

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ROVI GUIDES, INC.,
Patent Owner.

Patent No. 7,200,855
Filing Date: May 24, 2001
Issue Date: April 3, 2007

Title: METHOD AND APPARATUS OF MULTIPLEXING A PLURALITY OF
CHANNELS IN A MULTIMEDIA SYSTEM

Inter Partes Review No.: IPR2020-00787

DECLARATION OF DR. VERNON THOMAS RHYNE, III

Declaration in Support of Petition 1 of 3

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EXHIBITS

- Exhibit 1001: U.S. Patent No. 7,200,855 (“the ’855 patent”)
- Exhibit 1002: Declaration of Dr. Vernon Thomas Rhyne, III
- Exhibit 1003: Excerpts from the File History of U.S. App. No. 09/864,602
- Exhibit 1004: *In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.), July 17, 2019 – Complainants’ Notice of Patent Priority Dates / Conception Dates
- Exhibit 1005: U.S. Patent No. 8,601,519 (“Hicks”)
- Exhibit 1006: Excerpts from *PCI Local Bus Specification, Revision 2.2*, PCI Special Interest Group, December 18, 1998 (“PCI”)
- Exhibit 1007: Declaration of Doanh Vu
- Exhibit 1008: Declaration of Stephen Kunin
- Exhibit 1009: Reserved
- Exhibit 1010: *Extending PCI Performance Beyond the Desktop*, Shlomo Weiss and Ehud Finkelstein, Computer, June 1999, pp. 80-87
- Exhibit 1011: U.S. Patent No. 6,218,864 (“Young”)
- Exhibit 1012: U.S. Patent No. 5,808,694 (“Usui”)
- Exhibit 1013: Declaration of Carrie Gardner
- Exhibit 1014: Excerpts from *Computer Networks*, Andrew S. Tanenbaum, Prentice Hall, Third Edition, 1996 (“Tanenbaum”)
- Exhibit 1015: Excerpts from *Communication Systems*, Simon Haykin, John Wiley & Sons, Fourth Edition, 2001 (“Haykin”)
- Exhibit 1016: Excerpts from *MPEG-2*, John Watkinson, Focal Press, 1999 (“Watkinson”)

- Exhibit 1017: Excerpts from *Digital Video: An Introduction to MPEG-2*, B. Haskell et al., Chapman & Hall, 1997 (“Haskell”)
- Exhibit 1018: Excerpts from *Cable Television Handbook*, Eugene R. Bartlett, McGraw-Hill Video/Audio Professional, First Edition, 2000 (“Bartlett”)
- Exhibit 1019: U.S. Patent No. 5,870,474 (“Wasilewski”)
- Exhibit 1020: U.S. Patent No. 6,493,873 (“Williams”)
- Exhibit 1021: Excerpts from *In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.), January 14, 2020 – Transcript of Telephonic Conference
- Exhibit 1022: Excerpts from *In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.), January 28, 2020 – Transcript of Administrative Hearing Volume VI
- Exhibit 1023: *In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.), October 21, 2019 – Joint Claim Construction Chart
- Exhibit 1024: *In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.), January 22, 2020 – Comcast Respondents’ Notice of Withdrawal of Claim Terms
- Exhibit 1025: *In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.), March 20, 2020 – Order No. 35: Initial Determination Granting Complainants’ Third Unopposed Motion for Partial Termination of the Investigation Without Prejudice [Motion Docket No. 1158-033]
- Exhibit 1026: Excerpts from *Telecommunications Engineer’s Reference Book*, Fraidoon Mazda, Editor, Butterworth-Heinemann Ltd, 1993

- Exhibit 1027: Excerpts from *Dictionary of Computing*, Oxford University Press, Fourth Edition, 1996
- Exhibit 1028: Excerpts from *Switched, Fast, and Gigabit Ethernet*, Robert Breyer and Sean Riley, Macmillan Technical Publishing, Third Edition, 1999
- Exhibit 1029: Reserved
- Exhibit 1030: Excerpts from *Newton's Telecom Dictionary*, Telecom Books, Sixteenth Edition, 2000
- Exhibit 1031: U.S. Patent No. 7,039,021 ("Kokudo")
- Exhibit 1032: Reserved
- Exhibit 1033: Excerpts from *Internetworking With TCP/IP Vol I: Principles, Protocols, and Architecture*, Prentice-Hall, Inc., Third Edition, 1995
- Exhibit 1034: Excerpts from *Wireless LANs: Implementing Interoperable Networks*, Jim Geier, Macmillan Technical Publishing, 1999 ("Geier")
- Exhibit 1035: Reserved
- Exhibit 1036: Reserved
- Exhibit 1037: U.S. Patent No. 4,386,436 ("Kocher")
- Exhibit 1038: U.S. Patent No. 6,487,362 ("Yuen")
- Exhibit 1039: U.S. Patent No. 6,408,128 ("Abecassis")
- Exhibit 1040: U.S. Patent No. 6,452,923 ("Gerszberg")
- Exhibit 1041: U.S. Patent No. 5,990,927 ("Hendricks")
- Exhibit 1042: U.S. Patent No. 7,031,380 ("Cheng")
- Exhibit 1043: Excerpts from *The MPEG Handbook MPEG-1, MPEG-2, MPEG-4*, John Watkinson, Focal Press, 2001 ("Watkinson2001")

- Exhibit 1044: Excerpts from *In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.), Verified Complaint Under Section 337 of the Tariff Act of 1930, as Amended
- Exhibit 1045: U.S. Patent No. 6,400,280 (“Osakabe”)
- Exhibit 1046: Excerpts from *FireWire® System Architecture: IEEE 1394a*, Don Anderson, Addison-Wesley, Second Edition, 1999 (“Anderson”)
- Exhibit. 1047 PCI System Architecture, Fourth Edition, Tom Shanley and Don Anderson, Addison-Wesley, 1999 (“Shanley”)

APPENDICES TO THE DECLARATION

Appendix A: *Curriculum Vitae* of Dr. Vernon Thomas Rhyne, III

MY DECLARATION

1. I, Dr. Vernon Thomas Rhyne, III, declare that I have personal knowledge of the facts set forth in this Declaration and, if called to testify as a witness, could and would do so competently.

I. INTRODUCTION

2. I have been retained as an expert witness on behalf of the Petitioner, COMCAST CABLE COMMUNICATIONS, LLC (“Petitioner”).

3. I reside in Austin, Texas.

4. I have been asked to provide testimony regarding multiplexing and systems for multiplexing of television channels in a multimedia system, as well as the relevant industry knowledge and practices in that field during the 2001 time-frame. I have also been asked to render opinions regarding certain matters pertaining to U.S. Patent No. 7,200,855 (“the ’855 patent”) and the unpatentability grounds set forth in the Petition associated with this proceeding.

5. I am being compensated for my work on this matter at my usual consulting rate of \$695 per hour. My compensation is not dependent upon my opinions or testimony as set forth herein, or on the outcome of this matter.

6. The facts set forth below are known to me personally and I have firsthand knowledge of them. I am a U.S. citizen over eighteen years of age. I am

fully competent to testify as to the matters addressed in this Declaration.

II. MY PROFESSIONAL BACKGROUND AND QUALIFICATIONS

7. A detailed account of my work experience and qualifications, and a list of my publications, is included in my Curriculum Vitae which is attached as Appendix A.

8. I believe that my extensive academic and industry experience, as well as my electrical and computer engineering background, qualify me as an expert in distributed multimedia computing systems, and particularly in the relevant field of in-home local area networking. I am also knowledgeable of the relevant skill set that would have been possessed by a person having ordinary skill in the art (a “PHOSITA”) as of the date of the alleged invention of the ’855 patent which, I understand, was May 24, 2001, the filing date for that patent.

A. My Education and Certifications

9. I hold degrees from Mississippi State University (Bachelor of Science in Electrical Engineering with Honors, 1962), the University of Virginia (Master of Electrical Engineering, 1964), and the Georgia Institute of Technology (Ph.D. in Electrical Engineering, 1967).

10. I have been a Registered Professional Engineer in the State of Texas since 1969 (Reg. No. 28,728). I have been a Registered Patent Agent with the USPTO since 1999 (Reg. No. 45,041).

B. My Experience

11. I am currently self-employed as a consulting engineer to the industrial, educational, and legal communities, having previously taught and practiced electrical and computer engineering for more than fifty years.

12. I taught electrical engineering, computer engineering, computer architecture, and computer science at the undergraduate and graduate levels full-time at Texas A&M University from 1967 to 1983 and part-time at the graduate level at the University of Texas from 1983 to 1991. My twenty-plus years of industrial experience include work at the Electric Power Research Institute, Texas Instruments, Control Data Corporation, NASA, Texas Digital Systems, Inc. (a company I co-founded to produce microprocessor-based computer peripherals in 1976), the Microelectronics and Computer Technology Corporation (“MCC”), and Motorola, Inc.

13. I have extensive experience with computer technology, including design and teaching experience with a variety of computer systems, microcomputer/microprocessor systems, and microcontrollers. I have participated in the design of several computer systems and microprocessors, and I have designed systems which made use of those devices as controllers. I am familiar with a variety of computer architectures, and I am an experienced programmer in a variety of programming languages as well as assembly-level language on a number of different

computers and microprocessors.

14. I have more than a decade of experience with television transmission systems, television set-top boxes, and interactive electronic television program guides (“EPGs”), including the use of the blanking interval for transmitting data such as program descriptions, closed captions, and parental-control information as part of the broadcast television signal. I also have extensive hands-on experience with a variety of set-top boxes including the Scientific-Atlanta Explorer® 2000, 3000, and 8600X set-top boxes (including visiting the Scientific-Atlanta R&D facilities to meet with their engineers regarding the design and deployment of those products), the Pioneer BD-V3000 set-top box, and the Cisco 8742HDC set-top box, and have studied other manufacturers’ set-top boxes and satellite receivers in the course of my consulting practice over the past ten years. I have also owned or rented several other set-top boxes and have owned a TiVo digital video recorder from its introduction in 1999 through to 2005. I am also familiar with the AT&T U-verse system for delivery of television programming and an EPG.

15. I have chaired and otherwise participated in a number of national and international IEEE and ISO/IEC standards committees. During my academic career, I authored thirty technical papers. I have also presented papers at thirty-seven conferences and authored an award-winning textbook, *Fundamentals of Digital System Design*, published by Prentice-Hall in 1973 and adopted at over thirty-five

U.S. and international universities during its lifetime. My textbook has been cited as a reference by the USPTO. I have also served as a technical reviewer for Prentice-Hall, the *IEEE Transactions on Computers*, and *IEEE Spectrum*.

16. I was elected to serve on the IEEE Board of Directors for two terms representing the engineering education community and the IEEE Computer Society. I was also elected to two terms as the IEEE Treasurer and served one term on the Board of Governors of the IEEE Computer Society. I also represented the IEEE for five years on the Engineering Accreditation Commission and for six years on the Board of Directors of the Accreditation Board for Engineering and Technology (“ABET”).

17. My experience and qualifications have been recognized by the Texas Society of Professional Engineers (Young Engineer of the Year in Texas, 1973), the American Society for Engineering Education (Terman Awardee as the “Outstanding Young Electrical Engineering Educator in the U.S.,” 1980), the Institute of Electrical and Electronics Engineers (IEEE Fellow, 1990, recognizing my contributions to “computer engineering and computer engineering education”), the Accreditation Board for Engineering and Technology (ABET Fellow, 1992), and the IEEE Computer Society (Golden Core Awardee, 1996).

18. I retired from full-time work as of 1997. In addition to the work described above and in my *Curriculum Vitae* (Appendix A), I have worked part-time

as a consulting engineer for the past fifty years doing computer systems design, application-specific system design, and expert witness work in intellectual property litigation.

19. I believe that my industrial experience (including experience with content delivery over cable systems, local area networks, and the Internet) and my educational background qualify me as an expert in the relevant field of distributed computing systems such as multimedia systems, including in-home local area networking. I am also knowledgeable of the relevant skill set that would have been possessed by a PHOSITA at as of the filing date of the '855 patent (May 24, 2001) for the purposes of this proceeding.

III. MATERIALS CONSIDERED

20. In connection with my study of this matter and reaching the opinions stated herein, I have reviewed the exhibits accompanying this Declaration as well as the following documents:

(A) the '855 patent;

(B) the prosecution history of the '855 patent; and,

(C) the prior art and other materials identified in this Declaration.

IV. MY OPINIONS

21. Based on my study, knowledge, and experience, it is my opinion that

claims 1-63 of the '855 patent are unpatentable because they are obvious under 35 U.S.C. § 103(a) over Hicks in view of PCI (Ground 1) as I explain in Section IX.B below, and claims 1-17, 19-20, 38-39, and 54 of the '855 patent are further unpatentable because they are obvious under 35 U.S.C. § 103(a) over Hicks in view of PCI and Usui (Ground 2) as I also explain in that same section.

22. It is also my opinion that claims 2, 5, 20-21, 29, 39, 42, and 53-63 are unpatentable as being obvious under 35 U.S.C. § 103(a) based on Hicks in view of PCI and Grier (Ground 3) as I explain in Section IX.C below, and claims 2, 5, 20, 39, and 54 are further unpatentable as being obvious under 35 U.S.C. § 103(a) based on Hicks in view of PCI, Usui, and Grier (Ground 4) as I also explain in that same section.

23. It is also my opinion that claims 6-11, 13, 22-24, 26, 31-32, 34, 43-48, 50, 57-60, and 62 are unpatentable as being obvious under 35 U.S.C. § 103(a) based on Hicks in view of PCI and Watkinson (Ground 5) as I explain in Section IX.D below, and claims 6-11, and 13 are further unpatentable as being obvious under 35 U.S.C. § 103(a) based on Hicks in view of PCI, Usui, and Watkinson (Ground 6) as I also explain in that same section.

24. It is also my opinion that the '855 patent claims are unpatentable as being obvious under 35 U.S.C. § 103(a) further based on the same grounds 1-6 as noted above with each of these grounds further combined with Osakabe.

V. THE APPLICABLE LEGAL STANDARDS

25. I understand that my assessment of the patentability of the above-identified claims must be undertaken from the perspective of what would have been known or understood by a PHOSITA upon reading the '855 patent as of its relevant priority date, and in light of the specification and file history of the '855 patent. Although I am not an attorney, as an experienced expert witness and patent agent I have a general understanding of the applicable legal standards pertaining to the patentability issues addressed in this Declaration.

26. I understand that in this *inter partes* review Petitioner has the burden of proving that each challenged claim is unpatentable by a preponderance of the evidence.

27. I also understand that to be valid, a patent claim must be “novel,” and is invalid if “anticipated” by a single prior art reference. I further understand that a reference anticipates if it discloses each and every element as arranged in the claim, so as to enable a PHOSITA to make and use the claimed invention without undue experimentation.

28. I also understand that a patent claim is unpatentable if, at the time of the alleged invention, it would have been obvious to a PHOSITA to combine the teachings of the prior art to yield the patent claim. I also understand that it is not required (although it is acceptable) that each element/limitation of a patent claim be

found in a single reference in order to find a patent claim obvious. For a patent claim to be found obvious, all the elements/limitations of the claim may be found in a combination of references at which a PHOSITA would have been reasonably expected to arrive. I also understand that a proper analysis of whether an invention is unpatentable for obviousness includes a review of the scope and content of the prior art, the differences between the patent claims at issue and the prior art, the level of ordinary skill in the field of the invention at the time of the invention, and other objective considerations identified below.

29. I also understand that a showing of obviousness based on a combination of references requires some articulated reasoning with a rational underpinning to support the combination of the references. I also understand that in consideration of the issue of obviousness it is important to identify whether a reason existed at the time of the invention that would have led a PHOSITA to combine elements of the references in a way that yields the claimed invention.

30. I also understand that a patent claim may be considered unpatentable for obviousness for various reasons. I have been informed that the following exemplary rationales may support a finding of obviousness:

- (A) combining prior art elements according to known methods to yield predictable results;

- (B) simply substituting one known element for another to obtain predictable results;
- (C) use of a known technique to improve similar devices in the same way;
- (D) applying a known technique to a known device ready for improvement to yield predictable results;
- (E) choosing from a finite number of identified, predictable solutions with a reasonable expectation of success;
- (F) known work in a field that prompts variations in the work in the same or a different field that leads to predictable results; and
- (G) some teaching, suggestion, or motivation in the prior art that would have led a person of ordinary skill in the art to modify a prior art reference or combine multiple prior art references or teachings to arrive at the claimed invention.

31. I understand that various objective or “real world” factors may be indicative of non-obviousness. I understand that such factors include:

- (A) the commercial success of the claimed invention;
- (B) the existence of a long-felt, unresolved need for a solution to the problem solved by the claimed invention;

- (C) failed attempts to solve the problem solved by the claimed invention;
- (D) copying of the claimed invention;
- (E) unexpected results of the claimed invention;
- (F) praise for the claimed invention by others in the relevant field; and,
- (G) willingness of others to accept a license under the patent because of the merits of the claimed invention.

VI. THE RELEVANT ART AND THE LEVEL OF ORDINARY SKILL

32. I agree with the statement made in the '855 patent that its relevant field of art is "generally ... communication systems and more particularly ... in-home local area networking." Ex. 1001 at 1:5-22.

33. I understand that obviousness is determined from the vantage point of a PHOSITA at the time of the alleged invention (May 24, 2001).

34. I understand that the following factors may be considered when identifying the appropriate level of a PHOSITA: (i) the types of problems encountered by those working in the field and prior art solutions thereto; (ii) the sophistication of the technology in question, and the rapidity with which innovations occur in the field; (iii) the educational level of active workers in the field; and (iv) the educational level of the inventor. I also understand that a PHOSITA is one who is presumed to be aware of all pertinent prior art, thinks along conventional wisdom

in the art, and is a person of ordinary creativity.

35. It is my opinion that for the '855 patent a PHOSITA would have had bachelor's degree in electrical engineering, computer engineering, computer science, or a similar discipline, and at least two years of experience with distributed computing systems such as multimedia systems, or would have had equivalent experience either in industry or research, such as designing, developing, evaluating, testing, or implementing the aforementioned technologies.

36. I worked in the relevant field with persons meeting this definition of a PHOSITA in my full-time work and in my consulting work at, and leading up to, the time of the alleged invention of the '855 patent. I am therefore familiar with the levels of knowledge and skills that such persons had as of 2001.

37. In my further opinion, a PHOSITA's skill set as of May of 2001 would have also included client- and server-level programming skills and distribution system design skills, and more specifically, a PHOSITA's skill set would have included computer programming and network architecture skills (*e.g.*, the skills needed to configure or operate a network, particularly one involving a local area network hub functioning as an interface between a local area network and another network such as a wide area network ("WAN")). Such a PHOSITA would have also had computer architecture and network design skills enabling them to, for example, connect various components (*e.g.*, processors, microprocessors, integrated circuits

(“ICs”), memory, memory controllers, network cards, graphics cards, input/output (“I/O”) devices, *etc.*) via various mediums (wired or wireless).

38. In this Declaration, wherever I refer to a PHOSITA it should be understood that I am referring to such a hypothetical person at the time of the alleged invention of the ’855 patent (May 24, 2001) who meets the description I provided above.

VII. CLAIM CONSTRUCTION

39. In making this Declaration, I have considered the meaning of the terms found in the claims of the ’855 patent. My opinions regarding the meanings of those terms have been formed not only in the context of the particular claim in which the terms appear, but also in the context of the entire patent. For terms not specifically addressed in this Declaration, I have used what I believe to be the ordinary and customary meaning of those terms as would be understood by a PHOSITA at the time of the alleged invention.

40. I have also noted that in the co-pending proceeding before the International Trade Commission (*In re Certain Digital Video Receivers, Broadband Gateways, and Related Hardware and Software Components*, Investigation No. 337-TA-1158 (U.S.I.T.C.)), the Petitioner and Patent Owner have proposed constructions for a number of terms, and the Administrative Law Judge has adopted constructions for some of these terms, from the claims of the ’855 patent. Ex. 1021 at 61-63; Ex.

1023; Ex. 1024. These proposed constructions are provided in the following table for completeness and for the Board’s convenience.¹ Ex. 1021 at 61-63; Ex. 1023 at 5-8; Ex. 1024 at 1. In forming the opinions expressed in this Declaration I have initially applied Petitioner’s construction in my discussion of a term, as well as an alternative, where appropriate, applying Patent Owner’s proposed construction for that term.

Claim	Term	Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction	ALJ Adopted Construction
1	“A method for multiplexing a plurality of channels in a multimedia system”	The preamble is limiting but only to the environment in which the invention operates, and the preamble does not add steps or	The preamble is limiting. The steps of the claim are performed within a home as part of an in-home	

¹ In the ITC proceeding only infringement of claims 60 and 63, which depend from claim 53 is being asserted. Ex. 1025. Other claims were previously asserted at earlier stages of the proceeding, and I have applied the proposed constructions for the terms as previously construed.

Claim	Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	ALJ Adopted Construction
		components to the recited claim.	communication network. Further, the steps of the claim are performed by a multimedia server within a user's home, e.g., a stand-alone device or a device that may be incorporated in a satellite receiver, set-top box, cable box, HDTV tuner, home entertainment receiver, et cetera.	

Claim	Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	ALJ Adopted Construction
28	“A tuning module for using in multimedia system the tuning module comprises: plurality of selectors . . . encoding module . . . and bus interface module”	The preamble is limiting but only to the environment in which the invention operates, and the preamble does not add steps or components to the recited claim.	The preamble is limiting. The claimed apparatus is in a home as part of an in-home communication network. Further, the elements of the claim are performed by a tuning module within a multimedia server within a user's home, e.g., a stand-alone device or a device that may be incorporated in a satellite receiver, set-	

Claim	Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	ALJ Adopted Construction
			top box, cable box, HDTV tuner, home entertainment receiver, et cetera.	
53	“An apparatus for multiplexing channels in a multimedia system”	The preamble is limiting but only to the environment in which the invention operates, and the preamble does not add steps or components to the recited claim.	<p>The preamble is limiting.</p> <p>The claimed apparatus is in a home as part of an in-home communication network.</p> <p>Further, the elements of the claim are in a multimedia server within a user's home, e.g., a stand-alone device or a device that</p>	

Claim	Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	ALJ Adopted Construction
			may be incorporated in a satellite receiver, set-top box, cable box, HDTV tuner, home entertainment receiver, et cetera.	
1, 53	“channel selection request”	data that identifies a particular channel and at least one of the clients	data that identifies a particular channel and at least one of the clients	
1, 28, 29, 53	“channel selection command”	command related to selection of a channel	command that is derived from a channel selection request and that identifies a particular	

Claim	Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	ALJ Adopted Construction
			channel of a plurality of channels	
1, 28, 53	“shared bus”	bus within a multimedia server	[a] bus within a multimedia server used for data transfer between components of the multimedia server	a box [<i>sic: bus</i>] located within a multi media server, that is shared by components of that multi media server
1, 53	“identify[ing] a data [frame / packet] at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection [commands/requests]”	Plain and ordinary meaning, which is “determin[e/ing] that a data [frame / packet] at one of the specific time intervals contains at least a portion of one of the plurality of channel selection	determining, without decoding a frame based on a data conveyance protocol of the multimedia system to recapture its contents, that the frame	determin{E/ING} , that a data {frame/packet} at one of the specific time intervals contains at least a portion of one of the plurality of channel selection {commands/requests} without

Claim	Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	ALJ Adopted Construction
		[commands/requests]”	contains at least a portion of a channel selection [command/request]	recapturing be <i>[sic]</i> at least a portion of one of the plurality of channel selection {commands/requests} via decoding
28	“to identi[f]y at least one of the packets at one of the specific time intervals, that contains at least a portion of one of the plurality of channel selection commands to produce an identified packet”	Plain and ordinary meaning, which is “determine that a data packet at one of the specific time intervals contains at least a portion of one of the plurality of channel selection commands”	determining, without decoding a packet based on a data conveyance protocol of the multimedia system to recapture its contents, that the packet contains at least a portion of a channel selection	determin{E/ING}, that a data {frame/packet} at one of the specific time intervals contains at least a portion of one of the plurality of channel selection {commands/requests} without recapturing be <i>[sic]</i> at least a portion of one of the plurality of

Claim	Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	ALJ Adopted Construction
			command to produce an identified packet	channel selection {commands/requests} via decoding.

41. Many of the claims of the '855 patent include the phrase “the method comprises[or includes]: ... at least one of: [A] and [B],” where “[A]” represents one or more singular items that are listed following the “at least one of” phrase and the “and” precedes the last such item, “[B].”² See Element [1E] as an example. I understand that Petitioner proposes to interpret this phrase as a disjunctive list where only one of the items needs to be present in the claim, *i.e.*, requiring only of the items listed in [A] or only the single item of [B], but not excluding more than one of the items from both [A] and [B].

42. I further understand that during prosecution of the application that became the '855 patent, the examiner also determined that the above phrase should be interpreted as a disjunctive list at least with respect to claim 1. Ex. 1003 at 108.

² The list in the '855 specification also includes a “specific channel select command,” which is a limitation in claims 19, 38, and 54.

This construction is also consistent with the '855 patent specification. For example, Element [1E] requires:

wherein the each of the plurality of channel selection commands includes *at least one of*: last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, *and* select channel from user define [sic “defined”] list

Ex. 1001 at 63:11-16.

43. The '855 specification itself (Ex. 1001 at 42:64-43:7) includes similar language:

Each of the channel select commands include a specific channel select command, less [sic “last”] channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, *and/or* select channel from a user defined list.

44. I also note that at 42:64-43:1 the '855 specification discloses a nearly identical list of items, but instead of reciting—“includes at least one of [A] and [B]”—the specification states there that “[e]ach of the channel select commands

include a [list of commands [the “A”]] and/or [a single final command, the [B]].”³ In my opinion the use of “and/or” (without “at least one of”) would be understood by a PHOSITA to require [A] or [B] or both [A] and [B], a statement which has the same scope as the construction proposed by Petitioner and used by the examiner for “includes at least one of [A] and [B].” I believe that this interpretation of the “at least one” limitations found in the ’855 claims is correct.

45. However, I have also been asked to consider whether the phrase “comprising: ... at least one of A and B” means that all elements listed in [A] *and* the one item that is [B] *are required, as in a conjunctive list*. I do not agree with this second interpretation because it would mean the claim phrase “comprises: ... at least one of A and B” is exactly the same as “comprises: A and B,” thus treating the claim as if “at least one of” was not required by it. Such an interpretation would also render certain claims meaningless, because the list includes items that are mutually exclusive. For example, the list in claim 12 recites that “the encoding [of Element [1H]] comprises at least one of: multilevel encoding data ...[and] Manchester encoding the data” Ex. 1001, claim 12. Each of these encoding schemes refers to how data is represented in the electrical signals that are transmitted over a

³ The specification’s list at 42:64-43:1 also includes a “specific channel select command.”

network, with “multilevel encoding” using three or more voltage levels (*e.g.*, +1 volt, 0 volt, -1 volt) to encode the data, while “Manchester encoding” uses only two voltage levels (*e.g.*, 0 volt and +3 volts). Ex. 1028 at 37-42. Thus, the same data cannot be encoded according to both of these formats, and claim 12 of the ’855 patent, for example, cannot be interpreted as requiring all of the encoding schemes in its list of schemes. Thus, my analysis as follows identifies prior art that teaches at least one of the elements in the list for any claim that includes the “at least one of A and B phrase,” *i.e.*, as a disjunctive list requiring only one of the list must be disclosed. In addition, specifically regarding:

- Claim 2: in my opinion a PHOSITA would understand that the “authenticating” step does not require that the “at least one client” identified in the “interpreting” step be authenticated. Thus, claim 2 should be construed as a disjunctive list.
- Claim 9: in my opinion a PHOSITA would understand that CSMA with collision avoidance, and CSMA with collision detection are mutually exclusive. Thus, a PHOSITA will find that claim 9 should be construed as a disjunctive list.
- Claim 16: the claim recites a “single channel” and then provides a list of sources for the single channel. In my opinion a PHOSITA would understand

that it is not possible to receive the exact same single channel from multiple sources, and thus the list is disjunctive.

- Claim 17: the claim recites a list of sources for “audio and video data for each of the plurality of channels.” In my opinion a PHOSITA would understand that each of the channels is not received from multiple sources, and thus claim 17 should be interpreted as a disjunctive list.

46. It is my further opinion that none of claims include means plus function limitations. While claims 28-63 use the term “module” (for example “encoding module”) to identify many elements of the claims, in my opinion PHOSITA would understand the types of circuits and devices to which these modules refer. To the extent the Patent Owner might argue that the term “module” invokes a means plus function construction, my analysis below identifies the corresponding structure in the ’855 patent and also how the prior art discloses the same or equivalent structure.

VIII. STATE OF THE ART AND AN OVERVIEW OF THE ’855 PATENT

A. Overview

47. As I noted above, the ’855 patent states that “[t]he invention relates generally to communication systems and more particularly to in-home local area networking.” Ex. 1001 at 1:7-9.

48. The ’855 patent further describes its invention as establishing an in-home communication network:

Generally, the present invention provides a method and apparatus for multiplexing a plurality of channels within a multimedia system. Such a method and apparatus includes processing that begins by receiving a plurality of channels from a multimedia source. For example, the plurality of channels may correspond to channels provided via a satellite connection, cable connection, NTSC broadcast, HDTV broadcast, et cetera. In addition, or in the alternative, the plurality of channels may be provided by a group of video sources such as a VCR, DVD, laser disk player, et cetera. The processing then continues by receiving a plurality of channel selection commands from client modules. The client modules are affiliated with client devices (e.g., television, personal computer, lap top computer, etc.) that are requesting access to a particular channel of the plurality of channels.

The processing continues by selecting a channel of the plurality of channels for each of the channel selection commands to produce selected channels. As such, for each channel selection command, a corresponding channel is selected from the plurality of channels. The processing continues by encoding the selected channels based on a data conveyance protocol (e.g., encoding scheme and/or modulation scheme). The encoded channel data is then conveyed to a plurality of clients. With such a method and apparatus, an in-home communication network is

established that allows multiple client devices to have independent access to multimedia sources without requiring traditional receiving and/or transmitting equipment associated with independent access to such multimedia sources.

Ex. 1001 at 5:46-6:8.

49. In its Background section, the '855 patent admits that “[c]ommunication systems are known to convey data from one entity to another” and that “[t]he data may be audio data, video data and/or text data.” Ex. 1001 at 1:13-15. The '855 patent further admits that “[i]n such communication systems, the data is transmitted via one or more transmission mediums (e.g., radio frequencies, coaxial cable, twisted pair copper wire, fiber optic cabling, et cetera) in accordance with one or more data transmission protocols.” Ex. 1001 at 1:15-19. I agree that a PHOSITA would have known that communication systems, including multimedia distribution systems, transmitted data in accordance with one or more data transmission (*i.e.*, “conveyance”) protocols. I also believe that a PHOSITA would have known that such data would be encoded in accordance with one or more conveyance protocols in order to be properly received and understood by other entities. In fact, the '855 patent describes numerous well-known and illustrative data conveyance protocols, including amplitude modulation (“AM”), frequency modulation (“FM”), ultra-high frequency transmission (“UHF”), and very high

frequency transmission (“VHF”), in the context of a system transmitting a broadcast signal such as television programming. Ex. 1001 at 1:41-44. I agree that a PHOSITA would have known each of these data conveyance protocols, and possibly others, for broadcast signals.

50. The ’855 patent also describes “asymmetrical” communication systems such as “the Internet, where web servers transmit substantially more data than they receive from any one user.”⁴ Ex. 1001 at 1:45-50. Specifically, the ’855 patent describes illustrative asymmetrical data conveyance protocols for accessing and using the Internet such as the asynchronous transfer mode (“ATM”). Ex. 1001 at 1:51-57. I agree that a PHOSITA would have known each of the identified asymmetrical data conveyance protocols, among others, which could be employed when communicating between devices.

51. The ’855 patent also describes “symmetrical” communication systems⁵ “where the data flow between any of the users could be equal.” Ex. 1001 at 1:61-63. The ’855 patent provides specific examples of such symmetrical communication

⁴ An “asymmetrical communication system” is one that provides different data transmission rates for each direction of data transmission.

⁵ A “symmetrical communication system” is one that provides the same data transmission rate for each direction of data transmission.

systems including “[the] public switch telephone network (PSTN), local computer networks, cellular telephone systems, intercom systems, [and] private branch exchanges (PBX).” Ex. 1001 at 1:63-66. The ’855 patent explains that “[s]uch symmetrical communication systems use at least one data transmission protocol” such as one of the Ethernet standards for use within a computer network. Ex. 1001 at 1:66-2:2. I agree that a PHOSITA would have known each of these symmetric data conveyance protocols, including Ethernet, among others, which could be employed when communicating between devices.

52. The ’855 patent also describes how homes often have multiple television sets with multiple receivers, multiple cable set-top boxes (“STBs”), and multiple modems.⁶ Ex. 1001 at 2:13-17.

53. The ’855 patent concludes its Background section by noting that “entertainment type data transmissions (e.g., from VCRs, DVDs, et cetera) are not supported by the in-home local area network without having the home specially

⁶ A “modem” is a device that can transmit data by modulating a signal to be sent over an appropriate communications medium, or, in the reverse, demodulate such a signal as it is received over that medium, hence the name “modem” which is a contraction of “modulator/demodulator.”

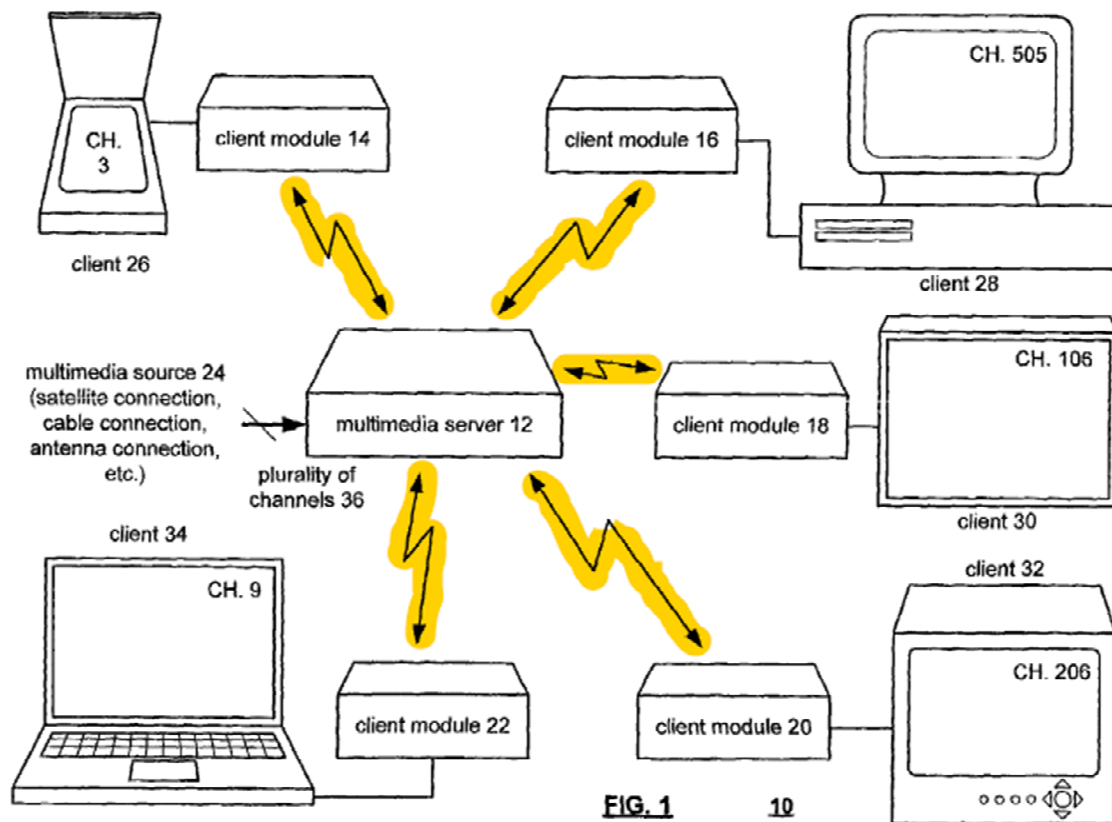
wired to support an in-home LAN that transceives entertainment type data.”
Ex. 1001 at 2:40-44.

54. As a solution to this alleged shortfall, the '855 patent proposes the provision of a multimedia server that receives a plurality of television channels from a multimedia source that may correspond to, *e.g.*, “channels provided via a satellite connection, cable connection, NTSC⁷ broadcast, HDTV broadcast, et cetera. In addition, or in the alternative, the plurality of channels may be provided by a group of video sources such as a VCR, DVD, laser disk player, et cetera.” Ex. 1001 at 5:50-55, 6:14-23, Figs. 1-6. As shown in the patent’s Figure 1, “a plurality of client modules 14–22 [which are] operably coupled to a plurality of clients 26-34. The multimedia server 12 is operably coupled to receive a plurality of channels 36 from a multimedia source 24.” Ex. 1001 at 6:11-16.

55. The '855 patent also discloses that the “multimedia server 12 communicates with the plurality of client modules 14–22 via a communication path, which may be a radio frequency communication path, a wire line connection, an infrared connection, and/or any other means for conveying data,” and may be a

⁷ “NTSC” is an acronym for the National Television System Committee, which is the analog television color system that was introduced in North America in 1954 and stayed in use until the conversion to digital television.

known “ISO standardized communication system.” Ex. 1001 at 6:26-30, 12:18-22. The multimedia server is further described as “includ[ing] a receiver and/or transmitter . . . to convey data via the . . . communication path.” Ex. 1001 at 6:30-33. The “communication path” between the multimedia server (12) and the plurality of client modules (14-22) is highlighted in Figure 1 below. That “communication path” may consist of any of a number of different types of communication mediums, including “a wire line connection, a transmit wire line connection, a receive wire line connection, a transceiving radio frequency path, a transmit radio frequency path, a receive radio frequency path, a transceiving infrared path, a transmitting infrared path, and/or a receiving infrared path.” Ex. 1001 at 11:31-36.



Ex. 1001, Fig. 1 (annotated).

56. The '855 patent also discloses that each client module is operably coupled to a client that may be any of a number of different types of devices. “[T]he client module 22 may be a separate device from its associated client or embedded within the client.” Ex. 1001 at 6:51-53. For example, the patent discloses that in accordance with Figure 1:

. . . client module 14 is operably coupled to client 26, which is representative of a personal digital assistant. Client module 16 is operably coupled to client 28, which is representative of a personal computer. Client module 18 is operably coupled to client 30, which is representative of

a monitor (e.g., LCD monitor, flat panel monitor, CRT monitor, et cetera). Such a monitor may include speakers, or a speaker connection, control functions including channel select, volume control, picture quality, et cetera. Client module 20 is operably coupled to client 32, which may be a television set, high definition television (HDTV), standard definition television (SDTV), a home theatre system, et cetera. Client module 22 is operably coupled to client 34, which is representative of a laptop computer.

Ex. 1001 at 6:36-50.

57. The '855 patent also describes the ability of users to change channels at their client:

. . . client 26 may at any time change its channel selection from, for example, channel 3 to channel 120. The client module 14 provides the channel selection request to the multimedia server 12, which now retrieves data related to channel 120 for client 26 as opposed to channel 3. Similarly, client 28–34 could also change their channel selection from the illustrated selection to another channel.

Ex. 1001 at 7:23-31.

58. The '855 patent also describes a “selection module” that allows a user to change channels, as, “[e]ach of the channel modules 14–22 includes a network interface controller 168, a selection module 170, and a video and/or audio interface 172. The selection module 170 is operably coupled to receive an input from

the client to produce a channel selection 178.” Ex. 1001 at 11:37-41. In the case of a television set the patent goes on to explain that:

.... the television set provides a signal to the selection module 172 indicating the channel selected. Alternately, the channel selection module 170 may include a remote control receiver such that when the remote control of the television is used to change the channel on the television set, the selection module 170 receives the control signal, interprets it, and produces the channel selection 178 therefrom.

Ex. 1001 at 11:41-49.

59. The '855 patent also explains that a channel selection request may be any of a number of types, including “audio channel, video channel, a particular audio source (e.g., CD playback), a particular video source (e.g., DVD player), etc.,” as well as “volume adjust, picture quality settings and adjustments, displaying restrictions, purchase request, picture-in-picture activation and deactivation, picture-in-picture channel select, video pausing, reverse play, fast forward, and/or audio muting.” Ex. 1001 at 12:2-11.

60. Figure 6 of the '855 patent “illustrates a schematic block diagram of a multimedia server and client modules of the multimedia communication system illustrated in FIG. 1.” Ex. 1001 at 2:65-67. Figure 6 is copied below with highlighting to identify network interface controller 168 and transceiving module

154:

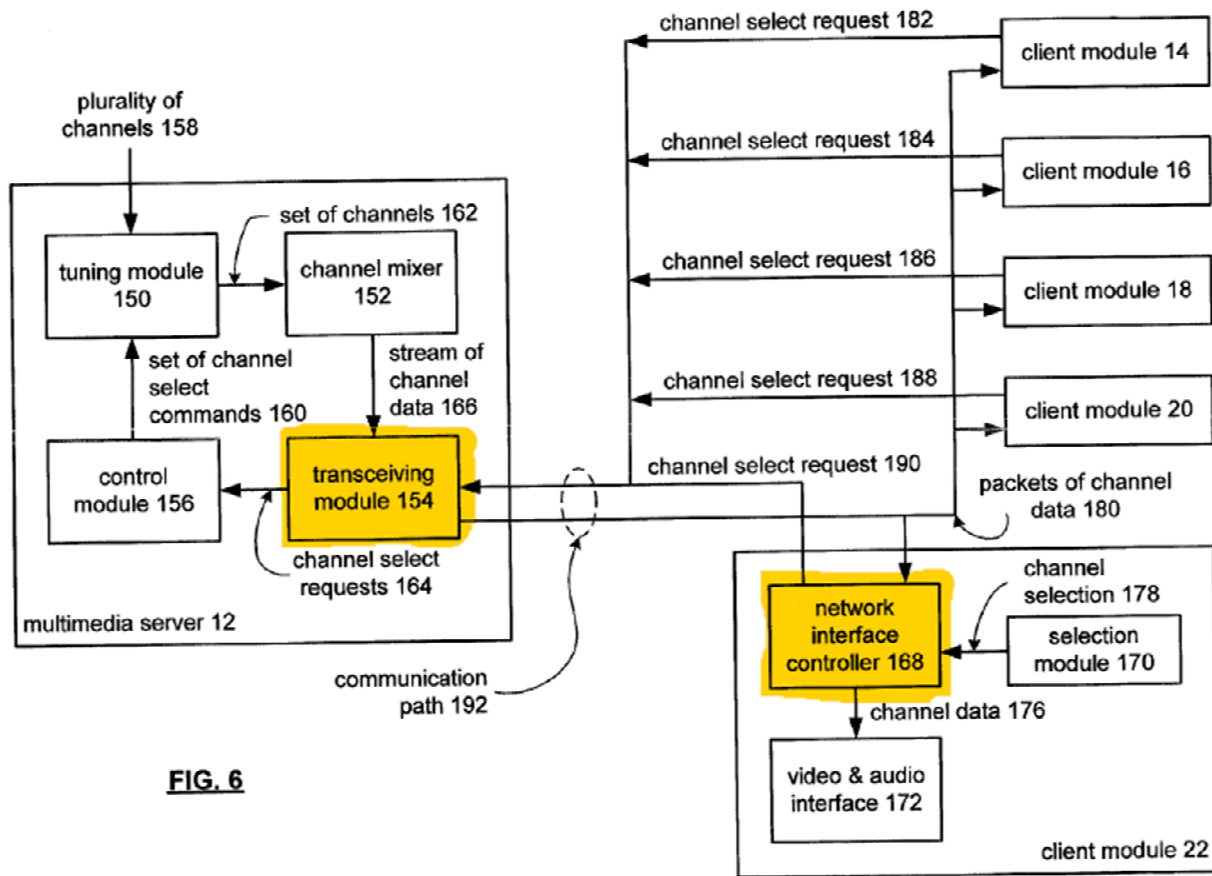


FIG. 6

Ex. 1001, Fig. 6 (annotated).

61. Referring to the components shown in Figure 6, the '855 specification explains that, "[t]he network interface controller 168 receives the channel selection 178 and prepares it for transmission via the communication path 192 to the multimedia server 12." Ex. 1001 at 11:50-52. The '855 specification then explains that, "[t]he network interface controller 168 provides the process channel selection 178 as a channel select request 190 to the transceiving module 154 of multimedia server 12." Ex. 1001 at 11:64-66. And that, "[t]he transceiving module 154 provides

the channel select request 164 to control module 156.” Ex. 1001 at 12:17-18. Finally, the patent explains that, “[t]he control module 156 processes the channel select request 164.” Ex. 1001 at 12:28-29.

62. The ’855 patent also explains that processing of a channel selection request “includes authenticating the request and preparing a set of channel selection commands 160 therefrom.” Ex. 1001 at 12:29-31, Fig. 6. The “channel selection commands” are then sent to “[t]he tuning module 150” which “extracts a set of channels 162 from a plurality of channels 158 based on the set of channel selection commands 160. The plurality of channels corresponds to channels provided via a satellite connection, a cable connection, an NTSC broadcast, an HDTV broadcast, a PAL broadcast, et cetera.” Ex. 1001 at 12:29-38, Fig. 6.

63. After a set of channels has been extracted from the plurality of provided channels based on the set of channel selection commands, those channels are multiplexed together by channel mixer 152 to produce a stream of channel data 166 that is thereafter transmitted to the client. That operation is described as:

The channel mixer 152 mixes (i.e., multiplexes) the set of channels 162 to produce a stream of channel data 166. The mixing of the set of channels includes converting the data of each channel into a generic data type and then converting the generic data into a specific data format for transmission as the stream of channel data 166.

Ex. 1001 at 12:41-46.

The transceiving module 154 transmits the stream of channel data 166 in packets of channel data 180. Alternatively, the stream of channel data 166 may be transmitted in frames of channel data. Each of the client modules 14–22 receives the packets, or frames, of channel data 180 via its network interface controller 168.

Ex. 1001 at 12:47-52.

64. In some of the embodiments disclosed in the '855 patent, the components of the multimedia sever are connected by a shared bus:

The tuning module 825 includes a plurality of selectors 780-786, an encoding module 804, and a bus interface 806 that provides connectivity to a shared bus 824. The shared bus 824 is shared with the channel mixer processing module and other components of the multimedia servers as shown in FIGS. 12, 14–16.

Ex. 1001 at 39:1-7.

65. As is also shown in Figure 6, the “tuning module” (Element 150 in the multimedia server in Figure 6 above, and Element 850 in Figure 31), relies on a “bus interface module” to “monitor[] a shared bus at specific time intervals” as shown in Figures 31 and 35. Ex. 1001 at 43:50-55.

66. Specifically referencing Figure 35, the '855 specification discloses:

At Step 916, the tuning module monitors a shared bus at

specific time intervals for frames of relevant data. The process then proceeds to Step 918 where the tuning module identifies a data frame at one or the specific time intervals to contain at least a portion of one of the plurality of channel select commands.

Ex. 1001 at 43:50-55, Figs. 31, 35.

67. In addition, the '855 patent discloses that the channels selected by the channel selection commands may be processed with some combination of known techniques of compression, encryption, and encoding, before being transmitted.

Ex. 1001 at 41:19-39; *also see* 38:66-39:12, 40:27-30, 43:33-38.

B. The '855 Patent Prosecution History

68. The '855 patent was filed on May 24, 2001, receiving Patent Application Serial No. 09/864,602 ("the '602 Application"). The '855 patent does not claim priority to any U.S. provisional application(s), any U.S. non-provisional application(s), nor any foreign application(s). It is thus my opinion that the earliest priority date for the '855 patent is May 24, 2001, the filing date of the '602 Application.

69. The applicant (Indra Laksono) included 77 claims in the '602 Application. Although numbered up to claim 79, the examiner noted that claims 26 and 27 were absent in the originally filed claims. Ex. 1003 at 2-3.

70. The '855 patent issued after three rejections: (1) a non-final Office

action mailed October 26, 2005 (the first Office action; Ex. 1003 at 1-11), (2) a second non-final Office action mailed May 22, 2006 (the second Office action; Ex. 1002 at 52-67), and (3) a final Office action mailed September 7, 2006 (the third Office action; Ex. 1003 at 106-124) over a five-year period from its filing date in 2001 before the examiner allowed the application. Ex. 1001, cover; Ex. 1003 at 160-166.

71. The prosecution history of the '855 patent reflects that:

- (A) the examiner allowed the claims only after the applicant amended the independent claims of the original application to incorporate the following new limitation, “*wherein the receiving the plurality of channel selection commands further includes monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands, and decoding, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection command*” (Ex. 1003 at 165 (Notice of Allowance noting this limitation));
- (B) the applicant did not dispute that the added limitations of the dependent claims, such as authentication, multiple multimedia sources,

decryption, encryption, decompression, compression, encoding, packetizing, framing, and conveying, were well known at the time of the invention (Ex. 1003 at 45-51 (response to first Office action failing to dispute that these limitations were well known), 100-105 (response to second Office action failing to dispute that these limitations were well known), 156-159 (response to third Office action failing to dispute that these limitations were well known)); and

- (C) the applicant ultimately did not dispute that all claim limitations, other than monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands, decoding, based on a data conveyance protocol of the multimedia system, and the data frame to recapture the at least a portion of the one of the plurality of channel selection command, were well known at the time of the invention (Ex. 1003 at 156-159 (reply to third Office action in which the applicant did not dispute that the claim limitations were well known)).

72. During prosecution, the applicant filed three amendments, one on March 9, 2006 (Ex. 1003 at 12-51), one on June 12, 2006 (Ex. 1003 at 68-105), and one on October 4, 2006 (Ex. 1003 at 125-159), in response to the first Office action,

the second Office action, and the third Office action, respectively. Thereafter, a Notice of Allowance was mailed October 26, 2006 (Ex. 1003 at 160-166) and the '855 patent issued on April 3, 2007 (Ex. 1001, cover).

