United States District Court
Northern District of California

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

FUNAI ELECTRIC CO., LTD., et al., Plaintiffs, v. LSI CORPORATION, et al., Defendants.	Case No. 16-cv-01210-BLF **ORDER CONSTRUING CLAIMS IN U.S. PATENT NO. 5,870,087**

Plaintiff Funai Electric Co., Ltd. ("Funai") brings this declaratory relief action, asking the Court to declare that it does not infringe U.S. Patent No. 5,870,087 ("the '087 patent"), owned by Defendants LSI Corporation, et al. ("Defendants"). The Court held a tutorial on October 6, 2017 and a Markman hearing on October 13, 2017 for the purpose of construing five disputed terms in the '087 patent.

I. BACKGROUND

The '087 patent is titled "MPEG Decoder System and Method Having a Unified Memory for Transport Decode and System Controller Functions." It was filed on November 13, 1996 and issued on February 9, 1999.

The '087 patent generally relates to "[a]n MPEG decoder system and method for performing video decoding or decompression which includes a unified memory." '087 patent, Abstract. MPEG ("Moving Picture Experts Group") is a compression standard that is used to save video at reduced file sizes. *Id*., 2:23-27. A video is composed of many still image frames, which are then displayed to a viewer in rapid succession. *See id*., 1:36-48. Left uncompressed, a digital video file uses an extraordinary amount of memory, as each image frame is saved individually and in full. *Id*., 1:36-37.

MPEG compresses digital video using intraframe and interframe compression techniques. *Id.*, 1:41-48. Intraframe compression techniques take advantage of spatial redundancies within an image (such as where an image contains a whole block of pixels that are the same color) to compress the image stored in a single frame. *Id.*, 1:41-44. This is often done using frequency domain techniques, such as the discrete cosign transform, which can be used to efficiently encode the image in the frame. *Id.*, 1:49-54. Interframe compression techniques take advantage of temporal redundancies between frames to reduce the amount of information that is stored on a per-frame basis. *Id.*, 1:44-46. This is often done by storing only some frames in full, and then storing the differences for successive frames. *Id.*, 2:4-13.

MPEG encoding or MPEG compression generally refers to the process of analyzing image frames in a video file and then storing it according to these compression techniques. *Id.*, 3:6-59. MPEG decoding or MPEG decompression generally refers to the process of taking a file that has been saved according to these techniques and reconstructing full image frames such that video can be played for a viewer. *Id.*, 3:60-4:13.

The ’087 patent discloses that an MPEG decoder will typically include “motion compensation logic . . . to reconstruct temporally compressed frames,” “transport logic . . . to demultiplex received data into a plurality of individual multimedia streams,” and a “system controller [to] control[] operations in the system and execute[] programs or applets.” *Id.*, 4:14-28. In prior art decoders, the memory used by the motion compensation logic was separate from the memory used by the transport logic and the system controller. *Id.*, 4:29-43. Specifically, the motion compensation logic would use a “frame store memory . . . which stores the reference frames or anchor frames as well as the frame being reconstructed.” *Id.*, 4:29-32. The transport logic and system controller would then use a separate memory to perform their functions. *Id.*, 4:33-34. “It generally [was not] possible to combine these memories, due to size limitations.” *Id.*, 4:35-36.

The MPEG decoder of the ’087 patent is purportedly an improvement over these prior art systems because it includes “a single unified memory which stores code and data for the transport logic, system controller and MPEG decoder functions.” *Id.*, 5:4-6. This “single unified memory

is preferably a 16 Mbit memory." *Id.*, 5:6-7. According to the '087 patent, this is an improvement because it "requires only a single memory, and thus has reduced memory requirements compared to prior art designs." *Id.*, 5:7-10. Figure 3 illustrates an exemplary system:

Id., Fig. 3.

LSI asserts that Funai infringes at least claims 1, 10, and 16 of the '087 patent. Claim 1

