the main module.

Ex. 1010, 5:5–19. The configuration is detailed in Fig. 2, below.



Ex. 1010, Fig.2. A POSITA would know that the LCPs can be inserted and changed, like a modular system. In fact, the title of Cook is “Modular block unit for input-output subsystem.” Ex. 1010, [19].

266. It is my opinion that a POSITA would have understood that the connections with the backplane act as the ports between the LCPs and the backplane.

267. Therefore, it is my opinion that Cook in view of Lewis discloses “modular electronic apparatus.”

27. Claim 15[a]: a backplane, which comprises traces for carrying data between modules that are plugged into the backplane;

268. In my opinion, Cook in view of Lewis discloses 15[a] for the same reasons as 1[pre] and claim 5.

28. Claim 15[b]: a main module, plugged into the backplane, the main module comprising a switch having ports for connection to the traces of the backplane;

269. In my opinion, Cook in view of Lewis discloses 15[b] for the same reasons as 1[pre] and claim 5.

29. Claim 15[c]: at least first and second subsidiary modules, plugged into the backplane so as to be connected to the main module by the traces, at least some of which traces are sometimes idle; and

270. In my opinion, Cook in view of Lewis discloses 15[c] for the same reasons as 1[pre] and claim 5.

30. Claim 15[d]: a system control processor, which is operative to select a first idle trace among idle traces connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid trace,

271. In my opinion, Cook discloses 15[d] for the same reasons as 1[a]. A POSITA would have understood that the DCU has a processor so that it can process data sent to it and route the data to the correct LCP, or to the IOT.

272. Therefore, it is my opinion that Cook in view of Lewis discloses “a system control processor, which is operative to select a first idle trace among idle traces connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid trace.”

31. Claim 15[e] to instruct the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid trace,

273. In my opinion, Cook in view of Lewis discloses 15[e] for the same reasons as 1[b].

32. Claim 15[f] to select for testing a second idle trace among the idle traces connecting the second subsidiary module to a second port of the switch on the main module, and

274. In my opinion, Cook in view of Lewis discloses 15[f] for the same reasons as 1[c].

33. Claim 15[g] to configure the switch to link the first and second ports,

275. In my opinion, Cook in view of Lewis discloses 15[g] for the same reasons as 1[d].

34. Claim 15[h] the system control processor being further operative to cause test traffic to be transmitted over the second idle trace from the second subsidiary module to the main module, wherein the test traffic is conveyed via the switch to the aid trace connecting to the first subsidiary module, and

276. In my opinion, Cook in view of Lewis discloses 15[h] for the same reasons as 1[e].

35. Claim 15[i] to report that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time.

277. In my opinion, Cook in view of Lewis discloses 15[i] for the same reasons as 1[e] and 1[f].

36. Claim 16: Apparatus according to claim 15, wherein the first subsidiary module is configured, under control of the system control processor, to loop back the traffic on the aid trace to

the main module substantially without processing data comprised in the test traffic.

278. In my opinion, Cook in view of Lewis discloses claim 16 for the same reasons as claim 2.

37. Claim 17: Apparatus according to claim 16, wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.

279. In my opinion, Cook in view of Lewis discloses claim 17 for the same reasons as claim 3.

38. Claim 18: Apparatus according to claim 15, wherein the system control processor is operative to select one or more further idle traces for testing among the idle traces in the system, wherein the further idle traces connect to further ports of the switch on the main module, and to repeatedly configure the switch, cause the test traffic to be transmitted, and report the failure when it occurs with respect to the further idle traces until all the idle lines have been tested.

280. In my opinion, Cook in view of Lewis discloses claim 18 for the same reasons as claim 4.

39. Claim 19: Apparatus according to claim 15, wherein the switch is configured to connect the traces to a network communication trunk, and wherein the traffic comprises communication traffic.