73. In the first Office action, the examiner rejected then-pending claims 1-2, 6-7, 11, 13-15, 18-22, 29, 31-33, 36, 42-45, 48-50, 54-55, 59, 61-63, 66-68, 73, 75-77 under pre-AIA 35 USC § 102(e) as being anticipated by U.S. Patent No. 6,493,873 ("Williams"). Ex. 1003 at 3-7. The examiner also rejected all of the other pending dependent claims under pre-AIA 35 U.S.C. § 103(a) as being obvious over Williams alone or Williams in view of U.S. Patent No. 6,598,231 ("Basawapatna"), U.S. Published Application No. 20040172658 ("Rakib"), or U.S. Patent No. 6,473,414 ("Hartley"). Ex. 1003 at 7-9 (rejecting claims 3-5, 8-10, 12, 16-17, 23-25, 28, 30, 34-35, 37-41, 46-47, 51-53, 56-58, 60, 64-65, 69-72, 74, and 78-79). For some of the claims rejected under 35 U.S.C. § 103(a) (*i.e.*, claims 8, 28, 41, 56, and 72), the examiner took official notice that certain claimed limitations were well known. Ex. 1003 at 7. For example, with respect to claims 8, 28, 41, 56, and 72 (corresponding to issued claims 5, 21, 29, 42, and 56), the examiner stated that "Official Notice is taken that the technique of decrypting information is well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Williams by decrypting each of the plurality of channel selection commands for security

purposes.” Ex. 1003 at 7.

74. The applicant filed a response to the first Office action on March 9, 2006. Ex. 1003 at 12-51. As part of that response, the applicant amended four of the independent claims (claims 1, 21, 36, and 49) to incorporate a limitation of an original dependent claim (claims 2, 29, 37, and 53, respectively) and amended the remaining independent claim 67 to require that each of the plurality of channel selection commands include “an identity of one of the plurality of sources.” Ex. 1003 at 46-50. The applicant then argued that the then-pending independent claims were allowable over the art of record. Ex. 1003 at 45-51. The applicant also argued that the then-pending dependent claims were allowable by virtue of their dependency on their respective then-pending independent claims. Ex. 1003 at 45-51. The applicant did not traverse the examiner’s taking of official notice of the limitations added to the then-pending independent claims by the in then-pending dependent claims 8, 28, 41, 56, and 72. Ex. 1003 at 45-51.

75. In the response to the first Office action rejecting independent claim 49, the applicant addressed the rejections based on obviousness over Williams in view of Rakib for dependent claim 53 (which had been incorporated into independent claim 49) by arguing:

Both Williams and Rakib entirely lack any teaching relating to monitoring a shared bus at specific time

intervals, or identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands.

Ex. 1003 at 49 (underscoring in the original).

76. In the second Office action, the examiner maintained the rejection of then-pending claims 1, 6-7, 11, 13-15, 18-22, and 31-33 under pre-AIA 35 USC § 102(e) as being anticipated by Williams. Ex. 1003 at 55-57. The examiner also rejected all of the other then-pending claims under pre-AIA 35 U.S.C. § 103(a) as also being obvious over Williams alone or Williams in view of one or more of Basawapatna, newly-cited U.S. Published Application No. 20010005908 (“Hodge”), Hartley, or newly-cited U.S. Patent No. 5,883,661 (“Hoarty”). Ex. 1003 at 58-66. For some of the claims rejected under 35 U.S.C. § 103(a) (claims 8, 28, 41, and 72), the examiner maintained official notice that certain claimed limitations were well known. Ex. 1003 at 58, 60-61, 64. For example, with respect to claims 8, 28, 41, and 72 (corresponding to issued claims 5, 21, 29, and 56), the examiner stated that:

Official Notice is taken that the technique of decrypting information is well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Williams by decrypting each of the plurality of channel selection commands for security purposes.

Ex. 1003 at 58, 60-61, 64.

77. For the other dependent claims rejected under 35 U.S.C. § 103(a) (claims 9-10, 16-17, 34-35, 46-47, and 78-79) the examiner took official notice that certain claimed limitations were well known. Ex. 1003 at 58, 61-62, and 64. For example, with respect to claims 9-10, 16-17, 34-35, 46-47, and 78-79 (corresponding to issued claims 6-7, 13-14, 26-27, 34-35, and 62-63), the examiner stated that:

Official Notice is taken that encrypting and/or compressing are well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined system of Williams by encrypting and/or compressing data for security purpose and for reducing bandwidth purpose.

Ex. 1003 at 58, 61-62, 64.

78. The examiner also objected to dependent claims 5, 25, 39-40, and 71 as being allowable but for dependency on an independent claim. Ex. 1003 at 66. The examiner also allowed independent claim 49 and dependent claims 50-51 and 53-66 based on the previous amendment to independent claim 49, stating that, “the prior art of the record fails to teach or fairly suggest the limitation ‘monitoring a shared bus at specific time intervals; and identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands.’” Ex. 1003 at 66.

79. The applicant filed a response to the second Office action on June 12, 2006. Ex. 1003 at 68-105. As part of that response, the applicant amended independent claim 67 to include a limitation of original dependent claim 68. Ex. 1003 at 94-95. The applicant then argued that the then-pending independent claims were allowable over the art of record. Ex. 1003 at 101-104. The applicant also argued that the then-pending dependent claims were allowable by virtue of their dependency on the corresponding then-pending independent claims. Ex. 1003 at 101-104. The applicant did not traverse the examiner's taking of official notice of the limitations in the then-pending dependent claims 8-10, 16-17, 28, 34-35, 41, 46-47, 72, and 78-79. Ex. 1003 at 101-105.

80. In the third Office action, the examiner maintained the same objections and rejections of all the pending claims but for allowed claims 49-51 and 53-66. Ex. 1003 at 106-124. Thus, then-pending claims 1, 6-7, 11, 13-15, 18-22, and 31-33 remained rejected under pre-AIA 35 U.S.C. § 102(e) as being anticipated by Williams. Ex. 1003 at 111-113. The examiner also maintained the rejection of then-pending claims 3-5, 8-10, 12, 16-17, 23-25, 28, 30, 34-36, 38-48, 67-70, 72-79 under pre-AIA 35 U.S.C. § 103(a) as being obvious over Williams alone or in view of one or more of Basawapatna, Hodge, Hartley, or Hoarty. Ex. 1003 at 114-123. The examiner based his rejections of then-pending claims 8-10, 16-17, 28, 34-35, 41, 46-47, 72, and 78-79 at least partially on taking official notice of claimed limitations

being well known in the art at the time of the invention. Ex. 1003 at 114, 117-118, 120-121.

81. In addition, the examiner responded to the applicant's arguments that were previously submitted in the response to the second Office action. Ex. 1003 at 108-110. For example, the examiner found that the applicant's previously submitted arguments as to why Williams did not anticipate then-pending claim 1 to be unpersuasive. Ex. 1003 at 108. Referring to those arguments, the examiner responded, "the context of claim 1 does not require selecting a new channel based on the last channel as applicant argued." Ex. 1003 at 109 (emphasis in original).

82. After receiving the third Office action, the applicant filed a response on October 4, 2006. Ex. 1003 at 125-159. In that response, the applicant amended each of the remaining independent claims (claims 1, 21, 36, and 67) by incorporating limitations of objected to then-pending dependent claims 5, 25, 39, and 71. Ex. 1003 at 157. Notably, the applicant never addressed or attempted to traverse the examiner's maintaining of official notice that various limitations in dependent claims 8-10, 16-17, 28, 34-35, 41, 46-47, 72, and 78-79 were well-known at the time of the invention. Ex. 1003 at 125-159.

83. Instead, in the applicant's response to the third Office action, the applicant merely opined that the independent claims and the claims that depend therefrom, "are patently distinct from the prior art." Ex. 1003 at 157-158. It is thus

my opinion that the applicant conceded that the claimed limitations of which the examiner took official notice, and that the applicant never addressed, were well known at the time of the invention of the '855 patent. Ex. 1003 at 7, 45-51, 58, 60-61, 64, 100-105, 114, 117-118, 120-121, 125-159.

84. Based on the applicant's submitted response to the third Office action, the examiner issued a notice of allowance on October 26, 2006. Ex. 1003 at 160-166.

85. Given the above events, it is my opinion, as I explain in detail below, that the claim limitations directed to monitoring of a shared bus at specific time intervals and the identification of a data frame that includes a portion of a channel command at one of those time intervals, as well as all of the other limitations of the '855 patent's claims, were well known and would have been obvious to a PHOSITA. My opinion relies on references that are not cited on the face of the '855 patent and thus do not appear to have been applied by the USPTO. For example, there is no evidence that the examiner considered Hicks, PCI, Usui, Grier, Osakabe, or Watkinson. Accordingly, there is no evidence that the examiner considered any of the combinations of prior art that I discuss below.

C. The State of the Art

86. As of the date of the alleged invention of the '855 patent, that being May 24, 2001, the technical field of multimedia distribution systems was well

advanced, with a number of companies developing and publicizing approaches to creating and operating such systems as a way of getting content to users. A significant driver for these developments was the transition by many television viewers from broadcast television received with the then-familiar TV antennas, to the delivery of television programming and other services through coaxial cables which were brought into their homes. Whereas over-the-air delivery of television programming had been limited to a small number of channels in most markets, the transition to cable delivery provided an opportunity to deliver many more channels of general and special-interest programming.

87. In this section, I provide an overview of the underlying technologies that are relevant to understanding the alleged inventions of the '855 patent. For each of these technologies, I primarily cite to well-known textbooks and other reference materials, each of which was published and publicly available prior to the priority date of the '855 patent or otherwise reflects the knowledge of a PHOSITA as of May 24, 2001.

1. Multiplexing

88. Various technologies for multiplexing data were well-known and used in the field of the art of the '855 patent, including multiplexing video content and other multimedia data such as program guide data. As I explain in my unpatentability analysis below, and as recognized by the examiner during

prosecution of the '602 Application, typical features included within many of the '855 patent's dependent claims, including time-division multiplexing, data compression/decompression, encryption/decryption, and channel selection by a user using a remote control device, were also well-known to a PHOSITA as of May 24, 2001. Ex. 1003 at 58, 60-61, 64, 114, 117-118, 120-121.

2. Time-Division Multiplexing / Frequency Division Multiplexing

89. Various systems for multiplexing which allowed multiple independent signals or streams of data to be combined into a single signal or stream for transmission, were well-known and “widely used in practice” at the time of the filing of the '602 Application. Ex. 1014 at 6-7, 9-16, 23-25; Ex. 1015 at 19-22; Ex. 1026 at 8-13 (describing aspects of deterministic and non-deterministic time division multiplexers); Ex. 1030 at 18-19 (“Statistical Multiplexing” and “STDM Statistical Time Division Multiplexer”).

90. At the time the '602 application was filed, frequency division multiplexing (“FDM”) and time-division multiplexing (“TDM”) were two of the most widely used multiplexing techniques. Ex. 1014 at 6-7, 9-12; Ex. 1026 at 8-13. In addition, the use of multiplexing techniques such as TDM and FDM to transmit various types of data, including video signals for television, was well-known in the art prior to May 24, 2001. Ex. 1026 at 8-13 (describing aspects of deterministic and non-deterministic time division multiplexers); Ex. 1030 at 18-19 (“STDM Statistical

Time Division Multiplexer. STDMs are TDMs (Time Division Multiplexers) with an added microprocessor that provides more intelligent data flow control and enhanced functionality, such as error control and more sophisticated user diagnostics. The major difference between TDMs and STDMs is that stat muxes dynamically allocate time slots on the link to inputting devices on an as-needed basis (rather than in round robin fashion where all devices are polled in preordained order).”).

91. In my opinion, therefore, a PHOSITA would have understood that TDM and FDM were well-known concepts employed in multimedia distribution systems. Ex. 1014 at 6-12; Ex. 1026 at 8-13. Both of those multiplexing techniques transmit multiple streams of data (*e.g.*, multiple channels of data) over a single medium (*e.g.*, a twisted pair of wires or coaxial cable). Ex. 1014 at 6-12; Ex. 1026 at 8-13.

92. As also I believe a PHOSITA would have known, TDM allocates various times on the medium to the different streams of data being multiplexed. Ex. 1014 at 6, 9-12; Ex. 1026 at 8-13; Ex. 1030 at 18-19 (“Statistical Multiplexing,” “STDM”).

93. In my further opinion, a PHOSITA would have also understood that FDM divides the signaling frequencies that can be carried by a given medium among the various data streams that are to be transmitted. Ex. 1014 at 6 (“In FDM the

frequency spectrum is divided among the logical channels, with each user having exclusive possession of some frequency band.”).

3. Compression and MPEG

94. Compression is a technique for reducing the amount of digital data required to represent a digital data set, while still being able to recover an acceptable approximation of (or the entirety of) the original data after the compression is removed (“decompression”). It is common to characterize the “size” of digital data that is being transmitted, including audio and video which may vary with time, in terms of bits per second (*e.g.*, the number of bits in an audio sample times the number of samples per second, commonly called the “bit rate” and abbreviated as “bps”). In this context, compression is a reduction in the bit rate (*i.e.*, the number of bits per second) used for communication of an amount of audio and/or video. Ex. 1016 at 11-14. Compression may be achieved in several ways, *e.g.*, by removing detectable redundancy from the data or by removing less perceptually significant data. “Lossless” compression can be reversed to recover the entirety of original data set, but when “lossy” compression is reversed, only an approximation of the original data set is recovered. Ex. 1016 at 16-22; Ex. 1017 at 5-6.

95. As I believe a PHOSITA would have known, digital television systems traditionally used a method of converting analog audio and visual information into a digital form and then encoding the digital data for transmission and storage. The

Motion Pictures Expert Group (“MPEG”) of the International Standards Organization (“ISO”) has developed a sequence of standards for the compression, transmission, and decompression of audio and visual information. The first standard from this group, referred to as “MPEG-1,” was developed in the late 1980s and early 1990s. Ex. 1017 at 11. The second standard from this group, referred to as “MPEG-2,” was published in 1996. Ex. 1016 at 36 (Reference 3). Development of a new standard, “MPEG-4,” was started in 1993. Ex. 1017 at 155. MPEG-1, MPEG-2, and MPEG-4 are standard ways to provide compression and formatting of underlying digital data that would have been well-known to a PHOSITA in May 2001. Ex. 1017 at 3-5, 11, 112, 118, 121, 154.

96. MPEG-1, MPEG-2, and MPEG-4 use various techniques for compression, such as the removal of redundancy in digitized images or taking advantage of human visual perception to store less information for features to which the eye is less sensitive. MPEG-4 was also intended to address in-home networking applications, including distribution of video on LANs and over wireless networks. Ex. 1017 at 172-173; Ex. 1016 at 13-25:

Inter-coding takes further advantage of the similarities between successive pictures in real material. Instead of sending information for each picture separately, inter-coders will send the difference between the previous picture and the current picture in a form of differential

coding.

Ex. 1016 at 25.

97. MPEG-1 was designed to allow VCR-quality video to be transmitted over a 1.2 Mbps link. Ex. 1014 at 19-25 (“The first standard to be finalized was MPEG-1 (International Standard 11172). Its goal was to produce video recorder-quality output (352 x 240 for NTSC) using a bit rate of 1.2 Mbps.”). MPEG-2 provided for the transmission of standard video at 4 to 8 Mbps and two-channel stereo audio at 128 to 384 kbps. Other compression standards such as the ITU’s G.722 standard, allow AM radio audio quality to be transmitted at a rate of 64 kb/s. Ex. 1017 at 57.

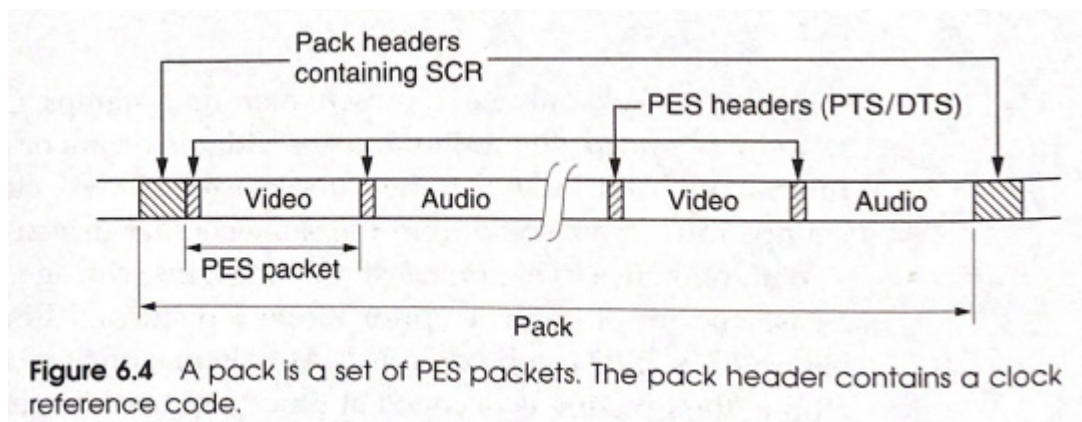
98. MPEG-4 provides for the transmission of standard definition video at rates between 10kbps to 1 Mbps and allows for audio data transmission at rates between 2 kbs and 64 kbs. Ex. 1017 at 176, 184. MPEG-4 was intended for wireless delivery of video and audio channels. Ex. 1017 at 172-173.

99. MPEG-1, MPEG-2, and MPEG-4 periodically send stand-alone pictures (called “I-frames”). In between the I-frames, MPEG-2 sends difference data (called “P-frames”). Ex. 1014 at 21; Ex. 1016 at 25-28; Ex. 1017 at 91-92. Together, the P- and I-frames represent the sequence of frames that make up a television program.

100. MPEG-2 also defines how to combine multiple streams of digital data

into a combined bitstream. MPEG-2 defines several bitstream formats. One format is called a “Program Stream,” which contains the audio stream and video stream for a single program. Another format is called a “Transport Stream,” which can be used to carry the audio and video streams of multiple programs. Ex. 1016 at 32-33, 52-56.

101. An MPEG bitstream is constructed by creating a collection of “Packetized Elementary Streams” (“PES’s”) by, for each data stream individually, compressing the digital data and then packetizing the compressed data. Before transmission, the PES’s are interleaved and control packets are added to create the MPEG bitstream. *Id.* See the following illustration of an MPEG bitstream comprising a video stream and an audio stream, a technique that that I believe would have been well-known to a PHOSITA as of May 24, 2001:



Ex. 1016 at 54 (Fig. 6.4).

102. Each data packet in a PES comprises a header and a payload. The payload is a portion of the compressed data, while the header contains information

about the payload. The header contains a field that identifies the type of data (*e.g.*, video or audio) being carried in the PES (the “Stream ID” shown below):

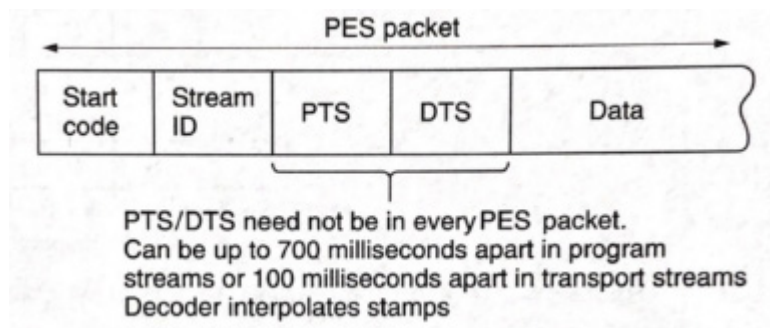


Figure 6.1 A PES packet structure is used to break up the continuous Elementary Stream.

Ex. 1016 at 53 (Fig. 6.1).

103. Since a Transport Stream may contain multiple video and audio PES's because it carries multiple television programs, each Transport Stream must indicate which PES belongs to which program. To do that, the Transport Stream packet header includes a Packet Identifier (“PID”), and an associated Program Association Table and Program Map Table which are periodically inserted into the bitstream to provide a mapping between the PID's, the PES type, and program. Ex. 1016 at 52-62.

104. As I explained in Section VIII.B above, the examiner during prosecution of the '602 Application, which would become the '855 patent, understood data compression to be commonly known in the art as of May 24, 2001. Ex. 1003 at 61-62, 64.

4. Encryption, Decryption, and Conditional Access Systems

105. In addition, techniques for data encryption and decryption were widely used and well-known in the art prior to the filing of the '602 Application, including use in the transmission of multimedia content. To protect content such as premium services (*e.g.*, premium channels and pay-per-view television), those techniques were in use well before May 24, 2001 to restrict access to those services to only the subscribers who paid for them (*e.g.*, people who paid for a package with premium channels such as HBO or paid for a pay-per-view event such as a prize fight). Ex. 1041 at 9:23-29.

106. A common restriction technique long used by pay television service providers such as cable operators is to limit access to the video signal of the premium services. Ex. 1018 at 93-96. This is called a “conditional access system.” In such systems, the premium services are encrypted by the cable operator prior to transmission from the cable facility (*e.g.*, the “headend”) and must be decrypted by the customer’s STB. *Id.* This requires hardware and software in the STB to communicate with the headend to authorize it as belonging to an authorized subscriber and then to configure the STB to perform the necessary decoding and decryption of the protected service upon receipt by the STB. *Id.* at 96-98; Ex. 1005 at 4:4-11; Ex. 1019 at 1:32-2:61; Ex. 1041 at 9:27-42. That hardware may take the form, for example, of a smartcard:

Smart cards are typically a credit card-sized card that contain a microprocessor, memory, and a battery. They can store electronic keys, user profiles, user identifiers, access rights, financial information, and other data.

Ex. 1005 at 10:38-42.

5. User Control of Content

107. As of the late 1990s, interactive electronic program guides (“IPG’s” or occasionally “EPGs”) were well-known and had been deployed in the television marketplace for years. Ex. 1041 at 3:41-48, 11:64-13:21, 25:52-60, 29:20-31:10. These program guides were typically software applications that caused television program listings to be presented to the user and enabled the user to navigate through those listings to select an individual listing and then to perform a function associated with the selected listing. *Id.* The IPG was created by a software application running on an STB at the subscriber premises that was connected to a television. *Id.* The IPG, along with the television content itself, was displayed to the subscriber on their television. *Id.* The subscriber typically used a remote control to interact with the IPG. For example, the subscriber could use the remote control to select a particular program by highlighting the program listing within the IPG by moving a cursor using a remote control “navigating the IPG”), and then selecting that program for viewing or recording by depression of a SELECT or ENTER button on the remote control. *Id.*

108. Many prior art references detail the capability of a user to select television content using a remote control to interact with a displayed IPG. For example, Hicks teaches using an infrared remote control to communicate with an STB to interact with a graphical user interface showing an IPG. Ex. 1005 at 4:21-41; *see* Ex. 1041 at 3:41-48, 11:64-13:21, 25:52-60, 29:20-31:10. Hicks explains that “to view broadcast video content, a consumer can use an infrared remote control to select the content that he or she wants to view by utilizing a broadcast program guide, a search function, entering a channel number, and so on.” Ex. 1005 at 4:38-41.

6. Additional Prior Art Known to a PHOSITA

109. In my opinion, the concept of having a multimedia server in the home for multiplexing multimedia content was disclosed in many other prior art references before May 24, 2001 and hence well-known to a PHOSITA. I discuss a few additional exemplary prior-art references below.

a. U.S. Patent No. 6,493,873 (“Williams”)

110. U.S. Patent No. 6,493,873 (“Williams”) resulted from U.S. Patent Application No. 09/008,879, filed on January 20, 1998 and issued on December 10, 2002. Ex. 1020, cover. Williams is a continuation-in-part of U.S. Patent Application No. 08/787,336, filed on January 27, 1997. *Id.* Williams was used as the primary rejections made in the three Office actions that I identified above. Ex. 1003 at 1-11,

52-67, 106-124.

111. As explained in its Abstract, Williams teaches a system for distributing a broadband audio-visual-data signal to a multiplicity of receiver units within a multiple dwelling unit (“MDU”) using a “transmodulator.” See the following citation and figure:

A system for redistributing a broadband audio-visual-data signal to a multiplicity of receiver units within a multiple dwelling unit (MDU) includes a main receiving antenna that receives a broadband video/audio/data signal having a number of individual program multiplex signals therein and a transmodulator device that transmodulates a selected subset of the individual program multiplex signals associated with the broadband signal from a first modulation scheme to a second modulation scheme. The transmodulated signals are broadcast over a cable network, along with terrestrial signals, to individual receiver units at the MDU. The receiver units send requests for user-selected ones of the individual program multiplex signals to the transmodulator device, demodulate the transmodulated and/or terrestrial signals and provide user-specified channels to television sets for display.

Ex. 1020, Abstract.

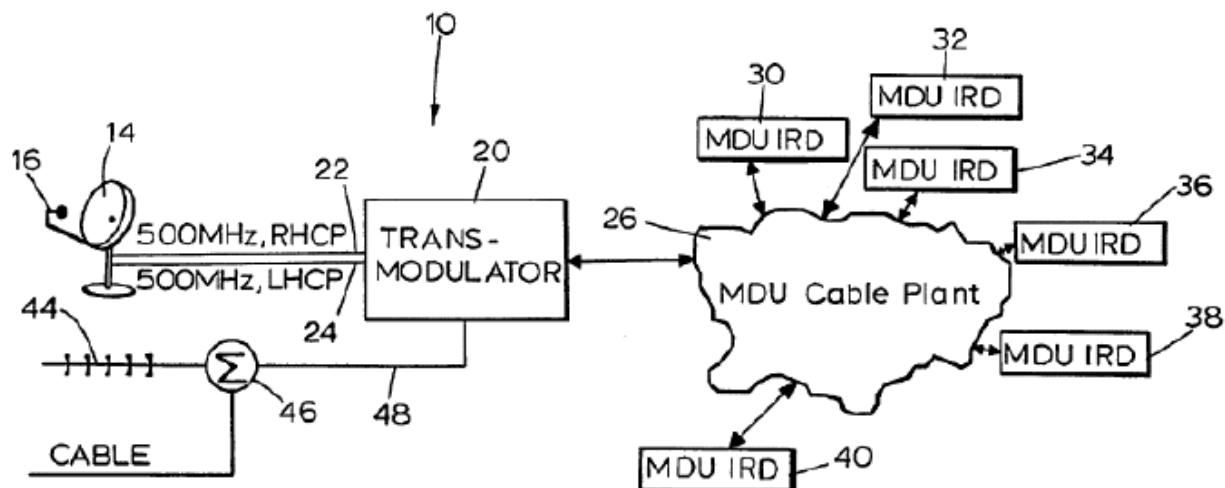


FIG. 1

Ex. 1020, Fig. 1.

112. As shown in Figure 1 and the following citation, Williams teaches that its signal distribution system includes a main signal receiver for receiving a signal transmitted by a satellite or other signal source for distribution in an MDU:

The signal distribution system 10 includes a main signal receiver 14 disposed on, for example, the roof of an MDU or any other location capable of receiving a signal transmitted by a satellite or other signal source. The signal receiver 14 is preferably in the form of a 24-inch diameter parabolic dish antenna pointed towards, for example, satellites that transmit a Ku-band or other broadband, QPSK-modulated PM composite signal. A two-channel LNB 16 associated with the dish antenna 14 receives the modulated satellite signal reflected from the dish antenna

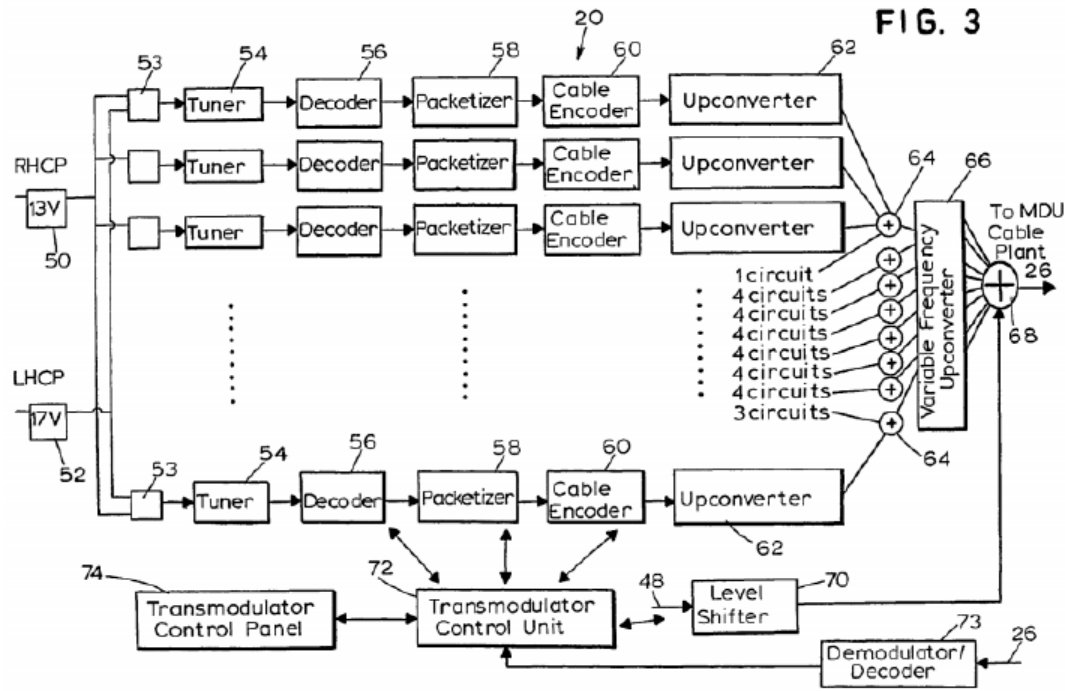
14. Each of the channels of the LNB 16 filters either the RHCP or the LHCP component of the received signal and mixes this filtered signal down to an intermediate frequency band, for example, the portion of L-band between 950 MHz and 1450 MHz. The LNB 16 amplifies and provides the 500 MHz, L-band signals associated with each of the RHCP and LHCP components of the downlink signal to a transmodulator 20 via lines 22 and 24, respectively. Other methods for providing the received QPSK input signals to the transmodulator 20 may also be used.

Id. at 5:59-6:11.

113. These other signals, referred to as “terrestrial” signals, “may comprise any cable, satellite or off-air signal including, for example, standard CATV, UHF, VHF, FM radio signals and/or other locally generated signals such as security camera or bulletin board channels. The terrestrial signals may be summed or added together in a summing network 46 (which may comprise any standard signal summer) and provided to the transmodulator 20 via a cable line 48, or may be provided separately to the transmodulator 20.” *Id.* at 6:47-63.

114. Williams further describes a transmodulator that receives and decodes requests for specific channels or satellite signals from an active set-top box or other integrated receiver and detector (“IRD”) associated with the receiver unit. *Id.* at 6:35-46, 7:31-47, 10:53-11:5, 16:5-22.

115. Figure 3 of Williams shows a block diagram of an embodiment of the transmodulator:



Ex. 1020, Fig. 3.

116. Williams also discloses selecting a channel from a plurality of channels per the requests for a particular channel from an active set-top box or other integrated receiver and detector (IRD) associated with the receiver unit. *Id.* at 11:6-21.

117. Williams also discloses that video can be encoded in accordance with the conveyance protocol of the multimedia system. *Id.* at 10:10-23, 13:23-14:25, 17:31-18:4.

118. Williams also discloses the use of FDM as a data conveyance protocol. *Id.* at 10:24-39.

b. U.S. Patent No. 6,400,280 (“Osakabe”)

119. Osakabe (Ex. 1045) is a U.S. patent issued on June 4, 2002, from an application filed on December 5, 1997, and is thus prior art under 35 U.S.C. § 102(e) (pre-AIA). Osakabe discloses an IEEE-1394 shared bus that communicates remote control commands and streams MPEG video between devices connected to the bus. Ex. 1045, Abstract, 7:28-48.

c. U.S. Patent No. 8,601,519 (“Hicks”)

120. Hicks (Ex. 1005) is a U.S. patent issued on December 3, 2013 from U.S. Application No. 09/749,825, filed on December 28, 2000.

121. Hicks teaches a digital residential entertainment system for multiplexing multimedia channels at a premises (*e.g.*, a home). Ex. 1005, Abstract, Fig. 1, 2:65-3:2. A broadband multimedia gateway (“BMG”) at the premises receives video and audio channels, such as cable TV, satellite TV, or broadcast radio, and multiplexes them to a plurality of clients, such as a digital television, digital set-top box, computer, audio system, wireless MP3 player, graphical data tablet, *etc.*, using a number of protocols and media, including HomePNA, HomeRF, 802.11, Bluetooth, Ethernet, and Internet Protocol (“IP”). *Id.* at 2:28-45, 3:36-67, 5:43-50, 6:1-42, 7:24-8:13, 11:48-12:3, Figs. 1, 2, 6; Ex. 1030 at 8-9 (describing Ethernet and Ethernet Switch “Ethernet-attached device puts data frames (data packets) onto the network”), 12-13 (describing HomeRF and HomePNA); Ex. 1034 at 18-25, 35-45,

69-73 (describing 802.11); Ex. 1028 at 18-29, 34-42, 44-45, 48-51 (describing Ethernet); Ex. 1033 at 39-40, 44-45, 53, 59-64 (describing IP). A user of the Hicks system selects programs using a remote control to communicate with a client STB. Ex. 1005 at 10:54-11:47, Fig. 3.

122. The Hicks system is designed to be flexible, and as new home networking standards emerged, the system was able to implement those new standards. *Id.* at 3:31-35. The multiplexed channels themselves are transmitted using a number of standards such as MPEG, and can be compressed/decompressed, encrypted/decrypted, and encoded/decoded. *Id.* at 4:1-11, 4:44-50, 6:43-50, 8:38-67, 10:54-11:47, Figs. 1, 3, 6, claim 3.

d. U.S. Pat. No. 6,218,864 / PCI Local Bus Specification, Rev. 2.2 (“PCI”)

123. U.S. Pat. No. 6,218,864 (Ex. 1011), issued on April 17, 2001 from an application filed on August 10, 1999. Ex. 1011, face page. This patent discloses a structure and method for generating a clock enable signal for use in PCI standard compliant and non-compliant circuits. Ex. 1011 at 3:7-25, 3:19-21. The PCI standard “is an open, non-proprietary local bus standard offering high performance for multiple peripheral devices.” Ex. 1011 at 1:42-46. The ’864 patent includes the following incorporation by reference of the PCI standard:

One such standard is the PCI standard. PCI is an open, non-proprietary local bus standard offering high performance for multiple peripheral devices. The standard is becoming widely accepted throughout the computer industry. A complete PCI Revision 2.2 specification is available from PCI Special Interest Group, P.O. Box 14070, Portland, Oreg. 97214, and is incorporated herein by reference. PCI works as a processor-independent bridge between a CPU and high-speed peripherals and allows PCI cards built today to be used in many different systems. In essence, the PCI standard specifies a standard data bus width, address bus width, and control signals to control a standardized set of commands implemented by the standard, e.g., read, write, and so forth. Also specified are the required timing relationships among all of these signals.

Ex. 1001 at 1:43-56 (annotated). As shown above, the '864 patent states: “A complete PCI Revision 2.2 specification is available from PCI Special Interest Group, P.O. Box 14070, Portland, Oreg. 97214, and is incorporated herein by reference.”

124. The patent states that “[t]he standard is becoming widely accepted throughout the computer industry,” which in my opinion a PHOSITA would agree with since the PCI bus was the predominant bus in desktop computers starting in the second half of the 1990s and was widely known by 2000 by computer and electrical engineers (including myself) who worked in the art of communication systems and had experience with computing systems in that time frame. *See, e.g.*, Ex. 1028 at 44-45; Ex. 1010 at 1-3, 9 (“PCI’s success gave birth to multiple PCI-related standards. These standards build upon PCI technology and leverage it for the benefit of other areas for which normal PCI cards are unsuitable.”). I included the PCI

standard as one of the interfaces addressed in a course on computer peripherals that I taught at the University of Texas in 1993 and 1994. That course also included coverage of the ISA bus and the Small Computer System Interface (SCSI). Books were also written about the standard, one of which is titled PCI System Architecture, Fourth Edition (Ex. 1047) by Tom Shanley and Don Anderson and copyrighted in 1999. This book specifically refers to revision 2.2, the same as that identified in the patent, and identifies the same source, “PCI Special Interest Group.” The ’855 patent also identifies the PCI as a known internal bus shared between peripheral components, the host device and memory. Ex. 1001 at 13:13-15, 18:47-50, 52:23-26.

125. Further, such a PHOSITA being interested in using PCI, for example to design a PCI interface, would have been interested in the ’864 patent, since the patent discloses how to address specific timing requirements required by the PCI standard. Ex. 1011 at 2:66-3:19. The ’864 patent includes many keywords, such as “PCI,” “ I_{RDY} ,” “ T_{RDY} ,” “PLD,” “setup requirement,” “clock enable,” etc., which a PHOSITA would have used to search for such subject matter, and from which a PHOSITA could have found the patent. *Id.*⁸

⁸ For reference, on April 19, 2020, I searched the USPTO website (www.uspto.gov)

126. I also reviewed the file history of the '864 patent as provided in the Declaration of Doanth Vu. As stated in Mr. Vu's declaration, a copy of the PCI standard revision 2.2 (Ex. 1006) was included with the file history. Ex. 1007 at 4. As a patent agent and as technical expert witness, I have reviewed many such file histories and am familiar with their typical contents. In this instance, page 10 of the '864 file history includes a document titled "UTILITY PATENT APPLICATION TRANSMITTAL," which is a form filed by the applicant to identify what papers are being submitted with the application. This transmittal indicates at check box 11 (reproduced below) that an Information Disclosure Statement ("IDS") and a copy of the reference cited in the IDS were submitted with the application.

11.	<input checked="" type="checkbox"/>	Information Disclosure Statement (IDS)/PTO-1449	<input checked="" type="checkbox"/>	Copies of IDS Citations
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On page 36 is an IDS, which would be the one referenced in the transmittal, since it is the only IDS contained in the file history. Under the "OTHER DOCUMENTS" section of the transmittal the following reference is listed: "PCI Local Bus Specification', PCI Special Interest Group, Revision 2.2, December 18, 1998." This information matches the information on the first page of Ex. 1006 (which indicates

for patents containing the terms "PCI" and "clock enable" and "setup requirement." That search yielded three patents, including the '864 patent.

the title, revision, and date) and on the second page which identifies the publisher (“PCI Special Interest Group”) of Ex. 1006, and also matches the information in the ’864 patent identifying the incorporated-by-reference document. Ex. 1001 at 1:43-56; Ex. 1007 at 36; Ex. 1006 at 1-2. Based on the ’864 patent identifying the incorporated-by-reference document name (“PCI”) and revision number (2.2), the source also being identified as “PCI Special Interest Group,” and Exhibit 1006 being found in the file wrapper of the patent, in my opinion a PHOSITA would have understood the incorporated-by-reference statement as referring to the “PCI Local Bus Specification, Revision 2.2” as provided in Exhibit 1006.

127. The PCI standard “includes the protocol, electrical, mechanical, and configuration specification for PCI Local Bus components and expansion boards.” Ex. 1006 at 21. “The PCI Local Bus is a high performance 32-bit or 64-bit bus with multiplexed address and data lines.” *Id.* PCI was originally developed in 1992 by Intel before the Peripheral Component Interconnect Special Interest Group (the “PCI-SIG”) took responsibility for specifying the PCI bus. Ex. 1006 at 21, 26.

128. The PCI standard discloses a synchronous bus architecture with all data transfers being performed relative to a system clock. *Id.* at 24, 28 (“CLK”), 46 (“All signals are sampled on the rising edge of the clock.”). “*Address and Data* are multiplexed on the same PCI pins. A bus transaction consists of an address phase followed by one or more data phases. PCI supports both read and write bursts.” *Id.*

at 29 (emphasis in original), 46. Under the PCI specification, the system clock was monitored at specific time intervals, *e.g.*, on the rising edge of that clock, by all target devices connected to the PCI local bus (the claimed “shared bus”) in order to determine which target device was supposed to receive a bus transaction being sent by an initiator device, *e.g.*, a processor, on the PCI local bus. *Id.* at 29-31, 46-47, 67-68 (Fig. 3-6).

e. Wireless LANs (“Grier”)

129. Grier (Ex. 1034) is a book published in 1999. Ex. 1013 at 38-40.

130. Grier teaches various aspect of the IEEE-802.11 wireless communication standard including client device authentication and Wired Equivalent Privacy (“WEP”) encryption. Ex. 1031 at 1:14-2:20, Figs. 1, 2; Ex.1034 at 43-44, 64-68.

131. According to the standard, data is communicated in frames which include up to four address fields, the second of which (“Address 2”) includes the

physical address of the sending device. Ex. 1034 at 68-69.

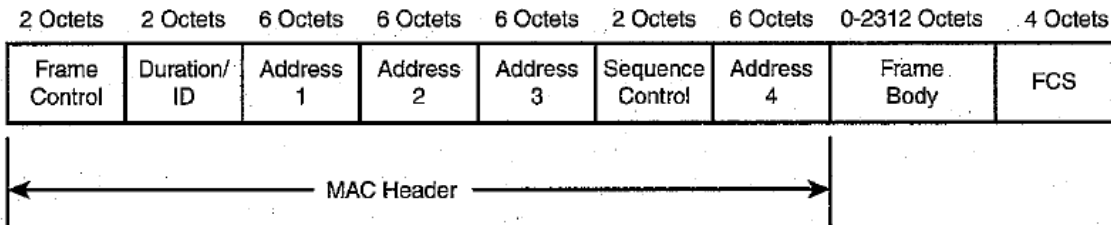


FIGURE 4.7 *The MAC frame consists of a header, variable length frame body, and a 32-bit frame check sequence (FCS), all of which support MAC Layer functionality.*

Ex. 1034 at 68-69.

f. MPEG-2 (“Watkinson”)

132. Watkinson is a book published in 1999 that teaches how to encode and decode audio and video data according to the MPEG-2 standard. Ex. 1013 at 28-37; Ex. 1016 at 11-13. The encoding process for audio and video signals according to the MPEG-2 standard is illustrated in Figure 1.13 of Watkinson (*Id.* at 32), which is reproduced below:

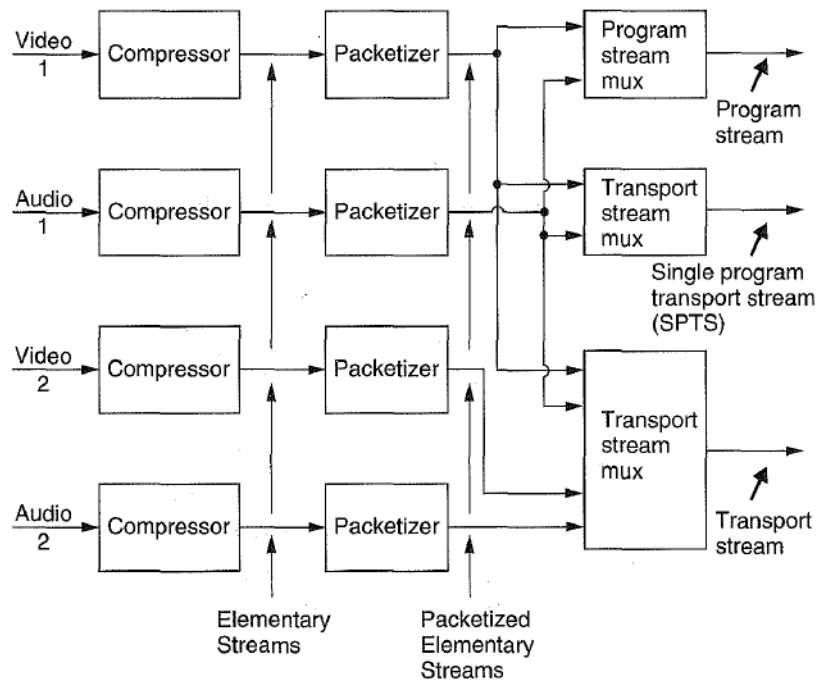


Figure 1.13 The bitstream types of MPEG-2. See text for details.

Ex. 1016, Fig. 1.13.

133. As shown in the above figure, under the MPEG-2 standard uncompressed video and audio data is received and compressed by compressors into Elementary Streams (ESs), which are then input to a Packetizer to generate Packetized Elementary Streams (PESs), and the PESs are then combined into one of two types of multiplexed streams: a Program Stream (PS) or a Transport Stream (TS). *Id.* at 32-33, 52-56. A program stream is used in situations such as for storage of single program on a Digital Video Disk (DVD), whereas a transport stream (TS) “is intended to be a multiplex of many TV programs with their associated sound and data channels.” *Id.* at 32-33, 52, 55-56.

g. U.S. Patent No. 5,808,694 (“Usui”)

134. Usui (Ex. 1012) is a U.S. patent issued on September 15, 1998, from an application filed on March 1, 1996. Usui teaches a remote control for use with a multimedia distribution system. Ex. 1012, Fig. 4. Usui describes a remote commander 7 with a channel up/down button 133, a jump button 141 (operated to return to the channel number that had been selected prior to changing to a second selected channel), a favorite button 144, and a ten numeric button switches 138 for direct entry of user selected channel numbers. *Id.* at 6:18-7:3.

IX. FACTS AND OPINIONS RELEVANT TO THE UNPATENTABILITY GROUNDS ASSERTED IN THE PETITION

A. Summary of My Analysis of the Unpatentability of the ’855 Claims

135. I understand that the Petition associated with my Declaration seeks an *inter partes* review of the patentability of claims 1-63 of the ’855 patent under the grounds set forth in Table 1 below.

Table 1				
Grounds	References	Basis	Claims Challenged	Section of This Report
1	Hicks and PCI	§ 103(a)	1-63	IX.B
2	Hicks, PCI, and Usui	§ 103(a)	1-17, 19-20, 38-39, 54	
3	Hicks, PCI, and Grier	§ 103(a)	2, 5, 20-21, 29, 39, 42, 53-63	IX.C
4	Hicks, PCI, Usui and Grier	§ 103(a)	2, 5, 20, 39, 54	
5	Hicks, PCI, and Watkinson	§ 103(a)	6-11, 13, 22-24, 26, 31-32, 34, 43-48, 50, 57-60, 62	IX.D
6	Hicks, PCI, Usui, and Watkinson	§ 103(a)	6-11, 13	
7	Ground 1 + Osakabe	§ 103(a)	1-63	IX.E
8	Ground 2 + Osakabe	§ 103(a)	1-17, 19-20, 38-39, 54	
9	Ground 3 + Osakabe	§ 103(a)	2, 5, 20-21, 29, 39, 42, 53-63	
10	Ground 4 + Osakabe	§ 103(a)	2, 5, 20, 39, 54	
11	Ground 5 + Osakabe	§ 103(a)	6-11, 13, 22-24, 26, 31-32, 34, 43-48, 50, 57-60, 62	
12	Ground 6 + Osakabe	§ 103(a)	6-11, 13	

136. For reference, the appendix attached to the Petition includes identifiers (*e.g.*, “[1A],” “[1B],” *etc.*) for the elements of the ’855 patent’s claims. I use those same identifiers below.

137. Based on my study of the references listed in Table 1 above, as well as my education and experience in the relevant art, it is my opinion that those references collectively render obvious all elements of all of the ’855 patent’s claims under each of the above Grounds, thereby rendering each of those claims unpatentable. My opinions have been formed by following the legal principles summarized in Section V above and by applying the claim constructions discussed above in Section VII.

B. Hicks in View of PCI (Ground 1), and Hicks in view of PCI and Usui (Ground 2)

138. As I explain in detail below, in my opinion a PHOSITA would have found the combination of Hicks and PCI to make the claims listed in Ground 1 above invalid for obviousness and would have also found it obvious to combine Hicks’s broadband multimedia gateway (“BMG”) with PCI’s architecture to create a bus shared among internal components of a computer system. That combination would have resulted in Hicks’s BMG implementing a well-known internal bus architecture as taught by the PCI standard that is specifically designed to operate with a Pentium

processor as identified in Hicks. *See* Ex. 1006 at 283 (Base Class 0Bh Table, Sub-class 02h, Interface 00h).

139. In my further opinion, a PHOSITA would find that the combination of Hicks and PCI meets all of the limitations of independent claims 1, 18, 28, 37, and 53 and many of the respective dependent claims as I explain below. Hicks provides the same basic system architecture as that of the '855 patent, and the combination with PCI does not change Hicks's basic architecture or the goals of Hicks. Rather, I rely on PCI only to provide a prior-art teaching of a shared bus architecture that is compatible with Hicks's system and which corresponds to the claimed elements of the above-listed '855 patent's claims. Specifically, PCI teaches a synchronous bus architecture with all data transfers being performed relative to a system clock, where addresses and data are multiplexed on the same PCI pins and bus transactions comprise a frame that includes an address phase followed by one or more data phases. Ex. 1006 at 24, 29, 46. In the following subsections, I explain in detail my opinion that the combination of Hicks and PCI discloses each of the elements of claims 163, along with my rationale for making that combination.

140. As I also explain below, in my opinion a PHOSITA would have found it obvious to combine Hicks and PCI and further to combine those two references with Usui. Usui is relied upon as a second disclosure (Hicks being the first) of the well-known, multiple command types required by independent claim 1 and

dependent claims 19, 38, and 54, commands that would be familiar to a PHOSITA. While Hicks alone teaches three of the command types (“next channel selection command,” “previous channel selection command,” and “select channel from user define list”), Usui discloses a remote control and system, similar to remote control 305 of Hicks, that provides *all* of the command types.

141. Thus, in my opinion a PHOSITA would have concluded that the combination of Hicks, PCI, and Usui make claims 1-17, 19-20, 38-39, 54 obvious. I explain that opinion on an element-by-element, claim-by-claim basis below.

1. Claims 1-17

a. Independent Claim 1 (Grounds 1 and 2)

i. Element [1A]

A method of multiplexing a plurality of channels in a multimedia system, the method comprises:

142. In the previously identified ITC proceeding, Petitioner has proposed that the preambles of independent claims 1, 28, and 53 are limiting, and should be construed such that the steps/elements of the claim “are in a home as part of an in-home communication network” and “are performed by a multimedia server [or tuning module within a multimedia server] within a user’s home, e.g., a stand-alone device or a device that may be incorporated in a satellite receiver, set-top box, cable box, HDTV tuner, home entertainment receiver, et cetera.” Ex. 1023 at 5-6.

143. In the ITC proceeding, Patent Owner has proposed that the preambles of the '855 claims are limiting, but only in regard to the environment in which the alleged invention operates, and that the preamble does not add steps or components to the recited claims. *Id.*

144. Given those two proposals, it is my opinion a PHOSITA would have found that that Hicks in view of PCI (Ground 1) and Hicks in view of PCI and Usui (Ground 2) disclose the preamble of claim 1 under either party's construction. Hicks discloses a method of multiplexing a plurality of channels in a multimedia system that operates in the user's home, *i.e.*, the environment in which that method is designed to operate. For example, Hicks discloses a network within the home that contains a multimedia server/tuning module (the BMG) that multiplexes channels to a plurality of clients (*e.g.*, thin-client set top boxes 300). Ex. 1005 at 5:57-6:16, 8:15-21, 11:48-12:3, Figs. 1-4, 6.

145. In addition, Hicks discloses that:

The present invention is a comprehensive digital residential entertainment system. A system includes a data switch, a mass storage device, a tuner and a demodulator. The data switch has a plurality of switch ports, and the mass storage device is coupled to a switch port of the plurality of switch ports of the data switch. The tuner selects an information channel of a plurality of information channels. The demodulator is coupled to a

switch port of the plurality of switch ports of the data switch and to the tuner. A Web-based graphical user interface can be provided for accessing and controlling the features and functions of the digital residential entertainment system.