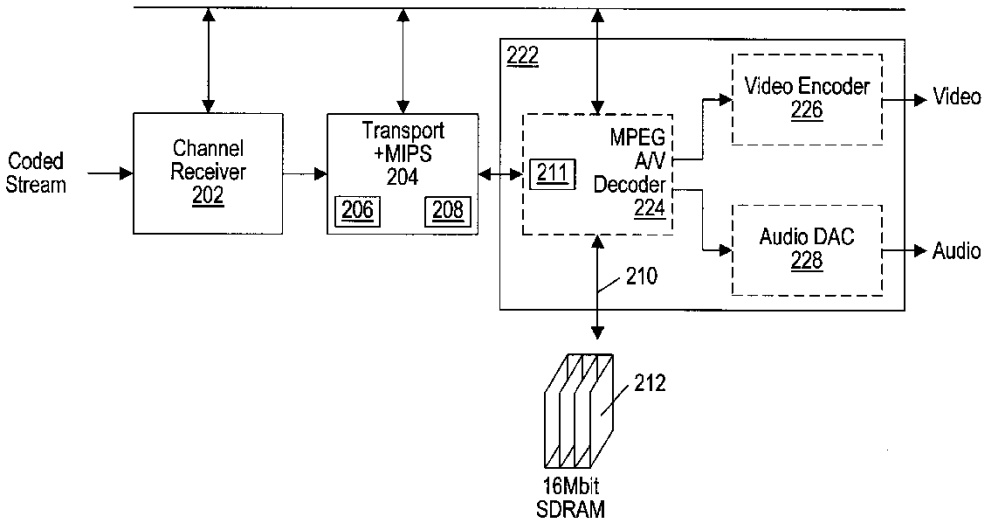

FIG. 3

recites:

> 1. An MPEG decoder system which includes a single memory for use by transport, decode and system controller functions, comprising:
>
> a channel receiver for receiving and MPEG encoded stream;
>
> transport logic coupled to the channel receiver which demultiplexes one or more multimedia data streams from the encoded stream;
>
> a system controller coupled to the transport logic which controls operations within the MPEG decoder system;
>
> an MPEG decoder coupled to receive one or more multimedia data streams output from the transport logic, wherein the MPEG decoder operates to perform MPEG decoding on the multimedia data streams; and
>
> a memory coupled to the MPEG decoder, wherein the memory is used by the MPEG decoder during MPEG decoding operations, wherein the memory stores code and data useable by the system controller which enables the system controller to perform control functions within the MPEG decoder system, wherein the memory is used by the transport logic for demultiplexing operations;

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wherein the MPEG decoder is operable to access the memory during MPEG decoding operations;

wherein the transport logic is operable to access the memory to store and retrieve data during demultiplexing operations; and

wherein the system controller is operable to access the memory to retrieve code and data during system control functions.

Id., 17:15-45.

II. LEGAL STANDARDS

A. Claim Construction

Claim construction is a matter of law. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 387 (1996). "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude," *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (internal citation omitted), and, as such, "[t]he appropriate starting point . . . is always with the language of the asserted claim itself," *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1186 (Fed. Cir. 1998).

Claim terms "are generally given their ordinary and customary meaning," defined as "the meaning . . . the term would have to a person of ordinary skill in the art in question . . . as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1313 (internal citation omitted). The court reads claims in light of the specification, which is "the single best guide to the meaning of a disputed term." *Id.* at 1315; *see also Lighting Ballast Control LLC v. Philips Elecs. N. Am. Corp.*, 744 F.3d 1272, 1284-85 (Fed. Cir. 2014) (en banc). Furthermore, "the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim." *Phillips*, 415 F.3d at 1316 (quoting *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)). The words of the claims must therefore be understood as the inventor used them, as such understanding is revealed by the patent and prosecution history. *Id.* The claim language, written description, and patent prosecution history thus form the intrinsic record that is most significant when determining the proper meaning of a disputed claim limitation. *Id.* at 1315-17; *see also Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996).

Evidence external to the patent is less significant than the intrinsic record, but the court may also consider such extrinsic evidence as expert and inventor testimony, dictionaries, and learned treatises "if the court deems it helpful in determining 'the true meaning of language used in the patent claims.'" *Phillips,* 415 F.3d at 1318 (quoting *Markman*, 52 F.3d at 980). However, extrinsic evidence may not be used to contradict or change the meaning of claims "in derogation of the 'indisputable public records consisting of the claims, the specification and the prosecution history,' thereby undermining the public notice function of patents." *Id.* at 1319 (quoting *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1578 (Fed. Cir. 1995)).

B. Indefiniteness

Under 35 U.S.C. § 112, ¶ 2 (2006 ed.),[1] a patent must "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as [the] invention." Section 112, ¶ 2 includes what is commonly called the "definiteness" requirement. *Nautilus, Inc. v. Biosig Instruments, Inc*., 134 S. Ct. 2120, 2125 (2014). In *Nautilus*, the Supreme Court held that "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 134 S. Ct. at 2124. In applying the *Nautilus* standard, the Federal Circuit has cautioned that "the dispositive question in an indefiniteness inquiry is whether the 'claims,' not particular claim terms" fail the *Nautilus* test. *Cox Commc'ns, Inc. v. Sprint Commc'n Co. LP*, 838 F.3d 1224, 1231 (Fed. Cir. 2016). For that reason, a claim term that "does not discernably alter the scope of the claims" may fail to serve as a source of indefiniteness. *Id*.

The Court therefore reviews the claims, specification, and prosecution history to determine whether the claims "inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 134 S. Ct. at 2124. Indefiniteness renders a claim invalid, and must be shown by clear and convincing evidence . *See Halliburton Energy Servs. v. M-I LLC*, 514 F.3d

[1] Paragraph 2 of 35 U.S.C. § 112 was replaced with newly designated § 112(b) when § 4(c) of the America Invents Act ("AIA"), Pub. L. No. 112-29, took effect on September 16, 2012. Because the '087 patent was filed before that date, the Court refers to the pre-AIA version of § 112.