281. In my opinion, Cook in view of Lewis discloses claim 19 for the same reasons as claim 6.

- 40. Claim 20: Apparatus according to claim 19, wherein the test traffic is transmitted over the second idle trace while continuing to use the trace that are not idle for carrying the data to the network communication trunk.**

282. In my opinion, Cook in view of Lewis discloses claim 20 for the same reasons as claim 7.

- 41. Claim 21[pre]: Modular electronic apparatus, comprising:**

283. In my opinion, Cook in view of Lewis discloses 21[pre] for the same reasons as 15[pre].

- 42. Claim 21[a]: a backplane, which comprises traces for carrying data between modules that are plugged into the backplane;**

284. In my opinion, Cook in view of Lewis discloses 21[a] for the same reasons as 15[a].

- 43. Claim 21[b]: a main module, plugged into the backplane;**

285. In my opinion, Cook in view of Lewis discloses 21[b] for the same reasons as 15[b].

- 44. Claim 21[c]: a plurality of subsidiary modules, plugged into the backplane so as to be connected to the main module by the traces; and**

286. In my opinion, Cook in view of Lewis discloses 21[c] for the same reasons as 15[c].

- 45. Claim 21[d]: a system control processor, which is operative to select first and second subsidiary modules of different types for testing among the multiple subsidiary modules, the first and second subsidiary modules being configured to**

transmit and receive the data in different, respective first and second formats, and which is further operative to test the modules by causing the first subsidiary module to loop back traffic reaching the first subsidiary module from the main module, by configuring the main module to connect the first and second subsidiary modules, so that a traffic transmitted by the second subsidiary module is conveyed to the first subsidiary module via the main module and is then looped back via the main module to the second subsidiary module, and by causing the second subsidiary module to transmit test traffic in the second format to the main module, and assessing whether the test traffic is returned intact from the first module.

287. In my opinion, Cook in view of Lewis discloses 21[d] for the same reasons as 8[a] and 15[d]–15[i].

46. Claim 22: Apparatus according to claim 21, wherein the first subsidiary module is configured to loop back the traffic to the main module substantially without processing the data comprised in the test traffic.

288. In my opinion, Cook in view of Lewis discloses claim 22 for the same reasons as claim 2.

47. Claim 23: Apparatus according to claim 21, wherein the main module comprises a switch, which is coupled to connect the traces to a network communication trunk, and wherein the system control processor is operative to configure switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module during the test.

289. In my opinion, Cook in view of Lewis discloses claim 23 for the same reasons as claim 11.

48. Claim 24: Apparatus according to claim 23, wherein the system control processor is operative to test one or more of

the traces connected to the second subsidiary module while at least some of the traces that are not under test continue to be used for carrying the data from the subsidiary modules to the network communication trunk.

290. In my opinion, Cook in view of Lewis discloses claim 24 for the same reasons as claim 12.

49. Claim 25: Apparatus according to claim 21, wherein the traffic comprises communication traffic, and wherein the first and second formats are determined respectively by different first and second communication protocols.

291. In my opinion, Cook in view of Lewis discloses claim 25 for the same reasons as claim 13.

50. Claim 26: Apparatus according to claim 25, wherein one of the first and second protocols is a time domain multiplexing (TDM) protocol, while the other of the first and second protocols is a packet data protocol.

292. In my opinion, Cook in view of Lewis discloses claim 26 for the same reasons as claim 14.

F. Ground 4

293. To the extent claims 3, 6, 8, 13, 14, 17, 21, 25, and 26 are not rendered obvious by Cook and Lewis, it would have been obvious to combine Cook and Lewis with Sarkinen to fully disclose the claimed invention of the '369 patent.

1. Motivations to Combine Cook, Lewis and Sarkinen

294. It would have been obvious to a POSITA to combine Sarkinen with Cook and Lewis.⁴ The Cook-Lewis combined system would be a backplane system with subsidiary modules able to implement loopback testing to test specific links, traces or lines. Sarkinen discloses a system with a backplane, subsidiary modules and a traffic manager, as well as fabric that manages different formats. Ex. 1011, ¶¶15, 49. A POSITA looking to expand the formats supported by Cook-Lewis combination would have reason to look to Sarkinen. Sarkinen also discloses one type of backplane device to which the loopback testing system available in the Cook-Lewis combination could apply. Sarkinen discloses that the invention enables “[u]sing [a line-to-switch] interface and isolating such an interface in accordance with the invention, routers and switches can provide multiple service classes, efficiently handle multicast traffic, and instantaneously direct the flow of traffic to other ports should there be a failure on a link.” Ex. 1011, ¶58. A POSITA would have been motivated to apply the testing from Cook and Lewis to ensure that the line cards traces, or links of Sarkinen were functioning properly so as to know the links available to which traffic could be instantaneously directed to in the event of a failure on a link. A POSITA would have understood that the fabric interface would act as a switch to help address traffic of different formats between the line cards and that