Ex. 1005, Abstract.

Systems and methods in accordance with the embodiments of the present invention disclosed herein can advantageously provide a comprehensive digital residential entertainment system. In an embodiment, a digital residential entertainment system can provide access to multimedia content over an in-house broadband data network that is coupled to a data switch, a mass storage device and a variety of information appliances. The broadband data network can include Category 5 or better twisted pair wiring that can support the distribution of broadcast video, multimedia-on-demand services, broadcast audio, Web surfing, and other multimedia applications and services.

Ex. 1005 at 2:16-27.

In accordance with an embodiment of the present invention, multiple information appliances can receive a digital information signal from data switch 101. For example, a television program broadcast by a CATV system can be received by BMG 100, and BMG can send that television program to a plurality of televisions 40

and/or computer 50 such that a user at an information appliance views the television program in real-time.

Ex. 1005 at 7:56-63.

Within the digital residential entertainment system, the primary broadband data network can be supplemented and extended by the addition of plug-in modules for other lower bandwidth data networking technologies, such as Home Phoneline Networking Alliance (HomePNA) Version 2.0, HomeRF Shared Wireless Access Protocol (Home RF SWAP), IEEE 802.11, Bluetooth, and other similar technologies. For example, HomePNA Version 2.0 allows for the multiplexing of 10 Mbps of data over existing phone wiring in the home without interfering with analog telephony services operating over the same telephone wiring. HomeRF, IEEE 802.11 and Bluetooth are wireless data, or voice/data, technologies. Within the digital residential entertainment system, HomePNA, HomeRF, IEEE 802.11 and Bluetooth can principally be used for transmitting lower bandwidth multimedia content, such as audio content, as opposed to entertainment quality audio-video transmitted over the primary broadband data network. As newer technology emerges that improves the performance characteristics of HomePNA and “wireless” technology, entertainment quality audio-video can be supported over what is defined today as lower bandwidth technologies.

In the preferred embodiment of the present invention, the digital residential entertainment system is based on a client/server architecture. A core element of the system is a broadband multimedia gateway (BMG) that can operate both as a multimedia gateway and content server within a client/server architecture. It contains an Ethernet switch that, in a typical embodiment, is capable of data communications of at least 100 Mbps per switch port. The BMG can receive video, audio and other forms of multimedia content from a variety of broadcasts (e.g., direct digital broadcast satellite TV, digital cable TV, terrestrial broadcast analog and/or digital TV), Intranet, and Internet sources. As used to describe embodiments of the present invention, the term “multimedia” encompasses video, audio, audio-video, text, graphics, facsimile, data, animation, and combinations thereof. The BMG can deliver multimedia content to a wide range of information appliances, such as digital televisions, computers, sound systems, electronic book displays, and graphical data tablets.

A digital residential entertainment system can include a BMG that has multiple tuner/demodulators which receive broadcast multimedia content and send the received tuner/demodulators have a shared communication link to a switch port of the Ethernet switch. Upon receiving multimedia content, the BMG can transmit the multimedia

content through the Ethernet switch over the twisted pair data network to an information appliance (e.g., a thin-client digital set-top box, an audio system, a wireless MP3 player, or a wireless electronic device), store the multimedia content for future access, or transmit and store coincidentally (e.g., simultaneously). The BMG includes a mass storage device (e.g., a computer hard drive) that can store multimedia content from broadcast sources, an Intranet or the Internet.

Ex. 1005 at 3:14-67.⁹

146. More specifically, under Petitioner’s proposed construction, Hicks discloses that the claimed method of multiplexing is performed “by a [] multimedia server within a user’s home, e.g., a stand-alone device or a device that may be incorporated in a satellite receiver, set-top box, cable box, HDTV tuner, home entertainment receiver, et cetera.” Ex. 1023 at 5. Hicks’s user home network, which includes the BMG (e.g., Fig. 1 (100), Fig. 2 (110), Fig. 6 (600)) and the thin-client digital set-top boxes 300, corresponds to the “multimedia system” of claim 1. Ex. 1005 at 5:57-6:16, 8:15-21, 11:48-12:3.

147. Hicks also discloses that his BMG can receive multiple channels from

⁹ HomeRF was initially referred to as the Shared Wireless Access Protocol, hence the “SWAP” acronym.

a multimedia source (*e.g.*, multiple channels from an antenna, direct broadcast satellite TV, or a cable network (CATV) through communication links 12, 22, and 32 in Figs. 1 and 2), extracting the multiple channels using multiple tuners/demodulators (*e.g.*, Fig. 1 (102), Figs. 2 and 6 (121, 123)), multiplexing the extracted channels onto a shared bus within the BMG (*e.g.*, Fig. 2 (135, 145), Fig. 6 (610, 615, 620)) for communicating the extracted channel to a switch/router (*e.g.*, Fig. 1 (101), Figs. 2 and 6 (105)), and then using the switch/router to multiplex those channels onto a local network (*e.g.*, ATM, Ethernet, Home RF) to distribute the channels to a plurality of thin-client digital set top boxes 300). *Id.*, Abstract, 2:16-45, 3:14-67, 4:12-20, 4:44-50, 5:22-32, 5:57-67, 6:1-42, 6:66-7:63, 8:15-67, 9:62-65, 10:4-16, 10:59-61, 11:3-8, 11:48-12:3, Figs. 1-4, 6. For reference, Figs. 1 and 2 are copied below:

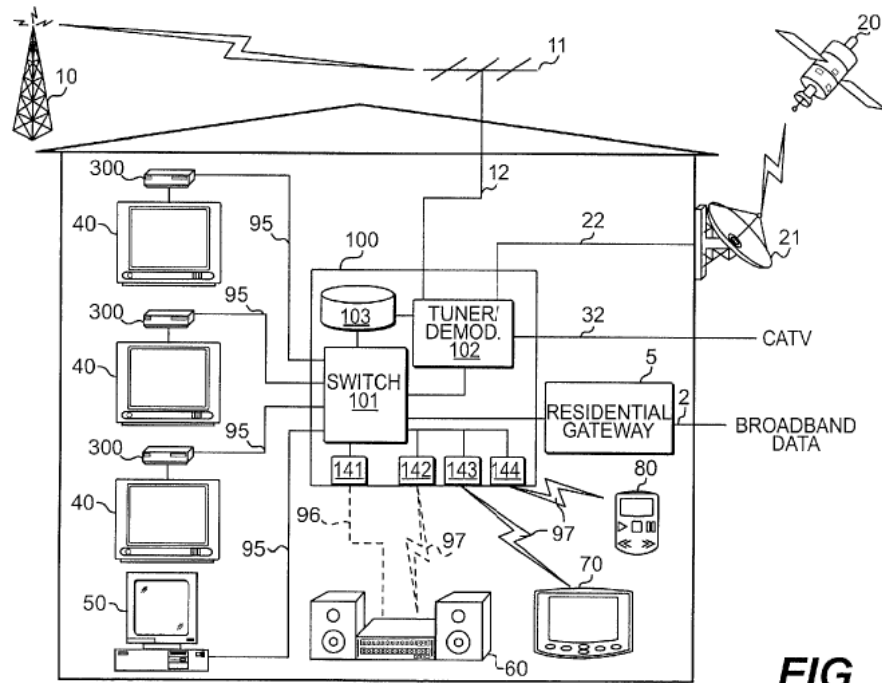


FIG. 1

Ex. 1005, Fig. 1.

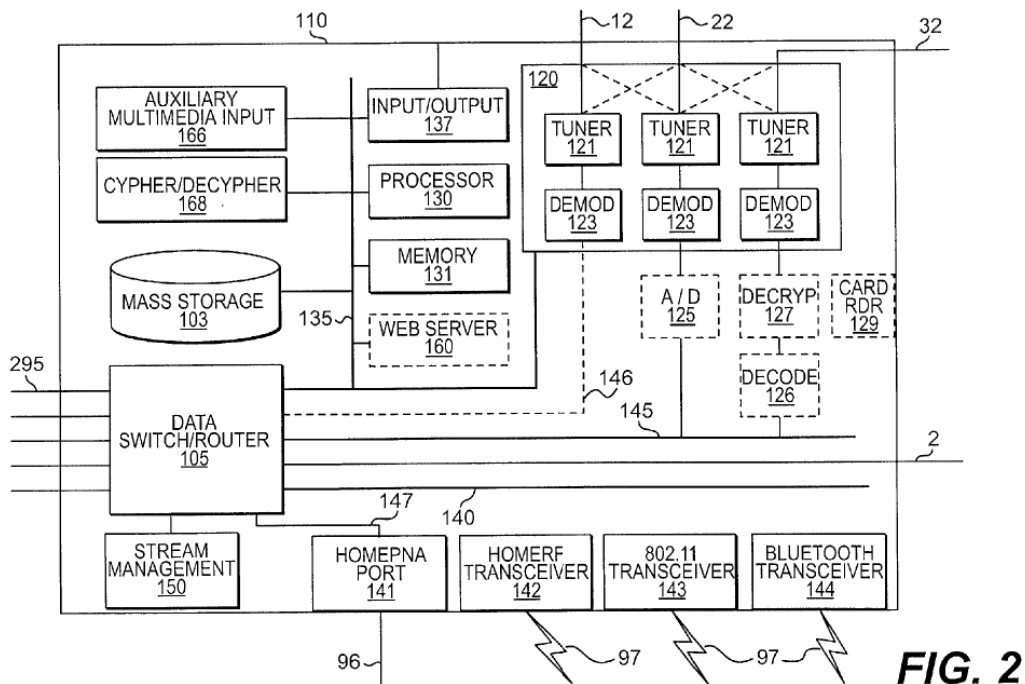


FIG. 2

Ex. 1005, Fig. 2.

148. Thus, in my opinion a PHOSITA would have understood that Hicks discloses Element [1A] under either Patent Owner's or Petitioner's proposed construction of that element and under Ground (1) and Ground (2).

ii. Element [1B]

receiving a plurality of channels from a multimedia source;

149. In my opinion, Hicks in view of PCI (Ground 1) and Hicks in view of PCI and in view of Usui (Ground 2) teach this element, for which neither party has proposed a construction other than the ordinary and customary meaning. In fact, it is my opinion that Hicks *alone* discloses receiving a plurality of channels from a multimedia source as required by this element of claim 1. For example, Hicks discloses:

The BMG can receive video, audio and other forms of multimedia content from a variety of broadcasts (*e.g.*, direct digital broadcast satellite TV, digital cable TV, terrestrial broadcast analog and/or digital TV), Intranet, and Internet sources. As used to describe embodiments of the present invention, the term "multimedia" encompasses video, audio, audio-video, text, graphics, facsimile, data, animation, and combinations thereof.

Ex. 1005 at 3:43-50.

Tuner/demodulator 102 can be coupled to one or more of

a plurality of multimedia transmission systems, where each multimedia transmission system transmits a plurality of transmission signals (e.g., audio, video, television, data, etc.). Examples of multimedia transmission systems include CATV, direct broadcast satellite TV, direct broadcast satellite radio, terrestrial broadcast TV, terrestrial broadcast radio, and so forth. Tuner/demodulator 102 can be coupled to a CATV system (e.g., a headend of a CATV system) via communications link 32 (e.g., a coaxial cable). A plurality of transmission signals from a direct broadcast satellite TV system including satellite 20 and satellite dish 21 can be received by tuner/demodulator 102 via communications link 22. Also, tuner/demodulator 102 can be coupled to a terrestrial broadcast TV system via transmitter 10, antenna 11, and communications link 12.

The plurality of transmission signals from the multimedia transmission systems can be transmitted over a plurality of information channels, such as, for example, frequency divided information channels, time divided information channels, code divided information channels, wave divided information channels, or dense wave divided information channels. A tuner of tuner/demodulator 102 can select an information channel of the plurality of information channels and pass a transmission signal to a demodulator of tuner/demodulator 102. The demodulator

of tuner/demodulator 102 can extract an information signal from the transmission signal. For example, a tuner can pass a transmission signal at a particular frequency to a demodulator, and the demodulator can extract the information signal from the transmission signal. In such an example, the transmission signal includes a carrier signal and an information signal. The information signal can be a discrete (i.e., singular) information signal or a multiplexed, composite information signal. For example, a multiplexed, composite information signal may contain a plurality of information signals where discrete information signals are time-division multiplexed, frequency-division multiplexed, and/or code-division multiplexed. Accordingly, tuner/demodulator 102 can include a plurality of tuners and/or demodulators to isolate an information signal that is multiply multiplexed (e.g., frequency-multiplexed and time-multiplexed).

Ex. 1005 at 6:1-42.

Data switch 101 can receive a digital information signal from mass storage device 103, another digital information signal from tuner/demodulator 102, or a plurality of digital information signals from mass storage device 103 and/or tuner/demodulator 102. In an embodiment, a BMG 100 includes a plurality of tuner/demodulators, each of which can provide a digital information signal to data switch 101. In an embodiment, data switch 101 receives each digital

information signal via a respective, dedicated switch port. For example, when mass storage device is capable of concurrently sending four information signals to switch 101, switch 101 can include four dedicated switch ports, where each dedicated switch port receives one information signal via a dedicated communications path. Moreover, when BMG 100 includes three tuner/demodulators, each tuner/demodulator can be coupled to a respective switch port of three switch ports of switch 101 such that each switch port receives one information signal. In another embodiment, data switch 101 can include a switch port coupled to a shared bus, where the shared bus carries a plurality of information signals. For example, dependant [*sic*] upon the data bandwidth requirements of the information signals and the data bandwidth capabilities of the shared bus and the switch port, the switch port may be able to receive four concurrent information signals.

Id. at 6:66-7:23; *see also* Ex. 1005 at 3:54-58, 8:22-37, 8:44-51, 9:17-21, 12:4-10, 12:44-47, 12:57-66, 17:60-18:3, 18:50-60, Figs. 1-4, 6.

150. Hicks also discloses that his BMG is a multimedia server that is placed in the home and that the BMG performs Element [1B] by receiving multiple channels (*e.g.*, multiplexed in a composite information signal) from a multimedia source such as from a CATV, direct broadcast satellite radio 21, terrestrial broadcast TV 11, mass storage 103, terrestrial broadcast radio, or broadband data link 2. *Id.* at 3:43-50, 3:54-58, 6:1-42, 6:66-7:31, 8:22-37, 8:44-51, 9:17-21, 12:4-10, 12:44-47,

12:57-66, 17:60-18:3, 18:50-60, Figs. 1, 2, 4, 6. For reference, Figure 1 is copied again below:

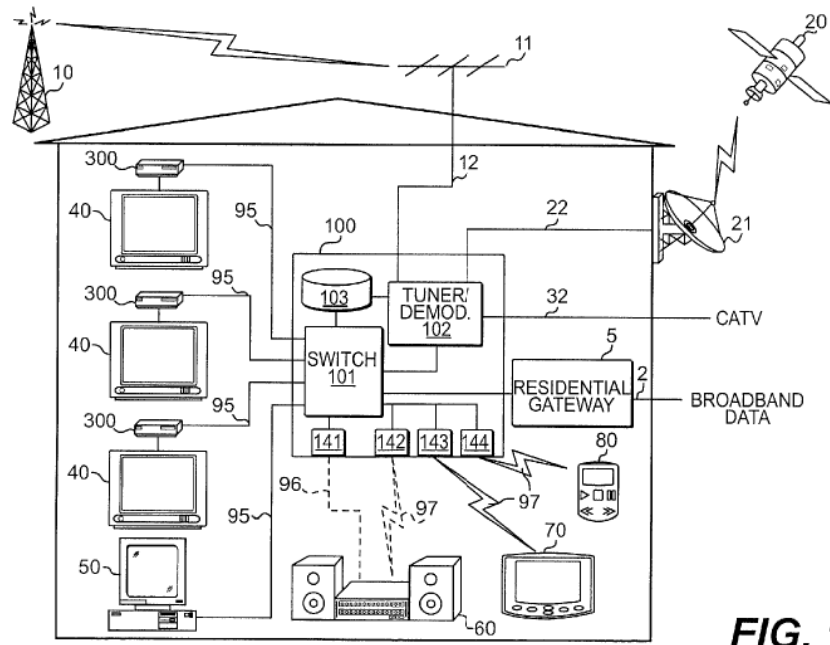


FIG. 1

Ex. 1005, Fig. 1.

151. Thus, in my opinion a PHOSITA would have understood that Hicks discloses Element [1B] under both Ground (1) and Ground (2) since both of those grounds include Hicks.

iii. Element [1C]

**receiving a plurality of channel selection commands
by:**

**receiving, from a plurality of clients, a plurality of
channel selection requests; and**

152. In my opinion, a PHOSITA would have found that Hicks in view of PCI (Ground 1) and Hicks in view of PCI and Usui (Ground 2) disclose this limitation under the common construction proposed by both Petitioner and Patent Owner in the ITC proceeding, where both agreed that the term “channel selection request” should be construed as “data that identifies a particular channel and at least one of the clients.” Ex. 1023 at 5 (top).

153. Hicks discloses:

In an embodiment, the BMG can include a Web-server to support a structured, Web browser-based user interface on each information appliance coupled to the BMG, such as digital STBs, audio systems, wireless MP3 players and wireless electronic books. For example, **an infrared remote control and/or an optional wireless keyboard can communicate with a digital STB to interact with the Web browser-based graphical user interface that is presented on an information appliance such as a TV screen. The Web browser-based graphical user interface may be used to access broadcast and on-**

demand video and audio content and multimedia applications and services.

...

For example, to view broadcast video content, a consumer can use an infrared remote control to **select the content that he or she wants to view by utilizing a broadcast program guide, a search function, entering a channel number**, and so on. After the **consumer makes a selection, the thin-client digital STB communicates with the BMG requesting that the digital multimedia content be delivered to the digital STB**. When the consumer selects playing of a broadcast satellite television channel, for example, the BMG can tune a demodulator/tuner to the selected broadcast channel and begin streaming the selected MPEG video stream through the Ethernet switch and over the twisted pair wiring to the digital STB where the video stream is decoded and displayed on the TV.

Ex. 1005 at 4:21-50 (emphasis added).

Remote control 305 can select programs to be displayed that are being transmitted by a CATV system, a DBS TV system, a terrestrial TV system. Playback control commands can be sent by remote control 305 to control playback of programs stored on mass storage device 103. In an embodiment, remote control 305 can include

keyboard and pointer functionality to facilitate Web surfing and/or Web-enhanced television. . . .

For example, **applications that can be executed based on the WBB GUI and the remote 305 include a broadcast program guide**; broadcast TV viewing control; broadcast audio listening control; movies-on-demand; audio-on-demand; recording, storage and **playback of broadcast programs**; interactive TV; Web-enhanced TV; e-mail communications; Web surfing; electronic surfing; and so forth.

Ex. 1005 at 11:26-47 (emphasis added);¹⁰ *also see* Ex. 1005 at 4:51-62, 15:9-11.

154. Hicks thus explains that a user of his thin-client digital STBs selects a program by using a broadcast program guide, a search function, or directly entering a channel number, *etc.*, by using a keyboard or remote control, and that the thin-client digital STB communicates this selection to the BMG. *Id.* at 4:21-44, 11:20-47, 15:9-11. An example of this process is described in Hicks with respect to the

¹⁰ Direct broadcast satellite (“DBS”) refers to satellite television (TV) systems in which the subscribers, or end users, receive signals directly from satellites. Ex. 1030 at 5-6. Such signals are broadcast in digital format at microwave (Ku-band) frequencies. *Id.* DBS is the descendant of direct-to-home (“DTH”) satellite services. *Id.* at 7.

flow diagram illustrated in Figure 4:

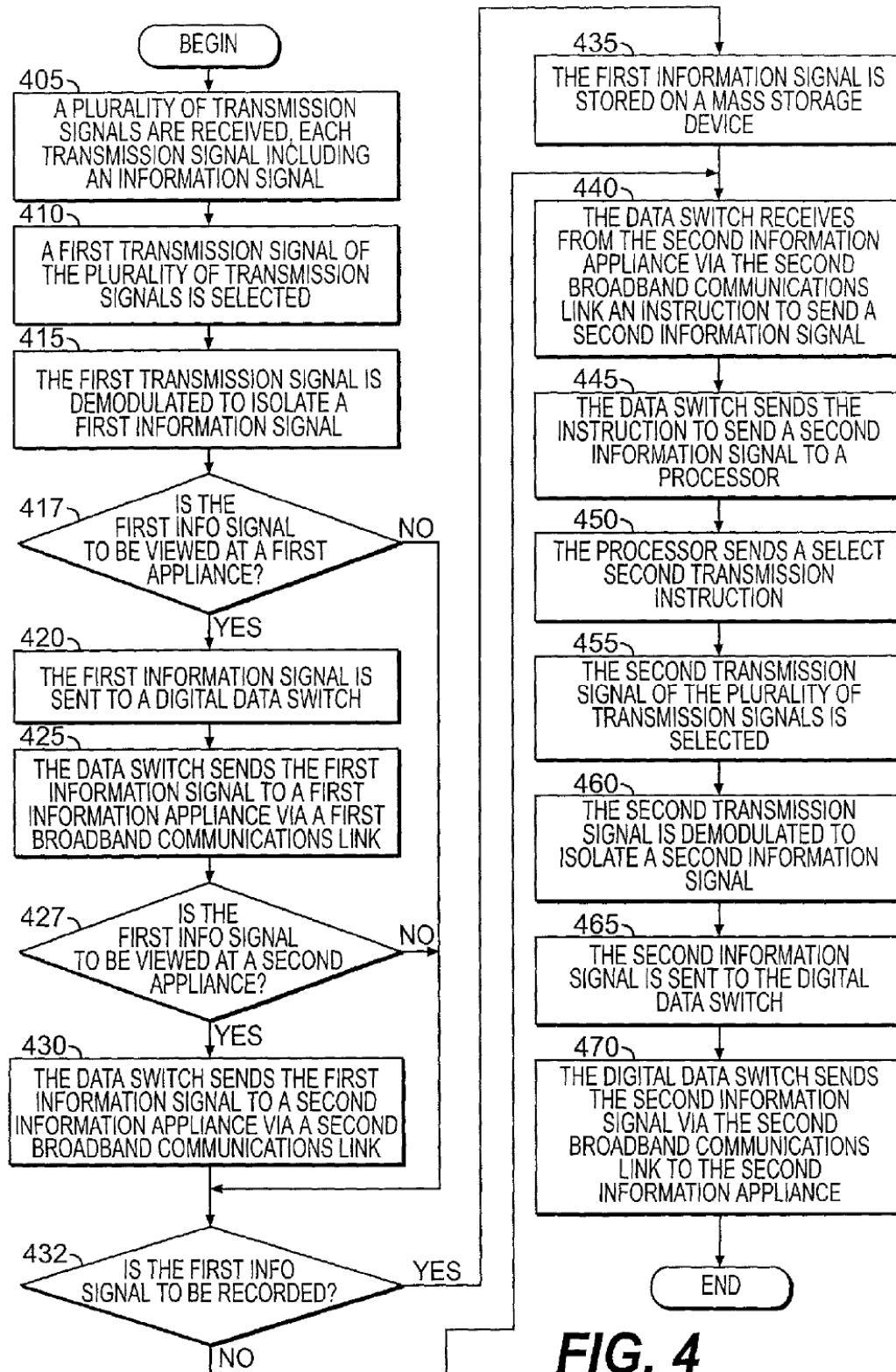


FIG. 4

Ex. 1005, Fig. 4.

155. In Steps 405-435 of the process shown above, the BMG: (a) receives a plurality of transmission signals each including an information signal (a plurality of channels), (b) demodulates and isolates a first information signal using a multichannel tuner, (c) determines whether the first information signal is to be sent to first and/or second information appliances and/or is to be recorded, and (d) according to the determinations, sends the first information signal via the digital data switch to the first and/or second information appliances and/or records the first information signal. *Id.* at 12:4-37.

156. Hicks further discloses with respect to Steps 440-470 that:

The digital data switch receives an instruction to send a second information signal from the second information appliance via the second broadband communications link (box 440), and **sends the instruction to send a second information signal to a processor** (box 445). **The processor sends a select second transmission instruction (e.g., to the multichannel tuner)** (box 450).

The second transmission signal of the plurality of transmission signals is selected (e.g., by the multichannel tuner) (box 455), and demodulated to isolate a second information signal (box 460). The second information signal is sent to the digital data switch (box 465), and the digital data switch sends the second information signal to

the second information appliance via the second broadband communications link (box 470).

Id. at 12:38-51 (emphasis added).

157. As shown above, Hicks discloses that when users of his thin-client digital STBs respectively select a channel (*e.g.*, by entering a channel number using their remote control), the thin-client digital STBs sends their selections to the BMG. *Id.* at 4:21-37, 4:38-44 (“by utilizing a broadcast program guide, a search function, entering a channel number, and so on.”) (“the thin-client digital STB communicates with the BMG requesting that the digital multimedia content be delivered to the digital STB”), 8:47-54, 11:26-29 (“Remote control 305 can select programs to be displayed that are being transmitted by a CATV system, a DBS TV system, a terrestrial TV system.”), 12:38-42 (“The digital data switch receives an instruction to send a second information signal”), 15:9-11. The BMG thus performs the function of “receiving, from a plurality of clients, a plurality of channel selection requests,” where each of the requests “identifies a particular channel” (*e.g.*, “channel number,” “second information signal”) as the parties have agreed is the construction of the “channel selection request” required by Element [1C]. Ex. 1023 at 5.

158. The communication from each thin-client digital STB also requests “that the digital multimedia content be delivered to the digital STB.” Ex. 1005 at 4:41-44. Thus, the communication “identifies ... at least one of the clients” as the

parties further agreed is required by the claimed “channel selection request.” *Id.*; Ex. 1023 at 5 (construing “channel selection request” as “data that identifies a particular channel and at least one of the clients.”).

159. One way the client device is identified in each of the Hicks STB communications requesting a multimedia content is via the communication protocol implemented by the in-home broadband network. Hicks discloses that his in-home broadband network may be implemented using a data switch/router 101/105 coupled to thin-clients 300 by dedicated or shared communication links 95/295. Ex. 1005 at 3:2-13, 4:38-44, 5:62-67, 7:37-45, 9:49-54, 10:56-61, Figs. 1 (95, 101, 300), 2 (105, 295), 6 (95, 105). According to Hicks, the in-home broadband network may be implemented with various protocols, including: Ethernet, IP, Home RF, Home PNA 2.0, IEEE 802.11, Bluetooth, *etc.* *Id.* at 3:14-26, 5:43-48, 8:15-21, 11:4-8. In my opinion, therefore, a PHOSITA would understand that each of these well-known protocols communicates data in frames, packets, and/or datagrams that include header information which identifies (*e.g.*, via a MAC or IP address) the source and destination devices that send and receive the data, respectively. Ex. 1030 at 8-11 (describing Frames generally and Ethernet Frames/Packets), 12-13 (describing HomeRF SWAP and Home PNA 2.0 IP packets), 14 (describing IP Datagrams/Packets), 17 (“The specific native protocol of the data network may term the packet as a packet, block, frame or cell.”). For example, an Ethernet frame and

an Internet Protocol packet are illustrated below.

160. As shown below, an Ethernet frame, which is utilized to transmit data in the Ethernet, IP, and Home PNA 2.0 protocols, includes a six-byte “source address” field in the header of the frame that identifies the physical address of the device (*e.g.*, a thin-client digital STB) that sent the data. Ex. 1030 at 8, 11-12.

AN ETHERNET FRAME					
Preamble	Destination address	Source address	Type	Data up to 1500	Frame check sequence
8 bytes	6 bytes	6 bytes	2 bytes	bytes	4 bytes (contains CRC check)

Id. at 8.

161. Similarly, as shown below, an 802.11 frame, which is utilized in the 802.11 protocol, includes up to four address fields, the second of which (“Address 2”) includes the physical address of the sending device. Ex. 1034 at 68-69.

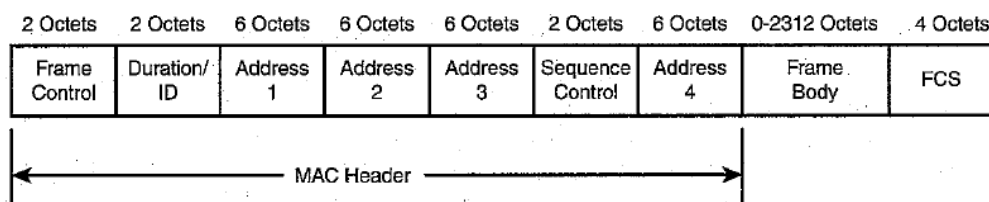


FIGURE 4.7 *The MAC frame consists of a header, variable length frame body, and a 32-bit frame check sequence (FCS), all of which support MAC Layer functionality.*

Ex. 1034 at 68-69.

162. Ethernet and 802.11 provide connections between devices at the hardware level in that their headers provide addresses of the physical devices (*e.g.*,

network interface cards (“NICs”) connected to the network. IP packets, on the other hand, are encapsulated within Ethernet and 802.11 frames to provide connections between the software running within the devices. Ex. 1034 at 39-40, 83-88. As illustrated below, when using Ethernet and IP (as is disclosed in Hicks), an IP packet is encapsulated within an Ethernet Frame. Ex. 1005 at 5:43-48; Ex. 1033 at 39-40, 53, 59-61.

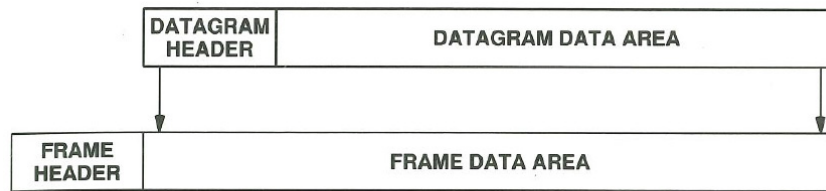


Figure 7.5 The encapsulation of an IP datagram in a frame. The physical network treats the entire datagram, including the header, as data.

Ex. 1033, Fig. 7.5. An IP packet includes its own “Source IP Address” field, which uniquely identifies the sending device by its logical connection to the network (the network address assigned to the device by the BMG as opposed to the addresses in

the Ethernet Frame which are unique to the device's interface hardware). Ex. 1033 at 37, 44-45; Ex. 1034 at 83-88. *See* the following depiction of that packet:

0	4	8	16	19	24	31
VERS	HLEN	SERVICE TYPE	TOTAL LENGTH			
IDENTIFICATION			FLAGS	FRAGMENT OFFSET		
TIME TO LIVE		PROTOCOL	HEADER CHECKSUM			
SOURCE IP ADDRESS						
DESTINATION IP ADDRESS						
IP OPTIONS (IF ANY)					PADDING	
DATA						
...						

Figure 7.3 Format of an Internet datagram, the basic unit of transfer in a TCP/IP internet.

Ex. 1033, Fig. 7.3.

163. Since Hicks discloses Ethernet, Ethernet (IP), Home RF, Home PNA 2.0, IEEE 802.11, and Bluetooth as protocols which may be implemented on his in-home network over which requests for channels are transmitted in a format specific to those protocols (claimed “channel selection request”), and those protocols will identify the client which sends the request via a physical address and/or logical network address in the headers of the frames and packets carried over that network. Ex. 1005 at 3:14-26, 5:43-48, 8:15-21, 11:4-8.

164. Thus, in my opinion, a PHOSITA would have understood that Hicks alone discloses Element [1C], thereby meeting Grounds 1 and 2, both of which include Hicks.

iv. Element [1D]

receiving a plurality of channel selection commands

by:

...

processing the plurality of channel selection requests to

produce the plurality of channel selection commands,

165. In the ITC proceeding, Petitioner has proposed that the “channel selection command” should be construed as a “command that is derived from a channel selection request and that identifies a particular channel of a plurality of channels.” Ex. 1023 at 6-7. There, Patent Owner proposed that the “channel selection command” should be construed as a “command related to selection of a channel.” *Id.* Thus, it is my opinion that a PHOSITA would find that Hicks in view of PCI (Ground 1) and Hicks in view of PCI and Usui (Ground 2) disclose this limitation under both Petitioner’s and Patent Owner’s construction.

166. As I explained above with respect to Element [1C], users of the Hicks system can select a particular channel (*e.g.*, by using remote control 305 that provides “remote control instructions”) for their respective thin-client digital STBs (an example of the claimed “channel selection commands”), and the STB using the IP protocol would generate IP packets including the instructions, and encapsulate the IP packets in Ethernet Frames (an example of the claimed “channel selection requests”), which are communicated over the in-home network (*e.g.*, utilizing

Ethernet and IP protocols) to the data switch of the BMG server. Ex. 1005 at 3:14-26, 4:21-50, 5:43-48, 8:15-21, 11:4-8, 11:20-47, 15:10-12. In response to receiving the communications from the thin-client digital STBs, the data switch 101/105 in the BMG sends those instructions (*e.g.*, encapsulated in IP packets) to a processor in the BMG (Step 445 of the flow diagram in Figure 4) and the processor then sends “a select second transmission instruction” to the multichannel tuner (Step 450). *Id.* at 12:4-51; *also see id.* at 4:21-50, 8:44:54, 11:20-47. Each of these steps—sending the instructions from the data switch to the processor and sending the “select second transmission instruction” to the tuner—performs the requirement of Element [1D] calling for “processing the plurality of channel selection requests to produce the plurality of channel selection commands.”

167. The Hicks data switch performs this step by receiving the “channel selection requests” from the clients via the in-home network, which include, for example, IP packets containing instructions from the thin-client digital STBs, and then forwarding those packets to the processor. That processor is connected to the switch by shared bus 135. *Id.* at 8:44-54, 9:22-32, 11:48-12:3, 17:50-18:5, Figs. 2 (135), 6 (620). To forward the instructions, it is my opinion that a PHOSITA would understand that the digital switch must process the communications (the “channel selection requests”) received on connections 295 (Fig. 2) (or 95 in Figs. 1, 6) of the in-home network in order to send the instructions (“channel selection commands”)

which are to the processor in the BMG over shared bus 135. *Id.*, Fig. 2.

168. For example, the communications identified above would include frames and/or packets utilized by one of the network protocols identified in Hicks—Ethernet, IP, Home RF, Home PNA 2.0, IEEE 802.11, or Bluetooth. *Id.* at 3:14-26, 5:43-48, 8:15-21, 11:4-8. To send the instructions to the processor over shared bus 135, the instructions would have to be reformatted from the frame format of the network (*see* ¶¶ 159-109 above) into a format compatible with the shared bus and the processor (*e.g.*, a Pentium® III processor). *Id.* at 9:22-27. Thus, in my opinion a PHOSITA would understand that if using, for example, Ethernet and IP as described in Hicks, which is part of a layered set of communication protocols, the processing would require that the data switch de-multiplex the received Ethernet frames in order to select only those from a particular client (as identified by the source address in the header), de-encapsulate the IP packets from the selected frames (*e.g.*, by removing the frame header), and assemble data from multiple frames to regenerate the IP packets including the instruction that was identical to that created at the client. Ex. 1033 at 63-64 (explaining the Protocol Layering Principle: “Layered protocols are designed so that layer n at the destination receives exactly the same object sent by layer n at the source.”).

169. By receiving the communications from the client devices in a protocol-specified format such as Ethernet via the in-home network and forwarding the IP

packets including the instructions in a format readable by the processor, the BMG of Hicks's data switch performs the step of "processing the plurality of channel selection requests to produce the plurality of channel selection commands" as required by Element [1D]. The IP packets are the claimed "channel selection requests" that include the instructions, which are the claimed "channel selection commands." These packets are extracted and reassembled from the Ethernet frames, and thus "processed" as required by Element [1D]. Each instruction from each client which identifies the channel (*e.g.*, by a "channel number") is a "command that is derived from a channel selection request and that identifies a particular channel of a plurality of channels" (as Petitioner proposed) and a "command related to selection of a channel" (as Patent Owner proposed) for the construction of "channel selection command[s]" in the ITC proceeding. Ex. 1023 at 6-7; Ex. 1005 at 4:21-44, 12:38-51; *see also* Ex. 1001 at 12:18-25.

170. As I also explained above, the processor in Hicks performs the step required by Element [1D] of "processing the plurality of channel selection requests to produce the plurality of channel selection commands" by receiving the IP packets containing the instructions that identify channels and identify the STB, and in response, sending "select second transmission instruction[s]" to a multichannel tuner 121 (Step 450 of Fig. 4). Ex. 1005 at 12:38-51; *also see id.* at 4:21-50, 8:44-54, 11:20-47. The IP packets received by the processor form part of the "channel

selection requests,” and the processor would have to process the packets to produce the instructions originally generated at the STB, which are an example of the claimed “channel selection commands” as described above. Additionally, the processor uses the instructions contained in the IP packets to produce corresponding “select second transmission instruction[s]” which are sent to the multichannel tuner 121 (another example of “channel selection commands”). Each “select second transmission instruction” tells a multichannel tuner 121 of the Hicks system to demodulate the second information, and thus, is a “command that is derived from a channel selection request and that identifies a particular channel of a plurality of channels” (as Petitioner proposed) and a “command related to selection of a channel” (as Patent Owner proposed) for the construction of “channel selection command[s]” in the ITC proceeding. Ex. 1023 at 6-7; Ex. 1005 at 4:21-44, 12:38-41.

171. Thus, in my opinion a PHOSITA would have understood that Hicks discloses Element [1D] under either party’s proposed construction of that element and under Grounds (1) and Grounds (2), both of which include Hicks.

v. Element [1E]

wherein the each of the plurality of channel selection commands includes at least one of: last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and select channel from user

define list;

172. It is opinion that Hicks in view of PCI (Ground 1), and alternatively Hicks in view of PCI and Usui (Ground 2), discloses this limitation.

173. Figure 33 of the '855 patent illustrates the steps of a process for selecting channels within the Hicks multimedia system. Step 892 of that process is described in the '855 specification as follows:

The process then proceeds to Step 892 where a plurality of channel selection commands are received. The plurality of channel selection commands are derived from select requests provided by a plurality of client modules **wherein each of the channel select commands identifies a particular channel of the plurality of channels. The processing then continues at Step 894 where a channel of the plurality of channels is selected per channel selection command.**

Ex. 1001 at 42:15-24 (emphasis added).

174. As I explained above, each channel select command identifies a particular channel in Step 892 and then a channel is selected “per [the] channel selection command” in Step 894. *Id.* Figure 34 of the '855 patent illustrates further steps for performing Step 892. That description is as follows:

FIG. 34 illustrates a logic diagram of a method that further defines the receiving of the channel select commands as

described generally in Step 892 of FIG. 33. The processing begins at Step 900 where the channel select requests are received from a plurality of client modules. The process then proceeds to Step 902 where the channel select requests are processed to produce the plurality of channel select commands. **Each of the channel select commands include a specific channel select command, less [sic “last”] channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and/or select channel from a user defined list. Such a command corresponds to the particular request by the client and/or a default processing scheme used within the multimedia server.** Accordingly, when a particular client makes a request, **the tuning module will interpret the request in light of one of these particular multimedia channel selection schemes.**

The processing of the plurality of selection requests may be done in one or more of Steps 904–908. At Step 904, the channel select request is interpreted to identify at least one of the clients. **In addition, the request is interpreted to determine the particular channel selection request being made. Based on this information, the channel command may be generated.**

At Step 906, the client initiating the selection request is authenticated. The authentication determines whether the

client is a valid client of the multimedia server. **At Step 908, the specific channel selection request made by a client is authenticated. This may be done by determining whether the client has access privileges for the particular channel being requested,** whether the request is being made within an approved time of the day, and/or whether a time allotment of accessing multimedia sources has been exceeded. In addition, the authentication of the specific channel request may include **determining whether the client is authorized to purchase the requested channel** from one of the multimedia sources (e.g., whether the client is authorized to access pay preview channels), and/or whether the client has exceeded in the count limit established by the multimedia server.

Ex. 1001 at 42:57-43:29 (emphasis added).¹¹

175. This description of the process of Figure 34 of the '855 patent substantially repeats the language of Element [1E], although it discloses a “less channel selection command” instead of the claimed “last channel selection command,” a disclosure I believe is a scrivener’s error since the “less command”

¹¹ If the term “less channel” is *not* a scrivener’s error, then there is no support in the '855 specification for the requirement of claims 1, 19, 38, and 54 for a channel select command named the “last channel selection command.”

language is paired with a “next command,” where “Last Channel” and “Next Channel” are a common pairing when channels are selected by use of a remote control. *Id.* at 42:64:43:1. This description also indicates that each command “corresponds to the particular request by the client” and that each request indicates the “particular channel” or “specific channel.” *Id.* at 43:1-3, 43:11-14, 17-21, 23-26.

176. Given the above descriptions of Figures 33 and 34, it is my opinion that a PHOSITA would understand that the ’855 patent describes a process that starts when, at each client device, a user makes a channel selection request that identifies a particular channel and each of those requests is then received by the server. *Id.* at 42:25-30, 43:11-14, 43:17-21, 43:23-26. For each channel selection request, a corresponding channel selection command is generated that identifies the channel named in the corresponding request, which results in the identified channel being selected. *Id.*

177. The above disclosure further indicates that each request will be interpreted “in light of one of these particular multimedia channel selection schemes” and that the command corresponding to the request will include “a specific channel select command, less [sic “last”] channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and/or select channel from a user defined list.” Ex. 1001 at 42:64-43:7.

178. The ’855 patent also discloses “particular multimedia channel selection

schemes” with respect to “enhance feature privileges”:

In addition to allocating the resources as shown in Step 1462, the multimedia system may also provide the functionality as shown in Steps 1464–1468. At Step 1464, the multimedia server determines whether the system has access available resources. If not, the process reverts to Step 1462. If so, the process proceeds to Step 1466 where the multimedia server determines whether the client has enhance feature privileges. **The enhance feature privileges allow the client's favorite channels to be selected and processed by the multimedia server, previous-channel, next-channel, picture-in-picture, et cetera.** If the client does not have the enhance features, the process reverts to Step 1462. If, however, the client has advanced features, the process proceeds to Step 1468. At Step 1468, the multimedia server allocates further resources to support the enhance features of the client.

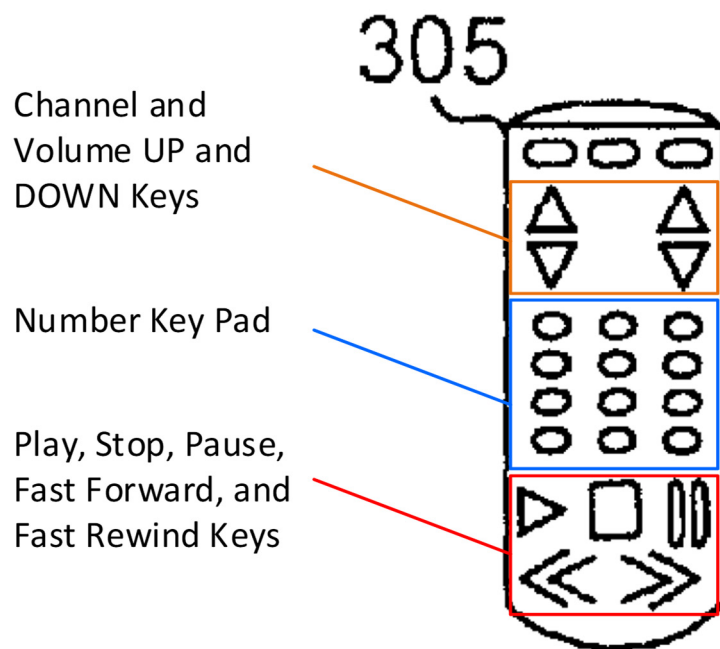
Id. at 61:12-26 (emphasis added).

179. As shown above, the favorite channel selection limitation disclosed in the '855 patent is an “enhance feature” of the system, and that selection may be made using various processes, including a previous channel selection and a next channel selection. *Id.* Thus, in my opinion a PHOSITA would understand this additional disclosure to indicate that each “channel selection command” shown in Figure 34 may simultaneously be two types of the listed commands. For example, a “next

channel selection command,” when made in the context of the enhance feature privileges that provide the client’s favorite channels, is also a “favorite channel selection command.” *Id.* at 61:19-22.

180. Consistent with this description of Element [1E] in the ’855 patent, therefore, it is my opinion that a PHOSITA would find that Hicks in view of PCI (Ground 1) and Hicks in view of PCI and Usui (Ground 2) disclose this element. For example, Hicks discloses that the user is able to select a channel using a remote control for the thin-client digital STB to utilize a broadcast program guide, to perform a search function, or to enter a channel number. Ex. 1005 at 4:38-44, 4:55-62, 9:35-39, 11:20-33, 11:41-47. In my opinion, therefore, a PHOSITA would understand that using Hicks’s remote control to perform a search function is no different from the ’855 patent’s broadly described “select channel from a user defined list” limitation of Element [1E]. Such a search would produce one or more channel identifiers as the search results, those forming “user defined list” that can be used to select a channel meeting the search criteria.

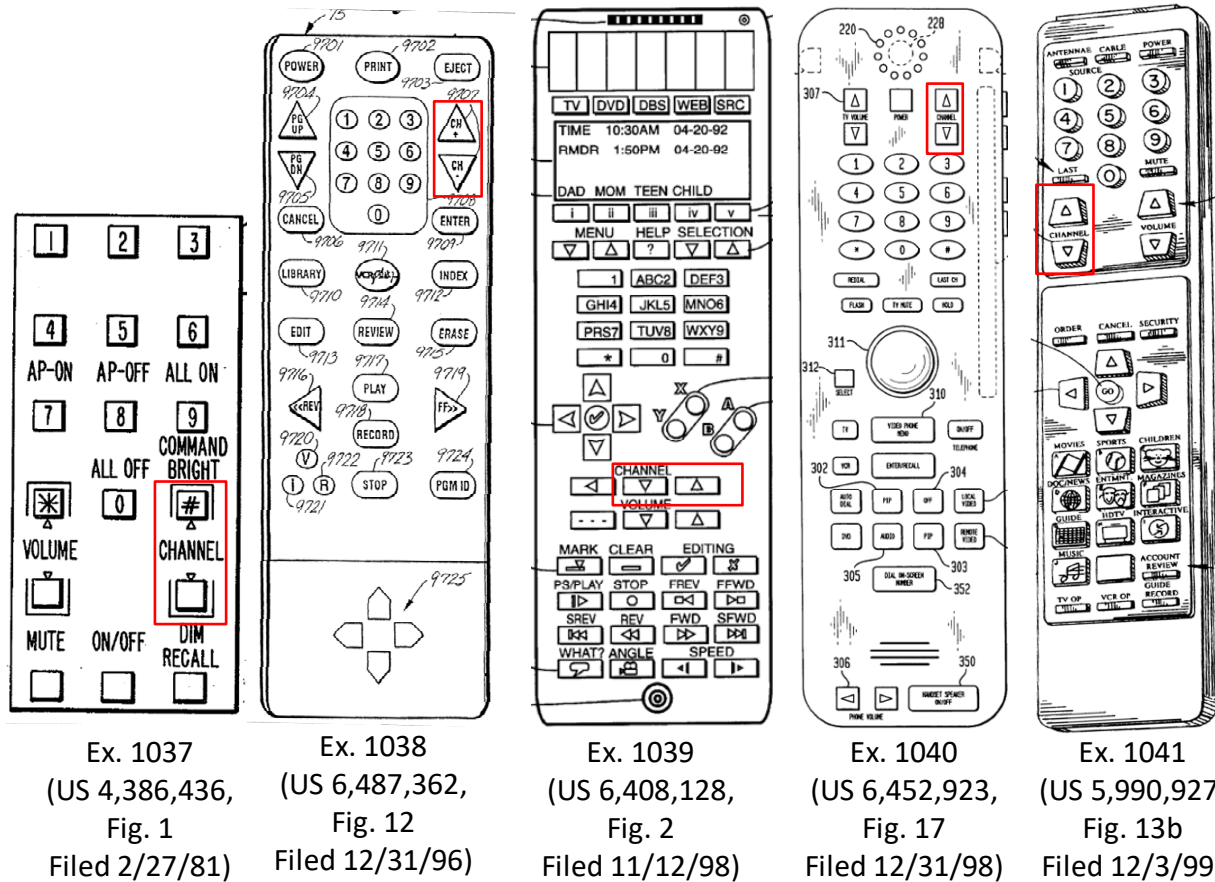
181. As another example, Figure 3 of Hicks illustrates remote control 305 as shown (and annotated) below.



Ex. 1005, Fig. 3 (annotated and excerpted).

182. Given this disclosure of the Hicks remote control, in my opinion a PHOSITA would recognize that remote control 305 includes a Channel selection control (the typical UP/DOWN arrow-shaped keys), Volume UP and DOWN keys, a number key pad, and keys for controlling the playback of a recorded program. The Channel and Volume UP and Down keys were nearly universally included on remote controls for televisions, STBs, VCRs, DVRs, *etc.*, at the time of the invention (and well before). This is demonstrated by the following examples of such remote controls taken from five exemplary prior-art patents as reproduced below and annotated to highlight the Up and Down arrow channel keys. Ex. 1037 at 4:53-65, Fig. 1 (annotated below); Ex. 1038 at 26:53-33, Fig. 12 (annotated below) ; Ex. 1039 at 10:4-5, Fig. 2 (annotated below); Ex. 1040 at 26:40-45, Fig. 1 (annotated below);

Ex. 1041 at 29:49-57, Fig. 13b (annotated below).

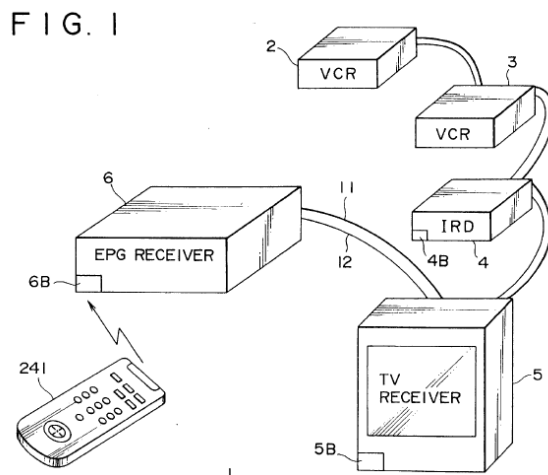


183. Given these disclosures, in my opinion a PHOSITA would recognize that pressing the Up and Down keys and entering a channel number of remote control 305 in Hicks would generate remote control instructions (“channel selection commands”) that included, respectively, the broadly described “next channel selection command” and “previous channel selection command” and “favorite channel selection command” as required by Element [1E], where the “next” channel button goes to the next highest numbered channel and the “previous” channel button goes to the next lowest numbered channel, and the user enters a favorite channel via

the key pad. Ex. 1005 at 4:21-5:3, 11:20-33, 11:41-47, Fig. 3.