1244, 1249 (Fed. Cir. 2008); *cf. Nautilus*, 134 S. Ct. at 2130 n.10.

III. CONSTRUCTION OF DISPUTED TERMS

A. State of the Art

Before turning to individual terms, the Court finds it helpful to clarify its view regarding the state of the art. In general, "the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question *at the time of the invention, i.e., as of the effective filing date of the patent application*." *Phillips*, 415 F.3d at 1313 (emphasis added). The '087 patent was filed in 1996; thus, the Court must construe the disputed claim terms according to a person of ordinary skill's perspective at that time. In light of the intrinsic and extrinsic evidence before the Court, the Court finds the following with respect to the state of video decoders in 1996:

In 1996, video decoders were typically hardware devices. The specification itself indicates this: in the Background of the Invention section, it explains how "[a] typical MPEG decoder includes motion compensation logic which includes local or *on-chip* memory." '087 patent, 4:15-16 (emphasis added). This reference to "on-chip" suggests that typical MPEG decoders were hardware devices, which included physical memory "on-chip." This is strengthened by its observation that "[t]he amount of memory is a major cost item in the production of video decoders." *Id.*, 4:44-45. This observation makes sense if MPEG decoders are hardware devices: "production" generally refers to physical production and it would make sense that larger amounts of physical memory would drive up production costs for a hardware device.

Extrinsic evidence submitted by the parties also shows hardware-based decoders were more prevalent at the time of invention. An academic paper entitled "Demultiplexer IC for MPEG2 Transport Streams" observes that "[h]ardware implementation was preferred for first generation decoders since software implementation would have required significant system architecture changes and an early selection of high performance microcomputer resources." Ex. D to Acton Decl.[2] at 700, ECF 98-11. Several other academic papers also describe decoders that are

[2] "Acton Decl." refers to the Declaration of Scott T. Acton in Opposition to Plaintiffs' Proposed Claim Constructions, filed as Ex. 5 to Opening Br., ECF 98-11.

implemented primarily in hardware. For example, "MPEG2 Video and Audio CODEC Board Set for a Personal Computer" describes a DECODER board that can be "directly inserted into a PC/AT PCI bus slot." Ex. C to Acton Decl. at 484, ECF 98-11; *see also id*. at 485-86. Similarly, "Demultiplexer IC for MPEG2 Transport Streams" references an "MPEG2 Demultiplexer IC [(integrated circuit)]," which it states "is a fully static CMOS integrated circuit realized as an 0.8pm Gate Array." Ex. D to Acton Decl. at 701, ECF 98-11.

However, even though hardware-based decoders were typical in 1996, it was also known in the art that video decoders could be implemented through a hybrid hardware/software approach, where some functionality (such as demultiplexing) is implemented in software and other functionality (such as decoding itself) is implemented in hardware. For example, the paper "Implementation of MPEG Transport Demultiplexer with a RISC-Based Microcontroller" describes a hybrid system that implements demultiplexing in software but still uses hardware to perform the actual MPEG2 decoding. Ex. E to Acton Decl. at 433-35, ECF 98-11. Similarly, "Demultiplexer IC for MPEG2 Transport Streams" describes how a model of the demultiplexer was implemented in C (i.e., software). Ex. D to Acton Decl. at 701, ECF 98-11. The paper "Design and Performance of a Multi-Stream MPEG-I System Layer Encoder/Player" also mentions hybrid approaches. Ex. F to Action Decl. at 2, ECF 98-11 ("Currently, several hardware and software products exist to playback single audio/single video MPEG-I system-layer streams but, at the time of this submission, we are not aware of any software-only systems that have been generated to support multiple audio/video MPEG-I playback.").

Finally, and most significantly, these papers also show that implementing a decoder purely in software was possible and known in the art. Specifically, "Design and Performance of a Multi-Stream MPEG-I System Layer Encoder/Player," published in 1995, describes a software-only MPEG decoder. Ex. F to Acton Decl. at 16, ECF 98-11 ("The software package generated as a result of this project is suitable as a basis for an MPEG-I engine for audio/video applications."). In addition, academic papers describe software-only implementations of components of a decoder and acknowledge that this can be used as a basis for creating a software-only decoder. For example, "Implementation of MPEG Transport Demultiplexer with a RISC-Based

Microcontroller" describes a software-based demultiplexer and observes that this "system could also have an upgrade path to a total software decoding of MPEG bitstreams by the microcontroller in the future." Ex. E to Acton Decl. at 431, ECF 98-11.

Thus, as intrinsic and extrinsic evidence shows, video decoders in 1996 were typically hardware devices, but alternatives that were either hybrid hardware/software implementations or purely software implementations were also in existence and known in the art. With this understanding, the Court proceeds to consider the parties' disputes over individual claim terms.