⁴ This combination does not alter the combination discussed in Ground 2. Claims discussed under this combination continue to map to the Ground 2 claims of relevance for the reasons explained in those sections.

the fabric interface would operate in between the line cards and could set up the paths between the line cards as shown in Figure 4.

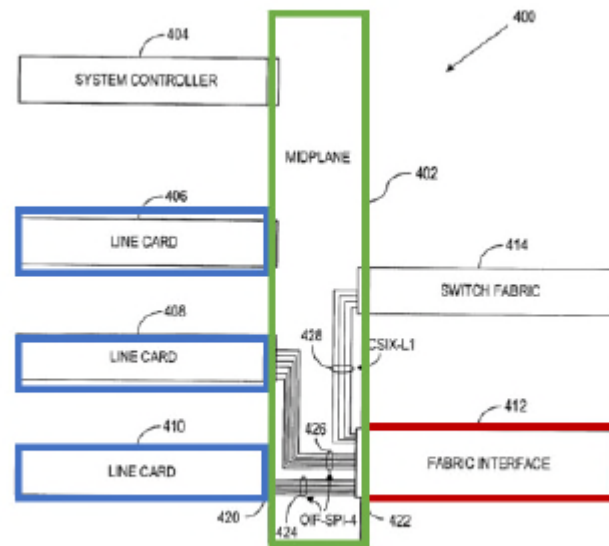


FIG. 4

2. **Claim 6: A method according to claim 1, wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.**

295. To the extent that claim 6 is not rendered obvious by Cook and Lewis, it is my opinion that it is rendered obvious by Cook, Lewis, and Sarkinen. Sarkinen discloses:

Network line interface circuitry and switch fabric circuitry is located on one or more printed circuit boards (PCB). For example, the network line interface circuitry may be located on one or more line cards, and the switch fabric

circuitry may be located on one or more switch cards. A fabric interface circuit which interfaces the network line interface circuitry to the switch fabric circuitry, is separately located on a fabric interface board that is distinct and isolated from the PCBs associated with the network line interface and switch fabric circuits.

Ex. 1011, ¶13. A POSITA would recognize that the backplane in the '369 patent was a (or, the same as the) printed circuit board, as the line cards and fabric cards were the same as the subsidiary modules and the fabric interface board was the main module. Sarkinen also makes clear that the traffic transmitted over the line and fabric cards is communication traffic for routing over the network when it states that:

The PCBs are connected to the fabric interface board, and information is communicated between the network line interface circuitry and the switch fabric circuitry via the distinct fabric interface board.

Ex. 1011, ¶13.

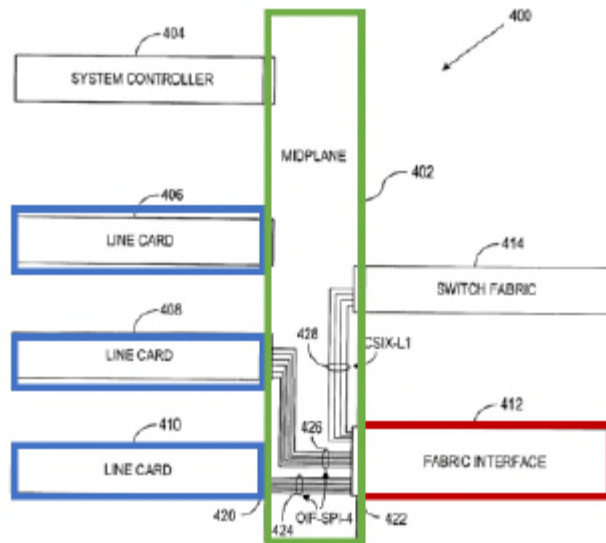


FIG. 4

Ex. 1011, Fig. 4.