184. Based on the above analysis, it is my opinion that a PHOSITA would conclude that Hicks discloses Element [1E] under Grounds 1 and 2.

185. In my further opinion, a PHOSITA would recognize that using the full-function remote control disclosed in Usui would improve the Hicks system by providing more flexibility in selecting programs for viewing or recording. The overall system described in Usui as illustrated in his Figure 1 includes a television receiver 5, an integrated receiver/decoder (IRD) 4, video cassette recorders 2 and 3 and an electronic program guide (EPG) receiver 6 integrated together. Ex. 1012 at 2:27-34, 3:9-10, 7:36-44. The Usui system also includes devices that receive programs from multiple sources. For example, Usui's television receiver 5 receives terrestrial television broadcasts and Usui's IRD 4 receives satellite broadcasts. Ex. 1012 at 2:27-34, 3:9-10, 7:36-44, Fig. 1. Figure 1 of Usui illustrating his system is reproduced below:



Ex. 1012, Fig. 1.

186. One problem addressed by Usui is that the TV 5 and the IRD 4 separately receive program guide data for programs received by each system, and that the user has to separately search each program guide to find a specific program the user is interested in watching. Ex. 1012 at 1:13-63. Usui provides a solution to this problem by combining the separate program guides (Fig. 13 (IRD EPG), Fig. 14 (TV EPG) into a single integrated program guide (Fig. 12). *Id.* at 1:66-2:16, 12:32-38, 13:35-43, 16:20-40, Figs. 12-14 (reproduced below), Fig. 18. The processes for storing and integrating the program guides is described with respect to Figures 7-8 and 10-11. *Id.* at 8:19-10:5, 10:26-62, 12:6-13:35, Figs. 7-8, 10-11.

FIG. 12

	9:00	10:00	11:00
LOCAL A			
LOCAL B			
LOCAL C			
CNN			
MTV			
M!			

CURSOR

FIG. 14

	9:00	10:00	11:00
LOCAL A			
LOCAL B			
LOCAL C			

FIG. 13

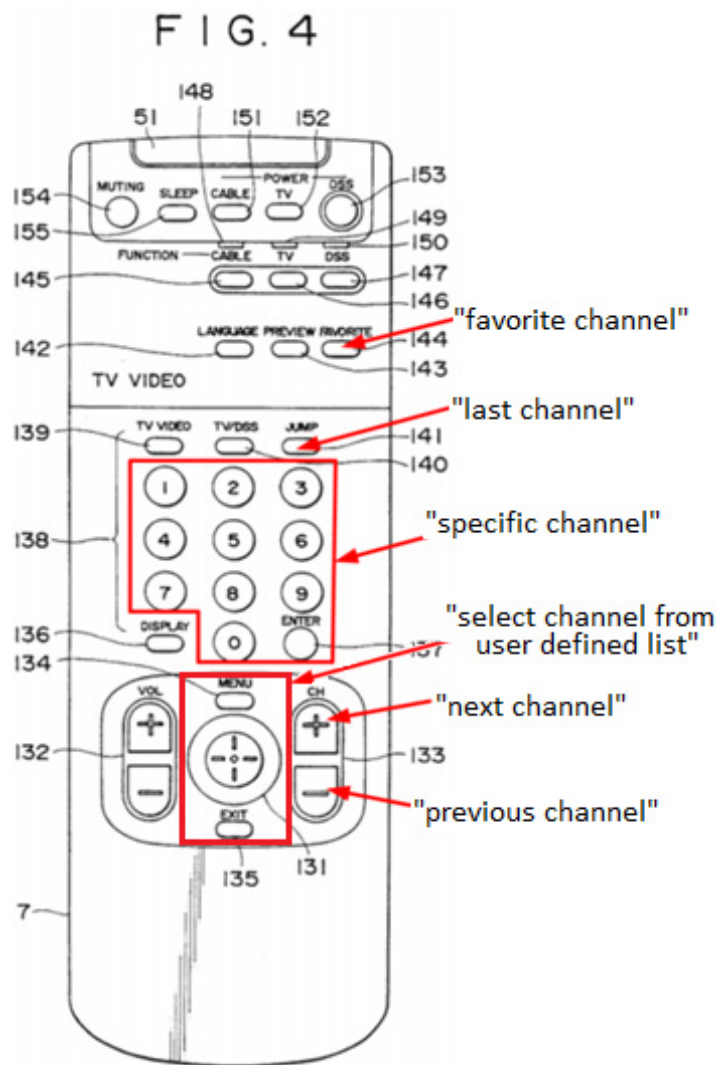
	9:00	10:00	11:00
CNN			
MTV			
M!			

Ex. 1012, Figs. 12, 13, and 14.

187. Given the processes disclosed by Usui for storing and integrating the program guides, the user may specify conditions about which EPG data is stored and displayed. *Id.* at 9:7-40, 12:55-13:18. For example, the user may specify that the stored or displayed EPG data includes a “predetermined channel,” “programs pertaining to a predetermined category,” a “predetermined program,” or a “program of [a] specified actor or actress.” *Id.* at 8:8-15, 9:22-40, 13:11-18. Usui’s EPG with such user specified programs is an example of the claimed “user define[d]” list, and thus a user selecting a program from this EPG resulting in a command being generated to select the program is an example of the “select channel from user define[d] list” limitation of Element [1E]. *Id.* at 8:8-15, 13:48-14:23.

188. Usui also discloses an infrared remote commander 7 (controller) as illustrated in Figure. 4 for controlling the devices in the system shown in Figure 1 to select programs from the integrated EPG. Ex. 1012 at 6:18-7:3, 15:50-16:39, Figs.

4, 12, 18. When the buttons on remote commander 7 are operated, an infrared signal representing the activated operation is generated, and the IRD 4 element receives the signal and outputs a command according to the signal. *Id.* at 15:60-67. Figure 4 showing Usui's remote commander 7 is annotated below to identify the buttons that generate each of the command types required by Element [1E]: "[a] last channel selection command, [b] next channel selection command, [c] previous channel selection command, [d] favorite channel selection command, and [e] select channel from user define[d] list." Ex. 1001 at 63:2-16 (identifiers [] added, noting that disclosure of select channel command [e] was addressed in Par. 187 above):



Ex. 1012, Fig. 4 (annotated).

189. In particular, Usui's jump button 141 "is operated to return to the channel number prior to the change" (Ex. 1012 at 6:61-63), thus disclosing command (c) the claimed "previous channel selection command;" his channel up/down button 133 "is operated to increment or decrement the number of the received broadcasting channel" (Ex. 1012 at 6:33-35), thus disclosing to the claimed "next channel selection command" (a) and the "previous channel selection

command” (b); and his favorite button 144 “is operated to select a favorite channel that has been previously entered” (Ex. 1012 at 7:1-3), thus disclosing the claimed “favorite channel selection command.” The disclosures of Usui I identified above meet all of the channel selection commands required by Element [1E].

190. In my opinion a PHOSITA would have been motivated to apply Usui’s teaching of an integrated and user defined EPG to Hicks’s BMG and then add the specific types of channel selection commands disclosed for Usui’s remote commander to the Hicks remote control 305, thereby providing the user of the Hicks system with an improved way to select channels of interest.

191. The Usui and Hicks systems are quite similar in that both Usui’s television receiver 5 and Hicks’s BMG receive terrestrial television broadcasts, and both Usui’s integrated receiver/decoder (“IRD”) 4 and Hicks’s BMG receive satellite broadcasts. Ex. 1005 at 6:10-16, 8:24-26, Figs. 1-2; Ex. 1012 at 2:27-34, 3:9-10, 7:36-39, 9:7-40, 12:66-13:18, Figs. 3A (61), 5 (221), 11 (S81), Fig. 1. Thus, in my opinion a PHOSITA would have understood that the problem recognized in Usui of receiving separate EPG data from each of his different sources would exist in Hicks and could be addressed in the same way in the Hicks system. To do that, the broadcast program guide implemented by Hicks’s web browser-based GUI could be adapted to integrate EPG data from Hicks’s communication links 11, 22, and 32, and then to present a list of user-specified programs as taught by Usui. Ex. 1005 at

6:8-16, 11:34-47, Figs. 1-2. Such a combination would avoid a user of the Hicks system having to search multiple separate EPGs for a desired program and would list only those programs the user was interested in as determined by the user-specified criteria. Ex. 1012 at 1:52-63, 9:7-40, 12:66-13:18. Accordingly, such a combination would merely be the use of a known technique (Usui's AV system with an integrated and user defined EPG) to improve a similar device (Hicks's BMG receiving programs from multiple sources and presenting a broadcast program guide) in the same way (by modifying Hicks's program guide according to the EPG taught in Usui).

192. In my opinion a PHOSITA would also have been motivated to have the remote control 305 of Hicks include the additional and useful functionality of the remote commander 7 of Usui in order to further allow a user to send a particular channel selection request in a variety of different ways, thereby improving the user's experience. Ex. 1012 at 15:50-16:39. Such a PHOSITA would have known that the remote control of Hicks would provide a greater user experience by having the specific channel-selection types taught by Usui as an easily accessible option for channel selection that was well-known in the art. Such a modification to Hicks would do nothing more than combine well known elements (Hicks's remote controller and Usui's additional remote commander's functionality) according to known methods (integrating Usui's different ways of channel-selection capability

with Hicks's remote controller) to yield predictable results (a user could easily choose which channel to request by a number of easily accessible options provided by the Hicks/Usui remote).

193. In my further opinion, a PHOSITA would have had a reasonable expectation of success in combining Hicks and Usui and the result would have been predictable given the skillset of such a person (*e.g.*, designing, developing, evaluating, testing, or implementing distributed computing systems such as multimedia systems. (*See* Section VI above.)) along with the simplicity of modifying Hicks's BMG to implement the EPG taught by Usui and to modify Hicks's client STBs to use Usui's remote commander 7. Hicks's client STBs can already be controlled with a wireless IR signal from a remote control, so using Usui's remote commander 7 that outputs an IR signal would merely require reprogramming Hicks's client STBs and BMG to receive the specific additional command instructions generated Usui's remote commander 7, each of which results in a specific channel change, something the Hicks system already can perform. Ex. 1005 at 9:22-48, 11:20-48, 16:59-17:12. Similarly, receiving, integrating and tailoring EPG data according to the teachings of Usui to present those data in Hicks's BMG would merely require a change to the programming of the processor in the BMG. *Id.* Such reprogramming would be well within the capability of a PHOSITA as I defined it in Section VI above.

194. Thus, in my opinion, a person of ordinary skill in the art would have understood that Hicks combined the teachings of Usui discloses Element [1E].

vi. Element [1F]

wherein the receiving the plurality of channel selection commands further includes monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one or the plurality of channel selection commands, and decoding, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands

195. In the ITC proceeding, Patent Owner has proposed that the term “shared bus” should be construed as the “bus within the multimedia server,” and Petitioner proposed that the term should be construed as a “bus within a multimedia server used for data transfer between components of the multimedia server.” Ex. 1023 at 7. The Administrative Law Judge in the ITC adopted a hybrid of both of these: “a box [*sic: bus*] located within a multi media server, that is shared by components of that multi media server.” Ex. 1021 at 61:6-62:2.

196. In the ITC proceeding, Petitioner also proposed that the term “identify[ing] a data [frame/packet] at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection [commands/requests]”

should be construed as “determining without decoding, that the [frame/packet] at one of the specific time intervals contains at least a portion of a channel selection [command/request],” and Patent Owner proposed that the term “should be construed as “plain and ordinary meaning, which is “determin[e/ing] that a data [frame/packet] at one of the specific time intervals contains at least a portion of one of the plurality of channel selection [commands/requests].” Ex. 1023 at 7. The Administrative Law Judge adopted the following construction: “determin{E/ING}, that a data {frame/packet} at one of the specific time intervals contains at least a portion of one of the plurality of channel selection {commands/requests} without recapturing be *[sic]* at least a portion of one of the plurality of channel selection {commands/requests} via decoding.” Ex. 1021 at 62:3-63:10.

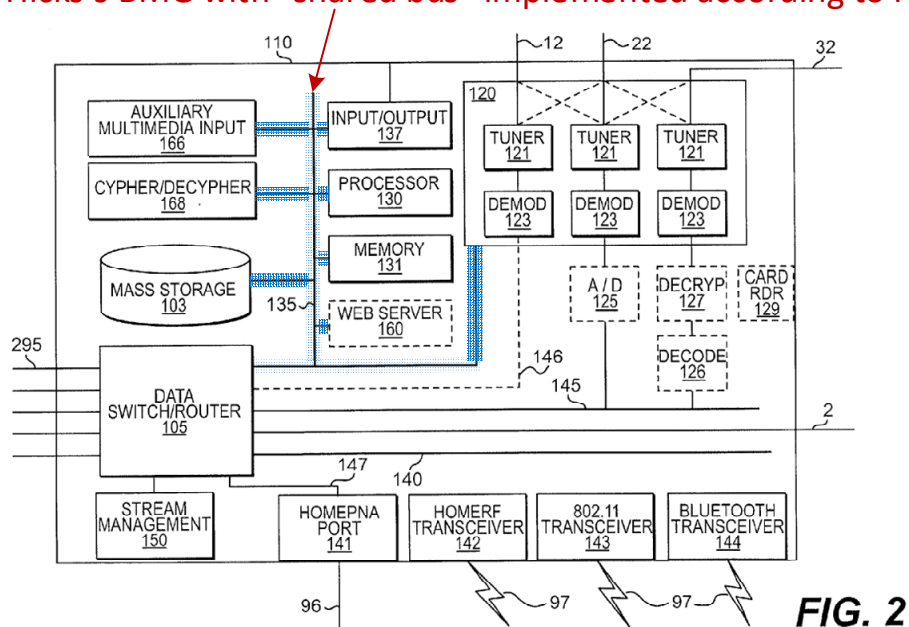
197. It is my opinion that Hicks in view of PCI (Ground 1) and Hicks in view of PCI and Usui (Ground 2), teach this limitation under all of these claim constructions.

198. As I explained above with respect to Element [1D] (*see* Section IX.B.1.a.iv above), Hicks discloses the claimed “channel selection commands” in two ways: (1) as instructions sent from data switch 105 to processor 130 which identify the broadcast channels requested by the client devices, and (2) as instructions sent from processor 130 to signal processing circuit 120 for controlling its tuners and demodulators to tune/demodulate the broadcast channels requested by

the client devices. Ex. 1005 at 4:21-50, 8:38-60, 11:20-12:51, Figs. 2, 6. Both of these data transactions that include the “channel selection commands” occur over Hicks’s “system data bus” (the claimed “shared bus”).

199. Hicks’s “system data bus” is shared by several components internal to the BMG in order to connect the BMG’s processor to its tuners and data switch/router, and thus, is a “bus within the multimedia server” and a “bus within a multimedia server used for data transfer between components of the multimedia server” as Petitioner and Patent Owner have contended in the ITC, and “a box [*sic: bus*] located within a multi media server, that is shared by components of that multi media server” as the Administrative Law Judge has construed is required of a “shared bus.” Ex. 1005 at 8:43-60, 9:22-32, 11:48-12:51, Fig. 2 (annotated below), Fig. 6; Ex. 1021 at 61:6-62:2; Ex. 1023 at 7. An example of Hicks’s processor connected to the shared bus is described as being “an Intel Pentium® III processor” that executes instructions stored in memory 131 to control the BMG. Ex. 1005 at 9:23-35.

Hicks's BMG with "shared bus" implemented according to PCI



Ex. 1005, Fig. 2 (annotated).

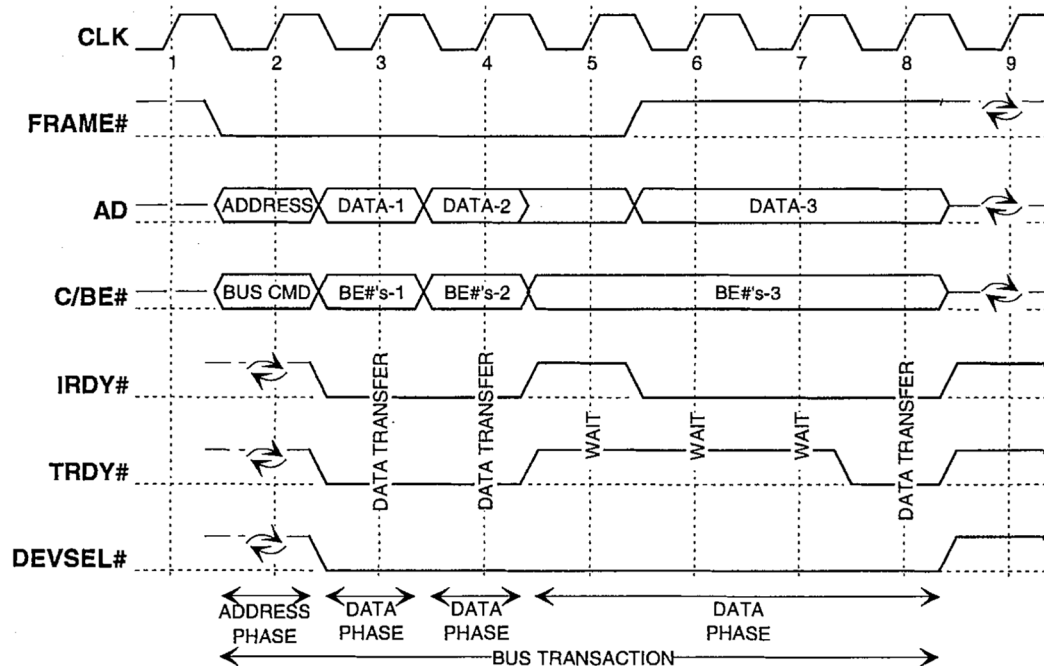
200. In my opinion a PHOSITA would have understood that Hicks's "system data bus" (the "shared bus" of Element [1F]) uses a data conveyance protocol implemented on the bus, and devices receiving data over the bus (*e.g.*, processor 130 in the first transaction noted above and signal processing circuit 120 in the second transaction noted above) would perform "monitoring [the] shared bus at specific time intervals" to identify and decode the data in order to "recapture at least a portion of the one of the plurality of channel selection commands" as required by Element [1F]. Ex. 1005 at 8:47-54, 12:38-44. Any component connected to the Hicks system's data bus would perform these functions because such components (including the exemplary Intel Pentium® III processor disclosed in Hicks (Ex. 1005) at 9:22-25) were synchronous digital systems that performed operations according

to a defined clock (*e.g.*, at periodic intervals). Ex. 1005 at 9:23-35; *see, e.g.*, Ex. 1006 at 24.

201. An example of such a system data bus compatible with and often implemented in conjunction with an Intel Pentium processor was (and still is) PCI bus that I introduced in Section VIII.C.6.d above. Ex. 1006 at 283; Ex. 1028 at 44-45, 48-51. The PCI standard describes a synchronous bus architecture with all data transfers being performed relative to a system clock (“CLK”). Ex. 1006 at 24 (“Synchronous bus with operation up to 33 MHz or 66 MHz”), 46 (“All signals are sampled on the rising edge of the clock.”). The PCI standard further describes that a bus transaction consists of an address phase (a header section) followed by one or more data phases (a data section) with “[a]ddress and data[] multiplexed on the same PCI pins.” Ex. 1006 at 28, 29, and 46-48 (all showing a 32-bit bus identified as AD[31::00]).

202. The PCI bus performs transactions using “frames” of data as indicated by the FRAME# signal which is controlled by a bus master “to indicate the beginning and end of a transaction.” Ex. 1006 at 46. In its Sections 3.3.1 and 3.3.2, the PCI standard describes a “read transaction” and a “write transaction” on the shared PCI local bus that move data from a target device (initiator) to a master device (a read transaction) and from the master device to the target device (a write transaction), respectively. *Id.* at 67-69. Figure 3-6 of the PCI standard (copied

below) illustrates the timing of signals on the shared PCI bus for a basic write transaction.



Ex. 1006, Fig. 3-6. Figures 3-5 of PCI (not shown) includes an example of a read transaction having similar timing. Ex. 1006 at 67.

203. As I explained immediately above, devices on the PCI bus sample the bus signals on the rising edges of the CLK signal (the “monitoring” of Element [1F]), which in the timing diagram copied above are enumerated as 1 through 9. Ex. 1006 at 46, 68. The bus transaction (the “data frame” of Element [1F]) is delineated by the FRAME# signal, which starts on the first rising edge of the CLK signal after FRAME# changes from HIGH to LOW (clock edge #2 in the timing diagram). During that transaction, an address (clock edge #2, “Address Phase”) and a sequence of data values (clock edges #3-#8, “Data Phase[s]”) are time multiplexed to form

the AD bus signals (which are actually 32 signals in parallel on the 32-bit PCI bus). *Id.* at 46, 67-69.

204. The address value identifies a target device and a memory or register location within the target device into which to store the data (during a write transaction) or from which to retrieve the data (during a read transaction). *Id.* at 42-43, 46-47, 67-68. “[E]ach potential target compares the address with its Base Address register(s) to determine if it is the target of the current transaction. If it is the target, the device asserts DEVSEL# to claim the access.” *Id.* at 47, 108.

205. For each data phase, the IRDY# signal is driven by the master to indicate when data is ready for transfer, and the TRDY# signal is driven by the target to indicate that it is ready to receive the data. *Id.* at 46; Ex. 1011 at 2:13. The C/BE# signal (actually four signals (*Id.* at 49 referring to C/BE[7::4])) identifies the type of command (*e.g.*, a read or a write) during the address phase, and identifies which signals on the AD bus are valid during the data phases (*e.g.*, for a target that only uses the first 16 AD signals (0 through 15), the C/BE# signals will indicate that AD signals 16 through 32 are not valid). *Id.* at 41, 48, 67.

206. The end of each data frame is initiated by the FRAME# signal changing from LOW to HIGH to indicate that the data value on the AD bus is the last data value of the frame (clock edge #6 in the timing diagram shown above). *Id.* at 46-47, 67-68. Each bus transaction ends when the last data value is read by the receiving

device, as indicated by the TRDY# signal going LOW (clock edge #8 in the above timing diagram). *Id.*

207. Knowing the PCI bus's operations, in my opinion a PHOSITA would have understood that the system data bus within the BMG of the Hicks system encompasses a shared bus that supports functionality such as the read and write transactions over that bus. In my opinion the PCI standard would have been very well-known to a PHOSITA due to its popularity with the Pentium processor. The PCI bus was widely-deployed at the time the '855 patent was filed. *See*, for example, Ex. 1010 at 1. In my opinion a PHOSITA would have further understood that the Hicks system, by implementing the system data bus according to the PCI standard (the claimed "data conveyance protocol"), would have the Hicks processor operating as a PCI master device, and the data switch and signal processing circuit 120 (including the tuners/demodulators) each operating as PCI target devices, would monitor that bus at the rising edges of the CLK signal (the claimed "monitoring a shared bus at specific time intervals") to identify data frames carrying the channel selection instructions from data switch 105 to processor 130, and from processor 130 to signal processing circuit 120 according to the FRAME# signal and according to the AD signals indicating (during the address phase) the addresses assigned to each device (the claimed "identifying a data frame at one of the specific time intervals that contains at least a portion of one or the plurality of channel selection commands")

of Element [1F]). Ex. 1006 at 42-43, 46-47, 67-68; Ex. 1005 at 4:21-50, 8:38-60, 11:20-12:51, Figs. 2, 6.

208. Thus, using the PCI bus, Hicks's processor 130 would receive the channel selection commands from data switch 105, and signal processing circuit 120 would also receive the channel selection commands from processor 130 (*see* Section IX.B.1.a.iv above (Element [1D])), by reading the data on the AD bus during the data phases of the frames as indicated by the TRDY# signal (the claimed "decoding, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands" of Element [1F]). Ex. 1006 at 46-47, 67-68. In my opinion, a PHOSITA would know that Hicks in combination with the PCI standard thus discloses Element [1F].

209. Hicks's processor 130 and signal processing circuit 120 would also identify the frames of data carrying the channel selection commands by interpreting the address during the PCI address phase before receiving (and thus before decoding) the data, recapturing the channel selection commands during the PCI data phases before decoding the data, and thereafter decoding the data to identify the channel selection commands. Ex. 1006 at 46-47 ("All signals are sampled on the rising edge of the clock."). Thus, Hicks's processor 130 and signal processing circuit 120, when connected to the shared bus implemented according to PCI, would perform

“determining without decoding, that the [frame] at one of the specific time intervals contains at least a portion of a channel selection [command/request]” and perform “determin[ing] that a data [frame] at one of the specific time intervals contains at least a portion of one of the plurality of channel selection [commands/requests]” as Petition and Patent Owner respectively proposed, and “determin{E/ING}, that a data {frame/packet} at one of the specific time intervals contains at least a portion of one of the plurality of channel selection {commands/requests} without recapturing be [sic] at least a portion of one of the plurality of channel selection {commands/requests} via decoding” as adopted by the Administrative Law Judge, was required by Element [1F] at the ITC. Ex. 1021 at 62:3-63:10; Ex. 1023 at 7-8.

210. As I also noted above, in my opinion a PHOSITA would have known that the PCI standard disclosed a shared bus architecture compatible with and often implemented with an Intel Pentium processor. Ex. 1006 at 283 (identifying “Pentium” under Base Class 0Bh); Ex. 1028 at 44-45 (“In 1997, all Pentium processor class or higher systems had PCI slots”), 48-51.

211. I also believe that a PHOSITA would have been motivated to implement Hicks’s bus functionality as set forth in the PCI standard since the PCI was a widely deployed “industry standard”, including in off-the-shelf equipment, and yielded predictable results (e.g., a shared bus that operates effectively by following a well-known specification for a shared bus). Ex. 1010 at 1-3, 9 (“PCI’s

success gave birth to multiple PCI-related standards. These standards build upon PCI technology and leverage it for the benefit of other areas for which normal PCI cards are unsuitable.”); Ex. 1028 at 44-45, 48-51.

212. In my further opinion, a PHOSITA would have recognized and been motivated to implement Hicks’s system data bus by using the PCI standard as I explained above to provide interoperability with that system’s processor, data switch, and tuners/demodulators, because it was known at the time that the Pentium III processor disclosed in Hicks was compatible with the PCI local bus. Ex. 1005 at 9:22-25; Ex. 1006 at 113 (referring to “x86”, which identifies the bus architecture of a family of Intel processors including the Pentium III.”) Ex. 1006 at 225, 228-229, 283; Ex. 1010 at 1, 6 (referring to “x86 processors”); Ex. 1028 at 44-45, 48-51. Thus, implementing Hicks’s system data bus by using the PCI standard would have simply been combining prior art elements (the Pentium III processor and the PCI standard) according to known methods (as specified in the PCI standard) to yield predictable results (because the combination was already known and established in the industry).

213. In my further opinion, a PHOSITA would have also understood the PCI bus architecture to be one of a finite set of widely implemented techniques for transmitting information at the time the ’855 patent was filed, and thus, obvious to try. Ex. 1005 at 9:22-35; Ex. 1010 at 1-3, 9 (“PCI’s success gave birth to multiple

PCI-related standards. These standards build upon PCI technology and leverage it for the benefit of other areas for which normal PCI cards are unsuitable.”).

214. I also believe that a PHOSITA would have had a reasonable expectation of success in implementing Hicks's system data bus according to the PCI standard for the same reasons described above—PCI was an “industry standard” widely deployed, including in off-the-shelf equipment, and the use of Hicks’s Pentium III processor with PCI was already known. Ex. 1005 at 9:22-35; Ex. 1010 at 1, 7, 9; Ex. 1006 at 113 (referring to “x86”, which identifies the bus architecture of a family of Intel processors including the Pentium III), 225, 228-229, 283; Ex. 1028 at 44-45, 48-51.

215. Thus, it is my opinion that a PHOSITA would have understood that the combination of Hicks and PCI (Ground 1) discloses Element [1F]. For the same reasons, it is my opinion that a PHOSITA would have understood that the combination of Hicks and PCI further combined with Usui (Ground 2) as I explained above in Section IX.B.1.a.v and with respect to Element [1E]) also discloses Element [1F].

vii. Element [1G]

**selecting a channel of the plurality of channels per
channel selection command of the plurality of channel
selection commands to produce selected channels**

216. In my opinion Hicks also discloses this element by disclosing that the

television channels selected by the user at the client STBs (the thin-client STBs) will be selected by the multimedia server (the BMG) in accordance with the user's channel selection command(s) to produce the selected channels for delivery to the client set top boxes (the thin-client STBs). Ex. 1005 at Abstract, 2:16-27, 3:14-67, 6:1-50, 10:54-11:34. *See* the following disclosure from Hicks:

For example, to view broadcast video content, a consumer can use an infrared remote control to select the content that he or she wants to view by utilizing a broadcast program guide, a search function, entering a channel number, and so on. After the consumer makes a selection, the thin-client digital STB communicates with the BMG requesting that the digital multimedia content be delivered to the digital STB. **When the consumer selects playing of a broadcast satellite television channel, for example, the BMG can tune a demodulator/tuner to the selected broadcast channel and begin streaming the selected MPEG video stream through the Ethernet switch and over the twisted pair wiring to the digital STB where the video stream is decoded and displayed on the TV.**

Ex. 1005 at 4:21-50 (emphasis added).

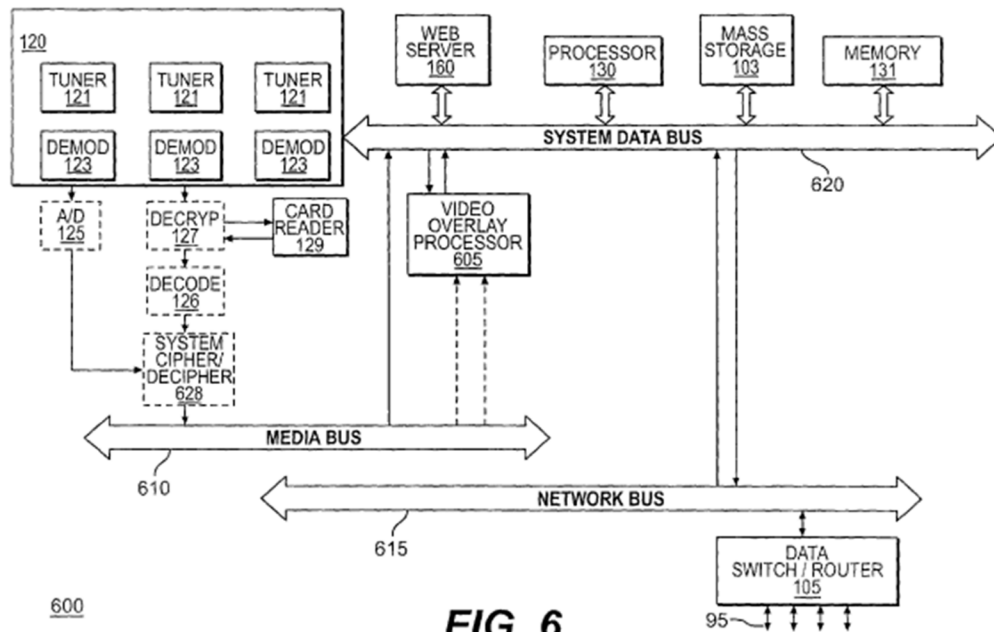
The digital data switch receives an instruction to send a second information signal from the second information appliance via the second broadband communications link (box 440), and sends the instruction to send a second

information signal to a processor (box 445). **The processor sends a select second transmission instruction (e.g., to the multichannel tuner) (box 450). The second transmission signal of the plurality of transmission signals is selected (e.g., by the multichannel tuner) (box 455), and demodulated to isolate a second information signal (box 460). The second information signal is sent to the digital data switch (box 465), and the digital data switch sends the second information signal to the second information appliance via the second broadband communications link (box 470).**

Ex. 1005 at 12:38-51 (emphasis added).

217. As I explained above with respect to Element [1D] (*see* Section IX.B.1.a.iv), Hicks discloses the claimed “channel selection commands” in two ways: (1) as instructions sent, from data switch 105 to processor 130 (*e.g.*, Figure 4, “box 445”), which identify the broadcast channels requested by the client devices, and (2) as instructions sent from the processor 130 to the signal processing circuit 120 (*e.g.*, Figure 4, “box 460”). Ex. 1005 at 4:21-50, 8:24-60, 11:20-12:51, Figs. 2, 6.

218. Figures 2 and 6 of Hicks as shown below detail the system bus of the BMG, which is used send these instructions (the “channel selection commands”). Ex. 1005 at 4:21-50, 8:51-54, 11:48-12:3, Figs. 2, 6.



Ex. 1005, Fig. 6.

219. Following the user-supplied instructions (the claimed “channel selection commands”), the tuners and demodulators in the BMG select the particular broadcast channels requested by the client devices, thus disclosing “selecting a channel of the plurality of channels per channel selection command of the plurality of channel selection commands to produce selected channels” as required by Element [1G]. Ex. 1005 at 4:21-50, 6:1-50, 8:24-9:21, 11:20-12:51, Figs. 2-4, 6.

220. Therefore, in my opinion, a PHOSITA would have understood that Hicks alone discloses Element [1G] under both Ground 1 and Ground 2, since both of those grounds include Hicks.

viii. Element [1H]

encoding each of the selected channels based on the

**data conveyance protocol of the multimedia system to
produce a set of encoded channel data**

221. In my opinion a PHOSITA would find that Hicks in combination with the PCI standard and Hicks in combination with the PCI standard and Usui discloses this limitation. Hicks discloses the following:

In an embodiment, each tuner 121 is coupled to the Ethernet switch via a dedicated connection to the Ethernet switch (*e.g.*, a first tuner 121 is coupled to a first switch port of data switch/router 105 via a dedicated communications link 146, a second tuner 121 is coupled to a second switch port of data switch/router 105 via another dedicated communication link). **In another embodiment, each tuner 121 is coupled to data switch/router 105 via a shared communications link, such as shared Ethernet communications link 145, or a shared system bus 135.**

Ex. 1005 at 8:38-47 (emphasis added).

FIG. 6 illustrates another embodiment of the present invention. A BMG 600 can include a plurality of buses to interconnect BMG components. For example, the plurality of buses can include a media bus 610, a network bus 615, and a system data bus 620. Media bus 610 can receive information signals (*e.g.*, broadcast signals, multimedia signals, and so on) from signal processing circuit 120. In an embodiment, signal processing circuit 120 and media

bus 610 are coupled via system cipher/decipher [sic decipher] logic 628. **System data bus 620 can be coupled to the media bus 610 to receive information signals (e.g., for storage on mass storage device 103, for sending to information appliances, and so on).** In an embodiment, media bus 610 and system data bus 620 can be coupled to a video overlay processor 605 to support at least in part picture-in-picture operations, picture-in-graphic operations, and other video overlay operations. **System data bus 620 can be coupled to data switch/router 105 via network bus 615 to receive information signals (e.g., real-time information signals), overlaid [sic overlaid] information signals and stored information signals (e.g., stored on mass storage device 103).** Data switch/router 105 can be coupled to a plurality of high bandwidth communications links 95 for transmission of information signals to information appliances.

Ex. 1005 at 11:48-12:3.

222. As I explained above, and as shown in his Figure 6 (reproduced and annotated below), Hicks discloses that the information signals (channels) selected by the tuners/demodulators are communicated over system data bus 620 (and system bus 135 of Figure 2). Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-47, 9:17-21, 11:48-67, Figs. 2, 6.

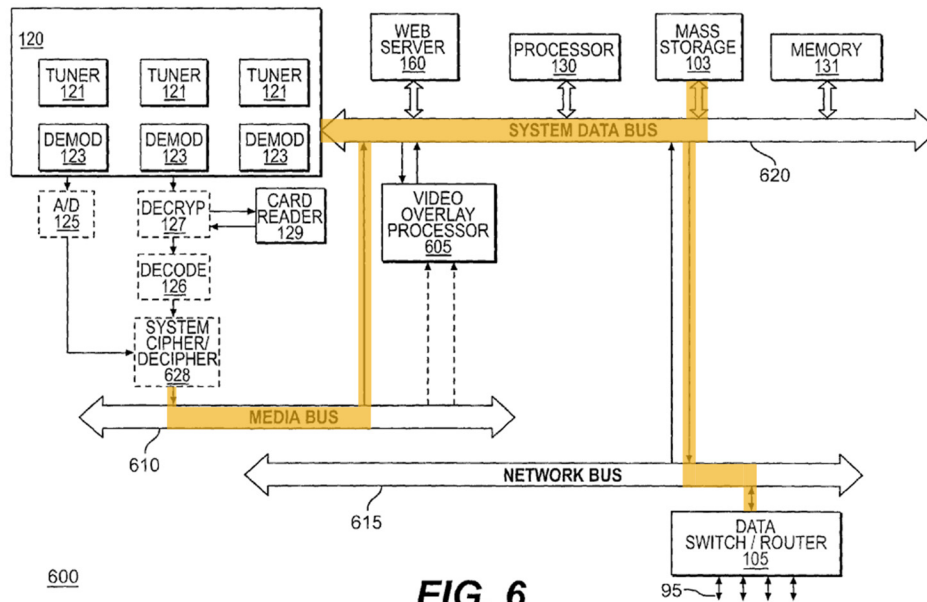


FIG. 6

Ex. 1005, Fig. 6 (annotated).

223. As I explained above (¶¶ 197-215), the combination of Hicks and PCI implements Hicks’s system data bus according the PCI protocol (the claimed “data conveyance protocol”). Ex. 1006 at 42-43, 46-47, 67-68. By utilizing Hicks’s system data bus in the PCI standard, the combined Hicks/PCI system with a PCI bus will encode (using the signal processing circuit 120, A/D 125, decryption circuit 127, decoder 126, etc.) the information signals (“selected channels”) according the PCI read and write cycles, and thus will perform: “encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data.” Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-47, 9:17-21, 11:48-67, Figs. 2, 6; Ex. 1006 at 42-43, 46-47, 67-68, Figs. 3-5, 3-6.

224. Thus, in my opinion, a PHOSITA would have understood that Hicks in

combination with the PCI standard (Ground 1) discloses Element [1H]. For the same reasons, it is my opinion that a PHOSITA would have understood that the combination of Hicks and the PCI standard further combined with Usui (Ground 2) (as described above in Section IX.B.1.a.v with respect to Element [1E]) also discloses Element [1F].

ix. Summary Opinion Regarding Claim 1

225. As explained above, in my opinion a PHOSITA would have found that Hicks in combination with the PCI standard (Ground 1), and Hicks in combination with that standard and Usui (Ground 2) disclose all elements of claim 1 under all proposed constructions of those elements and the two alternate constructions of Element [1E], thereby showing that claim 1 is unpatentable for being obvious under those combinations of references.

b. Dependent Claims 2 and 5 (Grounds 1 and 2)

Claim 2

[2A] The method of claim 1, wherein the processing the plurality of channel selection requests further comprises at least one of:

[2B] interpreting at least one channel selection request to identify at least one client of the plurality of clients and at least one of the channel selection requests of the plurality of channel selection requests;

[2C] authenticating a client of the plurality of clients that provides a specific channel selection request; and
[2D] authenticating the specific channel selection request.

Claim 5

[5A] The method of claim 1, wherein the receiving the plurality of channel selection commands further comprises at least one of:

[5B] decrypting each of the plurality of channel selection commands; and

[5C] decompressing each of the plurality of channel selection commands.

226. It is my additional opinion that Hicks in view of PCI (Ground 1), and Hicks in view of PCI and Usui (Ground 2) disclose dependent claims 2 and 5. Claims 2 and 5 depend from claim 1, thereby incorporating all elements of claim 1. I explained my opinion that a PHOSITA would find that the references identified for Ground 1 and Ground 2 make claim 1 unpatentable in Section IX.B.1.a above. Claim 2 requires only one of Elements [2B]-[2D] and claim 5 requires only that Element [5B] or [5C], be performed.

227. As I explained above for Element [1C], in Hicks, a user at a thin-client digital STB selects a channel and the thin-client digital STB then communicates a request that the selected channel be delivered to the STB. Ex. 1005 at 3:54-64, 4:21-

44 (“a consumer can ... select the content ... by utilizing a broadcast program guide, a search function, entering a channel number, and so on ...[T]he thin-client digital STB communicates with the BMG requesting that the digital multimedia content be delivered to the digital STB.”), 11:20-47 (“Remote control 305 can select programs to be displayed that are being transmitted by a CATV system, a DBS TV system, a terrestrial TV system.”), 12:38-41, 15:10-12. This communication thus identifies the channel to be delivered and the particular client digital STB that the digital multimedia content should be delivered to. *Id.*

228. The BMG receives this instruction at the digital data switch, processes the instruction to control the tuners/demodulators to extract the channel, and sends the channel back to the STB that requested it. Ex. 1005 at 3:54-64, 4:38-44; 12:38-41 (“The digital data switch receives an instruction to send a second information signal [and] sends the instruction ... to a processor ... The processor sends a select second transmission instruction (*e.g.*, to the multichannel tuner) ... The second information signal is sent to the digital data switch ... and the digital data switch sends the second information signal to the second information appliance via the second broadband communications link”), 15:10-12. By sending the channel to the client in response to the instructions, the BMG thus performs the steps of Elements [2A] and [2B] requiring that, “wherein the processing the plurality of channel selection requests further comprises at least one of: interpreting at least one channel

selection request to identify at least one client of the plurality of clients and at least one of the channel selection requests of the plurality of channel selection requests.”

229. With respect to Elements [2C] and [5B], Hicks discloses:

Within the digital residential entertainment system, the primary broadband data network can be supplemented and extended by the addition of plug-in modules for other lower bandwidth data networking technologies, such as Home Phoneline Networking Alliance (HomePNA) Version 2.0, HomeRF Shared Wireless Access Protocol (Home RF SWAP), **IEEE 802.11**, Bluetooth, and other similar technologies. For example, HomePNA Version 2.0 allows for the multiplexing of 10 Mbps of data over existing phone wiring in the home without interfering with analog telephony services operating over the same telephone wiring. HomeRF, **IEEE 802.11** and Bluetooth **are wireless data, or voice/data, technologies. Within the digital residential entertainment system, HomePNA, HomeRF, IEEE 802.11 and Bluetooth can principally be used for transmitting lower bandwidth multimedia content, such as audio content,** as opposed to entertainment quality audio-video transmitted over the primary broadband data network.

Ex. 1005 at 3:14-31 (emphasis added).

Examples of wireless lower bandwidth communications links 97 include a HomeRF communications link (*e.g.*,

generated at least in part by a HomeRF transceiver 142), an IEEE 802.11 communications link (*e.g.*, generated at least in part by an IEEE 802.11 transceiver 143), a Bluetooth communications link (*e.g.*, generated by a Bluetooth transceiver 144), and so on.

Ex. 1005 at 7:49-55.

Stream management logic and/or circuitry 150 can be coupled to data switch/router 105. **In an embodiment, the stream management 150 can include a port router, a multiplexer, and overlay processing logic.** The port router can preserve quality of service (QOS) delivery between end points in the home network (*e.g.*, between TVs and the Digital Residential Entertainment System). **The router ensures that the only digital signal sent on the unique network segment pertains to the established session between the designated end point devices.**

Ex. 1005 at 9:62-10:4 (emphasis added).

230. As I explained above, Hicks discloses that the BMG includes an IEEE transceiver 143 used to implement an IEEE 802.11 communication link to transmit lower bandwidth content, such as audio content, to client devices and that Stream Management 150 includes a router that ensures that the digital signal sent between two end points (*e.g.*, the BMG and client STB) pertains to the established session between those two endpoints. Ex. 1005 at 7:45-55, 9:62-10:4. In my opinion,

therefore, a PHOSITA would understand this disclosure as requiring the BMG to authenticate the client STB to which it sends the requested channel, thus disclosing Element [2C].

231. Such a PHOSITA would also understand that IEEE 802.11 is a wireless network protocol in which each station (*e.g.*, thin-client STB) first sets up a session with the access point (*e.g.*, the BMG) by going through an open system or shared key authentication. Ex. 1031 at 1:14-2:20, Figs. 1, 2; Ex. 1034 at 43-44 (“First the station wanting to authenticate with another station sends an authentication management frame containing the sending station's identity. The receiving station then sends back a frame alerting whether it recognizes the identity of the authenticating station.”), 64-68. A PHOSITA would also understand that the IEEE 802.11 standard also teaches to encrypt communications according to the Wired Equivalent Privacy (WEP) encryption/decryption standard. Ex. 1031 at 1:14-2:20 (“Open system authentication method and Shared key authentication method used WEP (wired equivalent privacy)”), Figs. 1, 2; Ex.1034 at 43-44 (“IEEE 802 .11 counters this problem by offering a privacy service option that raises the security level of the 802.11 network to that of a wired network. The privacy service, applying to all data frames and some authentication management frames, is based on the 802.11 Wired Equivalent Privacy (WEP) algorithm that significantly reduces risks if someone eavesdrops on the network”), 64-68.

232. Thus, in the Hicks system, the BMG receives a channel selection request from a client device connected by the wireless 802.11 communication link only after the client device has been authenticated and a session established. Ex. 1005 at 7:45-55, 9:62-10:4; Ex. 1031 at 1:14-2:20, Figs. 1, 2; Ex. 1034 at 43-44, 64-68. As such, Hicks discloses the steps of Elements [2A] and [2C] requiring that, “wherein the processing the plurality of channel selection requests further comprises at least one of: ... authenticating a client of the plurality of clients that provides a specific channel selection request.” Moreover, the channel selection request would be encrypted according to the WEP standard, thus disclosing the steps of Element [5B] requiring “decrypting each of the plurality of channel selection commands.”

233. With respect to the step of Element [2D], Hicks further discloses that:

Encryption of multimedia content can ensure that proprietary and/or copyrighted material is protected as it is transmitted across the residential broadband data network. **Conditional access systems (“CAS”) using smartcard technology, such as those manufactured by NagraCard S.A. of Cheseaux, Switzerland and NDS Group PLC of the United Kingdom, can be integrated in the entertainment system.**

Ex. 1005 at 4:4-11 (emphasis added).

The signal processing circuit 120 can also be coupled to a decryption circuit/logic 127 that can decrypt and/or

unscramble an encrypted and/or scrambled information signal, and a decoder 126 that can convert a digital information signal from one digital format to a second digital format. **In a further embodiment, the decryption circuit/logic 127 is coupled to a smartcard reader 129 to support CAS functionality.**

Ex. 1005 at 8:60-67 (emphasis added).

BMG 110 can also include input/output logic and devices.

...

Input/output can also include a smart card reader/writer that can in part **control access** to pay-per-view services, **limit access to types of programs or channels**, and support debug operations. Smart cards are typically a credit card-sized card that contain a microprocessor, memory, and a battery. **They can store electronic keys, user profiles, user identifiers, access rights, financial information, and other data.** Debug operations can be integrated as a base operation in the system service applications. Only authorized and ultimately authenticated smart cards inserted into the entertainment system (*e.g.*, into card reader 129, coupled to the input/output) can open locally accessible debug operations. **“Consumer” smart cards are authorized for services designed and developed for entertainment content delivery. Thus, an embodiment of the present invention has real-time**

pay-per-view and multimedia delivery support. In a further embodiment, pay-per-view events can be authorized at least in part with a CAS smartcard device.

Ex. 1005 at 10:18-53 (emphasis added); *also see* Ex. 1005 at 1:54-62, 9:33-44, 13:15-22, 18:39-41.

234. As shown in the excerpts above, Hicks discloses that the BMG may have a card reader coupled to input/output logic (input/output 137 of Fig. 2) in which “Consumer” smart cards “store electronic keys, user profiles, user identifiers, access rights” etc., can be inserted to “control access to pay-per-view services, limit access to types of programs or channels.” Ex. 1005 at 10:35-53. Thus, a PHOSITA would understand that Hicks’s BMG also determines whether a request can be supported based on access rights determined by a smart card. Ex. 1005 at 1:54-62, 4:4-11, 8:60-67, 9:33-44, 10:18-53, 13:15-22, 18:39-42; *compare* to Ex. 1001 at 43:17-29. The CAS reads smart cards that include “electronic keys, user profiles, user identifiers, access rights, financial information” and that authorizes these smart cards “for services designed and developed for entertainment content delivery,” which includes “real-time pay-per-view and multimedia delivery support.” *Id.* Thus, according to Hicks when the user has selected a pay-per-view channel or other program or channel for which access is controlled by the CAS in the BMG, the CAS would authorize the channel based on the access rights and other data stored on the

“Consumer” smart card. Hicks thus discloses the steps of Elements [2A] and [2D] requiring that, “wherein the processing the plurality of channel selection requests further comprises at least one of: . . . authenticating the specific channel selection request.”

235. In my further opinion, a PHOSITA, upon reading the Hicks specification, would have recognized that the thin-client digital STB or other information appliance of Hicks, which sends channel selection requests to the BMG, is associated with the client. In my opinion, the PHOSITA would have further recognized that the request to deliver multimedia content to the digital STB would involve an identification of both the client (*e.g.*, by way of the client digital STB) and the channel selection request (*e.g.*, by way of a channel number).

236. Thus, as I explained above, Hicks in combination with the PCI standard (Ground 1), and Hicks in combination with that standard and Usui (Ground 2), disclose all elements of claim 1 under all proposed constructions of those elements, thereby showing that claim 2 is unpatentable for being obvious under those combinations of references.

c. Dependent Claim 3 (Grounds 1 and 2)

The method of claim 1 further comprises:

receiving a second plurality of channels from a second multimedia source.

237. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the '855 patent's dependent claim 3. Claim 3 depends from claim 1, thereby incorporating all elements of claim 1. In my opinion the combination of Hicks and PCI, and the combination of Hicks, PCI and Usui disclose to a PHOSITA the limitations of claim 1 as I explained above in Section IX.B.1.a. In my further opinion a PHOSITA would have found that Hicks discloses the limitation added to claim 1 by claim 3, "receiving a second plurality of channels from a second multimedia source."