B. "Single Memory" and "First Unified Memory" (claims 1, 10, and 16)

Term	Defendants' Proposal	Funai's Proposal	Court's Construction
"single memory" and "first unified memory"	Plain and ordinary meaning; no claim construction necessary. Alternative: "memory functioning as a unit."	Indefinite under 35 U.S.C. § 112 Alternatively: "a single memory device which stores code and data for the transport logic, system controller and MPEG decoder functions."	"memory functioning as a unit"

i. Claim Construction

The parties' dispute here revolves around a single issue: whether the "single memory" and "first unified memory"[3] must be a single memory "device" or can simply be memory (including multiple memory "devices") which functions as a unit. At the hearing, the parties agreed on the record that these terms were not limited to a single chip.[4] The parties also each clarified certain aspects of their proposed constructions: Defendants explained on the record that "functioning as a unit" meant that accesses to the memory were coordinated, such as going through a single memory controller and accessing the memory in the same way. Funai clarified on the record that a memory "device" was characterized by having a corresponding datasheet, as is the case with the Samsung KM416S1120AT-12, a preferred embodiment disclosed in the specification.

[3] At the hearing, Funai confirmed on the record that it agreed with Defendants that "single memory" and "first unified memory" should be construed to have the same meaning.

[4] As neither party has ordered a transcript of the claim construction hearing, the Court summarizes the record based on its own recollection and internal notes of the proceedings.

To evaluate these competing positions, the Court begins with the claim language, as *Phillips* instructs. On that point, the Court observes that nothing in the claims limits the "single memory" or "first unified memory" to a single device. Instead, the claims simply recite that the "memory" is "coupled to" the "MPEG decoder" and is such that the "transport logic," "system controller," and "MPEG decoder" can "access" and "use" the memory. *See* '087 patent, 17:15-45, 18:14-34, 19:6-20:7. Either party's construction would satisfy these requirements. The question then becomes whether anything in the specification, prosecution history, or extrinsic evidence counsels any further restriction on the meaning of "single memory" or "first unified memory."

Nothing in the specification requires that the "single memory" or "first unified memory" be limited to a single device. Several times, the specification states that the "present invention" is directed to a "single memory" or "single unified memory" that "stores code and data for the transport logic, system controller and MPEG decoder functions." *Id*., Abstract, 1:30-34, 5:3-10, 6:24-27, 7:48-55, 11:15-20. The Federal Circuit has acknowledged that "an inventor may disavow claims lacking a particular feature when the specification describes 'the present invention' as having that feature." *Poly-Am., L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016), *cert. denied*, 137 S. Ct. 2267 (2017). However, the "present invention" statements here only characterize the functionality that the "single memory" and "first unified memory" must be capable of performing. They say nothing about whether this functionality must be accomplished through a single device. In addition to the "present invention" statements, the specification also discloses that a preferred embodiment of the "single memory" and "first unified memory" is a "16 MB synchronous dynamic random access memory (SDRAM)," "such as [a] Samsung KM416S1120AT-12, having an operating frequency of 81 MHz or 108 MHz and a burst size of 4 words." '087 patent, 8:45-46. To be sure, this particular embodiment would qualify as a single device. However, the Federal Circuit "has repeatedly cautioned against limiting claims to a preferred embodiment." *Comaper Corp. v. Antec, Inc.*, 596 F.3d 1343, 1348 (Fed. Cir. 2010). Thus, this cannot be used as a basis for restricting the scope of "single memory" and "first unified memory."

Instead, if anything, the specification suggests that "single memory" and "first unified

memory" should be construed to be broader than just a single device. First, the specification discloses that the "[t]he memory includes a plurality of memory portions, including a video frame portion for storing video frames, a system controller portion for storing code and data executable by the system controller, and a transport buffer for storing data used by the transport logic." '087 patent, 5:19-24. Use of the word "portions" suggests that the '087 patent takes a higher-level, more functionally-oriented view of "single memory" and "first unified memory." These different "portions" could exist regardless of whether the memory is one or several devices. Second, the specification also discloses that "[e]ach of the transport logic, system controller, and MPEG decoder logic accesses the single unified memory through the memory controller." *Id*., 5:26-29; *see also id*., 9:6-10. It further states that this "memory controller . . . controls access to the single unified memory." *Id*., 9:5-6. This too suggests that the "single memory" and "first unified memory" could be multiple memory devices, as the memory controller would provide a single interface through which multiple memory devices could be accessed and effectively allow them to function as a unit. *See id*. Third, in Figures 3 and 4, the specification depicts the "single memory" and "first unified memory" as multiple rectangular blocks. *Id*., Figs. 3 & 4. While the Court recognizes that these are simply "block diagrams" which may or may not represent the way these depicted embodiments are physically implemented, *id*., 5:60-63, the use of multiple rectangles at least weakly suggests that the "single memory" and "first unified memory" could actually be a combination of multiple vehicles for storage, such as multiple memory devices. Thus, read as a whole, these indications from the specification suggests that "single memory" and "first unified memory" could, if anything, more broadly encompass multiple devices rather than be limited to a single device.