296. Sarkinen also discloses that the invention relates generally to “communication networks.” Ex. 1011, ¶3. It also notes that one standard that can be utilized in implementing the invention is the “CSIX-L1 standard which defines an interface between a network processor (e.g., traffic manager, or any processor used for packetized information) and a switch fabric in data communications applications.” Ex. 1011, ¶¶ 66, 106.

297. Sarkinen further makes it clear that the line cards include a network line interface, which plugs into a network link or trunk to a broader network. Ex. 1011, ¶13.

298. Therefore, it is my opinion that Cook in view of Lewis and Sarkinen discloses “wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.”

3. Claims 3, 8, 13, 14, 17, 21, 25, and 26

299. To the extent that claims 3, 8, 13, 14, 17, 21, 25, and 26 are not rendered obvious by Cook and Lewis, it is my opinion that they are rendered obvious by Cook, Lewis and Sarkinen.

300. Claims 3, 8, 13, 14, 17, 21, 25, and 26 further recite that the subsidiary modules transmit and receive data in at least two different formats. To the extent Cook-Lewis does not render obvious this limitation, it would have been obvious to combine Cook-Lewis with Sarkinen because Sarkinen is an example of a network switch with the backplane architecture disclosed in Cook as set forth above. Sarkinen makes clear that the switch may support multiple protocols and multiple data formats. Ex. 1011, ¶¶49, 58, 66. A POSITA would have understood that, for example, each line card may support a different protocol and that each protocol would have a different format associated with the protocol. Sarkinen discloses that protocols and formats are typically defined by a standard. Ex. 1011, ¶¶47, 69. It would have been obvious to a POSITA that the different line cards that support different protocols may support data in different formats. Ex. 1011, ¶68. Sarkinen also discloses the use of a traffic manager for different formats. Ex. 1011, ¶68.

Sarkinen also discloses the use of a fabric processor to manage traffic of different formats across line cards. Ex. 1011, ¶49. It also would have been obvious to a POSITA that the subsidiary modules would have had to have chosen a common data format to communicate a test message, and it would have been obvious to choose one of the data formats already in use by the line card. Therefore, it is my opinion that Cook in view of Lewis and Sarkinen renders obvious claims 3, 8, 13, 14, 17, 21, 25, and 26.

4. Claims 13 and 25

301. Claims 13 and 25 also recite that different formats are associated with different protocols. Sarkinen discloses that the fabric processor 220 converts the data stream from one format to another, such as from POS frames to Common Switch Interface (CSIX) cells, and distributes the cells over the switch fabric. Ex. 1011, ¶49. Sarkinen also discloses that the CSIX-L1 specification defines an interface between a traffic manager and a switch fabric for data communication applications, and specifies certain data formats.” Ex. 1011, ¶66. Sarkinen thus discloses different formats determined by the different standards supported by the switches, or multiple line card system. Therefore, it is my opinion that Cook in view of Lewis and Sarkinen renders obvious claims 13 and 25.

5. Claims 14 and 26

302. Claims 14 and 26 recite that one protocol is a TDM protocol and the other is a packet data protocol. Sarkinen discloses the use of “Packet-Over-SONET/SDH (POS) frames” which is “known in the art, [as] a high-speed time division multiplexing (TDM) physical-layer transport technology.” Ex. 1011, ¶47. Sarkinen also discloses that “[t]ypically, the data packet stream is converted to a particular format, such as converted to comply with the CSIX standard.” Ex. 1011, ¶69. A POSITA would have been familiar with both TDM protocols and packet data protocols and would have understood Sarkinen disclosed the use of a TDM and packet data protocol in the Cook-Lewis combination.

303. Therefore, it is my opinion that Cook in view of Lewis and Sarkinen renders obvious claims 14 and 26.

VII. SECONDARY CONSIDERATIONS

304. I am not aware of any evidence of secondary considerations of nonobviousness relied upon by Patent Owner. To the extent Patent Owner is permitted to provide any evidence of secondary considerations to rebut my opinions expressed herein, I reserve the right to respond by supplementing and/or amending this declaration or submitting a declaration in reply to consider the alleged secondary considerations of nonobviousness.