238. The claimed "plurality of channels" of Element [1B] corresponds to the plurality of channels available from one of the multimedia sources taught by Hicks, such as from a cable television (CATV) 32, direct broadcast satellite radio 22, terrestrial broadcast TV 12, mass storage 103, terrestrial broadcast radio 11, or broadband data link 2 as I explained above in section IX.B.1.a.ii for Element [1B]. Ex. 1005 at 3:8-13, 3:43-50, 3:54-58, 6:1-42, 6:66-7:31, 8:22-37, 8:44-51, 9:17-21, 12:4-51 (steps 450-470), 12:57-66, 17:60-18:3, 18:50-60, Figs. 1, 2 (11, 22, 32), 4 (steps 450-470). The claimed "second plurality of channels from a second multimedia source" is disclosed in Hicks as the plurality of channels available from a different one of these source. *Id.* For example, the "first multimedia source" may be CATV and the "second multimedia source" may be multimedia received via

direct broadcast satellite radio. *Id.*

239. Hicks further discloses this element with respect to Figure 4. That figure discloses receiving a plurality of transmission signals by the multi-channel tuner in Step 405. Ex. 1005 at 12:4-7 (“A plurality of transmission signals are received (e.g., by a multichannel tuner), and each transmission signal includes an information signal (box 405).”). Figure 4 further includes steps for selecting and demodulating a first transmission signal to isolate a first information signal in Steps 410-435, and selecting and demodulating a second transmission signal to isolate a second information signal in Steps 460 through 470. Since as I explained above, each transmission signal may be from a different one of multiple sources, and each information signal may be a multiplexed composite of a plurality of information signals, the receiving of the first and second information signals shown in Figure 4 correspond, respectively, to the claimed “receiving a plurality of channels from a multimedia source” of Element [1B] and the “receiving a second plurality of channels from a second multimedia source” limitation of claim 3. Ex. 1005 at 6:32-36 (“The information signal can be . . . a multiplexed, composite information signal [that] may contain a plurality of information signals . . .”), 7:12-23(“the switch port may be able to receive four concurrent information signals”), 8:24-26 (“Each tuner can be coupled to one or more communication links, e.g., communication links 12, 22, and 32.”), 12:4-51.

240. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the '855 patent's claims 1 and 3, thereby rendering claim 3 unpatentable for obviousness.

d. Dependent Claim 4 (Grounds 1 and 2)

The method of claim 3, wherein the selecting a channel further comprises:

selecting a channel from either the plurality of channels or the second plurality of channels per each of the channel selection commands, wherein each of the channel selection commands includes identity of the multimedia source or the second multimedia source and identity of the channel.

241. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks and PCI, and the combination of Hicks, PCI, and Usui, disclose all the limitations of the '855 patent's dependent claim 4. In my opinion the combination of Hicks and PCI, and the combination of Hicks, PCI and Usui disclose to a PHOSITA the limitations of claim 1 as I explained above in Section IX.B.1.a. In my further opinion a PHOSITA would have found that Hicks discloses the limitation of claim 4 requiring, "selecting a channel from either the plurality of channels or the second plurality of channels per each of the channel selection commands, wherein each of the channel selection commands includes

identity of the multimedia source or the second multimedia source and identity of the channel.”

242. Claim 4 also depends from claim 3, thereby incorporating all elements of claim 3. I explained above my opinion that a PHOSITA would find that the combination of Hicks and PCI, and the combination of Hicks, PCI and Usui, disclose claims 1 and 3 as I explained in Sections IX.B.1.a above and IX.B.3 below. It is my further opinion that a PHOSITA would have found that Hicks also discloses the limitation added to claims 1 and 3 by claim 4.

243. As I explained above with respect to Element [1C], each user of the Hicks system selects a particular channel, for example, by using remote control 305 that provides “remote control instructions” to their respective thin-client digital STB. The STB then formats those instructions according to the protocol implemented by the in-home network (*e.g.*, the STB embeds the user’s instructions in an Ethernet Frame), and the STB communicates those instructions over the in-home network to the data switch of the BMG server. Ex. 1005 at 4:21-50, 4:59-62, 6:1-42, 7:5-26, 8:22-37, 8:43-54, 11:4-8, 11:20-47, 12:38-51, 15:10-12. In response to receiving the communications from the thin-client digital STB, the data switch in the BMG sends the instructions received from a thin-client digital STB to a processor in the BMG (Step 445 in the flowchart of Figure 4) and the processor sends control signals to the tuner module 120 in the form of “a select second transmission instruction” to

the multichannel tuner (Step 450). Each of the instructions sent from the data switch to the BMG, and from the BMG to tuner module 120, are examples of a claimed “channel selection command[.]” *Id.*

244. In response to the instructions, the Hicks multichannel tuner selects the channel designated by the channel selection command. *Id.* The BMG performs this function for each different user at each different STB, thus disclosing the limitation of claim 4 requiring “selecting a channel from either the plurality of channels or the second plurality of channels per each of the channel selection commands.” Ex. 1005 at 4:25-50, 7:5-26, 8:24-37, 11:20-47, 12:4-51, Figs. 1, 2.

245. Regarding the “wherein” phrase of Element [4A], Hicks discloses that each user may provide instructions to play a particular channel from a particular multimedia source. Ex. 1005 at 4:29-32 (“The Web browser-based graphical user interface may be used to access **broadcast and on-demand** video and audio content and multimedia applications and services.”) (emphasis added), 4:38-47 (“a consumer can use an infrared remote control to select the content that he or she wants to view by utilizing a broadcast program guide, a search function, **entering a channel number**, and so on. . . . When the consumer **selects** playing of **a broadcast satellite television channel**, for example, the BMG can tune a demodulator/tuner to the selected broadcast channel) (emphasis added), 11:26-29 (“Remote control 305 can select programs to be displayed that are being transmitted by a CATV

system, a DBS TV system, a terrestrial TV system.”) (emphasis added).

246. Since each of the instructions from each of the users identifies a specific channel from a source amongst a plurality of sources, and these instructions are forwarded by the STB to the data switch of the BMG, and the data switch forwards these instructions (as a claimed “channel selection command”) to the processor, Hicks discloses the claim 4 limitation of “wherein each of the channel selection commands includes identity of the multimedia source or the second multimedia source and identity of the channel.” Ex. 1005 at 4:21-50, 6:1-42, 7:5-26, 8:22-37, 8:43-54; 11:4-8, 11:20-47, 12:38-51, 15:10-12.

247. Further, each claimed “channel selection command[]”, for example, the instructions from the data switch to the BMG (which are forwarded from the STB), or the “a select second transmission instruction” from the BMG to the tuner module 120, Hicks further discloses the limitation of claim 4 for, “wherein each of the channel selection commands includes identity of the multimedia source or the second multimedia source and identity of the channel.”

248. The BMG’s processor also sends, in response to determining that the user has requested a particular broadcast channel, a transmission instruction (also corresponding to the claimed “channel selection command”) to the BMG’s multi-channel tuners via the bus to tune to and demodulate the particular broadcast channel (the claimed “identity of the channel”). Ex. 1005 at 4:38-50, 11:48-12:51, Fig. 6.

The BMG of Hicks also receives, via the tuner/demodulators, an information signal from a variety of broadcasts (*e.g.*, the multimedia sources), which includes direct digital broadcast satellite TV, digital cable TV (“CATV”), terrestrial broadcast analog and/or digital TV, Intranet, and Internet Sources. Ex. 1005 at 3:14-67, 6:1-42, 6:66-7:31, 8:22-37, 8:44-54.

249. Any pair of these multimedia sources (*e.g.*, the CATV source, the satellite broadcast source, and/or the VOD source) would be the claimed “multimedia source” providing a “plurality of channels” and the claimed “second multimedia source” providing a “second plurality of channels” of claim 4. Thus, the transmission instruction, which as discussed above specifies which information signal to be sent from the BMG’s tuner/demodulator to the BMG’s processor, identifies a multimedia source (*e.g.*, the second multimedia source) and a channel. Ex. 1005 at 3:14-67, 4:38-50, 11:48-12:51, Fig. 6.

250. As I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2), disclose all the limitations of the ’855 patent’s claims 1, 3, and 4, thereby making claim 4 unpatentable for obviousness.

e. Dependent Claim 6 (Grounds 1 and 2)

The method of claim 1, wherein each of the plurality of channels is compressed, wherein the selecting a

channel further comprises:

selecting a group of compressed channels of the plurality of channels per at least one of the plurality of channel selection commands, wherein the group of compressed channels includes the channel.

251. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks in view of PCI (Ground 1), and the combination of Hicks in view of PCI, and Usui (Ground 2) disclose dependent claim 6. Claim 6 depends from claim 1, thereby incorporating all elements of claim 1. In my further opinion the combination of Hicks and PCI, and the combination of Hicks, PCI and Usui disclose to a PHOSITA the limitations of claim 1 as I explained above in Section IX.B.1.a. It is my further opinion that a PHOSITA would have understood that Hicks also discloses the limitation added to claim by claim 6.

252. Hicks explains that a plurality of requests which identify channels selected by the users at the client STBs are received by the BMG, and that the BMG produces the user-selected channels for delivery back to the client STBs. Ex. 1005, Abstract, 2:16-27, 3:14-67; 4:44-50. Producing these user-selected channels involves selecting a group of compressed channels that include a user selected channel:

When the consumer selects playing of a broadcast satellite television channel, for example, the BMG can tune a

demodulator/tuner to the selected broadcast channel and begin streaming the selected MPEG video stream.

Ex. 1005 at 4:44-48.

The demodulator of tuner/demodulator 102 can extract an information signal from the transmission signal. For example, a tuner can pass a transmission signal at a particular frequency to a demodulator, and the demodulator can extract the information signal from the transmission signal. **In such an example, the transmission signal includes a carrier signal and an information signal.** The information signal can be a discrete (*i.e.*, singular) information signal or a multiplexed, composite information signal. **For example, a multiplexed, composite information signal may contain a plurality of information signals where discrete information signals are time-division multiplexed, frequency-division multiplexed, and/or code-division multiplexed.** Accordingly, tuner/demodulator 102 can include a plurality of tuners and/or demodulators to isolate an information signal that is multiply multiplexed (*e.g.*, frequency-multiplexed and time-multiplexed).

Ex. 1005 at 6:26-42 (emphasis added).

253. As shown in the excerpts copied above, Hicks discloses that each selected channel extracted by tuner/demodulator may be an “MPEG video stream,”

and that the BMG may perform MPEG-2 encoding of analog channels, which in my opinion a PHOSITA would understand to be a compressed form of encoded data. Ex. 1005 at 4:44-50, 6:26-56, 7:35-36, 8:54-60, 9:54-57; Ex.1016 at 11-14 (“MPEG is actually an acronym for the Moving Pictures Experts Group which was formed . . . to set standards for audio and video compression and transmission”), 16-22, 32-33; Ex. 1017 at 3-6, 11, 14, 18-24, 41; *see also* Section VIII.C.3 *above*. Hicks thus teaches the element of claim 6 requiring, “wherein each of the plurality of channels is compressed.” Ex. 1005 at 4:44-50, 6:26-42; Ex.1016 at 11-22, 32-33; Ex. 1017 at 3-6, 11, 14, 18-24, 41; *see also* Section VIII.C.3 *above*.

254. As further shown by the excerpts cited above, Hick discloses that each transmission signal that is tuned to and passed to a demodulator (in response to a channel selection command) may include a composite information signal which includes the selected channel (information signal) multiplexed with other information signals (*e.g.*, other selected channels). Ex. 1005 at 4:44-50, 6:26-42 (“The information signal can be a discrete (*i.e.*, singular) information signal or a multiplexed, composite information signal.”).

255. Hicks thus discloses the limitation of claim 6 requiring, “selecting a group of compressed channels of the plurality of channels per at least one of the plurality of channel selection commands, wherein the group of compressed channels includes the channel.”

256. Thus, in my opinion a PHOSITA would have known that the limitations of claim 6 were common knowledge at the time of the purported invention of the '855 patent. As shown below, the '855 patent concedes that a PHOSITA would understand that the selection of a composite signal (as described in Hicks) was typical and utilized compressed MPEG video data that included multiple channels carried on a typical NTSC transmission signal, and that to select a particular channel, multiple compressed channels were retrieved together:

As one of average skill in the art will appreciate, high definition television, satellite receivers, set-top boxes, et cetera typically utilize MPEG video data. As such, in the typical 6 MHz bandwidth for NTSC channel separation, compressed video includes multiple channels in the same frequency band. Thus, when a particular channel is selected from one of these multimedia sources, multiple compressed channels may be retrieved.

Ex. 1001 at 42:31-38.

As one of average skill in the art will appreciate, the incoming video data from a plurality of multimedia sources may be in a variety of video formats including digitized audio MPEG 1, MPEG 2, et cetera, analog format, et cetera.

Ex. 1001 at 49:52-55.

As one of average skill in the art will appreciate, MPEG

encoded video received via a satellite connection, or other type connection, typically includes multiple channels within a typical 6 Mhz band. As such, multiple channels are received within the typical single channel band. As such, the video for the channels in the single channel band are decompressed to retrieve the actual video data.

Ex. 1001 at 51:23-29.

257. Thus, the '855 patent concedes that a PHOSITA would have known that multiple MPEG encoded channels as I explained above would have been encoded in an MPEG-2 Transport streams, a technology which was commercially used at the time of the alleged invention for distributing programming carried in broadcast networks such as those described in Hicks. Ex. 1005 at 6:1-16; Ex. 1016 at 55-61, Ex. 1017 at 11-15. Also, the MPEG-2 transport stream (a sequence of packets) was (and still is) transmitted in a single transmission signal at a particular frequency from the multimedia source, which would be tuned to (selected) and extracted by a tuner device. Ex. 1016 at 55-61.

258. Thus, in my opinion a PHOSITA would have found that the limitation of claim 6 requiring, "selecting a group of compressed channels of the plurality of channels per at least one of the plurality of channel selection commands, wherein the group of compressed channels includes the channel" was taught by Hicks in view of the '855 patent's admitted prior art of receiving multiplexed MPEG data, and in view of a PHOSITA's common knowledge of MPEG at the time of the alleged

invention in 2002.

259. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the '855 patent's claims 1 and 6, thereby rendering claim 6 unpatentable for obviousness.

f. Dependent Claim 7 (Grounds 1 and 2)

The method of claim 6, wherein the encoding further comprises:

encoding the group of compressed channels into packets or frames based on the data conveyance protocol.

260. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks in view of PCI (Ground 1), and the combination of Hicks in view of PCI and Usui (Ground 2) disclose all the limitations of the '855 patent's dependent claim 7. Claim 7 depends from claim 6, thereby incorporating all elements of claim 6. In my opinion, a PHOSITA would have understood that the combination of Hicks and PCI and the combination of Hicks, PCI and Usui teach the limitations of claims 1 and 6 as I explained above in Sections IX.B.1.a and IX.B.1.e. It is my further opinion that a PHOSITA would have understood that Hicks and PCI disclose claim 7. Specifically, Hicks discloses:

When the consumer selects playing of a broadcast satellite

television channel, for example, the BMG can tune a demodulator/tuner to the selected broadcast channel and begin streaming the selected MPEG video stream through the Ethernet switch and over the twisted pair wiring to the digital STB where the video stream is decoded and displayed on the TV.

Ex. 1005 at 4:44-50

In an embodiment, each tuner 121 is coupled to the Ethernet switch via a dedicated connection to the Ethernet switch (*e.g.*, a first tuner 121 is coupled to a first switch port of data switch/router 105 via a dedicated communications link 146, a second tuner 121 is coupled to a second switch port of data switch/router 105 via another dedicated communication link). **In another embodiment, each tuner 121 is coupled to data switch/router 105 via a shared communications link, such as shared Ethernet communications link 145, or a shared system bus 135.**

Ex. 1005 at 8:38-47 (emphasis added).

A BMG 600 can include a plurality of buses to interconnect BMG components. For example, the plurality of buses can include a media bus 610, a network bus 615, and a system data bus 620. Media bus 610 can receive information signals (*e.g.*, broadcast signals, multimedia signals, and so on) from signal processing circuit 120. In an embodiment, signal processing circuit 120 and media

bus 610 are coupled via system cipher/decipher [sic decipher] logic 628. **System data bus 620 can be coupled to the media bus 610 to receive information signals (e.g., for storage on mass storage device 103, for sending to information appliances, and so on).**

Ex. 1005 at 11:49-59 (emphasis added).

261. As explained in these excerpts from Hicks, the information signals (the claimed “group of compressed channels”) are communicated over the shared data bus of the BMG. Ex. 1005 at 8:38-47, 11:49-59. As I explained above, it is my opinion that a PHOSITA will find that the combination of Hicks and PCI and the combination of Hicks, PCI, and Usui disclose Element [1H]’s limitation requiring, “encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data” by encoding the selected channels according to PCI on the system data bus of the BMG. *See* Section IX.B.1.a.viii (citing Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-47, 9:17-21, 11:48-67, Figs. 2, 6; Ex. 1006 at 42-43, 46-47, 67-68, Figs. 3-5, 3-6).

262. Hicks’s PCI bus performs transactions using frames of data as indicated by a FRAME# signal, and thus, the group of compressed channels, which are communicated over the system data bus from the tuners/demodulators 121 and 123 in Figure 2, to the data switch/router 105 for distribution over the network to the thin-client STBs, would be encoded into PCI frames. Ex. 1006 at 42-43, 46-47, 67-

68, Figs. 3-5, 3-6. As such, the combination of Hicks and PCI disclose the limitation of claim 7 requiring, “encoding the group of compressed channels into packets or frames based on the data conveyance protocol.” Further, Hicks discloses that the network uses the Ethernet, IEEE-802.11, and IP protocols, which would also encode the channels into Ethernet frames and IP packets as recited in claim 7. *See* ¶¶ 160-109 above; Ex. 1005 at 5:43-50; Ex. 1030 at 8, 11-12; Ex. 1033 at 37-40, 53, 59-61; Ex. 1034 at 39-40, 68-69 83-88.

263. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the ’855 patent’s claims 1, 6, and 7, thereby rendering claim 7 unpatentable for obviousness.

g. Dependent Claim 8 (Grounds 1 and 2)

The method of claim 1, wherein the encoding further comprises:

packetizing data of each of the selected channels into a packet that includes a header section and a data section, wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number.

264. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks in view of PCI and the combination of Hicks in view of PCI, and Usui disclose all the limitations of the '855 patent's dependent claim 8. Claim 8 depends from claim 1, thereby incorporating all elements of claim 1. In my opinion a PHOSITA would have known that the combination of Hicks and PCI and the combination of Hicks, PCI and Usui disclose the limitations of claim 1 as I explained above in Section IX.B.1.a. In my opinion a PHOSITA would have also understood that Hicks further discloses the limitation added to claim 1 by claim 8.

265. Hicks discloses the BMG, based on the channel selection commands, selecting and encoding analog information signals (channels) into multiple MPEG 2 digital signals (Ex. 1005 at 6:43-56, 8:54-60), communicating the MPEG-2 information signals to information appliances (*e.g.*, STBs) over Ethernet communication links (Ex. 1005 at 9:49-61), storing and playing back the MPEG-2 content to the information appliances (Ex. 1005 at 15:3-12), and the information appliances then being able to play back MPEG-2 content (*e.g.* MPEG Layer 3 content) (Ex. 1005 at 3:58-64, 4:21-25, 7:31-37), as detailed below:

The information signal can be an analog information signal or a digital information signal. When the information signal is an analog information signal, **an analog-to-digital converter can convert the analog information signal to a digital information signal (*e.g.*,**

a Motion Picture Experts Group 2 (MPEG-2) signal). In an embodiment, a BMG can support multiple MPEG2 encoding sessions (*e.g.*, two or more MPEG2 encoding sessions) and handle overlay processing. An example of overlay processing is presenting MPEG2 or other digital information in a multiple layer format. In another embodiment, a service application running on a BMG system can support transparent layers such as, for example, overlaying a Web page on top of a TV program image used for interactive TV services.

Ex. 1005 at 6:43-57 (emphasis added).

In an embodiment, control signals can control the operation of an analog-to-digital converter 125 that can receive an analog information signal (*e.g.*, an National Television Standards Committee (NTSC) TV signal) and output a **digital information signal based at least in part on the analog information signal (*e.g.*, an MPEG-2 digital information signal)**.

Ex. 1005 at 8:54-60 (emphasis added).

Information appliances can be coupled to data switch/router 105 via dedicated high bandwidth Ethernet communications links 295, each of which can be coupled to a respective switch port of data switch/router 105. In an embodiment, each of Ethernet communications links 295 is a CAT 5 or better cable. **High bandwidth Ethernet**

communications links 295 can carry high bandwidth information signals (e.g., digital TV signals, MPEG-2 information signals, HDTV signals, and other audio-video signals). Lower bandwidth information signals (e.g., audio, text, and so forth) can be communicated over lower bandwidth communications links, which can be a dedicated lower bandwidth communication link 147 or a shared lower bandwidth communication link 140.

Ex. 1005 at 9:49-61 (emphasis added).

For example, **a 120 minute movie at an MPEG2 encoded rate of 3.5 Mb/s can comprise a 3.15 gigabyte data file**, and known ADSL services can provide downstream data transmission rates of 1.5 Mbps. Downloading the 120 minute movie over such an ADSL line can take approximately 4.7 hours, and the downloading of the 120 minute to a MODD can be automatically performed in the middle of the night. **Subsequently, a user can request that the movie be played back to an information appliance at the playback rate (e.g., real-time).**

Ex. 1005 at 15:3-12 (emphasis added).

266. In my opinion a PHOSITA would have understood Hicks's above-cited disclosure of encoding (e.g., using A/D 125) and "output[ting] . . . an MPEG-2 digital information signal" to refer to encoding audio and video data according to ISO 13818 which defines the processes used to make an MPEG-2 encoding. Ex.

1005 at 8:58-60; Ex. 1016 at 11-14, 36; Ex. 1017 at 11, 18-19. A block diagram of the MPEG-2 encoding process according to this standard is illustrated in the figure below. Ex. 1016 at 32 (Fig. 1.13). As shown in the figure, uncompressed video and audio data is received and compressed by compressors into an Elementary Stream (“ES”), which are each input to a Packetizer to generate Packetized Elementary streams (“PES”). Ex. 1016 at 32-33, 52-56; Ex. 1017 at 19-20. The PES’s are then combined into one of two types of multiplexed streams: a Program stream (“PS”) or a Transport Stream (“TS”). *Id.*

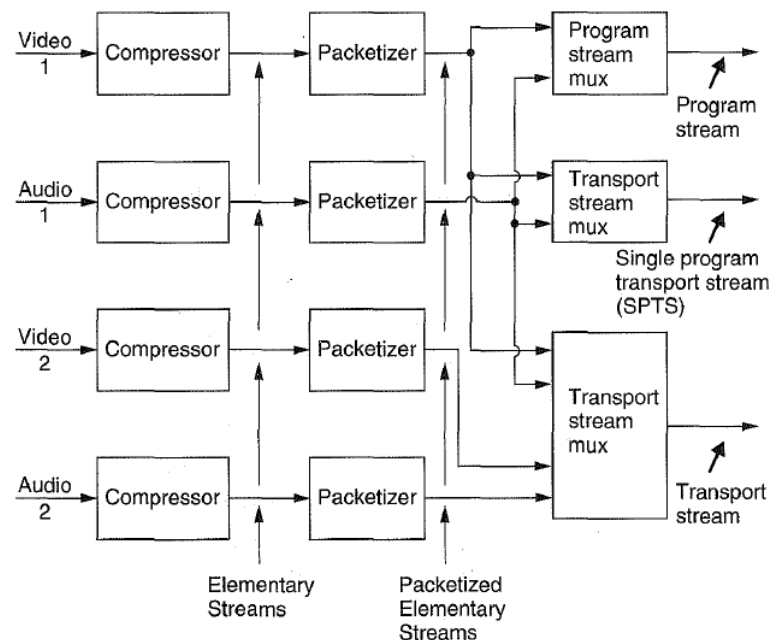


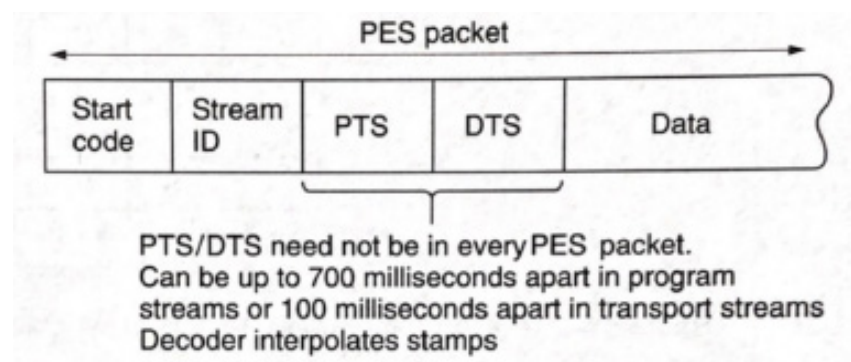
Figure 1.13 The bitstream types of MPEG-2. See text for details.

Ex. 1016 at 32 (Figure 1.13).

267. In my opinion it would have been well known to a PHOSITA at the time of the purported invention that the MPEG-2 PES packets created by the

Packetizers include a header section and a data section. Ex. 1016 at 52-53; Ex. 1017 at 20. Thus, Hicks, which teaches encoding programs according to MPEG-2, would have included generating such packets, and hence discloses claim 8's requirement for, "packetizing data of each of the selected channels into a packet that includes a header section and a data section."

268. In my opinion a PHOSITA would have further known that the header section of each MPEG-2 packet includes at least the type of data of the selected channel. Specifically, each PES packet includes a payload which includes a portion of the compressed audio or video data, and a header, which includes information about the payload. The structure of an MPEG-2 PES packet is illustrated below.



Ex. 1016 at 53 (Figure 6.1).

269. As shown in Figure 6.1, the PES header includes several fields, including a Stream ID that "identifies the type of data stream." Ex. 1016 at 53. For example, audio streams are identified with a Stream ID value of 0xC0-0xDF and video streams are identified with a Stream ID value of 0xE0-0xEF. Ex. 1017 at 37.

Hicks's disclosure of encoding programs according to MPEG-2 thus further discloses claim 8's limitation, "wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number."

270. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI and Hicks in view of PCI and Usui, disclose all the limitations of the '855 patent's claims 1 and 8, thereby rendering claim 8 unpatentable for obviousness.

h. Dependent Claim 9 (Grounds 1 and 2)

The method of claim 8 further comprises:

conveying the packet using at least one of: Carrier Sense Multiple Access (CSMA), CSMA with collision avoidance, and CSMA with collision detection

271. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks in view of PCI and the combination of Hicks in view of PCI and Usui disclose all the limitations of the '855 patent's dependent claim 9. Claim 9 depends from claim 8, thereby incorporating all elements of claim 8. I explained my opinion that a PHOSITA would know that the combination of Hicks and PCI and the combination of Hicks, PCI and Usui teach the limitations of claims 1 and 8 in Sections IX.B.1.a and IX.B.1.g. It is my further opinion that a PHOSITA

would have known that Hicks discloses the limitation added to claims 1 and 8 by claim 9.

272. Hicks discloses:

Information appliances can be coupled to data switch/router 105 via dedicated high bandwidth Ethernet communications links 295, each of which can be coupled to a respective switch port of data switch/router 105. In an embodiment, each of Ethernet communications links 295 is a CAT 5 or better cable. **High bandwidth Ethernet communications links 295 can carry high bandwidth information signals (e.g., digital TV signals, MPEG-2 information signals, HDTV signals, and other audio-video signals).** Lower bandwidth information signals (e.g., audio, text, and so forth) can be communicated over lower bandwidth communications links, which can be a dedicated lower bandwidth communication link 147 or a shared lower bandwidth communication link 140.

Ex. 1005 at 9:49-61 (emphasis added).

273. According to the Hicks citations provided above, the communication links 295 between the BMG and the client STBs are high-bandwidth Ethernet links that can carry MPEG-2 information signals. *Id.* Hicks further discloses that the Ethernet communication links may be (in increasing order of bit speeds) 10Base-T Ethernet, 100Base-T Ethernet, or Gigabit Ethernet through category 5 or better

quality twisted-pair wiring or OC-3 optical fiber. Ex. 1005 at 3:2-5, 3:41-43, 3:58-64, 4:44-50, 5:65-67, 7:41-55, 8:18-20, 8:38-47, 9:49-54. Given that disclosure, in my opinion a PHOSITA would have known that 10Base-T is specified by IEEE standard 802.3i-1990 for use over twisted-pair, 100Base-T Ethernet (also referred to as the “Fast Ethernet”) protocol is specified by IEEE standard 802.3u-1995, and that the Gigabit Ethernet protocol is specified by IEEE standard 802.3ab-1999. Ex. 1028 at 18-29, 24, 25. Each of these protocols implements Carrier Sense Multiple Access (“CSMA”) with collision detection. *Id.* Thus, Hicks’s BMG, which communicates the MPEG-2 packetized data (as I explained above regarding claim 8 in Section IX.B.1.g) to the client STBs via the disclosed Ethernet communication links, performs the added step of claim 9 requiring, “conveying the packet using at least one of: Carrier Sense Multiple Access (CSMA), CSMA with collision avoidance, and CSMA with collision detection.”

274. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1), and Hicks in view of PCI and Usui (Ground 2), disclose all the limitations of the ’855 patent’s claims 1, 8, and 9, thereby rendering claim 9 unpatentable for obviousness

i. Dependent Claim 10 (Grounds 1 and 2)

The method of claim 1, wherein the encoding further comprises:

framing data of each of the selected channels into frame that includes header section and a data section, wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and frame number.

275. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks in view of PCI and the combination of Hicks in view of PCI and Usui disclose the limitations of the '855 patent's dependent claim 10. Claim 10 depends from claim 1, thereby incorporating all elements of claim 1. It is my opinion that a PHOSITA would have understood the combination of Hicks and PCI (Ground 1) and the combination of Hicks, PCI and Usui (Ground 2) to teach the limitations of claim 1 as I explained above in Section IX.B.1.a. It is also my opinion that a PHOSITA would have understood that Hicks discloses the limitation added to claim 1 by claim 10.

276. Claim 10 is generally similar to claim 8 except for the following: (1) several differences in the typographical and grammatical errors, (2) reference to framing data into a frame rather than packetizing data into a packet as in claim 8, and (3) reference to a frame number rather than a packet sequence number as in claim 8. In my opinion, however, a PHOSITA would have understood at the

time of the purported invention that these differences between frames and packets were interchangeable. *See, e.g.*, Ex. 1030 at 10-11 (definition of “Frame”), 17 (definition of “Packet”). Ex. 1043 at 243-244 (using network “frames” and “packets” interchangeably in Figure 7.23 and accompanying description).

277. The '855 patent itself even acknowledges that a PHOSITA would have understood the terms “packet” and “frame to be used interchangeably:

As one of average skill in the art will appreciate, the packets 560, 566 and 572 may also be frames depending on the data conveyance protocol used within the multimedia communication system.

Ex. 1001 at 29:38-42.

While FIG. 17 is illustrated with respect to packetizing the encoded channel data 386, **one of average skill in the art will appreciate that the encoding module 380 may utilize a TDMA concept wherein the encoded channel data 386 is prepared as frames. Accordingly, packets 560, 566 and 572 will be replaced by frames where each frame includes a header section and a data section.** The header section includes one or more of the identity of the selected channel, the type of data of the selected channel, the identity of the multimedia source, an indication as to whether encryption is enabled or disabled, the type of encryption used, an indication as to whether compression is enabled or disabled, an indication of the type of

compression, and a frame number.

Ex. 1001 at 30:16-28 (emphasis added).

While FIG. 18 is illustrated with respect to receiving packets of encoded channel data 386, **one of average skill in the art will appreciate that the packets may be frames of data.**

Ex. 1001 at 31:8-10 (emphasis added).

278. The '855 patent's acknowledgment is consistent with a PHOSITA's understanding that "packet" and "frame" refer to conceptually similar things in this context, and which term is used depends on which specific transmission protocol is used—for example, the term "frame" is used in Ethernet and 802.11, and an "audio frame" and "transport stream packet" is used in MPEG-2. Ex. 1030 at 8, 10-11 (definition of "Frame"), 17 (definition of "Packet"); Ex. 1034 at 68-69; Ex. 1016 at 48, 52-53.

279. Patent Owner's expert, Dr. Mark Jones also considered the terms in the ITC. I reviewed a transcript of Dr. Jones testimony in an ITC hearing held on January 28, 2020. Ex. 1022. According to the transcript, Dr. Jones was asked if he agrees with a statement from Dr. Sandeep Chatterjee (Petitioner's expert): "[t]hat although packets and frames refer to concepts and means of transporting data, a POSITA would understand that either can be used for transmitting information in a network as claimed in the '855 patent, such that disclosures as to one effectively

disclose the other as well.” *Id.* at 1745. In response, Dr. Jones stated that:

“I think it would depend on the context. People use the terms “packet and “frames” often to refer to the same thing. Sometimes people make distinctions. It depends on the context. So I would say, at a high level, yes, they are often used interchangeably, but I don’t know that I could agree with a complete blanket statement. I would really have to see more.”

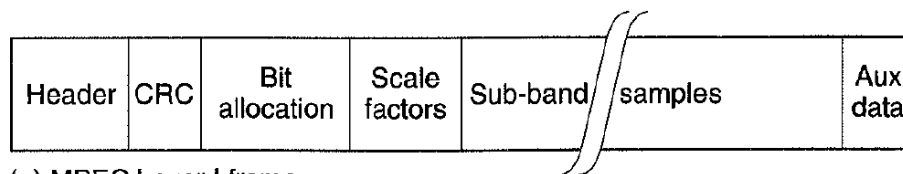
Id. at 1745-1746.

280. Given the ’855 patent’s disclosure that packets and frames are similar (at least in an inventive sense), and the Patent Owner’s expert’s treatment of the terms in the ITC that the terms are “often used interchangeably” (depending on context), in my opinion a PHOSITA would have found that the combination of Hicks and PCI and the combination of Hicks, PCI and Usui render obvious claim 10 for the same reasons I explained in Section IX.B.1.g above with respect to claim 8. Ex. 1001 at 29:38-42, 30:16-28, 31:8-10 (“packets may be frames of data”); Ex. 1030 at 10-11, 17; Ex. 1016 at 243-244.

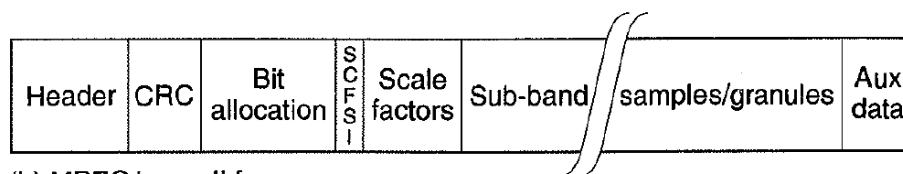
281. As I also explained above with respect to claim 8, Hicks discloses that the BMG selects analog information signals (carried in channels) and encodes (using A/D 125) those analog signals into multiple MPEG-2 digital signals, and that MPEG-2 encoding includes compressing video and audio into elementary streams. Ex. 1005 at 3:58-64, 4:21-25, 6:43-56, 7:31-37, 8:54-60, 9:49-61; Ex. 1016 at 32-

33, 52-56; Ex. 1017 at 19-20. In my further opinion a PHOSITA would have understood that MPEG-2 audio elementary streams are formatted as frames that include a header section and a data section. Ex. 1016 at 41, 48-49. Hicks thus discloses claim 10's requirement for "framing data of each of the selected channels into frame that includes header section and a data section."

282. The Figures below illustrate the organization of MPEG-2 audio frames in the Layer I and II formats respectively.



(a) MPEG Layer I frame



(b) MPEG Layer II frame

Ex. 1043 at 78 (Fig. 4.32); *also see* Ex. 1016 at 49.

283. The header of MPEG audio frames includes various fields that identify the type of data and/or type of compression of the data. These fields include the version (MPEG-1 or MPEG-2) and the layer (Layer 1, 2, or 3) of coding of the audio data, the sampling frequency of the audio data, and the channel mode (*e.g.*, mono, stereo) of the audio data. Ex. 1016 at 48-49; Ex. 1017 at 64. Because Hicks discloses encoding the selected channels (including audio) according to MPEG-2, which

would include the creation of audio frames with headers as I explained above, Hicks discloses claim 10's requirement for "wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and frame number."

284. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui, (Ground 2) disclose all the limitations of the '855 patent's claims 1 and 10, thereby rendering claim 10 unpatentable for obviousness.

j. Dependent Claim 11 (Grounds 1 and 2)

The method of claim 10 further comprises: conveying the frame in accordance with at least one of: a time division multiplexing data conveyance protocol, and frequency division multiplexing data conveyance protocol.

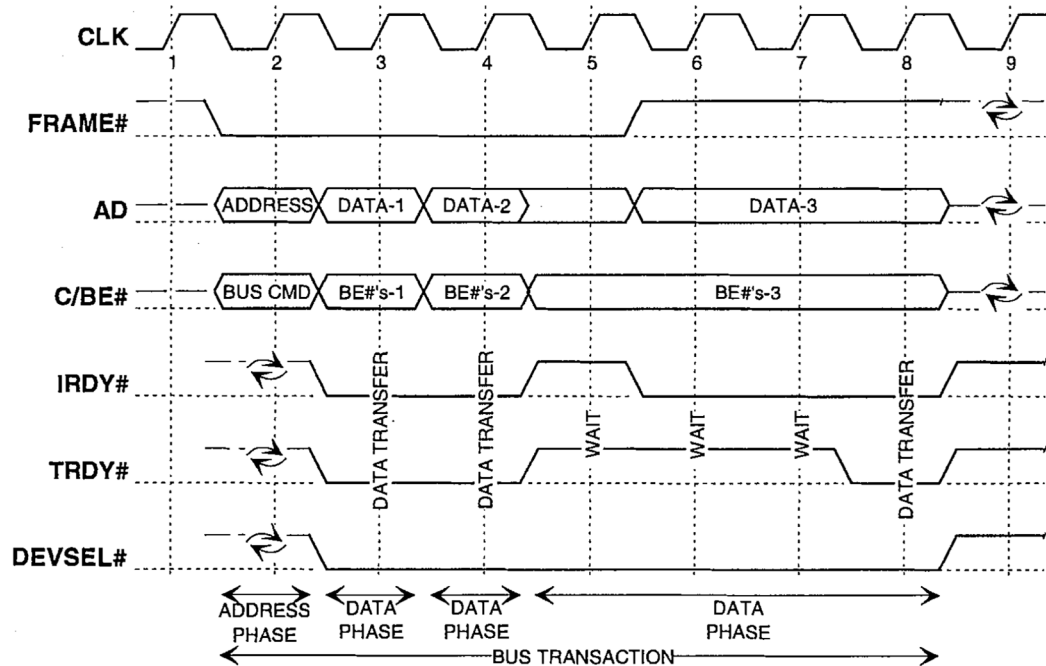
285. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks in view of PCI and the combination of Hicks in view of PCI, and Usui disclose all the limitations of the '855 patent's dependent claim 11. Claim 11 depends from claim 10, thereby incorporating all elements of claim 10. It is my further opinion that a PHOSITA would have understood the combination of Hicks and PCI and the combination of Hicks, PCI and Usui to teach the limitations

of claims 1 and 10 as I explained above in Sections IX.B.1.a and IX.B.1.i. It is also my opinion that a PHOSITA would have understood that Hicks discloses the limitation added to claims 1 and 10 by claim 11.

286. Claim 11 recites the term “the frame,” which raises an ambiguity, since similar (but not identical) terms are recited in claims 1 and 10, from which claim 11 depends. As a result, “the frame” in claim 11 could refer back to “[a/the] data frame” in claim 1, or it could refer back to “frame” (without an “a” or “the”) in claim 10. I address each of these possibilities in turn below.

287. Assuming “the frame” in claim 11 refers back to “[a/the] data frame” in claim 1, then claim 11 is disclosed by PCI as discussed above with respect to Element [1F]. *See* Section IX.B.1.a.vi above. As I explained in that section, in the combination of Hicks and PCI (and Hicks, PCI, and Usui), PCI discloses an “AD [31::00]” bus (part of the claimed “shared bus”) on which a frame of data (as indicated by the “FRAME#” signal) is transmitted. *See* ¶¶ 201-203 above (citing Ex. 1006 at 24, 27, 29, 42-43, 46-49, 67-69, 108, Figs. 3-5, 3-6).

288. As discussed above with respect to Element [1F], Figure 3-6 of the PCI standard (copied below) illustrates the timing of signals on the shared PCI bus for a basic write transaction. Ex. 1006, Fig. 3-6, 68. Figure 3-5 of PCI (not shown) includes an example of a read transaction having similar timing. Ex. 1006, Fig. 3-5, 67.



Ex. 1006 at 67 (Fig. 3-5)

289. As shown in the figure, an “ADDRESS,” “DATA-1,” “DATA-2,” and “DATA-3,” are sequentially time multiplexed on the “AD” bus, thus disclosing the limitation of claim 11 requiring “conveying the frame [the “data frame” of claim 1] in accordance with at least one of: a time division multiplexing data conveyance protocol”

290. Turning to claim 11 under the assumption that “the frame” in claim 11 refers to “frame” in claim 10. As I explained in Section IX.B.1.g above with respect to claim 8, Hicks explains that his BMG, based on the user-supplied channel selection commands, selects and encodes analog information signals (carried in channels) into multiple MPEG 2 digital signals (Ex. 1005 at 6:43-56, 8:54-60), communicates those MPEG-2 signals to information appliances (*e.g.*, the Hicks

STBs) over Ethernet communication links (Ex. 1005 at 9:49-61), stores and plays back the MPEG-2 content at the information appliances (Ex. 1005 at 15:3-12), and the information appliances are then able to display the MPEG-2 content (*e.g.* MPEG Layer 3 content) (Ex. 1005 at 3:58-64, 4:21-25, 7:31-37).

291. In my opinion a PHOSITA would have also understood Hicks's disclosure of encoding and "output[ing] ... an MPEG-2 digital information signal" to refer to encoding audio and video data according to ISO 13818, which defines the processes of MPEG-2 encoding. Ex. 1005 at 8:54-60; Ex. 1016 at 11, 14-15, 26; Ex. 1017 at 11, 18-19. A block diagram of the MPEG-2 encoding process according is illustrated in the figure below. Ex. 1016 at 32 (Fig. 1.13). As shown in the figure, uncompressed video and audio data is received and compressed by compressors into Elementary Streams (ESs), which are each input to a Packetizer to generate Packetized Elementary streams (PESs). Ex. 1016 at 32-33, 52-56; Ex. 1017 at 19-20. The PESs are then combined into one of two types of multiplexed streams, a Program stream (PS) or a Transport Stream (TS). Ex. 1016 at 32-33, 52-56; Ex. 1017 at 19-20.

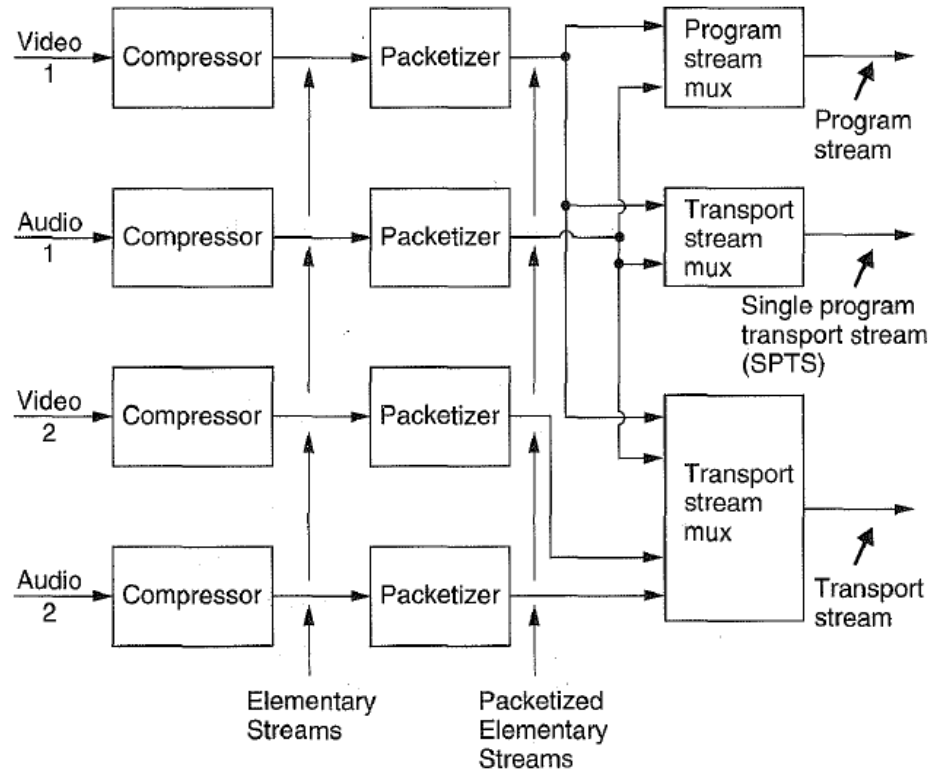


Figure 1.13 The bitstream types of MPEG-2. See text for details.

Ex. 1016 at 32 (Fig. 1.13).

292. A “program stream” is used where the multiplexed PESs are encoded based on a common clock (*e.g.*, in the case of synchronized video and audio stored on a DVD). *Id.* at 11-14, 32, 52. A transport stream (“TS”), on the other hand, “is intended to be a multiplex of many TV programs with their associated sound and data channels” where the programs are not necessarily synchronous to one another. *Id.* at 32-33, 52, 55-56.

293. In my further opinion, it would have been well known to a PHOSITA at the time of the purported ’855 invention that an MPEG-2 Program Stream and a Transport Stream each convey the packetized elementary stream(s) (including the

PES composed of audio frames as discussed above with respect to claim 10) using time division multiplexing. Ex. 1016 at 55-61; Ex. 1026 at 8-13 (describing aspects of deterministic and non-deterministic time division multiplexors); Ex. 1030 at 18-19 (“Statistical Multiplexing” and “STDM Statistical Time Division Multiplexer”)

294. An exemplary program stream is illustrated below. As shown, the stream includes a Pack Header followed by a collection of video and audio PES packets which have been time multiplexed together for sequential transmission. Ex. 1016 at 54.

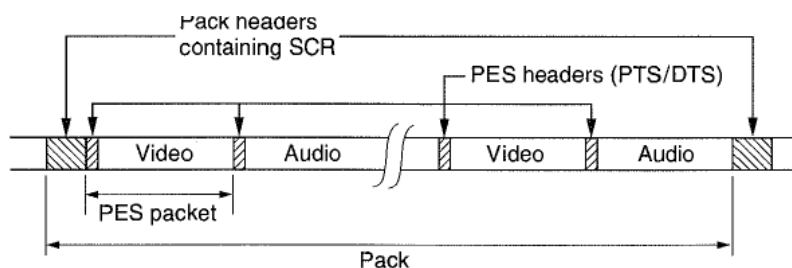
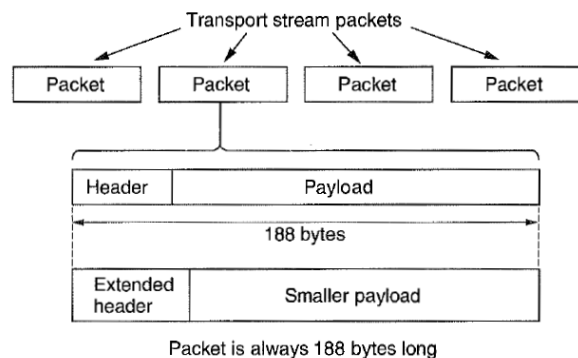


Figure 6.4 A pack is a set of PES packets. The pack header contains a clock reference code.

Ex. 1016 at 54 (Fig. 6.4).

295. Similarly, to transmit PESs in an MPEG-2 transport stream, video and audio PESs from the same or different programs are divided into TS packets that are time multiplexed for sequential (also called “serial”) transmission. Ex. 1016 at 55-56. Each TS packet has a header that includes information that allows for the individual audio and video elementary streams to be de-multiplexed and reassembled by a receiving device for decoding out of the MPEG formats. *Id.* at 55-60.



Ex. 1016 at 55 (Fig. 6.5, excerpted).

296. In my opinion, therefore, PHOSITA would have understood that Hicks’s encoding of analog information signals into compressed MPEG-2 digital information signals would have included encoding of the data in the form of MPEG-2 programs streams (*e.g.*, for storage) and MPEG-2 transport streams (*e.g.*, for transmission to the thin-client STBs), each of which would have included a sequence of time division multiplexed packets. Ex. 1005 at 6:43-56, 8:54-60; Ex. 1016 at 32-33. Hicks thus discloses the step required by claim 11, “conveying the frame [of claim 10] in accordance with at least one of: a time division multiplexing data conveyance protocol, and frequency division multiplexing data conveyance protocol.”

297. Hicks further discloses that the channels (which would have included MPEG-2 streams of time-multiplexed packets) were transmitted to client STBs via the in-home network, which could be implemented according to the “Home Phoneline Networking Alliance (HomePNA) Version 2.0” standard. Ex. 1005 at

3:4-35, 7:45-48, Fig. 2. A PHOSITA would have understood that the HomePNA standard simultaneously conveys voice and data signals using frequency division multiplexing over a home's preexisting phone wiring. Ex. 1042 at 1:62-2:8; Ex. 1030 at 12-13. Hicks also discloses the claim 11 limitation of "conveying the frame [of claim 10] in accordance with at least one of: ..., and frequency division multiplexing data conveyance protocol."

298. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the '855 patent's claims 1, 10, and 11, thereby rendering claim 11 unpatentable for obviousness.

k. Dependent Claim 12 (Grounds 1 and 2)

[12A] The method of claim 1, wherein the encoding further comprises at least one of:

[12B] multilevel encoding data of each of the selected channels;

[12C] non return to zero (NRZ) encoding the data of each of the selected channels;

[12D] Manchester encoding the data of each of the selected channels;

[12E] block encoding the data of each of the selected channels; and

[12F] nB/mB encoding the data of each of the selected channels, where $n < m$.

299. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2), disclose the limitations of the '855 patent's dependent claim 12. Claim 12 depends from claim 1, thereby incorporating all elements of claim 1. The combination of Hicks and PCI, and the combination of Hicks, PCI, and Usui teach the limitations of claim 1 as I explained above in section IX.B.1.a. In my further opinion, a PHOSITA would also find that Hicks discloses the limitation added to claim 1 by claim 12.

300. As I explained in Section IX.B.1.a.viii, a PHOSITA would understand the combination of Hicks and PCI and Hicks, PCI, and Usui disclose the Element [1H]'s requirement for, "encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data" by encoding the selected channels according to PCI on the system data bus of the BMG. *See* Section IX.B.1.a.viii above, (citing Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-47, 9:17-21, 11:48-67, Figs. 2, 6; Ex. 1006 at 42-43, 46-47, 67-68, Figs. 3-5, 3-6).