Neither party points to anything in the prosecution history or extrinsic evidence that warrants a different result. As to be expected, each party's expert offers testimony as to why that party's proposed construction accurately reflects the viewpoint of a person of ordinary skill in the art. However, "[i]t is not uncommon in patent cases to have such dueling experts." *Kara Tech. Inc. v. Stamps.com Inc.*, 582 F.3d 1341, 1348 (Fed. Cir. 2009). Thus, "the intrinsic evidence and particularly the claim language" remain the Court's "primary resources" and these competing

opinions do not alter its conclusion. *Id*.

Accordingly, because the claim language does not require that the "single memory" or "first unified memory" be limited to a single device and the specification, if anything, suggests that these terms could encompass more than just a single device, the Court adopts Defendants' proposal and construes these terms to mean "memory functioning as a unit."

ii. Indefiniteness

Funai argues that, should the Court adopt Defendants' proposed construction, it must find that the disputed phrases are indefinite because they are subject to multiple plausible constructions. Responsive Br. 10. In so reasoning, it points out that multiple courts have construed these terms in different ways:

- In *In re Certain Audiovisual Components & Prods. Containing the Same*, Inv. No. 337-TA-837, Initial Determination at 20-24 (Jul. 18, 2013), the U.S. International Trade Commission ("ITC") construed "single memory," "memory," and "first unified memory" to mean "memory functioning as a unit;"
- In *Barnes & Noble, Inc. et al., v. LSI Corporation, et al*. (Case No. 3:11-cv-2709; Order Re Claim Construction, Dkt. 303 at 26), Judge Chen construed "single memory" and "first unified memory" to mean "a single memory device which stores code and data for the transport logic, system controller and MPEG decoder functions;" and
- In *Broadcom Corp., et al., v. Sony Corp., et al*., (Case No. SACV 16-1052 JVS;(IN CHAMBERS) Order on Regarding Claim Construction, May 18, 2017, Judge Selna construed "memory" to mean "single unified memory."

As an initial matter, the Court notes that its reasoning and construction here are not inconsistent with the conclusions drawn by these other courts. First, the Court's construction here is the same as that reached by the ITC. Second, the Court agrees with Judge Chen's assessment of the issue that primarily captured his analysis: that the "single memory" and "first unified memory" are not limited to a single chip. Third, Judge Selna construed a slightly different claim term ("memory") and concluded that "memory" must be "single unified memory" but not limited to a

"single chip," which is consistent with the result the Court reaches here.

Further, simply because different courts have arrived at differently worded constructions does not necessarily mean that a term is indefinite. Specific constructions are often the product of the parties' competing proposals and the particular disputes regarding claim scope that confronted the court at the time. Indeed, the previous conclusions drawn by other courts reflect this: for example, the primary issues before the ITC and Judge Chen were whether the "single memory" or "first unified memory" were limited to a single chip, which is not disputed here.

Instead, to assess whether "single memory" and "first unified memory" render the asserted claims are indefinite, the Court turns to the standard set forth by the Supreme Court in *Nautilus*: whether the "claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention. *Nautilus*, 134 S. Ct. at 2124. Here, the Court finds that the asserted claims meet this bar. As discussed above, a person of ordinary skill in the art would understand the disputed terms to mean "memory functioning as a unit." The claims and specification provide explicit guidance as to how this happens: the transport logic, system controller, and MPEG decoder logic each have "access" to the "single memory" or "first unified memory." '087 patent, 17:15-45, 18:14-34, 19:6-20:7. Further, "[e]ach of the transport logic, system controller, and MPEG decoder logic accesses the single unified memory through the memory controller." *Id.*, 5:26-29, 9:6-10. In light of this, a person of ordinary skill in the art would be able to examine a memory in a decoder system, assess how it is functionally used by different components, and know with reasonable certainty whether it "function[s] as a unit." For example, use of a single controller or a uniform addressing scheme could indicate that it functions as a unit. *Id.*, 5:26-29, 9:6-10. Use of a single device, such as the Samsung KM416S1120AT-12, could also indicate that it functions as a unit. *Id.*, 8:45-46. Use of multiple memory devices that would need to be accessed in different ways—such as the prior art solutions discussed in the specification—could indicate that it does not. *Id.*, 4:28-36. Accordingly, the Court finds that the claims, read in light of the specification and the prosecution history, do not "fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 134 S. Ct. at 2124. They are not indefinite.