VIII. RIGHT TO SUPPLEMENT

305. I reserve the right to supplement this declaration, if appropriate, should additional information come to light that is relevant to my opinions in this declaration. I also reserve the right to consider and comment on additional evidence, e.g., objective evidence of nonobviousness, that may be presented by Patent Owner or its experts.

306. At any trial or hearing at which I may testify in this matter, I may provide demonstrative aids, such as computer animations, excerpts, and figures from relevant exhibits and prior art references, and physical examples to assist in explaining the subject matter in my report.

307. I will continue my study and evaluation of relevant prior art as these proceedings continue, at least up until the end of the period prescribed by the relevant rules and regulations. In the event further issues arise that concern the subject matter in my declaration, I expressly reserve the right to supplement, modify, or amend my opinions as stated in this declaration as well as the bases supporting my opinions. I further reserve the right to supplement and/or amend this declaration to submit a reply declaration based on any information or contentions expressed by Patent Owner or its experts attempting to rebut my opinions in this declaration. In addition, I reserve the right to use demonstratives or other exhibits at trial in support of my opinions in any of my expert declarations and/or supplements thereto.

IX. CONCLUSION

308. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with knowledge that willful false statements and the like are so made punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the Petition for *inter partes* review.

For the reasons set forth above, it is my opinion that the Challenged Claims of the '369 patent are invalid.

Executed in St. Louis, Missouri on April 17, 2023

By: 

Dr. Paul Min

Appendix A

APPENDIX A: CHALLENGED CLAIM LISTING

Claim No.	Claim Language
1[pre]	In an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data, at least 5 some of which lines are sometimes idle, the main module including a switch having ports connected to the lines, a method for self-testing the system, comprising:
1[a]	selecting a first idle line among idle lines connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid line;
1[b]	instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line
1[c]	selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module;
1[d]	configuring the switch to link the first and second ports;
1[e]	transmitting test traffic over the second idle line from the second subsidiary module to the main module, wherein 20 the test traffic is conveyed via the switch to the aid line connecting to the first subsidiary module; and
1[f]	reporting that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time.
2	A method according to claim 1, wherein instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.
3	A method according to claim 2, wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.
4[a]	A method according to claim 1, further comprising: selecting one or more further idle lines for testing among the idle lines in the system, wherein the further idle lines connect to further ports of the switch on the main module; and

Claim No.	Claim Language
4[b]	repeating the configuring the switch, transmitting the test traffic, and reporting that the failure has occurred with respect to the further idle lines until all the idle lines have been tested.
5	A method according to claim 1, wherein the main module and said at least first and second subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane.
6	A method according to claim 1, wherein the switch is configured to connect the lines to a network communication trunk, and wherein the traffic comprises communication traffic.
7	A method according to claim 6, wherein transmitting the test traffic comprises testing the second idle line while continuing to use the lines that are not idle for carrying the data to the network communication trunk.
8[pre]	In an electronic system that includes a main module and multiple subsidiary modules, each of said multiple subsidiary modules being connected to the main module by one or more lines for carrying data, a method for self-testing the system, comprising:
8[a]	selecting first and second subsidiary modules of different types for testing among the multiple subsidiary modules, the first and second subsidiary modules being configured to transmit and receive the data in different, respective first and second formats;
8[b]	instructing the first subsidiary module to loop back traffic reaching the first subsidiary module from the main module;
8[c]	configuring the main module to connect the first and second subsidiary modules, so that the traffic transmitted by the second subsidiary module is conveyed to the first subsidiary module via the main module and is then looped back via the main module to the second subsidiary module; and
8[d]	testing the system by causing the second subsidiary module to transmit test traffic in the second format to the main module and assessing whether the test traffic is returned intact from the first module.
9	A method according to claim 8, wherein instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic.