301. In using the PCI protocol to encode the selected channels on the Hicks system's data bus as I explained above, the PCI standard would require data signals

on the AD bus to be encoded with an additional parity bit “PAR” to allow one-bit errors to be detected. Ex. 1006 at 30, 114-117. To allow this, during the address and data phases of a read or write transaction, the PAR bit is set so that the total number of “1”s on the AD [31::00] lines (containing 32 address or data bits), the C/BE[3::0]# lines (containing 4 command or byte enables bits), and the PAR line equal an EVEN value (“even” parity). *Id.* The receiving device then checks the data bits and the PAR bit on each address or data phase to see if the total number of 1 bits in each address and data value is even, and if not, reports an error. *Id.*

302. This form of encoding belongs to the broad family of error detection and/or correction codes referred to as a “block code” (the claimed “block encoding the data of each of the selected channels”), and is specifically designated as a “36b/37b” code where 36 information bits (or symbols) are encoded into 37 encoded bits (or symbols) (the claimed Element [12F] “nB/mB encoding the data of each of the selected channels, where $n < m$ ”). Ex. 1027 at 4-5, *e.g.*, defining a “block code” as: “[a] type of []error-correcting or []error detecting code in which a fixed number (conventionally k) of digits are taken in to the encoder at a time and then output in the form of a *codeword* consisting of a greater number (conventionally n) of digits. It is often specified as an (n, k) code, with block length k and codeword length n .”); Ex. 1026 at 5-6 (“The simplest block coder appends a single parity digit to each block of k message digits. This produces a systematic $(k + 1, k)$ code known as a

single parity code. For binary digits, the parity bit may be either the modulo-2 sum of the message bits or 1 minus that sum. The former case is known as even parity, because the sum of the $k + 1$ bits of the codeword (including the parity bit) is 0, and the latter is known as odd parity.”); Ex. 1028 at 44-45.

303. In addition (and in some embodiments disclosed in the '855 patent, in the alternative) to conveying the user-selected channels according to the PCI protocol, the combination of Hicks and PCI further discloses that the BMG communicates those channels to the client STBs by using other coding and modulation schemes such as 10Base-T, 100Base-T, and Gigabit Ethernet through category 5 or better twisted pair wiring or OC-3 optical fiber. Ex. 1005 at 3:2-5, 3:41-43, 3:58-64, 4:44-50, 5:43-67, 7:41-55, 8:18-20, 8:38-47, 9:49-54. For example, Hicks discloses the following:

When the consumer selects playing of a broadcast satellite television channel, for example, the BMG can tune a demodulator/tuner to the selected broadcast channel and begin streaming the selected MPEG video stream through the Ethernet switch and over the twisted pair wiring to the digital STB where the video stream is decoded and displayed on the TV.

Ex. 1005 at 4:44-50.

Data switch/router 105 can be a 100Base-T Ethernet switch, a 10/100Base-T Ethernet switch, a Gigabit

Ethernet switch, an ATM router, and so forth.

Ex. 1005 at 8:18-20.

In an embodiment, each tuner 121 is coupled to the Ethernet switch via a dedicated connection to the Ethernet switch (e.g., a first tuner 121 is coupled to a first switch port of data switch/router 105 via a dedicated communications link 146, a second tuner 121 is coupled to a second switch port of data switch/router 105 via another dedicated communication link). In another embodiment, each tuner 121 is coupled to data switch/router 105 via a shared communications link, such as shared Ethernet communications link 145, or a shared system bus 135.

Ex. 1005 at 8:38-47.

304. The BMG (in the combination of Hicks and PCI) uses these other encoding and modulation schemes to convey the user selected channels. Thus, it is my opinion that a PHOSITA would have recognized that each of these additional schemes—10Base-T Ethernet, 100Base-T Ethernet, Gigabit Ethernet, and HomeRF—form part of the BMG’s data conveyance protocol. Each of these additional schemes also includes the encoding elements listed in claim 12. Ex. 1028 at 42-44.

305. For example, the 100Base-Tx Ethernet protocol (part of the 100Base-T standard) includes a standard “MII” electrical and mechanical interface between the

medium access control (MAC) layer and physical layer. Ex. 1028 at 28-29. Figure 6.1 of Exhibit 1028 illustrates the physical layer architecture implemented by the MII interface. This figure is reproduced and annotated below.

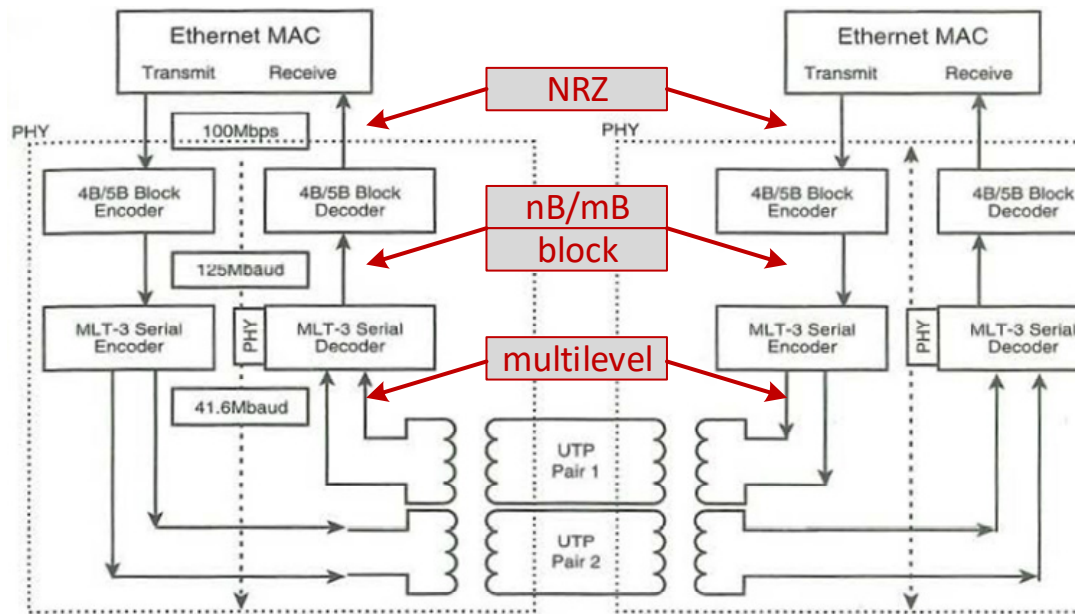


FIGURE 6.1 The Ethernet physical layer architecture consists of block encoding/decoding and serial or line encoding/decoding. The figure shows 100BASE-TX as an example.

Ex. 1028 at 38 (Fig. 6.1, annotated).

306. The MII standard specifies (see annotations in the figure above) that Ethernet MAC Interface drives standard digital logic type signals (the claimed “non-return to zero (NRZ) encoding”) over 0.5 meters or less of cable to the physical layer interface, which then encodes groups of 4 data bits into 5 data bits (4B/5B encoding with parity) (the claimed “block encoding” and “nB/mB encoding ... where $n < m$ ”), and then the data bits are encoded with multi-level transmit (MLT-3) encoding that uses three voltage levels (the claimed “multilevel encoding data of each of the

selected channels”) for transmission over the network. Ex. 1028 at 28-29, 34-42. The other variants of 10Base-T, 100Base-T, and 1000Base-T (Gigabit Ethernet) identified in Hicks also utilize variations of the claimed NRZ encoding, Manchester encoding, multilevel encoding (such as PAM-3 and PAM-5), and nB/mB (where $n < m$) encoding (such as 8B/10B). Ex. 1028 at 39-40. For example, 10Base-T Ethernet transmits Manchester encoded data (having only 2 voltage levels) over the network, and 1000Base-T Ethernet transmits PAM5 (having 5 voltage levels) over the network. *Id.* at 30.

307. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the ’855 patent’s claims 1 and 12, thereby rendering claim 12 unpatentable for obviousness.

I. Dependent Claim 13 (Grounds 1 and 2)

The method of claim 1 further comprises:

data compressing the selected channels prior to encoding.

308. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks in view of PCI (Ground 1), and the combination of Hicks in view of PCI, and Usui (Ground 2) disclose dependent claim 13. Claim 13 depends from claim 1, thereby incorporating all elements of claim 1. The combination of

Hicks and PCI (Ground 1), and the combination of Hicks, PCI and Usui (Ground 2) teach the limitations of claim 1 as I explained above in Section IX.B.1.a. It is my further opinion that a PHOSITA would understand that Hicks further discloses claim 13.

309. Hicks discloses that the user-selected channels received by tuner/demodulator 102 may be in the form of analog information signals, and that the BMG encodes these analog information signals into multiple MPEG 2 signals prior them to being sent to the information appliances (*e.g.*, the disclosed STBs) for playback:

The information signal can be an analog information signal or a digital information signal. When the information signal is an analog information signal, **an analog-to-digital converter can convert the analog information signal to a digital information signal (e.g., a Motion Picture Experts Group 2 (MPEG-2) signal). In an embodiment, a BMG can support multiple MPEG2 encoding sessions (e.g., two or more MPEG2 encoding sessions) and handle overlay processing. An example of overlay processing is presenting MPEG2 or other digital information in a multiple layer format.**

Ex. 1005 at 6:43-52 (emphasis added).

In an embodiment, control signals can control the operation of an analog-to-digital converter 125 that can

receive an analog information signal (e.g., an National Television Standards Committee (NTSC) TV signal) and output **a digital information signal based at least in part on the analog information signal (e.g., an MPEG-2 digital information signal).**

Ex. 1005 at 8:54-60 (emphasis added); *see id.* at 3:58-64, 4:21-25 (disclosing “MP3 players”), 7:31-37 (disclosing MPEG Layer-3 information appliances), 9:49-61, 15:3-12 (emphasis added).

310. In my opinion, therefore, a PHOSITA would have understood Hicks’s disclosure of using analog-to-digital converter 125 for encoding and “output[ting] ... an MPEG-2 digital information signal” to include compressing digital data of the user selected channels, thus performing the step required by claim 13 of, “data compressing the selected channels.” Ex. 1005 at 4:44-50, 6:43-48, 8:54-60; Ex. 1016 at 11-14 (“MPEG is actually an acronym for the moving pictures experts group which was formed ... to set standards for audio and video compression and transmission”), 16-22, 32-33; Ex. 1017 at 3-6, 11, 14, 18-24, 41; *see* Section VIII.C.3, *above*.

311. Hicks further discloses with respect to the BMG block diagram of Figure 6:

A BMG 600 can include a plurality of buses to interconnect BMG components. For example, the plurality of buses can include a media bus 610, a network bus 615,

and a system data bus 620. **Media bus 610 can receive information signals (e.g., broadcast signals, multimedia signals, and so on) from signal processing circuit 120.** In an embodiment, signal processing circuit 120 and media bus 610 are coupled via system cipher/decipher [sic] logic 628. **System data bus 620 can be coupled to the media bus 610 to receive information signals (e.g., for storage on mass storage device 103, for sending to information appliances, and so on).**

Ex. 1005 at 11:49-59 (emphasis added).

312. In my opinion, therefore, a PHOSITA would have understood that according to the above disclosure, the analog information signals selected by signal processing circuit 120 and compressed according to the MPEG-2 standard are communicated through media bus 610 and through system data bus 620 for transmission to the information appliances (the thin-client STBs). An annotated version of Hicks's Figure 6 is reproduced below to illustrate the path taken by these selected channels through Hicks's BMG.

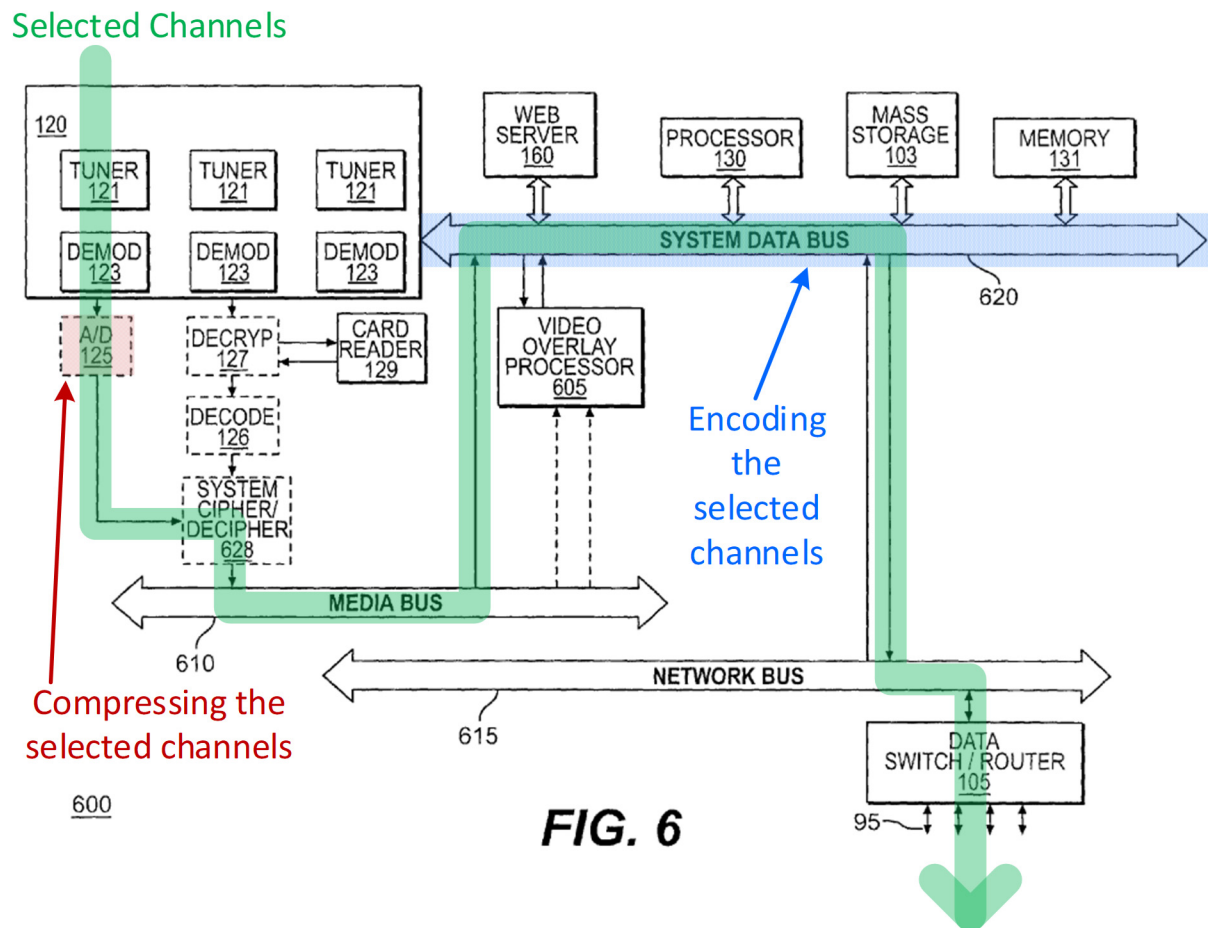


FIG. 6

Ex. 1005, Fig. 6 (annotated).

313. As illustrated above, the user-selected channels are compressed by A/D 125 prior to passing through the system data bus 620. As I explained above in Section IX.B.1.a.vi with respect to Element [1F] (see ¶¶ 195-199), in the combination of Hicks and PCI, Hicks's system data bus is implemented with the PCI protocol which encodes the data conveyed on it in frames. Ex. 1006 at 42-43, 46-47, 67-69, Figs. 3-5, 3-6. Accordingly, the combination of Hicks and PCI disclose the requirement of claim 13 for, "data compressing the selected channels prior to

encoding.”

314. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the ’855 patent’s claims 1 and 13, thereby rendering claim 13 unpatentable for obviousness.

m. Dependent Claim 14 (Grounds 1 and 2)

The method of claim 1 further comprises:

encrypting the selected channels prior to encoding.

315. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2), disclose all the limitations of the ’855 patent’s dependent claim 14. Claim 14 depends from claim 1, thereby incorporating all elements of claim 1. The combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI and Usui (Ground 2) teach the limitations of claim 1 as I explained above in Section IX.B.1.a. In my further opinion, a PHOSITA would also understand that Hicks discloses the limitation added to claim 1 by claim 14.

316. Hicks discloses that the user selected channels are encrypted by the system cipher/decipher 628 of the BMG 600. Ex. 1005 at 4:4-11, 9:7-17, 11:9-19, 11:48-12:3, Figs. 2-3, 6. For example, Hicks discloses with respect to the BMG block diagram of Figure 2:

In an embodiment, information signals can be encrypted and/or decrypted by cipher/decipher logic 168. Cipher/decipher logic 168 can decrypt and/or encrypt information signals according to encryption/copy protection protocols such as an Analog CPS (Copy Protection System) (e.g., a Macrovision protocol), CGMS (Copy Guard Management System), CSS (Content Scrambling System), CPPM (Content Protection for Prerecorded Media), CPRM (Content Protection for Recordable Media), DCPS (Digital Copy Protection System), DTCP (Digital Transmission Content Protection), and so forth.

Ex. 1005 at 9:7-17. Hicks further discloses with respect to the BMG block diagram of Figure 6:

A BMG 600 can include a plurality of buses to interconnect BMG components. For example, the plurality of buses can include a media bus 610, a network bus 615, and a system data bus 620. Media bus 610 can receive information signals (e.g., broadcast signals, multimedia signals, and so on) from signal processing circuit 120. **In an embodiment, signal processing circuit 120 and media bus 610 are coupled via system cipher/dechiper [sic “decipher”] logic 628.** System data bus 620 can be coupled to the media bus 610 to receive information signals (e.g., for storage on mass storage device 103, for sending to information appliances, and so on).

Ex. 1005 at 11:49-59 (emphasis added).

317. In my opinion, therefore, a PHOSITA would have understood that according to the above disclosure, the channels which are selected by signal processing circuit 120 are encrypted by cipher/decipher logic 168/628 and then communicated through the media bus 610 and through the system data bus 620 for sending to the information appliances (the thin-client STBs). An annotated version of Hicks's figure 6 is reproduced below to illustrate the path taken by the selected channels through Hicks's BMG.

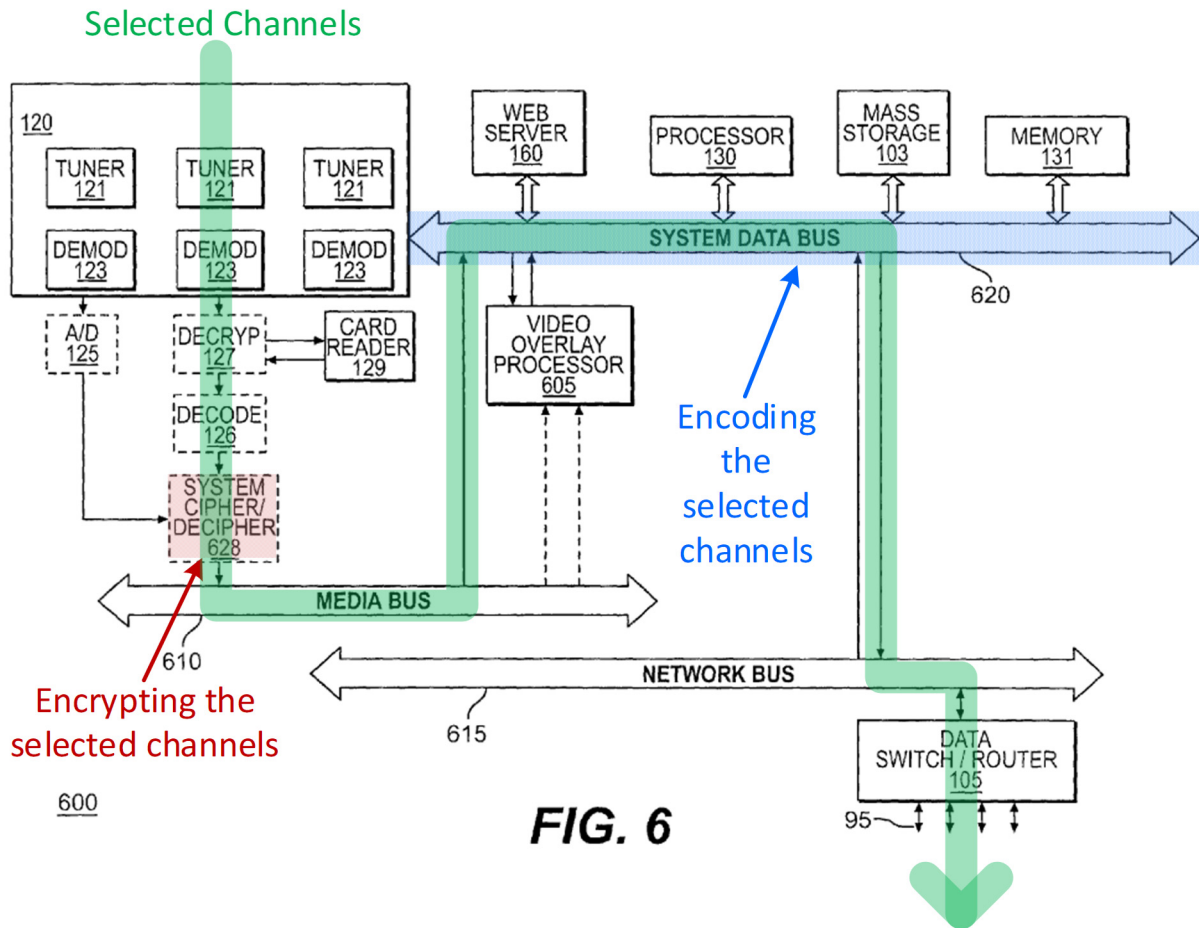


FIG. 6

Ex. 1005, Fig. 6 (annotated).

318. As illustrated above, the user-selected channels are encrypted by system cipher/decipher logic 628 prior to passing through to system data bus 620. As I explained in Section IX.B.1.a.vi above with respect to Element [1F] (see ¶¶ 195-199), in the combination of Hicks and PCI, the Hicks's system data bus is implemented with the PCI protocol which encodes data conveyed on it into frames. Ex. 1006 at 42-43, 46-47, 67-69, Figs. 3-5, 3-6. Accordingly, the combination of Hicks and PCI disclose the limitation added to claim 1 by claim 14 for, "encrypting

the selected channels prior to encoding.”

319. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the ’855 patent’s claims 1 and 14, thereby rendering claim 14 unpatentable for obviousness.

n. Dependent Claim 15 (Grounds 1 and 2)

[15A] The method of claim 1 further comprises:

receiving a single channel from a multimedia source;

[15B] selecting the single channel based on at least one of the plurality of channel selecting commands to produce a selected single channel; and

[15C] encoding the selecting single channel based on the data conveyance protocol.

320. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2), disclose all the limitations of the ’855 patent’s dependent claim 15. Claim 15 depends from claim 1, thereby incorporating all elements of claim 1. The combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI and Usui (Ground 2) teach the limitations of claim 1 as explained above in Section IX.B.1.a. In my further opinion a PHOSITA would understand that Hicks discloses the limitation added to claim 1 by claim 15.

321. As I explained in Section IX.B.1.a.ii above for claim Element [1B] (*see* ¶¶ 149-150), Hicks discloses a BMG that can receive multiple channels from a multimedia source (*e.g.*, multiple channels from a cable network through multiple tuners/demodulators), and multiplex those channels on a local network. Ex. 1005 at 3:43-50, 3:54-58, 6:1-42, 6:66-7:23, 8:22-37, 8:44-51, 9:17-21, 12:4-10, 12:44-47, 17:60-18:3, 18:50-60, Figs. 1-4, 6. The tuners/demodulators in the Hicks BMG perform the claimed “receiving a single channel from a multimedia source” as required by Element [15A] by receiving the multiple channels from a multimedia source such as a cable network.

322. As I explained in Section IX.B.1.a.vii above for Element [1G] (*see* ¶¶ 216-220), Hicks discloses that the channels selected by the user at the disclosed thin-client STBs will be communicated within the BMG (from the data switch to the processor and from the processor to the tuners/demodulators) as channel selection commands, and that the BMG selected a channel for each command for delivery to the client STBs. Ex. 1005, Abstract, 2:16-27, 3:14-67, 4:21-50, 6:1-50, 8:24-9:21, 10:54-11:33, 12:38-51. The channels selected by the BMG, which are produced for delivery to the client STBs, include the claimed “selected single channel,” and thus Hicks’s BMG performs the step of Element [15B] requiring, “selecting the single channel based on at least one of the plurality of channel selecting commands to produce a selected single channel.”

323. As I explained above regarding Element [1H], Hicks discloses that the channels selected by the tuners/demodulators are communicated over system data bus 620 (and system bus 135 of Figure 2). Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-47, 9:17-21, 11:48-67, Figs. 2, 6. As I also explained above (*see* ¶¶ 195-201), the combination of Hicks and PCI implement Hicks's system data bus according the PCI protocol (the claimed "data conveyance" protocol). Ex. 1006 at 42-43, 46-47, 67-68, Figs. 3-5, 3-6. By utilizing Hicks's system data bus in PCI as I explained, the combined Hicks and PCI system would encode the information signals (selected channels) according the PCI-defined read and write cycles. Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-47, 9:17-21, 11:48-67, Figs. 2, 6; Ex. 1006 at 42-43, 46-47, 67-68, Figs. 3-5, 3-6. Thus, just as with Element [1H], the combined Hicks and PCI system would perform step required by Element [15C] for, "encoding the selecting single channel based on the data conveyance protocol."

324. Additionally, the "single channel" of claim 15 may be a separate channel from one of the claim 1 "plurality of channels." If this were the case, Hicks and PCI would disclose claim 15 for the same reasons as discussed with respect to Elements [1B], [1G], and [1H], except that the "plurality of channels" would be from one of Hicks's multimedia sources (*e.g.*, DBS radio 22), where the "single channel" would be received from any one of Hicks's other multimedia sources (*e.g.*, CATV). Ex. 1005 at 3:8-12, 3:43-50, 3:54-58, 6:1-42, 6:66-7:31, 8:22-37, 8:44-51, 9:17-21,

12:4-51 (*e.g.*, steps 460-470), 12:57-66, 17:60-18:3, 18:50-60, Figs. 1-4, 6. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the '855 patent's claims 1 and 15, thereby rendering claim 15 unpatentable for obviousness.

o. Dependent Claim 16 (Grounds 1 and 2)

[16A] The method of claim 15, wherein the receiving the single channel further comprises at least one of:

[16B] receiving the single channel of audio data and video data from an output of a video cassette recorder;

[16C] receiving the single channel of audio data and video data from an output of a DVD player;

[16D] receiving the single channel of audio data and video data from an output of a camcorder;

[16E] receiving the single channel of audio data from an output of a compact disk player;

[16F] receiving the single channel of audio data from an output of a cassette player;

[16G] receiving the single channel of at least one of data and audio data from a telephone connection; and

[16H] receiving the single channel of at least one of data, audio data, and video data from a modem

325. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2), disclose dependent claim 16. Claim 16 depends from claim 15, thereby incorporating all elements of claim 15. The combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI and Usui (Ground 2) teach claim 15 as I explained above in Section IX.B.1.n. In my further opinion a PHOSITA would understand that Hicks further discloses claim 16.

326. Specifically, Hicks discloses that an information signal (which, as I explained above for claim 15, includes the claimed “single channel”) may be received via an auxiliary multimedia input 166 from “an audio-video signal from a DVD device” (the claimed “receiving the single channel of audio data and video data from an output of a DVD player”), “an audio signal from a Compact Disc (CD) device” (the claimed “receiving the single channel of audio data from an output of a compact disk player”), “an audio-video signal from a Video Cassette Recorder/Player (VCR)” (the claimed “receiving the single channel of audio data and video data from an output of a video cassette recorder” and claimed “receiving the single channel of audio data from an output of a cassette player”). Ex. 1005 at 9:1-21. Like the information signals received by Hicks’s tuners and demodulators, the information signals received via auxiliary multimedia input 166 are conveyed to the data switch 105 through the BMG system bus which, in the combined Hicks and

PCI system, encodes the information signal according to the PCI protocol. *Id.*; see ¶¶ 195-201 above.

327. Hicks further describes that “residential gateway 5 can interface communications between the broadband data service and the BMG 100” and that residential gateway 5 includes “an integrated ADSL modem” and that multimedia content such as movies may be downloaded via ADSL (the claimed “data, audio data, and video data from a modem”). Ex. 1005 at 4:50-55, 8:4-7. Hicks also discloses that the BMG can support maintenance, administration and billing applications via a voiceband analog modem (*e.g.*, V.90 modem) connected to an analog telephone line (the claimed “receiving the single channel of at least one of data and audio data from a telephone connection” and the claimed “receiving the single channel of at least one of data, audio data, and video data from a modem.”). Ex. 1005 at 5:4-16.

328. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the ’855 patent’s claims 1, 15, and 16, thereby rendering claim 16 unpatentable for obviousness.

p. Dependent Claim 17 (Grounds 1 and 2)

[17A] The method of claim 1, wherein the receiving the plurality of channels further comprises at least one of:

[17B] receiving audio and video data for each of the plurality of channels from a satellite connection;

[17C] receiving audio and video data for each of the plurality of channels from a set-top box;

[17D] receiving audio and video data for each of the plurality of channels from a cable connection;

[17E] receiving audio and video data for each of the plurality of channels from a high-definition television receiver; and

[17F] receiving audio and video data for each of the plurality of channels from an antenna

329. It is my additional opinion that a PHOSITA would have understood that the combination of Hicks and PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2), disclose dependent claim 17. Claim 17 depends from claim 1, thereby incorporating all elements of claim 1. The combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI and Usui (Ground 2) teach the limitations of claim 1 as I explained above in Section IX.B.1.a. In my further opinion a PHOSITA would understand that Hicks further discloses claim 17.

330. Specifically, Hicks discloses that “[t]he BMG can receive video, audio and other forms of multimedia content from a variety of broadcasts (e.g., direct digital broadcast satellite TV, digital cable TV, terrestrial broadcast analog and/or digital TV), Intranet, and Internet sources.” Ex. 1005 at 2:35-39, 3:43-47, 6:5-16,

11:26-29, 18:50-53, Figs. 1, 2. Hicks thus discloses “receiving audio and video data for each of the plurality of channels from a satellite connection,” “receiving audio and video data for each of the plurality of channels from a cable connection,” and “receiving audio and video data for each of the plurality of channels from an antenna.”

331. Hicks further discloses that the plurality of channels, which could include high definition television (HDTV) signals, are sent from the BMG to a thin-client digital set top box (STB), and that the STB decodes these signals and converts them to a display format that may be output to a television 40. Ex. 1005 at 10:59-11:29. In my opinion, therefore, a PHOSITA would understand that the Hicks system performs the steps required by claim 17 of, “receiving audio and video data for each of the plurality of channels from a set-top box” and “receiving audio and video data for each of the plurality of channels from a high-definition television receiver.”

332. Thus, as I explained above, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose all the limitations of the ’855 patent’s claims 1 and 17, thereby rendering claim 17 unpatentable for obviousness.

2. Claims 18-27

333. Independent claim 18 and dependent claims 19-27 each correspond to

one or more limitations of one or more earlier elements of claims 1-17. Thus, as I explain below, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) discloses claims 18-27, and that Hicks in view of PCI and Usui (Ground 2) disclose all the limitations of the '855 patent's claims 19 and 20, thereby rendering these claims unpatentable for obviousness.

a. Independent Claim 18 (Ground 1)

334. Claim 18 is a method claim corresponding to a combination of some, but not all of, method claims 1, 3, and 8, which are taught by the combination of Hicks and PCI (Ground 1) as discussed below.

i. Element [18A]

A method of multiplexing channels in a multimedia system the method comprises:

335. Elements [1A] and [18A] differ only in that “plurality of channels” in Element [1A] is recited as a “channels” in Element [18A]. Since these elements do not differ in scope, the combination of Hicks and PCI disclose Element [18A] for the same reasons I explained above with respect to Element [1A]. *See* Section IX.B.1.a.i, *above*.

ii. Element [18B]

**receiving a channel from each of a plurality of sources
to produce a plurality of channels;**

336. Element [18B] is similar in scope to the combination of Element [1B], which recites “receiving a plurality of channels from a multimedia source,” and claim 3, which recites “receiving a second plurality of channels from a second multimedia source.” Element [18B] differs in that it requires only a single channel (as opposed to a plurality of channels) from each source, and the sources are not required to be “multimedia sources.” Since Element [1B] and Claim 3 require all of the limitations of [18B], the combination of Hicks and PCI disclose Element [18B] for the same reasons I explained above with respect to Element [1B] and Claim 3 above. *See* Sections IX.B.1.a.ii and IX.B.1.c, *above*.

iii. Element [18C]

receiving a plurality of channel selection commands by monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands, and decoding, based on a data conveyance protocol of the multimedia system, the at least one packet to recapture the at least a portion of the one of the plurality of channel selection commands;

337. Element 18[C] is substantially identical to Element [1F], except that Element [18C] recites “**identifying a data frame ... and decoding, based on a data conveyance protocol of the multimedia system, the at least one packet ...**”

(emphasis added), whereas Element [1F] recites “**identifying a data frame ... and decoding, based on a data conveyance protocol of the multimedia system, the data frame ...**” (emphasis added).

338. As discussed above (with respect to claim 10), a PHOSITA would have understood at the time of the purported invention that a “frame” and a “packet” are used interchangeably in the ’855 patent, depending only upon the particular protocol, and would have understood the terms to refer to similar things. *See* Section IX.B.1.i (¶¶ 276-280), *above*; Ex. 1001 at 29:38-42, 30:16-28, 31:8-10 (“one of average skill in the art will appreciate that the packets may be frames of data”); Ex. 1030 at 8, 10 (“Frame”), 17 (“Packet 1”); Ex. 1034 at 68-69; Ex. 1016 at 48, 52-53; Ex. 1022 at 1745-1746 (Patent Owner’s Expert: “at a high level, yes, they are often used interchangeably”).

339. Thus, assuming “**the at least one packet**” refers to the previously recited “a data frame” in Element [18C], the combination of Hicks and PCI disclose Element [18C] for the same reasons I explained above with respect to Element [1F] (describing identifying PCI data frames). *See* Section IX.B.1.a.vi, *above*.

340. Should “the at least one packet” in Element [18C] be construed as something other than “the data frame” previously recited in the same element, the combination of Hicks and PCI disclose Element [18C] for the same reasons I explained above with respect to Element [1F], and additionally for the reasons I

explained above with respect to Element [1D]. *See* Section IX.B.1.a.iv, *above*. As discussed above, with respect to Element [1D], Hicks’s BMG receives the commands from the client STBs as encapsulated packet data via the data switch 105 according to the Ethernet, IP, 802.11, Home RF, HomePNA data conveyance protocols. *See* ¶¶ 166-169, *above*; Ex. 1005 at 3:14-26, 5:43-48, 8:15:21, 8:44:54, 9:22-32, 11:4-8, 11:48-67, 12:38-51, 17:50-18:5; Ex. 1033 at 63-64. A PHOSITA would understand that Hicks de-encapsulates the commands from the packets, thus performing the Element [18C] limitation of “decoding, based on a data conveyance protocol of the multimedia system, the at least one packet to recapture the at least a portion of the one of the plurality of channel selection commands.”

iv. Element [18D]

**selecting a channel of the plurality of channels per
channel selection command of the plurality of channel
selection command to produce selected channels; and**

341. Element [18D] is identical to Element [1G] and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1G]. *See* Section IX.B.1.a.vii.

v. Element [18E]

**encoding each of the selected channels based on the
data conveyance protocol of the multimedia system to
produce a set of encoded channel data ...**

342. Element [18E] is identical to Element [1H] and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1H]. *See* Section IX.B.1.a.viii.

vi. Element [18F]

encoding ... by packetizing data of each of the selected channels into a packet that includes a header section and a data section, wherein the header section includes at least one of: identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number.

343. Element [18F] is substantially identical to claim 8 and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 8. *See* Section IX.B.1.g above.

vii. Summary Opinion Regarding Claim 18

344. As I explained above, a PHOSITA would have found that Hicks in combination with the PCI standard (Ground 1) discloses all elements of claim 18, thereby showing that claim 18 is unpatentable for being obvious under those combinations of references.

b. Dependent Claim 19 (Grounds 1 and 2)

[19A] The method of claim 18, wherein the receiving

**the channel selection commands further comprises:
receiving, from a plurality of clients, a plurality of
channel selection requests; and**

**[19B] processing the plurality of channel selection
requests to produce the plurality of channel selection
commands,**

**[19C] wherein the each of the plurality of channel
selection commands includes at least one of: specific
channel selection command, last channel selection
command, next channel selection command, previous
channel selection command, favorite channel selection
command, and select channel from user define list.**

345. Elements [19A] and [19B] are substantially identical to Elements [1C] and [1D], respectively, and are thus disclosed by the combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2), for the same reasons I explained above with respect to Elements [1C] and [1D]. *See* Sections IX.B.1.a.iii, IX.B.1.a.iv. Element [19C] is identical to Element [1E], except that the list in Element [19C] includes the additional item of “specific channel selection command.” The combination of Hicks and PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose Element [19C] for the same reasons I explained above with respect to Element [1E]. *See* Section IX.B.1.a.v. Additionally, Hicks discloses that a user may select a program from a graphical user interface or by entering a channel number with a remote control, thus disclosing the Element

[19C] “specific channel selection command.” Ex. 1005 at 4:21-50, 4:55-59, 12:4-51, Figs. 4, 6. Usui likewise discloses that selecting a channel using a numeric keypad 138, thus also disclosing the requirement of Element [19C] for a “specific channel selection command.” Ex. 1012 at 6:36-42.

c. Dependent Claims 20 (Grounds 1 and 2) and 21 (Ground 1)

Claim 20

[20A] The method of claim 19, wherein the processing the plurality of channel selection requests further comprises at least one of:

[20B] interpreting at least one channel selection request to identify at least one client of the plurality of clients and at least one of the channel selection requests of the plurality of channel selection requests;

[20C] authenticating a client of the plurality of clients that provides a specific channel selection request; and

[20D] authenticating the specific channel selection request.

Claim 21

[21A] The method of claim 18, wherein the receiving the plurality of channel selection commands further comprises at least one of:

[21B] decrypting each of the plurality of channel

selection commands; and

[21C] decompressing each off the plurality of channel selection commands.

346. Claims 20 and 21 are identical to claims 2 and 5 other than their dependency from claim 18 instead of claim 1. I explained how those grounds make claim 18 unpatentable above. Thus, claims 20 and 21 are disclosed by the combination of Hicks and PCI (Ground 1), and claim 20 is disclosed by the combination of Hicks, PCI, and Usui (Ground 2), for the same reasons I explained above with respect to claims 2 and 5. *See* Section IX.B.1.b.

d. Dependent Claim 22 (Ground 1)

The method of claim 18 further comprises:

conveying the packet using at least one of: Carries Sense Multiple Access (CSMA), CSMA with collision avoidance, and CSMA with collision detection.

347. Claim 22 is identical to claim 9 other than its dependency from claim 18 instead of claim 1. I explained how Grounds 1 and 2 make claim 18 unpatentable above. Claim 22 is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 9. *See* Section IX.B.1.h.

e. Dependent Claim 23 (Ground 1)

The method of claim 18, wherein the encoding further comprises: framing data of each of the selected

channels into a frame that includes header section and a data section, wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and frame number.

348. Claim 23 is identical to claim 10 other than its dependency from claim 18 instead of claim 1. I explained how Grounds 1 and 2 make claim 18 unpatentable above. Claim 23 is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 10. *See* Section IX.B.1.i.

f. Dependent Claim 24 (Ground 1)

[24A] The method of claim 23 further comprises: conveying the frame in accordance with at least one of: a time division multiplexing data conveyance protocol, and frequency division multiplexing data conveyance protocol.

349. Claim 24 is identical to claim 11 other than its dependency from claim 18 instead of claim 1. I explained how Grounds 1 and 2 make claim 18 unpatentable above. Claim 24 is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 11. *See* Section IX.B.1.j.

g. Dependent Claim 25 (Ground 1)

[25A] The method of claim 23, wherein the encoding further comprises at least one of:

[25B] multilevel encoding data of each of the selection channels;

[25C] non return to zero (NRZ) encoding the data of each of the selected channels;

[25D] Manchester encoding the data oil each of the selected channels;

[25E] block encoding the data of each of the selection channels; and

[25F] nB/mB encoding the data of each of the selected channels, where $n < m$.

350. Claim 25 is identical to claim 12 other that its dependency from claim 18 instead of claim 1. I explained how Grounds 1 and 2 make claim 18 unpatentable above. Claim 24 is thus disclosed by the combination of Hicks and PCI (Ground 1) for the same reasons I explained above with respect to claim 12. *See* Section IX.B.1.k.

h. Dependent Claim 26 (Ground 1)

The method of claim 18 further comprises: data compressing the selected channels prior to encoding.

351. Claim 26 is identical to claim 13 other that its dependency from claim

18 instead of claim 1. I explained how Grounds 1 and 2 make claim 18 unpatentable above. Claim 246 is thus disclosed by the combination of Hicks and PCI (Ground 1) for the same reasons I explained above with respect to claim 13. *See* Section IX.B.1.l.

i. Dependent Claim 27 (Ground 1)

The method of claim 18 further comprises: encrypting the selected channels prior to encoding.

352. Claim 27 is identical to claim 14 other than its dependency from claim 18 instead of claim 1. I explained how Grounds 1 and 2 make claim 18 unpatentable above. Claim 27 is thus disclosed by the combination of Hicks and PCI (Ground 1) for the same reasons I explained above with respect to claim 14. *See* Section IX.B.1.m.

3. Claims 28-36

353. Independent claim 28 and dependent claims 29-36 each correspond to one or more limitations of one or more earlier elements of claims 1-17. Thus, as I explain below, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) discloses all the limitations of the '855 patent's claims claim 28 and 29-36, thereby rendering these claims unpatentable for obviousness.

a. Independent Claim 28 (Ground 1)

354. Claim 28 is an apparatus claim corresponding to some, but not all, of

the limitations of method claim 1, which are taught by the combination of Hicks and PCI as I explain below.

i. Element [28A]

A tuning module for using in multimedia system the tuning module comprises:

355. Element [28A] recites “A tuning module for using in multimedia system the tuning module comprises,” whereas Element [1A] recites “A method of multiplexing a plurality of channels in a multimedia system, the method comprises.” As I explained above with respect to Element [1A], Hicks discloses a BMG that performs the method of claim 1 in an in-home multimedia system, including tuning to different channels available from different multimedia sources. Ex. 1005 at 5:57-6:16, 8:15-21, 11:48-12:3, Figs. 1-4, 6. The ’855 patent describes the structure of the “tuning module” as processing module 882 (microprocessor) and memory 884 (RAM, magnetic tape drive) storing operational instructions. Ex. 1001 at 41:40-64. Hicks’s BMG includes the same or equivalent structure of a processor 130 (Pentium III processor) and memory 131 (RAM, magnetic storage device) storing operational instructions that control the operation of the BMG to perform the same functions. Ex. 1005 at 9:22-48. The combination of Hicks and PCI thus discloses Element [28A] for the same reasons I explained above with respect to Element [1A] using the same or equivalent structure to that disclosed in the ’855 patent. *See*

Section IX.B.1.a.i; Ex. 1005 at 9:22-48.

ii. Element [28B]

plurality of selectors, wherein each of the plurality of selectors is operably coupled to receive a plurality of channels,

356. Element [28B] recites a “plurality of selectors [] operably coupled” to perform a substantially identical step of Element [1B]. The ’855 patent describes the structure of these selectors as tuners (370-376, 450-454, 480) and/or multiplexors (430-434, 456-460) (operated according to instructions executed by processing module 882). Ex. 1001 at 41:56-64, 42:20-24; *see id.* at 20:20-31, 25:27-29, 26:32-34, 27:50-55, 39:1-10. As I explained above with respect to Element [1B], Hicks describes tuner/demodulator 102 and tuners 121 (“a plurality of selectors”) under the control of processor 130 that perform this function. *See* Section IX.B.1.a.ii; *also see* Ex. 1005 at 3:54-58, 8:22-37, 8:44-51, 9:17-21, 12:4-10, 12:44-47, 12:57-66, 17:60-18:3, 18:50-60, Figs. 1-4, 6. Thus, in my opinion a PHOSITA will find that the combination of Hicks and PCI discloses Element [28B] for the same reasons I explained above with respect to Element [1B] using the same or equivalent structure to that disclosed in the ’855 patent. Section IX.B.1.a.ii; Ex. 1005 at 9:22-48.

iii. Element [28C]

wherein each of the plurality of selectors outputs a channel of the plurality of channels based on a

**respective one of a plurality of channel selection
commands to produce selected channels;**

357. Element [28C] recites that the “plurality of selectors” perform a substantially identical step of Element [1G], except that Element [28C] recites “outputs a channel ...” as compared to “selecting a channel ...” in Element [1G]. As I explained above with respect to Element [1G], Hicks’s tuner/demodulator 102 and tuners 121 (“a plurality of selectors”) under the control of processor 130 both “select[]” and “output” the claimed “channel.” *See* Section IX.B.1.a.vii; *also see* Ex. 1005 at Abstract, 2:16-27, 3:14-67, 4:21-50, 6:1-50, 8:24-60, 10:54-12:4, 12:38-51. Thus, in my opinion a PHOSITA will find that the combination of Hicks and PCI disclose Element [28C] for the same reasons I explained above with respect to Element [1G] using the same or equivalent structure to that disclosed in the ’855 patent. *See* Section IX.B.1.a.vii; Ex. 1005 at 9:22-48.

iv. Element [28D]

**encoding module operably coupled to encode the
selected channels based on a data conveyance protocol
of the multimedia system to produce encoded channel
data; and**

358. Element [28D] recites an “encoding module operably coupled” to perform a substantially identical step of Element [1H]. The ’855 patent describes the “encoding module” as a function performed by processing module 882 executing

instructions and additionally including “buffers” that may be “memory devices” for buffering data. Ex. 1001 at 39:13-17, 41:56-64, 42:25-30. As I explained above with respect to Element [1H], this step is performed by processor circuit 130 (executing the instructions stored in memory 131) and signal processing circuit 120 interfaced to Hicks shared PCI bus. Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-51, 9:17-48, 11:48-67, Figs. 2, 6. According to PCI, each device coupled to the PCI bus requires physical (*i.e.*, memory) address spaces, through which data is transmitted. Ex. 1006 at 47-50 (describing memory and I/O address space). Thus, Hicks’s BMG with a PCI bus has the identical or equivalent structure to that described in the ’855 patent that formats the channel data into sequential 32-bit words to be transmitted on the AD bus in a PCI frame (the claimed “to encode the selected channels based on a data conveyance protocol of the multimedia system to produce encoded channel data”). *See* Section IX.B.1.a.viii; Ex. 1005 at 9:22-48. Thus, the combination of Hicks and PCI disclose Element [28D] for the same reasons I explained above with respect to Element [1H]. *See* Section IX.B.1.a.viii.

i. Element [28E] and [28F]

[28E] bus interface module operably coupled transmit the encoded channel data in accordance with the data conveyance protocol,

[28F] the bus interface module including a receiving module that is operably coupled to monitor packets

from a shared bus at specific time intervals and to identity *[sic]* at least one of the packets at one of the specific time intervals, that contains at least a portion of one of the plurality of channel selection commands to produce an identified packet, wherein the receiving module comprising decoding module to decode the identified packet, based on the data conveyance protocol, to recapture at least a portion of the one of the plurality of channel selection commands.

359. The '855 patent describes the “bus interface module” including a “receiving module” including a “decoding module” as functions performed by processing module 882 executing instructions. Ex. 1001 at 39:61-40:2, 41:56-64, 42:45-50. As I explained above with respect to Elements [1F] and [1H], the combination of Hicks and PCI implement Hicks’s system data bus (shared bus 135) according to the PCI standard, in which the Hicks processor 130 operates as a PCI master device to read and write data (which would include the channel data) from and to PCI target devices such as data switch 105 and signal processing circuit 120 (including the tuners/demodulators). *See* Sections IX.B.1.a.vi, IX.B.1.a.viii (¶¶ 198-215, 221-224); Ex. 1005 at 9:22-48. The Hicks processor and signal processing circuit 120 (each including a claimed “bus interface module”) are thus operably coupled to transmit the channel data, which is encoded by signal processing circuit 120 in 32 bit words, in accordance with the PCI protocol. *Id.* Thus, the combination

of Hicks and PCI disclose Element [28E] for the same reasons I explained above with respect to Element [1H]. *See* Section IX.B.1.a.viii.

360. Element [28F] recites the “bus interface module” including a “receiving module” including a “decoding module” that together perform the substantially identical steps to those of Element [1F], except that Element [28F] refers to “packets” instead “frame” as in Element [1F]. As I explained above with respect to claim 10 and Element [18C], the ’855 patent uses “packets” and “frames” interchangeably, Patent Owner’s expert in the ITC conceded the terms are “often used interchangeably” (depending on context), and a PHOSITA would understand that using one is the same as using the other—which is used is merely a matter of the particular data protocol being implemented. *See* Section IX.B.1.i (§§ 276-280), IX.B.2.a.iii (§ 338).

361. As I further explained above with respect to Elements [1D], [1F], and [18C], Hicks’s processor (a claimed “bus interface module”) receives PCI frames containing IP packets, which contain the channel selection commands. *See* Sections IX.B.1.a.iv, IX.B.1.a.vi. IX.B.2.a.iii (§ 338). In my opinion a PHOSITA would understand that PCI frames and the IP packets would each be “packets” as recited in Element [28F]. *See* Sections IX.B.1.i (§§ 276-280), IX.B.2.a.iii (§ 338).

362. A PHOSITA would also understand that by monitoring the PCI bus, the processor would identify both at least one PCI frame and at least one IP packet that

contains a portion of the original command from the STB, and decode the PCI Frame and the IP packet to recapture the original command just as described above with respect to Element [1F]. *See* Section IX.B.1.a.vi. A PHOSITA would understand that Hicks’s processor 130 would monitor the PCI bus at the rising edges of the CLK signal (the claimed “specific time intervals”) and determine from the FRAME# signal and AD signals indicating the destination addresses to identify and decode data frames carrying the channel selection instructions (IP packets) (the claimed “identity [sic identify] at least one of the packets at one of the specific time intervals, that contains at least a portion of one of the plurality of channel selection commands to produce an identified packet” and “to decode the identified packet, based on the data conveyance protocol, to recapture at least a portion of the one of the plurality of channel selection commands”) just as described above with respect to Element [1F]. Ex. 1006 at 41-43, 46-47, 67-68; Ex. 1005 at 4:21-50, 8:38-60, 11:20-12:51, Figs. 2, 6. Accordingly, in my opinion a PHOSITA would conclude that Hicks’s processor performs the functions recited in Element [28F] for the same reasons I explained above with respect to Element [1F]. *See* Section IX.B.1.a.vi; Ex. 1005 at 9:22-48.