C. "Transport Logic" (claims 1 and 16)

Term	Defendants' Proposal	Funai's Proposal	Court's Construction
"transport logic"	Plain and ordinary meaning; no construction necessary. Alternative: "a demultiplexer"	"a hardware component of the video decoding system, separate from the system controller and MPEG decoder logic, which operates to demultiplex received data into a plurality of individual multimedia streams."	"a component of the video decoding system, which operates to demultiplex received data into a plurality of individual multimedia streams"

The parties agree that the "transport logic" performs the function of "demultiplexing." In addition, Defendants do not appear to take issue with the remaining functionality-related language in Funai's construction: that the "transport logic" demultiplexes "received data into a plurality of individual multimedia streams." *See* Reply Br. 7-9. Thus, the parties only dispute whether the "transport logic" must be a hardware component which is separate from the system controller and MPEG decoder logic. The Court addresses each of these issues in turn.

i. Separate

Turning first to "separate," Funai argues that the "transport logic" must be "separate" from the "system controller" and "MPEG decoder logic" because the claims require that the "transport logic is "coupled to" these components. Responsive Br. 12-13. Defendants respond that there is no such requirement. Opening Br. 9-12. This is really more of a dispute about the meaning of "coupled to" than "transport logic." As such, the extent to which "coupling" implies separateness is best disposed of in the Court's construction of that term. The Court need not repeat its view on this issue here, as "coupled to" and the Court's construction of this term will sufficiently clarify for the jury the extent to which the asserted claims require separateness between the transport logic, system controller, and MPEG decoder logic. To do otherwise would be superfluous and risks inconsistency.

ii. Hardware

Turning next to "hardware," Funai contends that the "transport logic" must include hardware, either by being a separate hardware component or a combination of a separate hardware

component and software. Responsive Br. 10-14. Defendants, on the other hand, argue that "transport logic" can be pure software. Opening Br. 9-12.

Beginning with the claim language, the Court observes that claims 1 and 16 appear to use "logic" and "functions" interchangeably. In both of these claims, the preambles recite "a single memory for use by transport . . . functions" and then later recite that "the memory is used by the transport logic." *See* '087 patent, 17:15-45, 19:6-20:7. This interchangeable use of "logic" and "functions" suggests that the patent takes a higher-level, more functionally-oriented view of "logic" that could include software, hardware, or some combination of the two. However, this suggestion is modest at best; thus, the Court consults other intrinsic evidence for further guidance.

The specification is silent as to whether the "transport logic" must be implemented in software or hardware. Most of the descriptions of the "transport logic" relate to its function. *See, e.g.*, *id.*, 4:22-24, 8:10-21, 11:6-8. They do not state whether this function is implemented in hardware, software, or some combination of the two. The depiction of "transport logic" in Figure 3 is also unhelpful: it illustrates that, in that embodiment, the "transport logic" is connected in some way to the channel receiver and the system controller. *Id.*, Fig. 3. However, the blocks in this diagram could represent hardware and/or software, and nothing in the corresponding description of Figure 3 clarifies this. *See id.*, 7:65-8:20.

The parties do not identify anything in the prosecution history that would clarify whether the "transport logic" must be hardware or software. Thus, with only modest indicators in the claim language and no further guidance in the specification or prosecution history, the Court turns to extrinsic evidence.

Extrinsic evidence confirms that the "transport logic" can be pure software, hardware, or some combination of the two. As discussed above in Section III.A, at the time of invention, it was known in the art that video decoders could be implemented in hardware, software, or some hybrid of the two. It stands to reason, then, that if an entire video decoder could be implemented in pure software, the "transport logic" contained within it could also be purely software. Indeed, several papers submitted by Defendants confirm exactly this point. For example, "Implementation of MPEG Transport Demultiplexer with a RISC-Based Microcontroller" describes a hybrid system

that implements demultiplexing in software. Ex. E to Acton Decl. at 434-37, ECF 98-11 (describing software implementation of demultiplexing component). Similarly, "Demultiplexer IC for MPEG2 Transport Streams" describes how a model of a demultiplexer was implemented in C (i.e., software). Ex. D to Acton Decl. at 701, ECF 98-11. Thus, "transport logic" purely implemented in software was known in the art. As such, a person of ordinary skill in the art would interpret "transport logic" as used in the '087 patent—whose claim language modestly suggests software-based implementation and intrinsic evidence is otherwise silent on how the "transport logic" is implemented—as including implementations in either hardware or software.

Accordingly, the Court agrees with Defendants that "transport logic" can be pure software and need not include hardware.

iii. Conclusion

The Court disagrees with the portions of Funai's proposed construction that require hardware and separateness, but otherwise finds that its proposed language accurately reflects the meaning and functionality of the "transport logic." It thus adopts a modified version of Funai's proposal and construes "transport logic" to mean "a component of the video decoding system, which operates to demultiplex received data into a plurality of individual multimedia streams."