Claim No.	Claim Language
10	A method according to claim 8, wherein the main module and subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane.
11	A method according to claim 8, wherein the main module comprises a switch, which is coupled to connect the lines to a network communication trunk, and wherein configuring the main module comprises configuring the switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module.
12	A method according to claim 11, wherein testing the system comprises testing one or more of the lines of the second subsidiary module while continuing to use at least some of the lines that are not under test for carrying the data from the subsidiary modules to the network communication trunk
13	A method according to claim 8, wherein the traffic comprises communication traffic, and wherein the first and second formats are determined respectively by different first and second communication protocols.
14	A method according to claim 13, wherein one of the first and second protocols is a time domain multiplexing (TDM) protocol, while the other of the first and second protocols is a packet data protocol.
15[pre]	Modular electronic apparatus, comprising:
15[a]	a backplane, which comprises traces for carrying data between modules that are plugged into the backplane;
15[b]	a main module, plugged into the backplane, the main module comprising a switch having ports for connection to the traces of the backplane;
15[c]	at least first and second subsidiary modules, plugged into the backplane so as to be connected to the main module by the traces, at least some of which traces are sometimes idle; and
15[d]	a system control processor, which is operative to select a first idle trace among idle traces connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid trace,
15[e]	to instruct the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid trace,

Claim No.	Claim Language
15[f]	to select for testing a second idle trace among the idle traces connecting the second subsidiary module to a second port of the switch on the main module,
15[g]	to configure the switch to link the first and second ports,
15[h]	the system control processor being further operative to cause test traffic to be transmitted over the second idle trace from the second subsidiary module to the main module, wherein the test traffic is conveyed via the switch to the aid trace connecting to the first subsidiary module, and
15[i]	to report that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time.
16	Apparatus according to claim 15, wherein the first subsidiary module is configured, under control of the system control processor, to loop back the traffic on the aid trace to the main module substantially without processing data comprised in the test traffic.
17	Apparatus according to claim 16, wherein the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format.
18	Apparatus according to claim 15, wherein the system control processor is operative to select one or more further idle traces for testing among the idle traces in the system, wherein the further idle traces connect to further ports of the switch on the main module, and to repeatedly configure the switch, cause the test traffic to be transmitted, and report the failure when it occurs with respect to the further idle traces until all the idle lines have been tested.
19	Apparatus according to claim 15, wherein the switch is configured to connect the traces to a network communication trunk, and wherein the traffic comprises communication traffic.
20	Apparatus according to claim 19, wherein the test traffic is transmitted over the second idle trace while continuing to use the trace that are not idle for carrying the data to the network communication trunk.
21[pre]	Modular electronic apparatus, comprising:

Claim No.	Claim Language
21[a]	a backplane, which comprises traces for carrying data between modules that are plugged into the backplane;
21[b]	a main module, plugged into the backplane;
21[c]	a plurality of subsidiary modules, plugged into the backplane so as to be connected to the main module by the traces; and
21[d]	a system control processor, which is operative to select first and second subsidiary modules of different types for testing among the multiple subsidiary modules, the first and second subsidiary modules being configured to transmit and receive the data in different, respective first and second formats, and which is further operative to test the modules by causing the first subsidiary module to loop back traffic reaching the first subsidiary module from the main module, by configuring the main module to connect the first and second subsidiary modules, so that a traffic transmitted by the second subsidiary module is conveyed to the first subsidiary module via the main module and is then looped back via the main module to the second subsidiary module, and by causing the second subsidiary module to transmit test traffic in the second format to the main module, and assessing whether the test traffic is returned intact from the first module.
22	Apparatus according to claim 21, wherein the first subsidiary module is configured to loop back the traffic to the main module substantially without processing the data comprised in the test traffic.
23	Apparatus according to claim 21, wherein the main module comprises a switch, which is coupled to connect the traces to a network communication trunk, and wherein the system control processor is operative to configure switch to connect at least one of the lines of the first subsidiary module to at least one of the lines of the second subsidiary module during the test.
24	Apparatus according to claim 23, wherein the system control processor is operative to test one or more of the traces connected to the second subsidiary module while at least some of the traces that are not under test continue to be used for carrying the data from the subsidiary modules to the network communication trunk.
25	Apparatus according to claim 21, wherein the traffic comprises communication traffic, and wherein the first and second formats

Claim No.	Claim Language
	are determined respectively by different first and second communication protocols.
26	Apparatus according to claim 25, wherein one of the first and second protocols is a time domain multiplexing (TDM) protocol, while the other of the first and second protocols is a packet data protocol.