363. To the extent Element [28F] requires a particular organization of the “bus interface module,” “receiving module,” and “decoding module” (which the ’855 patent describes as all being performed by the same processing module 882),

in my opinion, a PHOSITA would have appreciated there are advantages and disadvantages when considering the number and arrangement of software modules used to implement desired functions. Ex. 1001 at 39:61-40:2, 41:56-64, 42:45-50. For example, the use of a hierarchy of modules (one module contained in another) makes programming easier by organizing the functions into conceptual levels and allowing a programmer to work at one level of the hierarchy without needing to consider the details of a lower level. But such hierarchies may result in less efficient code and use of memory as compared to a flat organization (with all modules at the same level). In my opinion, as a matter of routine practice a PHOSITA would have considered the number and organization of modules to use to be an obvious design choice between different structures that provide the same function. Such a PHOSITA would have reasonably expected to succeed in given their skillset and technical background in choosing between such designs.

ii. Summary Opinion Regarding Claim 28

364. As I explained above, a PHOSITA would have found that Hicks in combination with the PCI standard (Ground 1) discloses all elements of claim 28, thereby showing that claim 18 is unpatentable for being obvious under those combinations of references.

b. Dependent Claim 29 (Ground 1)

[29A] The tuning module of claim 28, wherein the bus interface module further comprises at least one of:

[29B] decrypting module for decrypting each of the plurality of channel selection commands; and

[29C] decompressing module for decompressing each of the plurality of channel selection commands.

365. Claim 29 recites a decrypting module and decompressing module that perform substantially identical steps of Element [5B] and [5C], respectively. The '855 patent discloses each of the recited modules as functions performed by processing module 882 (processor) executing instructions. Ex. 1001 at 41:19-26 (data compression module 862 and encrypting module 860), 41:56-64 (processing module 882). As I explained above with respect to claim 5, Hicks's BMG including the 802.11 interface under the control of processor 130 (executing the instructions stored in memory 131) performs the [29B] step of "decrypting each of the plurality of channel selection commands." *See Section IX.B.1.b*; Ex. 1005 at 9:22-48. Thus, for the same reasons I explained above with respect to claim 5, the combination of Hicks and PCI disclose claim 29 using the same or equivalent structure to that disclosed in the '855 patent. *See Section IX.B.1.b*; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:14-31, 7:49-55, 9:62-10:4 10:34-53; Ex. 1031 at 1:14-2:20, Figs. 1, 2; Ex. 1034 at 43-44, 64-68.

c. Dependent Claim 30 (Ground 1)

[30A] The tuning module of claim 28 further comprises: second plurality of selectors, wherein each of the second plurality of selectors is operably coupled to receive a second plurality of channels,

[30B] wherein each of the second plurality of selectors outputs a channel of the second plurality of channels based on a respective one at the plurality of channel selection commands to produce second selected channels.

366. Claim 30 recites a “second plurality of selectors” that perform the same “receive” and “output” steps as recited in Elements [28B] and [28C], except the steps are performed on a “second plurality of channels.” The ’855 patent describes the structure of these selectors as tuners (370-376, 450-454, 480) and/or multiplexors (430-434, 456-460) (operated according to instructions executed by processing module 882). Ex. 1001 at 41:56-64, 42:20-24; *see id.* at 20:20-31, 25:27-29, 26:32-34, 27:50-55, 39:1-10. As I explained above with respect to claims 3 and 4, Hicks’s “multiple tuners/demodulators” under the control of processor 130 (executing the instructions stored in memory 131) perform the “receiving” and “selecting” of a “second plurality of channels” as recited in claims 3 and 4. *See Section IX.B.1.c, IX.B.1.d*; Ex. 1005 at 3:54-58, 4:12-15, 6:38-42, 8:22-37, 9:22-48. Thus, for the same reasons I explained above with respect to Elements [28B] and [28C] and claims

3 and 4, the combination of Hicks and PCI discloses claim 30 using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.c, IX.B.1.d, IX.B.3.a.ii, and IX.B.3.a.iii.

d. Dependent Claim 31 (Ground 1)

The tuning module of claim 28, wherein the encoding module further comprises: packetizing module for packetizing data at each of the selected channels into a packet that includes a header section and a data section, wherein the header section includes at least one of identity of the selected channel, type of data of the selected channel, identity of a multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number.

367. Claim 31 recites that “the encoding module further comprises: packetizing module” which performs the step identical to that recited in claim 8. The '855 patent describes the “packetizing module” as function performed by processing module 882 (processor) executing instructions. Ex. 1001 at 39:49-60 (claim 31 “packetizing module”), 41:56-64 (processing module 882). As I explained above above with respect to claim 8, Hicks’s BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function. *See* Section IX.B.1.g; Ex. 1005 at 9:22-48; Ex. 1005 at 3:58-64, 4:21-25, 6:43-56, 7:31-

37, 8:54-60, 9:49-61, 15:3-12. Thus, for the same reasons I explained above with respect to claim 8, the combination of Hicks and PCI discloses claim 31 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.g.

e. Dependent Claim 32 (Ground 1)

The tuning module of claim 28, wherein the encoding module further comprises: framing module for framing data of each of the selected channels into a frame that includes header section and a data section, wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and frame number.

368. Claim 32 recites that “the encoding module further comprises: framing module” which performs the step substantially identical to that recited in claim 10. The '855 patent discloses the “framing module” as a function performed by processing module 882 (processor) executing instructions. Ex. 1001 at 40:14-24 (claim 32 “framing module”), 41:56-64 (processing module 882). As I explained above with respect to claim 10, Hicks’s BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function. *See*

Section IX.B.1.i; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:58-64, 4:21-25, 6:43-56, 7:31-37, 8:54-60, 9:49-61. Thus, for the same reasons I explained above with respect to claim 10, the combination of Hicks and PCI discloses claim 32 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.i.

f. Dependent Claim 33 (Ground 1)

The tuning module of claim 28, wherein the encoding module further comprises at least one of:

multilevel encoding module for multilevel encoding of data of each of the selected channels;

non return to zero (NRZ) encoding module for NRZ encoding of the data of each of the selected channels;

Manchester encoding module for Manchester encoding of the data of each of the selected channels;

block encoding module for block encoding of the data of each of the selected channels; and

nR/mR encoding module for nB/mB encoding of the data of each of the selected channels, where $n < m$.

369. Claim 33 recites that the encoding module further comprises various modules that perform steps substantially identical to those recited in claim 12. The '855 patent discloses each of the recited modules as functions performed by processing module 882 (processor) executing instructions. Ex. 1001 at 41:56-64

(processing module 882), 42:25-50 (claim 33 modules). As I explained above with respect to claim 12, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs each of these functions. *See* Section IX.B.1.k; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:2-5, 3:41-43, 3:58-64, 4:44-50, 5:43-67, 7:41-55, 8:18-20, 8:38-47, 9:49-54. Thus, for the same reasons I explained above with respect to claim 12, the combination of Hicks and PCI discloses claim 33 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.k.

g. Dependent Claim 34 (Ground 1)

The tuning module of claim 28 further comprises: data compressing module operably coupled to the plurality of selectors and the encoding module, wherein the data compressing module receives the selected channels from the plurality of selectors, compresses the selected channels to produce compressed channels, and provides the compressed channels to the encoding module.

370. Claim 34 recites a “data compressing module” that “receives the selected channels from the plurality of selectors, compresses the selected channels to produce compressed channels, and provides the compressed channels to the encoding module” in substantially the same way as Hicks discloses the step of claim 13 as I explained above. *See* Section IX.B.1.l. The '855 patent discloses the

“data compressing module” as a function performed by processing module 882 (processor) executing instructions. Ex. 1001 at 41:19-26 (data compression module 862 and encrypting module 860), 41:56-64 (processing module 882). As I explained above with respect to claim 13, Hicks’s BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function. *See* Section IX.B.1.1; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:58-64, 4:21-25, 6:43-52, 8:54-60, 7:31-37, 9:49-61, 15:3-12. Thus, for the same reasons I explained above with respect to claim 13, the combination of Hicks and PCI discloses claim 34 using the same or equivalent structure to that disclosed in the ’855 patent. *See* Section IX.B.1.1.

h. Dependent Claim 35 (Ground 1)

The tuning module of claim 28 further comprises: encryption module operably coupled to the plurality of selectors and the encoding module, wherein the encryption module receives the selected channels from the plurality of selectors, encrypts the selected channels to produce encrypted channels, and provides the encrypted channels to the encoding module.

371. Claim 35 recites an “encryption module” that “receives the selected channels from the plurality of selectors, encrypts the selected channels to produce encrypted channels, and provides the encrypted channels to the encoding module”

in substantially the same way as Hicks discloses the step of claim 14 as described above. *See* Section IX.B.1.m. The '855 patent discloses the “data encryption module” as a function performed by processing module 882 (processor) executing instructions. Ex. 1001 at 41:19-26 (data compression module 862 and encrypting module 860), 41:56-64 (processing module 882). As I explained above with respect to claim 14, Hicks’s BMG (including cipher/decipher logic 168) under the control of processor 130 (executing the instructions stored in memory 131) performs this function. *See* Section IX.B.1.l; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 1005 at 4:4-11, 9:7-17, 11:9-19, 11:48-12:3, Figs. 2-3, 6. Thus, for the same reasons I explained above with respect to claim 14, the combination of Hicks and PCI discloses claim 35 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.l.

i. Dependent Claim 36 (Ground 1)

The tuning module of claim 28 further comprises: bus controller operably coupled to the bus interface module, wherein the bus controller controls receiving of the plurality of channel selection commands and controls the transmitting of the encoded channel data.

372. As I explained above with respect to Elements [1F], [1H], [28E] and [28F], Hicks’s processor operates as a PCI master device to read from and write to PCI target devices, such as reading the channel selection commands from the data

switch 105, and reading the encoded channel data from the signal processing circuit 120 and writing the encoded channel data to the data switch 105. *See* Sections IX.B.1.a.vi, IX.B.1.a.viii (§§ 198-215, 221-224), IX.B.3.a.i. Thus, for the same reasons I explained above with respect to Elements [1H], [28E] and [28F], the combination of Hicks and PCI discloses claim 36. *See* Sections IX.B.1.a.viii (§§ 221-224), IX.B.3.a.i; Ex. 1005 at 9:22-48; Ex. 1006 at 41-42 (“Bus commands indicate to the target the type of transaction the master is requesting”), 43, 67-68 (Figs. 3-5, 3-6).

4. Claims 37-52

373. Independent claim 37 and dependent claims 43-52 each corresponds to one or more limitations of one or more earlier elements of claims 1-17. Thus, as I explain below, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) discloses all the limitations of the claims 37 and claims 43-52, and that Hicks in view of PCI, and Usui (Ground 2) disclose all the limitations of the claims 38 and 39.

a. Independent Claim 37 (Ground 1)

374. Claim 37 is an apparatus claim corresponding to a combination of some, but not all of, method claim 1, which are taught by the combination of Hicks and PCI (Ground 1) as I explain below:

i. Element [37A]

**An apparatus for multiplexing a plurality of channels
in a multimedia system, the apparatus comprises:**

375. Element [37A] is identical to Element [1A] except that it recites an “apparatus” instead of a method. As I explained above with respect to Element [1A], Hicks discloses a BMG (an apparatus) that performs the method of claim 1. *See* Section IX.B.1.a.i. Thus, the combination of Hicks and PCI discloses Element [37A] for the same reasons I explained above with respect to Element [1A]. *See* Section IX.B.1.a.i.

ii. Element [37B]

**processing module; and
memory operably coupled to the processing module,
wherein the memory includes operational instructions
that cause the processing module to:**

376. The '855 patent describes the structure of these elements as a processing module 882 (microprocessor) and memory 884 (RAM, magnetic tape drive) storing operational instructions. Ex. 1001 at 41:40-64. In the combination of Hicks and PCI, Hicks's BMG (including a shared PCI bus as described in [1F]) includes the same or equivalent structure of a processor 130 (Pentium III processor) and memory 131 (RAM, magnetic storage device) storing instructions that control the operation of the BMG. Ex. 1005 at 8:14-9:32, 9:22-48, 11:48-12:3. The

combination of Hicks and PCI thus discloses Element [37B].

iii. Element [37C]

receive a plurality of channels from a multimedia source;

377. Element [37C] requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to Element [1B]. As I explained above with respect to Element [1B], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1B] using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.ii; Ex. 1005 at 9:22-48, *also see* 3:54-58, 8:22-37, 8:44-51, 9:17-21, 12:4-10, 12:44-47, 12:57-66, 17:60-18:3, 18:50-60, Figs. 1-4, 6.

iv. Element [37D] and [37E]

[37D] receive a plurality of channel selection commands by: monitoring a shared bus at specific time intervals; and identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands;

[37E] decode, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel

selection commands;

378. Elements [37D] and [37E] requires that the processing module, memory, and instructions of Element [37B] perform a function that are substantially identical to Element [1F]. As I explained above with respect to Element [1F], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs these functions, and are thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1F] using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.vi; Ex. 1005 at 9:22-48.

v. Element [37F]

**select a channel of the plurality of channels per channel
selection command of the plurality of channel selection
commands to produce selected channels; and**

379. Element [37F] requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to Element [1G]. As I explained above with respect to Element [1G], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1G] using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.vii; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at Abstract, 2:16-27, 3:14-67, 4:21-50, 6:1-

50, 8:24-60, 10:54-12:4, 12:38-51.

vi. Element [37G]

encode each of the selected channels based on a the data conveyance protocol of the multimedia system to produce a set of encoded channel data.

380. Element [37G] requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to Element [1H]. As I explained above with respect to Element [1H], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1H] using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.viii; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:54-67, 6:57-7:31, 8:44-51, 9:17-48, 11:48-67, Figs. 2, 6; Ex. 1006 at 47-50.

vii. Summary Opinion Regarding Claim 37

381. As I explained above, a PHOSITA would have found that Hicks in combination with the PCI standard (Ground 1) discloses all elements of claim 37, thereby showing that claim 18 is unpatentable for being obvious under those combinations of references.

b. Dependent Claim 38 (Grounds 1 and 2)

[38A] The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to receive the channel selection commands by: receiving, from a plurality of clients, a plurality of channel selection requests; and

[38B] processing the plurality of channel selection requests to produce the plurality of channel selection commands,

[38C] wherein the each of the plurality of channel selection commands includes at least one of: specific channel selection command, last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and select channel from user define list.

382. Element [38A] requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to Element [1C]. As I explained above with respect to Element [1C], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1C] using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.iii; Ex. 1005 at 9:22-48.

383. Element [38B] requires a function (performed by the processing module, memory, and instructions of [37B/38A]) that is substantially identical to Element [1D]. As I explained above with respect to Element [1C], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1D] using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.iv; Ex. 1005 at 9:22-48.

384. Element [38C] requires a function (performed by the processing module, memory, and instructions of Elements [37B/38A]) that is substantially identical to Element [1E], except that the list in Element [38C] additionally includes the optional item of "specific channel selection command." As I explained above with respect to Element [1E], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function. Thus, the combination of Hicks and PCI (Ground 1), and the combination of Hicks, PCI, and Usui (Ground 2) disclose Element [38C] for the same reasons I explained above with respect to Element [1E] using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.a.v; Ex. 1005 at 9:22-48. Additionally, Hicks discloses that a user may select a program from a graphical user interface or by entering a channel number with a remote control, thus disclosing the Element [38C]

“specific channel selection command.” Ex. 1005 at 4:21-50, 4:55-59, 12:4-51, Figs. 4, 6. Usui likewise discloses selecting a channel using a numeric keypad 138, thus also disclosing the Element [38C] “specific channel selection command.” Ex. 1012 at 6:36-42. Hicks’s BMG under the control of processor 130 (executing the instructions stored in memory 131) performs the additional function of receiving this command, and thus discloses Element [38C] using the same or equivalent structure to that disclosed in the ’855 patent. Ex. 1005 at 9:22-48.

c. Dependent Claims 39 (Grounds 1 and 2) and 42 (Ground 1)

Claim 39

[39A] The apparatus of claim 38, wherein the memory further comprises operational instructions that cause the processing module to process the plurality of channel selection requests by at least one of:

[39B] interpreting at least one channel selection request to identity at least one client of the plurality of clients and at least one of the channel selection requests of the plurality of channel selection requests;

[39C] authenticating a client of the plurality of clients that provides a specific channel selection request; and

[39D] authenticating the specific channel selection request.

Claim 42

[42A] The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to receive the plurality of channel selection commands by at least one of:

[42B] decrypting each of the plurality of channel selection commands; and

[42C] decompressing each of the plurality of channel selection commands

385. Claims 39 and 42 requires that the processing module, memory, and instructions of Element [37B] perform functions that are substantially identical to claims 2 and 5, respectively. As discussed above with respect to claims 2 and 5, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs these functions. Thus, claims 39 and 42 are disclosed by the combination of Hicks and PCI (Ground 1), and claim 39 is disclosed by the combination of Hicks, PCI, and Usui (Ground 2) for the same reasons I explained above with respect to claims 2 and 5 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.b; Ex. 1005 at 9:22-48.

d. Dependent Claim 40 (Ground 1)

The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to: receive a second plurality of

channels from a second multimedia source.

386. Claim 40 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 3. As I explained above with respect to claim 3, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 3 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.c; Ex. 1005 at 9:22-48.

e. Dependent Claim 41 (Ground 1)

The apparatus of claim 40, wherein the memory further comprises operational instructions that cause the processing module to select a channel by: selecting a channel from either the plurality of channels or the second plurality of channels per each of the channel selection commands, wherein each of the channel selection commands includes identity of the multimedia source or the second multimedia source and identity of the channel.

387. Claim 41 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 4. As I explained above with respect to claim 4, Hicks's BMG under the

control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 4 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.d; Ex. 1005 at 9:22-48.

f. Dependent Claim 43 (Ground 1)

The apparatus of claim 37, wherein each of the plurality of channels is compressed, and wherein the memory further comprises operational instructions that cause the processing module to select a channel by: selecting a group of compressed channels of the plurality of channels per at least one of the plurality of channel selection commands, wherein the group of compressed channels includes the channel.

388. Claim 43 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 6. As I explained above with respect to claim 6, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 6 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.e; Ex. 1005 at 9:22-48.

g. Dependent Claim 44 (Ground 1)

The apparatus of claim 43, wherein the memory further comprises operational instructions that cause the processing module to encode each of the selected channels by: encoding the group of compressed channels into packets or frames based on the data conveyance protocol.

389. Claim 44 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 7. As I explained above with respect to claim 3, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 7 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.f; Ex. 1005 at 9:22-48.

h. Dependent Claim 45 (Ground 1)

45. The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to encode each of the selected channels by:

packetizing data of each of the selected channels into a packet that includes a header section and a data section, wherein the header section includes at least one

of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number.

390. Claim 45 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 8. As I explained above with respect to claim 8, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 8 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.g; Ex. 1005 at 9:22-48.

i. Dependent Claim 46 (Ground 1)

The apparatus of claim 45, wherein the memory further comprises operational instructions that cause the processing module to: convey the packet using at least one of: Carrier Sense Multiple Access (CSMA), CSMA with collision avoidance, and CSMA with collision detection.

391. Claim 46 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to

claim 9. As I explained above with respect to claim 9, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 9 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.h; Ex. 1005 at 9:22-48.

j. Dependent Claim 47 (Ground 1)

The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to encode each of the selected channels by: framing data of each of the selected channels into a frame that includes header section and a data section, wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and frame number.

392. Claim 47 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 10. As I explained above with respect to claim 10, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs

this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 10 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.i; Ex. 1005 at 9:22-48.

k. Dependent Claim 48 (Ground 1)

The apparatus of claim 47, wherein the memory further comprises operational instructions that cause the processing module to: convey the frame in accordance with at least one of: a time division multiplexing data conveyance protocol, and frequency division multiplexing data conveyance protocol.

393. Claim 48 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 11. As I explained above with respect to claim 11, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 11 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.j; Ex. 1005 at 9:22-48.

l. Dependent Claim 49 (Ground 1)

[49A] The apparatus of claim 37, wherein the memory

further comprises operational instructions that cause the processing module to encode each of the selected channels by at least one of:

[49B] multilevel encoding data of each of the selected channels;

[49C] non return to zero (NRZ) encoding the data of each of the selected channels;

[49D] Manchester encoding the data of each of the selected channels;

[49E] block encoding the data of each of the selected channels; and

[49F] nB/mB encoding the data of each of the selected channels, where $n < m$.

394. Claim 49 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 12. As I explained above with respect to claim 12, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 12 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.k; Ex. 1005 at 9:22-48.

m. Dependent Claim 50 (Ground 1)

The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to: compress the selected channels prior to encoding.

395. Claim 50 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 13. As I explained above with respect to claim 13, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 13 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.1; Ex. 1005 at 9:22-48.

n. Dependent Claim 51 (Ground 1)

The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to: encrypt the selected channels prior to encoding.

396. Claim 51 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 14. As I explained above with respect to claim 14, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs

this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 14 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.m; Ex. 1005 at 9:22-48.

o. Dependent Claim 52 (Ground 1)

[52A] The apparatus of claim 37, wherein the memory further comprises operational instruction that cause the processing module to: receive a single channel from a multimedia source;

[52B] select the single channel based on at least one of the plurality of channel selection commands to produce a selected single channel; and

[52C] encode the selecting single channel based on the data conveyance protocol.

397. Claim 52 requires that the processing module, memory, and instructions of Element [37B] perform a function that is substantially identical to claim 15. As I explained above with respect to claim 15, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 15 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.n; Ex. 1005 at 9:22-48.

5. Claims 53-63

398. Independent claim 53 and dependent claims 54-63 each corresponds to one or more limitations of one or more earlier elements of claims 1-17.

399. Thus, as I explain below, it is my opinion that a PHOSITA would have understood that Hicks in view of PCI (Ground 1) discloses all the limitations of claims 53-63, and that Hicks in view of PCI, and Usui (Ground 2) disclose all the limitations of claim.

a. Independent Claim 53 (Ground 1)

400. Claim 53 is an apparatus claim corresponding to a combination of some, but not all of, the steps of method claims 1, 2, 3, and 4 (as summarized in the table below), which is taught by the combination of Hicks and PCI (Ground 1) as I explain in the following sections.

Elements of Claims 53-63	Corresponding Element of Claims 1-4
[53A]	[1A]
[53B]	-
[53C]	[1B] + claim 3
[53D]	[1C] +[1F]
[53E]	[1D] + claims 2, 4
[53F]	[1G]
[53G]	[1H]

i. Element [53A]

An apparatus for multiplexing channels in a multimedia system, the apparatus comprises:

401. Element [53A] is substantially identical to Element [1A] except that it recites an “apparatus” instead of a method. As I explained above with respect to Element [1A], Hicks discloses a BMG (an apparatus) that performs the method of claim 1. See Section IX.B.1.a.i. Thus, the combination of Hicks and PCI discloses Element [53A] for the same reasons I explained above with respect to Element [1A]. See Section IX.B.1.a.i.

ii. Element [53B]

processing module; and memory operably coupled to the processing module, wherein the memory includes

**operational instructions that cause the processing
module to:**

402. The '855 patent describes the structure of these elements as a processing module 882 (microprocessor) and a memory 884 (RAM, magnetic tape drive) storing operational instructions. Ex. 1001 at 41:40-64. In the combination of Hicks and PCI, Hicks's BMG includes the same or equivalent structure of a processor 130 (Pentium III processor) and memory 131 (RAM, magnetic storage device) storing instructions that control the operation of the BMG. Ex. 1005 at 8:14-9:32, 9:22-48, 11:48-12:3. The combination of Hicks and PCI thus discloses Element [53B].

iii. Element [53C]

**receiving a channel from each of a plurality of sources
to produce a plurality of channels;**

403. Element [53C] recites that the processing module, memory, and instructions of [53B] perform a function that is similar in scope to the combination of Element [1B], which requires "receiving a plurality of channels from a multimedia source," and claim 3, which requires "receiving a second plurality of channels from a second multimedia source. Element [53C] differs in that it requires only a single channel (as opposed to a plurality of channels) from each source, and the sources are not required to be "multimedia sources." Since Element [1B] and claim 3 include all of the limitations of [53C], and as I explained above with respect

to Element [1B] and claim 3, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs these functions, the combination of Hicks and PCI discloses Element [53C] for the same reasons I explained above with respect to Element [1B] and claim 3 above using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.ii and IX.B.1.c; Ex. 1005 at 9:22-48, *also see* 3:54-58, 8:22-37, 8:44-51, 9:17-21, 12:4-10, 12:44-47, 12:57-66, 17:60-18:3, 18:50-60, Figs. 1-4, 6.

iv. Element [53D]

receiving, from a plurality of clients, a plurality of channel selection requests by monitoring shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection requests, decoding, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection requests; and

404. Element [53D] requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to Elements [1C] and [1F] except that whereas Element [53D] recites "channel selection requests," Element [1F] recites "channel selection commands." *See* Sections IX.B.1.a.iii, IX.B.1.a.vi.

405. As I explained above with respect to Element [1C], Hicks's thin-client digital STBs send channel selection requests to the Hicks BMG over a network, and the requests are received by the data switch 105 of the BMG, which is under the control of processor 130 (executing the instructions stored in memory 131) to perform this function. *See* Sections IX.B.1.a.iii; Ex. 1005 at 4:21-50, 9:22-48, 11:20-47, 15:10-12, 12:4-51, Figs. 1-3, 6.

406. As I further explained above with respect to Element [1F], the combination of Hicks and PCI discloses Element [1F] by Hicks's processor 130 (executing the instructions stored in memory 131) receiving—in PCI Frames from the data switch 105 via shared data bus 135—channel selection requests in the form of IP packets encapsulating instructions as payload data. *See* Sections IX.B.1.a.vi (¶¶ 198-215); Ex. 1005 at 3:14-26, 3:54-64, 4:38-44; 5:43-48, 8:15-21, 9:22-48; 12:38-41, 15:10-12; Ex. 1006 at 27-29, 42-43, 46-48, 67-69, 108, Figs. 3-6; Ex. 1030 at 8-11; Ex. 1033 at 37, 44-45. As I further explained above with respect to Element [1F], the Hicks processor decodes the PCI frame (part of the claimed “data conveyance protocol”) and recaptures the STB instructions encapsulated in the IP packets (the claimed “channel selection requests”).

407. Thus, the combination of Hicks and PCI discloses Element [53D] for the same reasons I explained above with respect to Element [1C] and [1F] using the same or equivalent structure to that disclosed in the '855 patent. *See* Section

v. Element [53E]

processing the plurality of channel selection requests to determine whether the request can supported, and, if so, producing a plurality of channel selection commands, wherein each of the plurality of channel selection commands includes an identity of one of the plurality of sources, and an identity of the channel;

408. Element [53E] requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to the combination of Elements [1D], claim 2 and the second clause of claim 4 (“wherein each of the channel selection commands includes identity of the multimedia source or the second multimedia source and identity of the channel”). As I explained above with respect to Element [1D] and claims 2 and 4, Hicks’s BMG, which is under the control of processor 130 (executing the instructions stored in memory 131), performs these functions—thus the combination of Hicks and PCI discloses Element [53E] for the same reasons I explained above with respect to Elements [1D] and claims 2 and 4 using the same or equivalent structure to that disclosed in the ’855 patent. *See* Sections IX.B.1.a.iv, IX.B.1.b, IX.B.1.d. As I also explained above with respect to Element [1D], the combination of Hicks and PCI discloses Element [1D] by Hicks’s processor receiving IP packets (“channel selection requests”) that encapsulate

instructions (“channel selection commands”) from Hicks’s thin-client digital STBs, and Hicks’s processor processes those IP packets and instructions to generate further instructions (also “channel selection commands”) for the tuners/demodulators to extract the channel, and sends the channel back to the STB that requested it. *See* Section IX.B.1.a.iv; Ex. 1005 at 3:54-64, 4:38-44, 9:22-48, 12:38-41 (“The digital data switch receives an instruction to send a second information signal ... [and] sends the instruction ... to a processor ... The processor sends a select second transmission instruction (e.g., to the multichannel tuner) ... The second information signal is sent to the digital data switch ... and the digital data switch sends the second information signal to the second information appliance via the second broadband communications link”), 15:10-12. Hicks’s processor also “determine[s] whether the request can supported [sic], and, if so, producing a plurality of channel selection commands” as further recited in Element [53E] by, for example, performing any of Elements [2C], or [2D] as I have described Hicks performing in Section IX.B.1.b *above*. *See* ¶¶ 227-236; Ex. 1005 at 1:54-62, 3:14-31, 3:54-64, 4:21-44, 7:45-55, 8:60-67, 9:22-48, 9:62-10:4, 10:18-53, 11:20-47, 12:38-41, 13:15-22, 15:10-12, 18:39-42; Ex. 1031 at 1:14-2:20, Figs. 1, 2; Ex. 1034 at 43-44, 64-68. For example, in my opinion a PHOSITA would understand that “authenticating a client of the plurality of clients that provides a specific channel selection request” (Element [2C]) and “authenticating the specific channel selection request: (Element [2D]) are each

ways to determine if a request can be supported as recited in Element [53E], because if any of these steps were to fail, a command could not or would not be generated in the manner described above with respect to Element [1D]. *See* Sections IX.B.1.a.iv, IX.B.1.b. Moreover, I note that if the request cannot be supported (e.g., because the user was not authenticated (per 802.11) or did not have access rights or for any other reason), the claim would not require the plurality of commands to be produced, and as a result, also would not require Elements [53F] and [53G] to be performed since both of those elements depend on the “plurality of channel selection commands” of Element [1E].

409. Further, as I explained above with respect to claim 4, the original instructions from the STB identified the channel (*e.g.*, by channel number) and the multimedia source (*e.g.*, broadcast video, on-demand video, CATV, DBS TV, terrestrial TV), thus disclosing “wherein each of the plurality of channel selection commands includes an identity of one of the plurality of sources, and an identity of the channel” as is also recited in Element [53E]. *See* Section IX.B.1.d (¶¶ 245-246); Ex. 1005 at 4:29-32, 4:44-47, 8:22-37, 8:43-54, 11:26-29, 11:41-47, 12:38-51, 15:10-12.

410. Thus, for the reasons I explained above with respect to Elements [1D] and claims 2 and 4, as further explained in this section, Hicks discloses Element [53E]. *See* Sections IX.B.1.a.iii, IX.B.1.b, IX.B.1.d.

vi. Element [53F]

selecting a channel of the plurality of channels per channel selection command of the plurality of channel selection command to produce selected channels; and

411. Element [53F] requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to Element [1G]. As I explained above with respect to [1G], Hicks's BMG, which is under the control of processor 130 (executing the instructions stored in memory 131), performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to Element [1G] using the same or equivalent structure to that disclosed in the '855 patent. *See* Sections IX.B.1.a.vii; Ex. 1005 at 9:22-48.

vii. Element [53G]

encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data.

412. Element [53G] requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to Element [1H]. As I explained above with respect to [1H], Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same

reasons I explained above with respect to Element [1H] using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.a.viii; Ex. 1005 at 9:22-48.

viii. Summary Opinion Regarding Claim 53

413. As I explained above, a PHOSITA would have found that Hicks in combination with the PCI standard (Ground 1) discloses all elements of claim 53, thereby showing that claim 18 is unpatentable for being obvious under those combinations of references.

b. Dependent Claim 54 (Grounds 1 and 2)

The apparatus of claim 53, wherein the each of the plurality of channel selection commands includes at least one of: specific channel selection command, last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and select channel from user define list.

414. Claim 54 is substantially identical to Element [1E], except that the list in claim 54 includes the additional optional item of “specific channel selection command.” The combination of Hicks and PCI (Ground 1) and the combination of Hicks, PCI, and Usui (Ground 2) disclose claim 54 for the same reasons I explained above with respect to Element [1E]. *See* Section IX.B.1.a.v.

415. Additionally, Hicks discloses that a user may select a program from a graphical user interface or by entering a channel number with a remote control, thus disclosing the requirement of claim 54 for a “specific channel selection command.” Ex. 1005 at 4:21-50, 4:55-59, 12:4-51, Figs. 4, 6. Usui likewise discloses selecting a channel using a numeric keypad 138, thus also disclosing the requirement of claim 54 for a “specific channel selection command.” Ex. 1012 at 6:36-42.

c. Dependent Claims 55 and 56 (Ground 1)

Claim 55

[55A] The apparatus of claim 53, wherein the memory further comprises operational instructions that cause the processing nodule to process the plurality of channel selection requests by at least one of:

[55B] interpreting at least one channel selection request to identify at least one client of the plurality of clients and at least one of the channel selection requests of the plurality of channel selection requests;

[55C] authenticating a client of the plurality of clients that provides a specific channel selection request; and

[55D] authenticating the specific channel selection request.

Claim 56

[56A] The apparatus of claim 53, wherein the memory further comprises operational instructions that cause

the processing module to receive the plurality of channel selection commands by at least one of:

[56B] decrypting each of the plurality of channel selection commands; and

[56C] decompressing each of the plurality of channel selection commands.

416. Claims 55 and 56 require that the processing module, memory, and instructions of Element [53B] perform functions that are substantially identical to claims 2 and 5. As I explained above with respect to claims 2 and 5, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs these functions. Thus, claims 2 and 5 are disclosed by the combination of Hicks and PCI (Ground 1) for the same reasons I explained above with respect to claims 2 and 5 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.b; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:14-31, 7:49-55, 9:62-10:4 10:34-53; Ex. 1031 at 1:14-2:20, Figs. 1, 2; Ex. 1034 at 43-44, 64-68.

d. Dependent Claim 57 (Ground 1)

The apparatus of claim 53, wherein the memory further comprises operational instructions that cause the processing module to encode each of the selected channels by:

packetizing data of each of the selected channels into a packet that includes a header section and a data

section, wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number.

417. Claim 57 requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to claim 8. As I explained above with respect to claim 8, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 8 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.g; Ex. 1005 at 9:22-48; Ex. 1005 at 3:58-64, 4:21-25, 6:43-56, 7:31-37, 8:54-60, 9:49-61, 15:3-12.

e. Dependent Claim 58 (Ground 1)

The apparatus of claim 57, wherein the memory further comprises operational instructions that cause the processing module to:

convey the packet using at least one of: Carrier Sense Multiple Access (CSMA), CSMA with collision avoidance, and CSMA with collision detection.

418. Claim 58 requires that the processing module, memory, and

instructions of Element [53B] perform a function that is substantially identical to claim 9. As I explained above with respect to claim 9, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 9 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.h; Ex. 1005 at 9:22-48.

f. Dependent Claim 59 (Ground 1)

The apparatus of claim 53, wherein the memory further comprises operational instructions that cause the processing module to encoding each of the selected channels by:

framing data of each of the selected channels into a frame that includes header section and a data section, wherein the header section includes at least one of identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and frame number.

419. Claim 59 requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to claim 10. As I explained above with respect to claim 10, Hicks's BMG under the

control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 10 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.i; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:58-64, 4:21-25, 6:43-56, 7:31-37, 8:54-60, 9:49-61.

g. Dependent Claim 60 (Ground 1)

The apparatus of claim 59, wherein the memory further comprises operational instruction that cause the processing module to:

convey the frame in accordance with at least one of: a time division multiplexing data conveyance protocol, and frequency division multiplexing data conveyance protocol.

420. Claim 60 requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to claim 11. As I explained above with respect to claim 11, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 11 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.j; Ex. 1005 at 9:22-48.

h. Dependent Claim 61 (Ground 1)

[61A] The apparatus of claim 53, wherein the memory further comprises operational instructions that cause the processing module to encode each of tho [sic the] selected channels by at least one of:

[61B] multilevel encoding data of each of the selected channels;

[61C] non return to zero (NRZ) encoding the data of each of the selected channels;

[61D] Manchester encoding the data of each of the selected channels;

[61E] block encoding the data of each of the selected channels; and

[61F] nB/mB encoding the data of each of the selected channels, where $n < m$.

421. Claim 61 requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to claim 12. As I explained above with respect to claim 12, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 12 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.k; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:2-5, 3:41-43, 3:58-64, 4:44-50, 5:43-67, 7:41-55, 8:18-20,

8:38-47, 9:49-54.

i. Dependent Claim 62 (Ground 1)

The apparatus of claim 53, wherein the memory further comprises operational instructions that cause the processing module to:

compress the selected channels prior to encoding.

422. Claim 62 requires that the processing module, memory, and instructions of Element [53B] perform a function that is substantially identical to claim 13. As I explained above with respect to claim 13, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 13 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.1; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 3:58-64, 4:21-25, 6:43-52, 8:54-60, 7:31-37, 9:49-61, 15:3-12.

j. Dependent Claim 63 (Ground 1)

The apparatus of claim 53, wherein the memory further comprises operational instructions that cause the processing module to:

encrypt tho [sic the] selected channels prior to encoding.

423. Claim 63 requires that the processing module, memory, and instructions of [53B] perform a function that is substantially identical to claim 14. As I explained above with respect to claim 14, Hicks's BMG under the control of processor 130 (executing the instructions stored in memory 131) performs this function, and is thus disclosed by the combination of Hicks and PCI for the same reasons I explained above with respect to claim 14 using the same or equivalent structure to that disclosed in the '855 patent. *See* Section IX.B.1.m; Ex. 1005 at 9:22-48; *also see* Ex. 1005 at 1005 at 4:4-11, 9:7-17, 11:9-19, 11:48-12:3, Figs. 2-3, 6.

C. Hicks in View of PCI, and Grier (Ground 3) Render Obvious Claims 2, 5, 20-21, 29, 39, 42, and 53-63, and Hicks in View of PCI, Usui, and Grier (Ground 4) Render Obvious Claims 2, 5, 20, 39, and 54

1. A PHOSITA Would Have Been Motivated to Combine Grier with Hicks and PCI, and with Hicks, PCI, and Usui

424. In my additional opinion, a PHOSITA would find that the combination of Hicks in view of PCI and Grier (Ground 3) and the combination of Hicks in view of PCI, Usui, and Grier (Ground 4) disclose claims 2 and 5. As I explained above with respect to Elements [1C], [1D], and [1F] (*see* Sections IX.B.1.a.iii, IX.B.1.a.iv and IX.B.1.a.vi above), Hicks discloses that his thin-client digital STBs generate instructions and send those instructions through an in-home network according to a specific protocol (*e.g.*, Ethernet, Internet Protocol, 802.11, *etc.*), which encapsulate the instructions in frames and IP packets (channel selection requests) for

transmission to the BMG. Ex. 1005 at 3:14-26, 4:21-50, 5:43-48, 8:15-21, 8:44-54, 11:4-8, 11:20-47, 12:38-42; Ex. 1030 at 8-14; Ex. 1033 at 37, 39-40, 53, 59-61; Ex. 1034 at 68-69, 83-88.

425. These framed/packetized messages are the claimed “channel selection requests.” *See* Section IX.B.1.a.iii (§§ 152-164) above; Ex. 1005 at 4:21-50, 8:38-60, 11:20-12:51, Figs. 2, 6. The data switch in the Hicks BMG in turn would process the transmission to extract the IP packets from the frames to forward the IP packets including the instructions to processor 130. *See* Sections IX.B.1.a.iv (§§ 165-109) and IX.B.1.a.vi (§§ 195-215) above; Ex. 1005 at 4:21-50, 8:38-60, 11:20-12:51, Figs. 2, 6.

426. Grier discloses how to implement Hicks’s 802.11 transceiver 143 according to the 802.11 standard, which would include authentication of client devices, and Wired Equivalent Privacy (WEP) encryption/decryption of the transmissions (including the STB instructions) received by the BMG over the network. Ex. 1034 at 36, 43-44, 65-68, 83-88. Since Grier discloses the details of the 802.11 network identified in Hicks, a PHOSITA would have found the combination of Hicks, PCI and Grier, and the combination of Hicks, PCI, Usui, and Grier to be nothing more than the combination of prior art elements (Hicks’s 802.11 transceiver 143 and Grier’s details regarding 802.11 authentication and encryption/decryption) according to known methods to yield predictable results (a

system incorporating authentication and encryption/decryption in its communications).

427. Moreover, in my opinion a PHOSITA would recognize that using the IEEE-802.11 authentication and WEP encryption as described in Grier would have improved Hick's system by providing privacy and security for the wireless communications, which could otherwise be intercepted by unauthorized or unwanted third parties. Ex. 1034 at 36, 43-44, 65-68. Thus, such a PHOSITA would have also found the combination of Hicks, PCI and Grier, and the combination of Hicks, PCI, Usui, and Grier to merely be the use of a known technique (the 802.11 standard with authentication and encryption) to improve a similar device (Hicks's 802.11 transceiver 143) in the same way as described in Grier.

428. Such a PHOSITA would have also had a reasonable expectation of success in implementing these combinations since Hicks's BMG was already specifically designed with an 802.11 interface, and the 802.11 protocol disclosed in Grier was an industry standard that was already commercially deployed. Ex. 1034 at 15, 20-23.

2. Dependent Claim 2 (Grounds 3 and 4)

[2A] The method of claim 1, wherein the processing the plurality of channel selection requests further comprises at least one of:

[2B] interpreting at least one channel selection request to identify at least one client of the plurality of clients and at least one of the channel selection requests of the plurality of channel selection requests;

[2C] authenticating a client of the plurality of clients that provides a specific channel selection request; and

[2D] authenticating the specific channel selection request.

429. As I explained above in ¶¶ 424-428, in the combination of Hicks, PCI, and Grier and in the combination of Hicks, PCI, Usui, and Grier, the BMG would perform authentication on all data traffic on the IEEE 802.11 network connecting the client STBs to it. *See* ¶ 426 above (citing Ex. 1034 at 36, 43-44, 65-68, 83-88).

430. This traffic would include the channel selection requests sent from a client STB to the BMG. *See* Section IX.B.1.a.iii above, citing Ex. 1005 at 4:21-44, 11:20-47, 12:38-41, 15:10-12. The authentication would verify the identity of the client STB that sent the channel selection request, thus performing Element [2C]. *See* ¶ 426 above; Ex. 1034 at 43 (“All 802.11 stations, whether they are part of an independent BSS or ESS network, must use the authentication service prior to establishing a connection (referred to as an association in 802.11 terms) with another station with which they will communicate.”), 44 (“Shared key authentication: This type of authentication assumes that each station has received a secret shared key through a secure channel independent from the 802.11 network.”), 64-67.

3. Dependent Claim 5 (Grounds 3 and 4)

[5A] The method of claim 1, wherein the receiving the plurality of channel selection commands further comprises at least one of:

[5B] decrypting each of the plurality of channel selection commands; and

[5C] decompressing each of the plurality of channel selection commands.

431. As I explained above in ¶¶ 416-428, in the combination of Hicks, PCI, and Grier (and in the combination of Hicks, PCI, Usui, and Grier), the BMG would perform decryption according to the WEP process on all data traffic on the IEEE 802.11 network connecting the client STBs to the BMG. *See* ¶¶ 424-428 above (citing Ex. 1034 at 36, 44, 68).

432. This traffic would include the channel selection requests—which encapsulate each of the plurality of channel selection commands—sent from a client STB to the BMG. *See* Sections IX.B.1.a.iii and IX.B.1.a.iv (citing Ex. 1005 at 3:14-26, 4:21-50, 5:43-48, 8:15:21, 11:4-8, 11:20-47, 12:38-42, 15:10-12). Thus, in these combinations, the Hicks/Grier 802.11 interface would perform the element [5B] step of “decrypting each of the plurality of channel selection commands.”

4. Dependent Claim 20 (Grounds 3 and 4)

[20A] The method of claim 19, wherein the processing

the plurality of channel selection requests further comprises at least one of:

[20B] interpreting at least one channel selection request to identify at least one client of the plurality of clients and at least one of the channel selection requests of the plurality of channel selection requests;

[20C] authenticating a client of the plurality of clients that provides a specific channel selection request; and

[20D] authenticating the specific channel selection request.

433. Claim 20 is substantially identical to claim 2 and is thus disclosed by the combination of Hicks, PCI, and Grier (Ground 3) and the combination of Hicks, PCI, Usui, and Grier (Ground 4), for the same reasons I explained above with respect to claim 2, and with respect to base claims 18 and 19. *See* Sections IX.B.2.a, IX.B.2.b, IX.C.1, IX.C.2.

5. Dependent Claim 21 (Ground 3)

[21A] The method of claim 18, wherein the receiving the plurality of channel selection commands further comprises at least one of:

[21B] decrypting each of the plurality of channel selection commands; and

[21C] decompressing each off the plurality of channel selection commands.

434. Claim 21 is substantially identical to claim 5 and is thus disclosed by the combination of Hicks, PCI, and Grier (Ground 3) for the same reasons I explained above with respect to claim 5, and with respect to base claim 18. *See* Sections IX.B.2.a, IX.C.1, IX.C.3.

6. Dependent Claim 29 (Ground 3)

[29A] The tuning module of claim 28, wherein the bus interface module further comprises at least one of:

[29B] decrypting module for decrypting each of the plurality of channel selection commands; and

[29C] decompressing module for decompressing each of the plurality of channel selection commands.

435. Claim 29 is substantially identical to claim 5 and is thus disclosed by the combination of Hicks, PCI, and Grier (Ground 3) for the same reasons I explained above with respect to claim 5, and with respect to base claim 28. *See* Sections IX.B.3.a, IX.C.1, IX.C.3.

7. Dependent Claim 39 (Grounds 3 and 4)

[39A] The apparatus of claim 38, wherein the memory further comprises operational instructions that cause the processing module to process the plurality of channel selection requests by at least one of:

[39B] interpreting at least one channel selection request to identify at least one client of the plurality of

clients and at least one of the channel selection requests of the plurality of channel selection requests;

[39C] authenticating a client of the plurality of clients that provides a specific channel selection request; and

[39D] authenticating the specific channel selection request.

436. Claim 39 is substantially identical to claim 2 and is thus disclosed by the combination of Hicks, PCI and Grier (Ground 3), and the combination of Hicks, PCI, Usui, and Grier (Ground 4), for the same reasons I explained above with respect to claim 2, and with respect to base claims 37 and 38. *See* Sections IX.B.4.a, IX.B.4.b, IX.C.1, IX.C.2.

8. Dependent Claim 42 (Ground 3)

[42A] The apparatus of claim 37, wherein the memory further comprises operational instructions that cause the processing module to receive the plurality of channel selection commands by at least one of:

[42B] decrypting each of the plurality of channel selection commands; and

[42C] decompressing each of the plurality of channel selection commands.

437. Claim 42 is substantially identical to claim 5 and is thus disclosed by the combination of Hicks, PCI, and Grier (Ground 3) for the same reasons I

explained above with respect to claim 5, and with respect to base claim 37. *See* Sections IX.B.4.a, IX.C.1, IX.C.3.

9. Claims 53-63 (Ground 3), Claim 54 (Ground 4)

a. Claims 53-54 and 57-63 (Ground 3), Claim 54 (Ground 4)

438. In my analysis of independent claim 53 above with respect to Ground 1, I noted that the feature of Element [53E] of “determine whether the request can be supported” was taught by Hicks for the same reasons Hicks teaches Elements [2C] and [2D]. *See* Section IX.B.1.a.v above. In my opinion, therefore, a PHOSITA would understand that “authenticating a client of the plurality of clients that provides a specific channel selection request” (Element [2C]) and “authenticating the specific channel selection request: (Element [2D]) are each ways to determine if a request can be supported as recited in Element [53E]. For similar reasons, the combination Hicks, PCI, and Grier (Ground 3) would also render claim 53 obvious, since this combination also teaches Element [2C] as I explained in the previous section. Sections IX.B.5.a, IX.C.2. Claims 54 and 57-63 would also be taught by Hicks, PCI, and Grier (Ground 3), and claim 54 would also be taught by Hicks, PCI, Usui, and Grier (Ground 4) for the same reason based on their dependencies to claim 53. Sections IX.B.1.b, IX.B.5.a, IX.B.5.b, IX.B.5.d-IX.B.5.j, IX.C.2.

b. Claims 55 and 56 (Ground 3)

439. Claim 55, which depends from claim 53 is substantially identical to

claim 2 and is thus disclosed by the combination of Hicks, PCI, and Grier (Ground 3) for the same reasons I explained above with respect to claim 2, and with respect to base claim 53. *See* Sections IX.B.5.a, IX.B.1.b, IX.C.1-IX.C.2.

440. Claim 56 is substantially identical to claim 5, and is thus disclosed by the combination of Hicks, PCI, and Grier (Ground 3) for the same reasons I explained above with respect to claim 5, and with respect to base claim 53. *See* Sections IX.B.5.a, IX.B.1.b, IX.C.1-IX.C.3.

D. Hicks in View of PCI, and Watkinson (Ground 5) Render Obvious Claims 6-11, 13, 22-24, 26, 31-32, 34, 43-48, 50, 57-60, and 62, and Hicks in View of PCI, Usui, and Watkinson (Ground 6) Render Obvious Claims 6-11 and 13

1. Dependent Claims 6-11 and 13 (Grounds 5 and 6)

441. In my analysis of dependent claims 6-11 and 13 above, my opinion a PHOSITA would find that Hicks and PCI (Ground 1) and Hicks, PCI, and Usui (Ground 2), disclosed every limitation of those claims is based in part on Hicks's disclosure of his BMG receiving MPEG-encoded data (claims 6 and 7) and the BMG encoding audio and video information channels using the MPEG-2 standard (claims 8, 9, 10, 11, and 13). *See* Sections IX.B.1.e-j, IX.B.1.l above.

442. To the extent the Patent Owner may argue that Hicks lacks sufficient detail to teach a PHOSITA the aspects of MPEG decoding and encoding that I relied upon in my analysis, or that the detailed aspects of MPEG would supposedly not have been known to a PHOSITA, it is my opinion that claims 6, 7, 8, 9, 10, 11,

and 13 would have been obvious in view of the combination of Hicks and PCI and the combination of Hicks, PCI, and Usui, further combined with Watkinson, which, like many contemporary MPEG references, expressly teaches how to encode audio and video data according to the MPEG-2 standard. Ex. 1016 at 11-14.