D. "System Controller" (claims 1, 10, and 16)

Term	Defendants' Proposal	Funai's Proposal	Court's Construction
"system controller"	Plain and ordinary meaning; no construction necessary. Alternative: "an element of the video decoding system which controls operations in the video decoder"	Indefinite under 35 U.S.C. § 112 Alternatively: "a hardware component of the video decoding system, separate from the transport logic and the MPEG decoder logic, which controls operations in the system and executes programs or applets comprised in the MPEG stream."	"a hardware component of the video decoding system that can execute software, which controls operations in the system and executes programs or applets comprised in the video stream"

i. Claim Construction

The parties are largely in agreement on this term. The parties generally agree on

functionality: as each proposed construction recites, the "system controller" "controls operations." In addition, with the exception of the use of "MPEG," Defendants do not appear to substantively disagree with the remaining functionality-related language in Funai's construction, "in the system and executes programs or applets comprised in [a video] stream." *See* Reply Br. 9-12. In addition, at the hearing, the parties both agreed on the record that the "system controller" is a hardware component that can operate software.

Thus, the only pending disputes are (1) whether "MPEG" should be used over "video;" and (2) whether the "system controller" must be "separate" from the transport logic and the MPEG decoder. Both can be quickly disposed of. As to the first, the Court agrees with Defendants that the functionality of the system controller should not be limited to "MPEG." Claim 10 recites "video decoder" not "MPEG decoder;" thus, the system controller should not be limited to only "MPEG" decoding. As to the second, the Court finds that, for the same reasons as discussed above with respect to "transport logic," this is more of a dispute about the meaning of "coupled to" and is best resolved through the Court's construction of that term.

Accordingly, the Court adopts a modified version of Funai's proposal and construes "system controller" to mean "a hardware component of the video decoding system that can execute software, which controls operations in the system and executes programs or applets comprised in the video stream."

ii. Indefiniteness

Having construed "system controller," the Court proceeds to determine whether, in light of this construction, the asserted claims are indefinite. Funai argues that "system controller" renders the claims indefinite because it is a generic term that refers to a broad array of processors that are used to perform control functions in computer systems. Responsive Br. 18. Defendants disagree. Opening Br. 12-13.

Claims are indefinite if they, "read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention. *Nautilus*, 134 S. Ct. at 2124. Here, as Funai itself admits, "system controller" refers to a broad array of processors that are used to perform control functions in

computer systems. Responsive Br. 18. For example, the specification discloses that an example of the "system controller" is a "MIPS RISC CPU." '087 patent, 8:36. It also discloses that the "system controller" has specific capabilities, such as: "monitor[ing] the MPEG system," being "programmable to display audio/graphics on the screen and/or execute interactive applets or programs," and "control[ling] operations in the MPEG decoder system." *Id*., 8:30-35. This indeed implies a broad class of devices, but it is not boundless: a person of ordinary skill in the art would know what a processor is and be able to determine whether it had these capabilities. *See* Ex. 4 to Mot. at 102:9-11, ECF 98-9 (testimony from Dr. Schonfeld, Funai's expert, that a person of ordinary skill in the art would know what a MIPS RISC CPU is); *id*. at 110:20-111:4 (testimony from Dr. Schonfeld that a person of ordinary skill would know how to program a CPU to perform certain control operations). As such, a person of ordinary skill in the art would be able to read the asserted claims in light of this understanding and know the scope of the invention with reasonable certainty.

Moreover, the effect that "system controller" has on the indefiniteness inquiry is tempered by the fact that it does not play a substantial role in defining the scope of the invention. The Federal Circuit has cautioned that "the dispositive question in an indefiniteness inquiry is whether the 'claims,' not particular claim terms" fail this test. *Cox Commc'ns*, 838 F.3d at 1231. For that reason, a claim term that "does not discernably alter the scope of the claims" may fail to serve as a source of indefiniteness. *Id*. Such is the case here: the primary contours of the asserted claims come from the collective recitation of all of the components in the decoder and their interaction with the "single memory" or "first unified memory." The "system controller" is simply one component in the system. Thus, it plays but a small role in shaping the scope of the asserted claims.

E. "Channel receiver for receiving and [sic] MPEG encoded stream" (claims 1 and 16)

Term	Defendants' Proposal	Funai's Proposal	Court's Construction
"channel receiver for receiving and [sic] MPEG encoded stream"	Plain and ordinary meaning; no construction necessary.	This is a means-plus-function claim term under 35 U.S.C. § 112, para. 6. The term is	The phrase "channel receiver" is construed to mean "a digital data receiver that receives

	Alternative: "a digital data receiver that receives data from a channel"	invalid under this paragraph because the specification fails to disclose sufficient structure/algorithm for performing the stated function. Construction: Function – receiving an MPEG encoded stream Structure – undefined Alternatively, if not means-plus-function term: "the component that receives an encoded video stream as an input and provides that stream to the transport logic"	data from a channel." The remaining language requires no construction.