443. For example, the encoding process for audio and video signals according to the MPEG-2 standard is illustrated in Figure 1.13 of Watkinson (Ex. 1016 at 32), which is reproduced below:

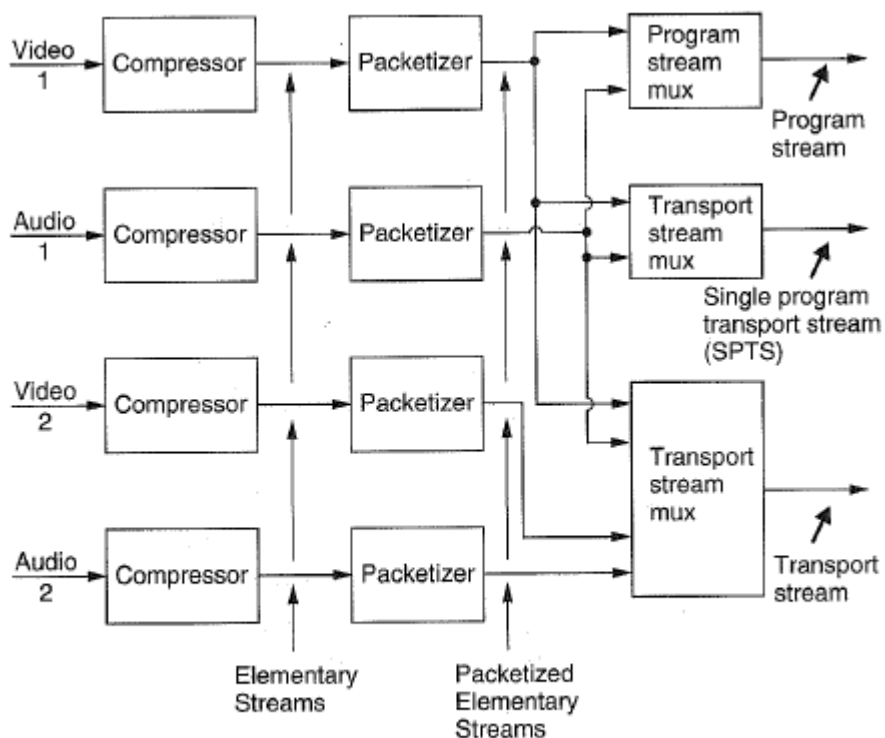
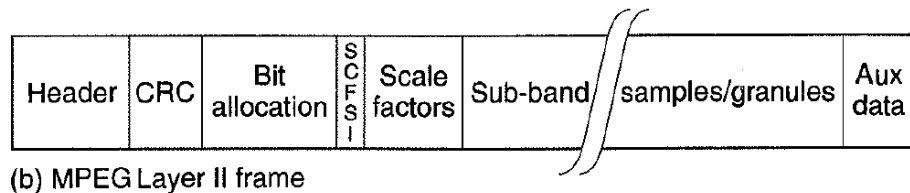
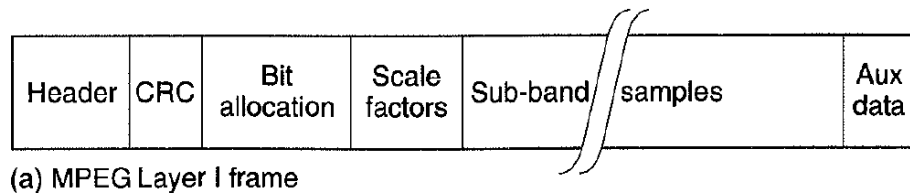


Figure 1.13 The bitstream types of MPEG-2. See text for details.

Ex. 1016 at 32 (Fig. 1.13).

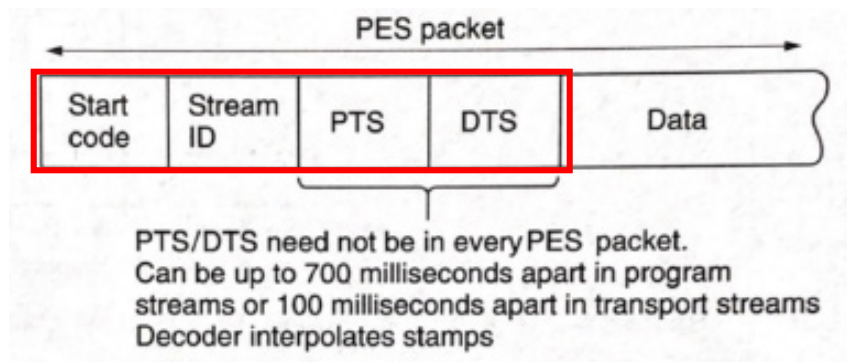
444. As shown in the above figure, under the MPEG-2 standard uncompressed video and audio data is received and compressed by compressors into

Elementary Streams (ESs). Ex. 1016 at 32-33, 52-56; Ex. 1017 at 19-20. Watkinson discloses that audio data that has been encoded into an MPEG-2 ES includes frames having both header and data sections where the header identifies the sampling rate of the audio data and other information describing that data such as whether the frame is encoded according to the MPEG version (-1 or -2), whether Layer 1, 2, or 3 encoding is used, *etc.* Ex. 1016 at 49; Ex. 1017 at 43-44, 54. These features of MPEG-2, which are described in Watkinson, are cited above as evidence of a PHOSITA's background knowledge with respect to claim 10. *See* Sections IX.B.1.i-j above.



Ex. 1043 at 78 (Fig. 4.32); *also see* Ex. 1016 at 49.

445. Each of the ESs is then input to a Packetizer to generate Packetized Elementary Streams (PESs). Ex. 1016 at 32-33, 52-56; Ex. 1017 at 19-20. A PES packet is illustrated below, which includes a header (marked in red) and the data.

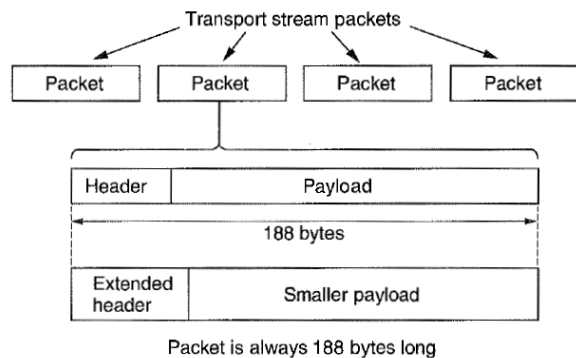


Ex. 1016 at 53 (Fig. 6.1).

446. The header of a PES packet includes a “Stream ID” that “identifies the type of data stream.” Ex. 1016 at 53; Ex. 1017 at 37, 43-44, 64-65. These packet features of MPEG-2, which are described in Watkinson, are cited above as evidence of a PHOSITA’s background knowledge with respect to claim 8. *See* Sections IX.B.1.g-h above.

447. The PESs are then combined into one of two types of multiplexed streams: a Program stream (PS) or a Transport Stream (TS). Ex. 1016 at 53; Ex. 1017 at 39-52. A program stream is used in situations such as for storage of multimedia on a Digital Video Disk (DVD), where only a single program (audio and video) is stored, and the data is encoded based on a common clock. Ex. 1016 at 23-25, 32, 52. A transport stream (TS), on the other hand, “is intended to be a multiplex of many TV programs with their associated sound and data channels” where the programs are not necessarily synchronous to one another. *Id.* at 32-33, 52, 55-56. To transmit data of multiple programs in a transport stream, video and audio PESs

from the different programs are divided into TS packets, with each TS packet has a header that includes information that allows for the individual audio and video elementary streams to be reassembled by a receiving device for decoding. *Id.* at 55-61.



Ex. 1016 at 55 (Fig. 6.5) (excerpted).

448. For example, transport stream packets for a single program elementary stream (*e.g.*, packets of associated an audio elementary stream or video elementary stream) have the same packet identifier (PID) in the packet header. Ex. 1016 at 55-56. Thus, by extracting packets with the same PID and concatenating the payload data from those packets, the original elementary stream can be reassembled.

449. These program and transport stream features of MPEG-2, which are described in Watkinson are cited above as evidence of a PHOSITA's background knowledge with respect to claims 6 and 11. *See* Sections IX.B.1.e, IX.B.1.j above.

450. Based on his or her background knowledge as I explained above, it is my opinion that a PHOSITA would have understood Hicks's discussion of MPEG-2

as referring to the same MPEG-2 features described in Watkinson, those features having been promulgated widely by the ISO. Ex. 1005 at 3:58-64, 4:21-25, 4:44-50, 6:26-42, 7:31-37, 8:54-60, 9:1-57, 15:3-12. In sum, the MPEG-2 features referred to in Hicks and explained more thoroughly in Watkinson include how the process of MPEG-2 encoding includes compressing audio and video data (claims 6 and 13) (Ex.1016 at 11-22, 32-33, 55-60; Ex. 1017 at 3-6, 11-15, 18-24, 41); formatting audio data into frames with headers that identify the type of data and type of compression of the encoded channel (claim 10) (Ex. 1030 at 10-11, 17; Ex. 1016 at 32-33, 41, 48-49, 52-56; Ex. 1043 at 78 (Fig. 4.32); Ex. 1017 at 19-20, 64-65); packetizing data into PES packets with headers that identifies the type of data of the encoded channel (claim 8) (Ex. 1016 at 11-14, 32-33 (Fig. 1.13), 26, 52-56 (Fig. 6.1); Ex. 1017 at 11, 18-20, 37); and receiving and combining multiple compressed digital data streams into a single time division multiplexed stream (claims 6 and 11) (Ex. 1016 at 11-14, 32-33 (Fig. 1.13), 26, 52-56).

451. In combining the BMG of Hicks with the MPEG-2 features of Watkinson, the BMG and the multimedia sources (*e.g.*, CATV or Satellite) described in Hicks would encode programs (audio and video) into MPEG-2 elementary streams (*e.g.*, compressing audio data (as in claim 13) into streams containing audio frames having a header and data (as in claim 10), would packetize those streams into PES packets (containing a header and data as in claims 8 and 9), and would multiplex

the PESs in MPEG-2 Program and Transport Streams for reception by the BMG from the multimedia sources, and for storage or transmission by the BMG to the client devices (as in claims 6, 7, and 11). The multimedia sources would transmit each MPEG-2 transport stream in a single transmission signal to the BMG at a particular frequency, and the transmission signal would be selected and extracted by Hicks's tuner/demodulator 102. Ex. 1005 at 6:23-32, 6:43-57,; Ex. 1016 at 55-60; Ex. 1001 at 42:31-38, 49:52-55, 51:23-26.

452. According to Hicks, the tuner/demodulator would select and demodulate the transmission signal including the MPEG-2 transport stream in response to receiving one or more channel selection commands from users, thus selecting the entire plurality of programs multiplexed in the MPEG-2 transport stream (as in claims 6 and 7). Ex. 1005 at 4:44-50, 12:38-51; Ex. 1016 at 32-33, 55-59. That combination would also utilize MPEG-2 program streams for storing programs and MPEG-2 transport streams for transmitting the selected channels from the BMG to the client STBs via Ethernet links (as in claim 11). Ex. 1016 at 32-33.

453. Thus, in my opinion a PHOSITA would understand the combination of Hicks and PCI (or Hicks, PCI, and Usui) further combined with Watkinson teaches the limitations of claims 6-11 and 13, thereby rendering those claims unpatentable.

454. In my opinion, PHOSITA would have also been motivated to apply the teachings of Watkinson to the combinations of Hicks and PCI and Hicks, PCI, and

Usui as I explained above because MPEG-2 as disclosed in Watkinson is specifically identified in Hicks. Ex. 1005 at 3:58-64, 4:21-25, 4:44-50, 6:26-42, 7:31-37, 8:54-60, 9:1-57, 15:3-12. Hicks discloses his BMG as receiving an “MPEG video stream” from multimedia sources, encoding analog information signals into multiple MPEG 2 signals, the BMG transmitting MPEG-2 information signals over the in-home Ethernet network, and storing MPEG-2 content and playing back stored MPEG-2 content to his information appliances. Ex. 1005 at 4:44-50, 6:43-56, 8:54-60, 9:49-61, 15:3-12.

455. Because Hicks’s BMG is described as being able to download, store, encode, and playback MPEG-2 signals, in my opinion a PHOSITA would have considered following the MPEG-2 standard to encode program according to MPEG-2 and receive MPEG-2 programs from multimedia sources as taught in Watkinson to be an improvement to Hicks’s BMG, since the BMG would need only handle one type of program encoding and decoding (for receiving, downloading, storing, and streaming programs to client devices for playback) resulting in the savings of hardware resources, software design, and storage. Ex. 1005 at 6:43-56, 8:54-60, 9:49-61, 15:3-12.

456. In my opinion, therefore, a PHOSITA would have further considered the receiving and transmitting of MPEG-2 transport streams carrying multiple programs (a group of compressed channels) as taught in Watkinson to be an

improvement on Hicks's BMG receiving from a multimedia source and transmitting to the thin-client STBs, multiple information signals. Ex. 1005 at 6:26-56; Ex. 1016 at 32-33, 52, 55-61. The MPEG-2 transport stream was already well known to be used for transmitting multiple programs in broadcast and other networks (*e.g.*, in Digital Video Broadcasting (DVB)), and would in my opinion it would have improved the Hicks system by adding robustness necessary for transmitting programs over noisy and error prone channels, such as those in coaxial cable television networks, satellite transponders, and Ethernet networks. Ex. 1016 at 14-15; Ex. 1043 at 219-220 (describing MPEG as used in DVB), 240-247 (describing MPEG over Ethernet and other networks); Ex. 1017 at 19 (describing MPEG applications in noisy and error prone channels), 20.

457. The use of the MPEG-2 transport stream would have also improved the Hicks system by enabling the transmission of multiple programs over the in-home network in a manner that statistically time multiplexes the data, which enables the bandwidth needed for each program to vary, thus optimizing the use of the shared bandwidth of the network bus. Ex. 1016 at 55-61; Ex. 1017 at 19; Ex. 1026 at 8-13 (describing aspects of deterministic and non-deterministic time division multiplexors); Ex. 1030 at 18-19 ("Statistical Multiplexing" and "STDM Statistical Time Division Multiplexor").

458. In summary, Hicks's BMG encoding of channels to send to client STBs

and receiving of a group of channels from multimedia sources, combined with Watkinson's teaching of performing such encoding and receiving according to MPEG-2 by compressing the channels into audio and video packetized elementary streams containing frames, and multiplexing the packetized elementary streams together into a transport stream, would have been nothing more than the obvious application of a known technique (the MPEG-2 encoding standard as disclosed in Watkinson) to a known device ready for improvement (Hicks's BMG that receives and distributes multiplexed audio and video information signals) to yield a predictable result (more effective distribution of programs according to the MPEG-2 standard to a plurality of client STBs).

459. Further, in my opinion a PHOSITA would have had a reasonable expectation of success in implementing the Hicks BMG using the MPEG-2 encoding standards as disclosed in Watkinson that I explained above. As I also noted above, Hicks's BMG was already specifically designed to encode and decode MPEG-2 streams for converting analog program signals into digital encoding, for storing programs, and for playback of programs. Moreover, Hicks's BMG includes a processor 130 (*e.g.*, an Intel Pentium III processor or ASIC) and memory on which software can be stored, thus making modifications to the BMG functionality merely a matter of reprogramming software. Ex. 1005 at 6:43-57, 8:54-60, 9:49-61, 15:3-12. Thus, it is my opinion that the reception of MPEG-2 encoded programs from a

multimedia source would not have required any additional resources in the BMG or required any new hardware design.

460. Moreover, MPEG-2 was already commercially used as the compression and transmission scheme for digital video broadcasting in CATV and digital satellite distribution networks such as those disclosed in Hicks, meaning that knowledge and subsystems for doing that was well known to PHOSITAs. Ex. 1016 at 24, 39-40; Ex. 1043 at 219-220 (describing MPEG as used in DVB), 240-247 (describing MPEG over Ethernet and other networks); Ex. 1017 at 19-20. Using this same encoding scheme in Hicks would have merely been adopting what was already widely implemented in the industry. Ex. 1016 at 24, 39-40; Ex. 1043 at 219-220, 240-247.

2. Dependent Claims 22-24, 26, 31, 32, 34, 43-48, 50, 57-60, and 62 (Ground 5)

461. As I explained above with respect to Ground 1, dependent claims 22-24, 26, 31, 32, 34, 43-48, 50, 57-60, and 62 are each substantially identical to one of claims 6-11 and 13, and thus taught by the combination of Hicks and PCI for the same reasons this combination teaches claims 6-11 and 13. These claims are further taught by the combination of Hicks and PCI and Watkinson for the same reasons I explained above with respect to Ground 1 and for the reasons discussed in the previous section with respect to combining Hicks and PCI further with Watkinson.

The claim correspondence and the sections providing this reasoning is summarized in the table below.

'855 Patent	Hicks-PCI-Watkinson
Claim 22	Substantially identical to Claim 9. <i>See</i> Sections IX.B.1.h, IX.B.2.d, IX.D.1.
Claim 23	Substantially identical to Claim 10. <i>See</i> Sections IX.B.1.i, IX.B.2.e, IX.D.1.
Claim 24	Substantially identical to Claim 11. <i>See</i> Sections IX.B.1.j, IX.B.2.f, IX.D.1.
Claim 26	Substantially identical to Claim 13. <i>See</i> Sections IX.B.1.l, IX.B.2.h, IX.D.1.
Claim 31	Substantially identical to Claim 8. <i>See</i> Sections IX.B.1.g, IX.B.3.d, IX.D.1.
Claim 32	Substantially identical to Claim 10. <i>See</i> Sections IX.B.1.i, IX.B.3.e, IX.D.1.
Claim 34	Substantially identical to Claim 13. <i>See</i> Sections IX.B.1.l, IX.B.3.g, IX.D.1.
Claim 43	Substantially identical to Claim 6. <i>See</i> Sections IX.B.1.e, IX.B.4.f, IX.D.1.

'855 Patent	Hicks-PCI-Watkinson
Claim 44	Substantially identical to Claim 7. <i>See</i> Sections IX.B.1.f, IX.B.4.g, IX.D.1.
Claim 45	Substantially identical to Claim 8. <i>See</i> Sections IX.B.1.g, IX.B.4.h, IX.D.1.
Claim 46	Substantially identical to Claim 9. <i>See</i> Sections IX.B.1.h, IX.B.4.i, IX.D.1.
Claim 47	Substantially identical to Claim 10. <i>See</i> Sections IX.B.1.i, IX.B.4.j, IX.D.1.
Claim 48	Substantially identical to Claim 11. <i>See</i> Sections IX.B.1.j, IX.B.4.k, IX.D.1.
Claim 50	Substantially identical to Claim 13. <i>See</i> Sections IX.B.1.l, IX.B.4.m, IX.D.1.
Claim 57	Substantially identical to Claim 8. <i>See</i> Sections IX.B.1.g, IX.B.5.d, IX.D.1.
Claim 58	Substantially identical to Claim 9. <i>See</i> Sections IX.B.1.h, IX.B.5.e, IX.D.1.
Claim 59	Substantially identical to Claim 10. <i>See</i> Sections IX.B.1.i, IX.B.5.f, IX.D.1.

'855 Patent	Hicks-PCI-Watkinson
Claim 60	Substantially identical to Claim 11. <i>See</i> Sections IX.B.1.j, IX.B.5.g, IX.D.1.
Claim 62	Substantially identical to Claim 13. <i>See</i> Sections IX.B.1.1, IX.B.5.i, IX.D.1.

E. Grounds 7-12: Grounds 1-6 Further Combined with Osakabe

462. In the ITC proceedings, Patent Owner construed “shared bus” (Elements [1F], [18D], [28F], [37D], and [53D]) as a “bus within a multimedia server” and accused Petitioner of infringement on the theory that the connection point of a multimedia server to the local (MoCA) network met this construction. Ex. 1044, ¶ 67. Interpreting Patent Owner’s infringement contention in the context of the ’855 patent would suggest, for example, that communication path 192 of Fig. 6 of the ’855 patent is a “shared bus” (as illustrated below), as opposed to “[t]he shared bus 824 [which] is shared with the channel mixer processing module and other components of the multimedia servers as shown in FIGS. 12, 14–16.” Ex. 1001 at 39:4-7, 40:43-44. Patent Owner’s infringement contention also does not comport with the construction adopted by the ALJ in the ITC of “a box [*sic: bus*] located within a multi media server, that is shared by components of that multi media server.” Ex. 1021 at 61:6-62:2; Ex. 1023 at 7.

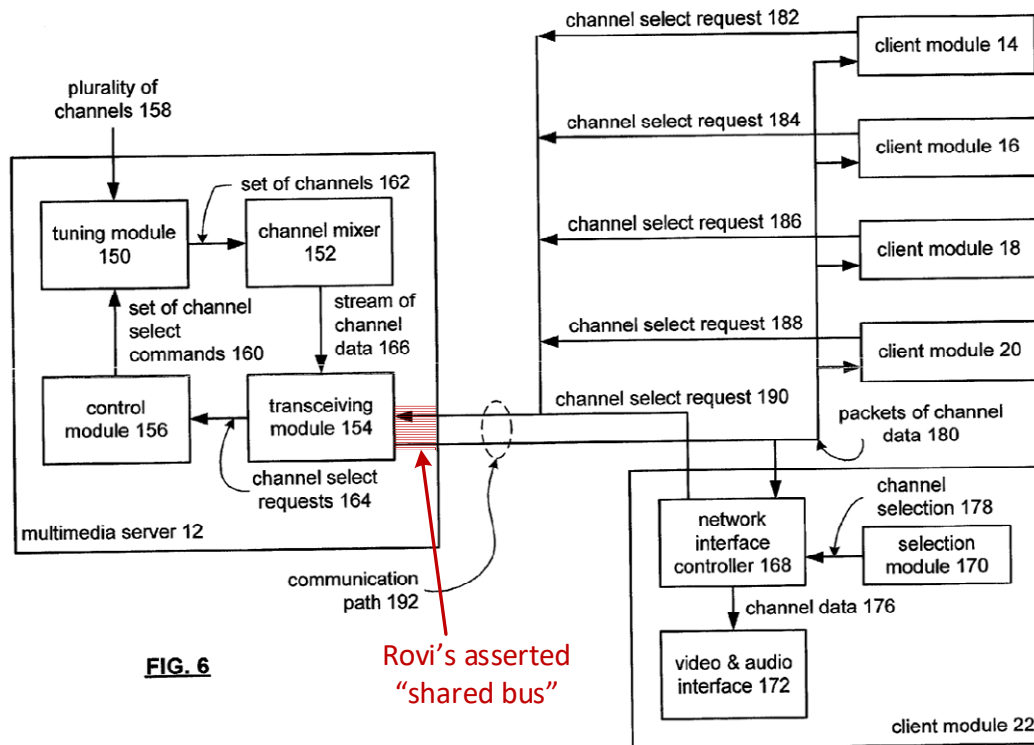


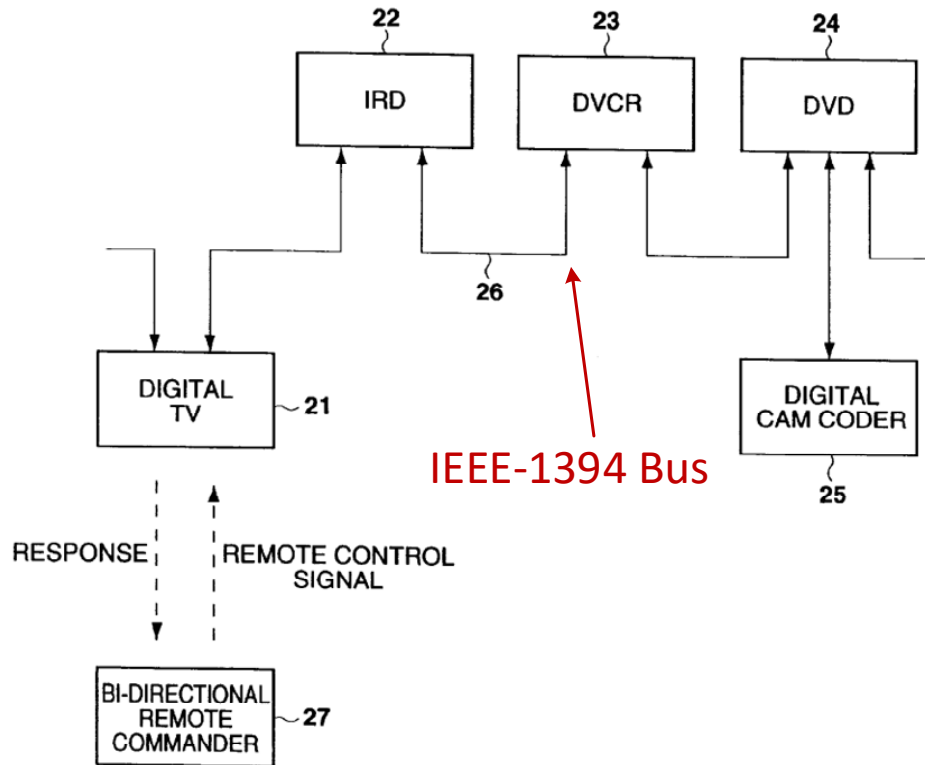
FIG. 6

Ex. 1001, Fig. 6 (annotated).

463. Even assuming for the sake of argument that the connection point of the multimedia server to the local network were a “shared bus” as claimed, Grounds 1-6 would still render obvious claims 1-63, because the PCI bus I identify in Section IX.B-IX.D regarding Element [1F] Hicks in View of PCI (Ground 1), and Hicks in view of PCI and Usui (Ground 2), above for this limitation is also a “shared bus” that meets both parties’ proposed ITC claim constructions. *See* section IX.B.1.a.vi above; Ex. 1023 at 7. Moreover, there were networks at the time that were commercially available that would have been obvious choices for implementing one of Hicks’s networks between the BMG and the STBs, which would have performed

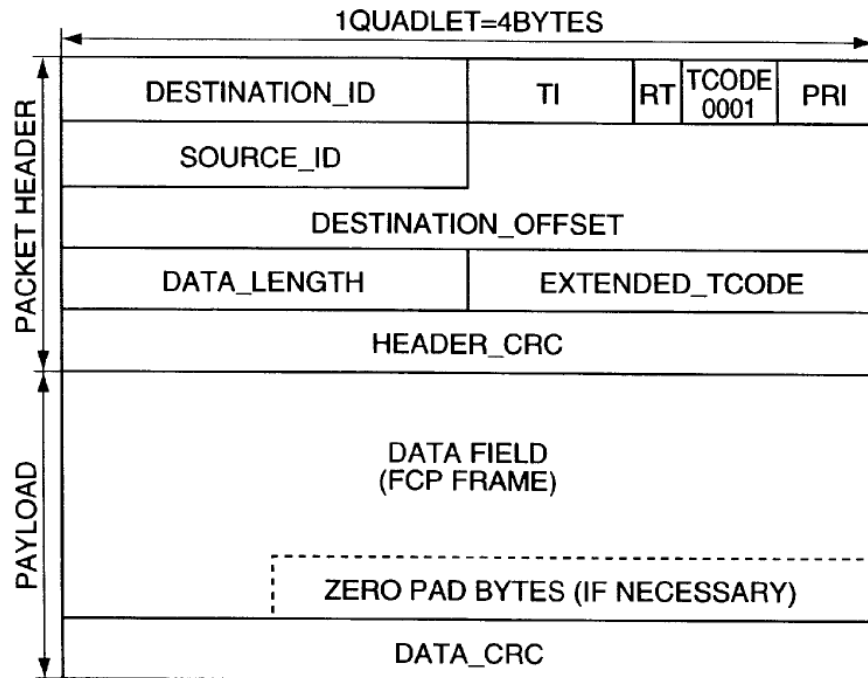
the steps of Element [1F]. Hicks proposes multiple types of networks, and does not limit its network implementation (s) between the BMG and the STBs to just one type. Ex. 1005 at 3:14-35, 7:37-55, 8:18-20, 11:4-8. Indeed, one such network that is specifically designed for the same application in Hicks of receiving multimedia requests and transmitting multimedia data in response to requests is disclosed in Osakabe. Ex. 1045. The combinations of Grounds 1-6 each *further* combined with Osakabe (Grounds 7-12, respectively) would render claims 1-63 obvious assuming the “shared bus” was the local network connection point as asserted by Patent Owner. Ex. 1045.

464. Osakabe discloses a system in which multimedia devices (*e.g.*, digital TV, integrated receiver-decoder (“IRD”), DVD, etc.) are networked together with an IEEE-1394 (“Firewire”) bus that transfers remote control commands in “asynchronous packet[s]” received by a TV to a video source and returns from the video source to the TV streaming MPEG video in “isochronous packet[s].” Ex. 1045 at 4:65-5:7, 5:20-34, 5:59-6:9, 6:19-34, 6:53-7:12, 7:28-60; Ex. 1046 at 37, 49-57, 61, 74-78.



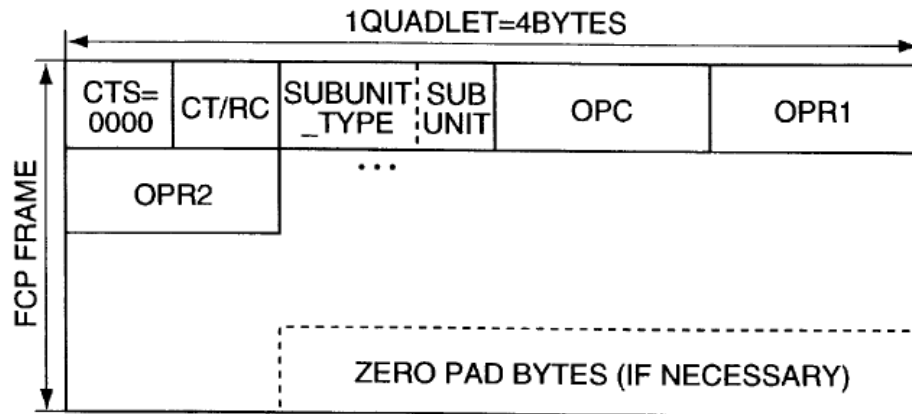
Ex. 1045, Fig. 3 (annotated).

465. The asynchronous packet (illustrated below) includes a header identifying the source (*e.g.*, TV) and destination (*e.g.*, video source) of the message, and a payload including a remote control command encapsulated in a “function control protocol (FCP)” frame. Ex. 1045 at 8:14-60; Ex. 1046 at 64-65.



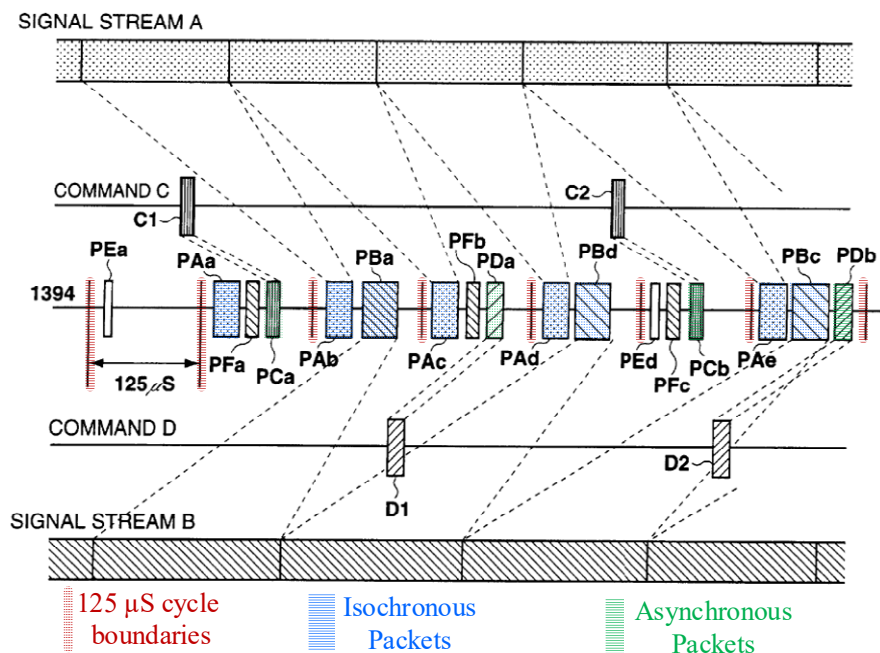
Ex. 1045, Fig. 6.

466. The FCP frame (illustrated below) includes a header indicating a command type (CT/RC) (*e.g.*, providing control or requesting status), a subunit type (SUBUNIT_TYPE) (*e.g.*, identifying a device type such as a VCR, TV Tuner, etc.), and an operation code (OPC) and one or more operands (OPR) that together provide the command from the remote control. Ex. 1045 at 8:61-9:58.



Ex. 1045, Fig. 8 (FCP Frame).

467. On the IEEE-1394 bus, isochronous packets containing streaming data (e.g., MPEG video and audio), and asynchronous packets containing FCP frames which contain remote control commands are time multiplexed within 125 μ S cycles as shown below. Ex. 1045, Fig. 4, 5:20-52; *also see* Ex. 1046 at 54-57.



Ex. 1045, Fig. 4 (annotated).

468. Each 125 μ sec cycle is started with the transmission by a cycle master device of a cycle start packet (not illustrated above), followed by isochronous packets that are pre-assigned bandwidths (portions of the cycle), followed by a “subaction gap” after which asynchronous packets may be transmitted for the remaining interval (called a “fairness interval”) of the cycle. Ex. 1045 at 5:20-52; Ex. 1046 at 54-57, 61-63.

469. In my opinion it would have been obvious to a PHOISTA to implement Hick’s broadband data network, or to extend this network using IEEE-1394 as taught by Osakabe such that Hicks’s BMG receives STB commands (channel selection commands) formatted as Opcodes (OPC) and Operands (OPR) and encapsulated within Osakabe’s FCP frames within asynchronous packets (channel selection requests), and for the BMG to send its MPEG-2 encoded channels back to the STBs in Osakabe’s isochronous frames. Ex. 1045 at 5:20-52; Ex. 1045, Fig. 4, 5:20-52; *also see* Ex. 1046 at 54-57. I explain how this combination discloses the claims of the ’855 patent and then why a PHOSITA would find this combination obvious below.

470. The elements of the independent claims and the dependent claims that would be disclosed by Osakabe (assuming the “shared bus” were the multimedia server’s interface to the local area network as asserted by Patent Owner) include Elements [1F], [18D], [28F], [37D], and [53D]. These independent claim elements

each recite “monitor[ing a] shared bus at specific time intervals,” but differ slightly as follows:

- Claims 1, 18, and 37 recite: “identifying a data *frame* [and] decoding ... to recapture the at least a portion of ... channel selection *commands*.”
- Claim 28 recites: “identify [] *packets* [and] decoding ... to recapture at least a portion of ... channel selection *commands*.”
- Claim 53 recites: “identifying a data *frame* [and] decoding ... to recapture the at least portion of ... channel selection *requests*.”

471. Each of these variations is disclosed by Osakabe’s IEEE-1394 interface (as included in Hicks’s BMG), which monitors the IEEE-1394 bus communications to identify asynchronous packets (“packets”) and FCP frames (“data frame”) at the fairness time interval at the end of the cycle (“specific time interval”) and decoding these communications to recapture “at least a portion of the [request and command].” Ex. 1045 at 4:65-5:7, 5:20-52, 5:59-6:9, 6:19-34, 6:53-7:12, 7:28-60, 8:14-9:58; Ex. 1046 at 54-57, 61-66.

472. Elements [1D] and [53E] and claims 2, 20, 39, and 55 recite further limitations which are also disclosed Osakabe (though they are also still taught in Grounds 1-6 even under Petitioner’s infringement construction). Osakabe discloses that when the FCP command frame is received, the receiving device replies to the sender with an FCP response frame indicating how the command was processed

(*e.g.*, “ACCEPTED,” “REJECTED”), and if accepted, executing the command by sending a requested video to the TV identified in the request. Ex. 1045 at 6:2-9, 7:10-16, 8:14-19, 9:1-6, 8:48-55, 9:13-19; Ex. 1046 at 50-51. Osakabe thus discloses:

- Element [1D] and claims 19 and 38 step of “processing . . . to produce the plurality of channel selection commands”;
- Element [53E] step of “processing . . . to determine whether the request can supported, and, if so, producing a plurality of channel selection commands” (Element [53E]); and
- Claims 2, 20, 39, and 55 step of “interpreting [the] request to identify at least one client [] and at least one of the channel selection requests [].

Ex. 1045 at 8:48-55, 9:1-19.

473. A PHOSITA would have been motivated to implement Hicks’s switch/router (101, 105) and communication links (95, 295) using Osakabe’s IEEE-1394 interface and network, or to add the IEEE-1394 interface as an additional communication link, because: (A) Hick’s BMG is disclosed as including any of a variety of high and low bandwidth shared networks (*e.g.*, Ethernet, OC-3, HomePNA, IEEE 802.11, etc) for connecting the BMG to clients; and (B) Osakabe’s IEEE-1394 network is specifically designed to perform the same functions performed by Hicks’s BMG of receiving commands and streaming MPEG video and

audio. Ex. 1005 at 4:38-50, 7:24-55, 9:49-61, 12:38-51; Ex. 1045 at 4:65-5:7, 5:20-34, 5:59-6:9, 6:19-34, 6:53-7:12, 7:28-60; Ex. 1046 at 35-57, 74-78. While Hicks describes that channel selection commands are sent from each STB to the BMG in a protocol format implemented by the network, Osakabe goes further by teaching a PHOSITA how to format these commands as FCP opcodes and operands, and to use responses to acknowledge that the commands were successfully received. A PHOSITA would thus consider the combination obvious as use of these known techniques in Osakabe as improvements to the Hicks's similar system for receiving multimedia requests and transmitting multimedia video and audio, in the same way as taught in Osakabe (by implementing Hicks's network using IEEE-1394).

474. Moreover, IEEE-1394 provides plug-and play support (does not require user configuration), is scalable to provide increased bandwidth depending upon how many devices are connected and is already known to be used with set top boxes, such as those in Hicks. Ex. 1046 at 35-41. As such, the combination of Osakabe with Hicks and the other references in Grounds 1-6 is nothing more than combining prior art elements according to known methods (Hick's BMG/STBs and Osakabe's IEEE-1394 bus and command protocol) to yield predictable results (since the IEEE-1394 bus in Osakabe and the PCI bus in Grounds 1-6 are both well-known and commercially deployed standard that have been previously integrated). Ex. 1046 at 35-44; Ex. 1010 at 1-3, 8 ("PCI's success gave birth to multiple PCI-related

standards.”).

475. I also believe that a PHOSITA would have had a reasonable expectation of success in integrating Osakabe’s bus and command protocol in Hicks's system for the same reasons described above—IEEE-1394 (as a shared external bus) and PCI (as Hicks’s internal shared bus) were widely deployed with off-the-shelf equipment available that integrated the two bus protocols together, and IEEE-1394 was designed to stream MPEG video as disclosed in Hicks and Watkinson. Ex. 1046 at 35, 44-46, 88-97; Ex. 1010 at 1, 7, 8; Ex. 1006 at 113 (referring to “x86”, which identifies the bus architecture of a family of Intel processors including the Pentium III), 225, 228-229, 283.


476. Thus, for the reasons stated above with respect to Grounds 1-6 (Sections IX.B, IX.D), and for the additional reasons stated above in this section, claims 1-63 would have been obvious in view of the Ground 1 prior art and Osakabe (Ground 7); claims 1-17, 19-20, 38-39, and 54 would have been obvious in view of the Ground 2 prior art and Osakabe (Ground 8); claims 2, 5, 20, 21, 29, 39, 42, and 53-63 would have been obvious in view of the Ground 3 prior art and Osakabe (Ground 9); claims 2, 5, 20, 39, and 54 would have been obvious in view of the Ground 4 prior art and Osakabe (Ground 10); claims 6-11, 13, 22-24, 26, 31, 32, 34, 43-48, 50, 57-60, and 62 would have been obvious in view of the Ground 5 prior art and Osakabe (Ground 11); and claims 6-11, and 13 would have been obvious in view

of the Ground 6 prior art and Osakabe (Ground 12).

X. Acknowledgement

477. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed in Austin, TX on April 22, 2020


V. Thomas Rhyne, Ph.D., P.E., R.P.A.

Appendix A

Curriculum Vitae and Publications

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BIOGRAPHICAL DATA

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Children: Amber Rhyne Compton and Vernon Thomas Rhyne, IV

Grandchildren: Truett Rhyne Compton and Tate James Compton

Security Clearance: Department of Defense Secret (Inactive)

PROFESSIONAL INTERESTS

- Microprocessor/Microcomputer Design and Application
- Computer-Aided Design

- Computer Architecture
- Digital Systems Design and Synthesis
- Digital Communications
- Electronic Circuit Design
- Semiconductor Manufacture
- Technology Maturation and Commercialization
- Intellectual Property Litigation

EDUCATION

- Ph.D. (Electrical Engineering) — Georgia Institute of Technology, 1967.
- M.E.E. — University of Virginia, 1964.
- B.S.E.E. (Special Honors) — Mississippi State University, 1962.
- Japanese Language Instruction, 1988-89, 1996, 1997.
- Modern Semiconductor Manufacturing, Motorola University, 1996.

WORK EXPERIENCE

Industrial and Research:

1997-Present: Retired from Texas A&M University; part-time engineering consultant.

1995-1997: Manager of Strategic Programs, Strategic Asset Group, Semiconductor Products Sector, Motorola, Inc., Austin, TX. Responsible for technology transfer negotiations and management of joint ventures with strategic partners.

1994-1995: Vice President, Research and Development, Information Systems Division, Microelectronics and Computer Technology Corporation (MCC). Responsible for MCC R&D in neural network applications, data mining, software interface standardization, and other advanced software development projects.

1991-1994: Director, MCC ATLAS Standards Laboratories. Responsible for definition and testing of CAD framework and interfaces in support of the CAD Framework Initiative, Inc.

1989-1991: Manager, CAD Framework Laboratory, MCC CAD Program. Responsible for definition and testing of CAD framework and interfaces.

1988-1989: Manager, Systems Engineering Group, MCC CAD Program, 1988. Responsible for alpha testing of MCC CAD System.

1986-1989: Deputy Director, MCC CAD Program. Responsible for general program administration.

1983-1986: Director, Systems Technology Laboratory, MCC CAD Program, Austin, TX. Responsible for development of supporting technologies for MCC CAD System including distributed databases, natural-language interface, and rule-based design management.

1962-1965: Aerospace Technologist, Analysis and Computer Technology Division, NASA Langley Research Center, VA

1965-1967: System Engineer (Part-Time), Lockheed-Georgia Research Center, Marietta, GA.

1961: Summer Intern, Union Carbide Corporation, Texas City, TX.

Academic:

- Senior Lecturer in Electrical/Computer Engineering, University of Texas at Austin, 1984-1994.
- Adjunct Faculty Member, Department of Electrical and Computer Engineering, Carnegie-Mellon University, 1986-1992.
- University/SRC Coordinator, MCC CAD Program, 1988-1990; SRC Design Sciences Advisory Committee, 1989-1990.

- Professor, Electrical Engineering, Texas A&M University 1974-1986 (on leave to MCC during 1983-86).
- Coordinator of Computing, Texas AM University, 1982-1983.
- Director, Digital Systems Laboratory, Department of Electrical Engineering, Texas A&M University, 1978-1983.
- Associate Professor, Electrical Engineering, Texas A&M University, 1969-1974.
- Assistant Professor, Electrical Engineering, Texas A&M University, 1967-1969.
- Instructor, Electrical Engineering, Georgia Institute of Technology, 1965-1967.
- Lecturer, Computer Systems, George Washington University Extension, 1964.

Consulting:

- Consultant to a number of companies and law firms re intellectual property litigation, 1978-present (part-time).

- Consultant to the Electric Power Research Institute, including serving as technical project manager on the EPRI/DOE Distribution Automation Project, 1979-1983.
- Consulting engineer to a variety of national and international industries dealing with microelectronics and computer design. Clients have included Texas Instruments, Control Data Corporation, AMD, ETA, and Signetics.
- Consulting engineer to a variety of clients dealing with computer systems for satellite navigation. Clients have included Texas Instruments, Gould, Matsushita, ITE-Europe, and the Federal Republic of Germany.
- Invited member of NASA Shuttle-GPS Advisory Panel and EPRI/DOE Distribution Automation Research Review Panel, 1979-1981.
- Consultant to U.S. Coast Guard, developing on-line data acquisition system for shipboard navigation data and off-line data processing/analysis systems, 1979-1982.
- Principal investigator on research projects dealing with automated Boolean minimization, high-speed computer arithmetic, bit-serial processing, special-purpose VLSI architectures, marine navigation systems, and computer-aided design of digital systems, 1967-83.

OTHER PROFESSIONAL ACTIVITIES

- Member, Panel on Assessment, Electrical and Electronics Engineering Laboratory, U.S. National Institute for Standards and Technology, 1993 to 1999; Panel Chair, 1996-99. (Appointed by National Research Council)
- Planning Committee, 1997 Workshop for National Technology Roadmap for Semiconductors, SIA.
- Member, Technical Working Group (TWIG) on Semiconductor Manufacture, SIA, 1995-97.
- Secretary, Board of Directors of White Oak Semiconductor, Inc., Richmond, VA, 1996-97.
- Executive Secretary, Board of Directors of the Tohoku Semiconductor Corporation, Sendai, Japan, 1996-97.
- Board of Directors Alternate, Semiconductor Research Corporation, representing Motorola, 1995-96.
- Roadmap Coordinating Committee, Semiconductor Industries Association, 1995.
- Book reviewer, American Scientist, 1993.

- Reviewer for State-funded research proposals in microelectronics, computer science, and computer engineering, Texas Higher Education Coordinating Board, 1993.
- Visitor for Accreditation Board for Engineering and Technology, accrediting undergraduate programs in Computer Science, Computer Engineering and Electrical Engineering, 1981-1983, 1991-92, 1997-present.
- Chair for nine U.S. engineering program accreditation teams, 1984-90, including the accreditation teams for the University of California at Berkeley (1988) and the University of Illinois (1989).
- Advisor, Texas State Board of Education (1985), Texas State Coordinating Board for Higher Education (1987).
- Consultant on international engineering accreditation, Kuwait University College of Engineering and Petroleum (1990 and 1992), Korean Institute for Advanced Science and Technology (1993), Bilkent University, Ankara, Turkey (1995), University of the United Arab Emirates (1998), ITESM, Querétaro, Mexico (1999), Kyoto University, Japan (2000), Ritsumeikan University, Japan (2000), Mapua Institute of Technology, Manila (2004).
- Consultant on engineering accreditation to the Japan Accreditation Board for Engineering Accreditation, 2000-2004.

- Advisor to the Washington Accord on International Engineering Accreditation, 2003-04.
- Consultant on engineering education and long-range planning, George Washington School of Engineering and Applied Science, 1990 and 1993-94.

PROFESSIONAL LICENSES

- Registered Professional Engineer, Texas, No. 28,728.
- Registered Patent Agent, No. 45,041.
- Pilot (Single-Engine Land).

PROFESSIONAL AND HONORARY SOCIETY MEMBERSHIPS

Professional Societies:

- Member, Institute of Electrical and Electronics Engineers, 1963-present.
- IEEE Treasurer, 1994 and 1995.
- IEEE Board of Directors, 1991-1995.
- IEEE Executive Committee, 1993-1995.
- IEEE Board of Directors, Division VIII Director, 1993, Division VI Director, 1991-1992.
- IEEE Technical Activities Board, 1991-93.

- IEEE Employee Benefits Committee, Member, 1991 to 1999, Chair, 1997, 1998.
- IEEE Computer Society, 1964 to present.
- IEEE Computer Society Board of Governors, 1985.
- IEEE Computer Society Executive Committee, 1993.
- Accreditation Board for Engineering and Technology, 1994 to 1999, representing IEEE.

Honorary Societies:

- Upsilon Pi Epsilon (Computer Science).
- Eta Kappa Nu (Electrical Engineering).
- Tau Beta Pi (Engineering).
- Phi Kappa Phi (Scholarship).
- Sigma Xi (Research).

Other Honors:

- The Contemporary Who's Who, 2003.
- Strathmore's Who's Who, 2000-present.
- IEEE Millennium Award, 2000.

- Golden Core Award, IEEE Computer Society, 1996.
- Fellow of the Accreditation Board for Engineering and Technology, 1992.
- Outstanding Engineering Graduate, Mississippi State University, 1992.
- IEEE Educational Activities Board Award for Meritorious Achievement in Accreditation Activities, 1991.
- Who's Who in America, 1991-present.
- Who's Who in Engineering, 1991-present.
- Elected as an IEEE Fellow for "contributions to computer engineering and the computer engineering profession," 1990.
- F. E. Terman Award (Outstanding Young Electrical Engineering Educator in U.S.), American Society for Engineering Education, 1980.
- Outstanding Young Engineer (Honorable Mention), National Society of Professional Engineers, 1974.
- Young Engineer of the Year, State of Texas, Texas Society of Professional Engineers, 1973.
- Outstanding Faculty Member, Texas A&M University Student Engineers Council Award, 1973.
- General Dynamics Award for Excellence in Engineering Teaching, 1972.

- American Men and Women of Science.

COMMITTEE MEMBERSHIPS

Professional:

- Technical Program Chair for 1992 IFIPS Workshop on Electronic CAD Design Environments, March 23-25, 1992, Paderborn, Germany.
- Chair, ISO TC184/SC4-IEC TC3 Joint Working Group (JWG9) for Electrical/Electronic Product Data Exchange, 1991-1993.
- DARPA Principal Investigators Advisory Panel, Information Systems Technology, 1990-1994
- Review team member for academic and research programs in microelectronics at the Microelectronics Research Center, Iowa State University, 1989.
- CAD Framework Initiative: Interim Steering Committee, 1988-1989; Board of Directors, 1989-1992; Treasurer, 1989-1992; Chair, Technical Coordinating Committee, 1989-1990.
- Member, IEC TC3, WG11, 1990-1991.

- Member, Working Group 2, IEC Technical Committee TC3, and IEEE SCC 11.9, developing IEEE Standard 91-1984, “Explanation of Logic Symbols,” 1982-1985.

Civic:

- Elected to Eanes Independent School District Board of Trustees, 1986-1997; President, 1987-1990, 1996-97.
- Texas Association of School Boards Finance Committee, 1989-1994; Tax Restructuring Committee, 1990.
- Citizens Advisory Committee, Westlake Picayune, 1988-90.
- Advisory Committee for Electric Power Distribution, City of West Lake Hills, 1987-1990.
- Capital Area Easter Seal Rehabilitation Center Advisory Board, 1985-1986, Telethon Committee, 1986.

Publications

Books, Contributions to Books, Published Notes, and Standards:

- Electronic Design Automation Frameworks—When Will the Promise Be Realized?, North-Holland, Amsterdam, 1992 (editor and contributor).

- ISO 10303 Standard for Product Data Exchange, Parts 103 (Electrical Interconnectivity), 212 (Electrotechnical Plants), 210 (Printed Circuit Assembly Design and Manufacture), and 211 (PCA Test and Logistics); editor and technical contributor, 1991-1993.
- “An Introduction to CAD Framework Technology,” Published notes for DAC Tutorial, 1991 Design Automation Conference, June 21, 1991.
- “NAVSTAR Global Position System, A User’s Approach to Understanding,” published notes for IEEE Continuing Education Course No. 1125 (1982), with P. S. Noe and J. H. Painter.
- Traffic Control Systems Handbook, Chapter 8, “Communications Concepts,” Federal Highway Administration, 1976.
- Fundamentals of Digital Systems Design, Prentice-Hall, 1973.
- “Supplementary Information for Computer Engineering Program Evaluators,” IEEE Manual for Program Evaluators on EAC Accreditation Teams, IEEE Educational Activities Board, May 1987.
- “ABET/EAC Program Criteria for Computer Engineering and Similarly Named Engineering Programs,” contributor, 1985-87.
- “Graphic Symbols for Logic Devices,” ANSI/IEEE Standard 91-1982, (co-author), IEEE Standards Office, New York, March 1982.
- “The NAVSTAR Global Positioning System, A User’s Approach to Understanding.” Produced by ALTAIR Corp., College Station, Texas. With P.S. Noe and John H. Painter. 1979 to 1985.