At the hearing, the parties reached an agreement on the record regarding this dispute: that "channel receiver" (not the remainder of the originally disputed phrase) should be construed to mean "a digital data receiver that receives data from a channel." In addition, Funai has dropped its contention that the longer phrase "channel receiver for receiving and [sic] MPEG encoded stream" is a means-plus-function term. Responsive Br. 20. According, the Court adopts the parties' agreed-upon construction and construes "channel receiver" to mean "a digital data receiver that receives data from a channel."

F. "Coupled to" (claims 1 and 16)

Term	Defendants' Proposal	Funai's Proposal	Court's Construction
"coupled to"	Plain and ordinary meaning; no construction necessary. Alternative: "having an interdependence with"	"a connection between two separate components to allow the transfer of signals"	"having an interdependence with"

In essence, the parties' dispute distills to a single issue: whether "coupl[ing]" must be a hardware connection. Funai argues that "coupled to" requires a hardware connection, where

separate components transfer signals between them. Responsive Br. 21-25. Defendants, on the other hand, argue that "coupled to" does not require a hardware connection, but can instead also be implemented purely in software such as through code dependencies or sharing variables through function calls. Opening Br. 15-16.

Beginning with the claims, the Court finds that nothing in the claim language informs whether "coupled to" requires a hardware connection. '087 patent, 17:15-45, 18:14-34, 19:6-20:7. The claims recite that various components are "coupled to" one another, but this could be read to mean either software or hardware. The Court thus turns to other intrinsic evidence.

The specification is at best equivocal. On one hand, it primarily discloses preferred embodiments of the "decoder[s]" which are hardware devices. For example, Figure 1 depicts "a video decoder 74" which is "preferably [an] adapter card[]"—i.e., hardware. *Id*., 6:50, 6:54. The specification also discloses that "video decoder 74" is "connected to PCI bus"—an interface for connecting hardware components. *Id*., 7:7. It also discloses preferred embodiments of some of the decoder's components as hardware components. For example, a preferred embodiment of the system controller is a "MIPS RISC CPU." *Id*., 8:36. A preferred embodiment of the external memory or single unified memory is a "16 MB synchronous dynamic random access memory (SDRAM)," "such as [a] Samsung KM416S1120AT-12, having an operating frequency of 81 MHz or 108 MHz and a burst size of 4 words." *Id*., 8:45-46. The fact that these preferred embodiments are primarily hardware devices implies that, in these preferred embodiments, the components are most likely "coupled" through hardware connections. Indeed, in describing the coupling between the "transport and system controller block" and the "MPEG decoder," the specification makes this explicit: it describes the interfaces as a "data bus"—a hardware connection. *Id*., 16:49. The way that they ensure correct communication (i.e., through control signals such as the "transmission data output enable (TDOE) signal" and "new packet word (NPW) signal") is also characteristic of hardware. *Id*., 16:51-56. In addition, the specification never explicitly discloses the software form of "coupl[ing]" that Defendants propose, i.e., code dependencies or sharing variables through function calls. *Cf*. Ex. 1 to Opp. at 64:13-25 (testimony from Dr. Acton, Defendants' expert, that the specification does not provide examples of the

software form of "coupl[ing]").

However, on the other hand, all of these descriptions are simply preferred embodiments. The Federal Circuit "has repeatedly cautioned against limiting claims to a preferred embodiment." *Comaper*, 596 F.3d at 1348. Indeed, here, the specification never explicitly defines "decoder[s]" as hardware devices, nor does it indicate that the "decoder[s]" should be so limited. On the contrary, it suggests that the "decoder[s]" could take a number of forms:

> It is noted that the system for decoding or decompressing video data may comprise two or more interconnected computers, as desired. The system for decoding or decompressing video data may also comprise other hardware, such as a set top box, either alone or used in conjunction with a general purpose programmable computer. It is noted that any of various types of systems may be used for decoding or decompressing video data according to the present invention, as desired.

Id., 7:56-63. The specification also mentions that "[t]he computer system 60" in Figure 1—which it describes as including "video decoder 74"—"also includes software, represented by floppy disks 72, which may perform portions of the video decompression or decoding operation and/or may perform other operations, as desired." *Id*., 6:56-60. This also suggests that at least some portions of the claimed "decoder[s]" could be implemented in software or some hybrid of hardware and software. Thus, even though the specification focuses on hardware embodiments of "decoders," it is not so "repeated[] and consistent[]" that decoding should be limited to hardware. *GPNE Corp. v. Apple*, 830 F.3d 1365, 1370 (Fed. Cir. 2016) (internal citations omitted). For example, in *GPNE*, the Federal Circuit limited the claimed "devices" to "pagers" because the "the words 'pager' and 'pager units' appear[ed] in the specification over 200 times, and, apart from the Abstract, the specification repeatedly and exclusively uses these words to refer to the devices in the patented system." *Id*. The Court is not presented with a similar situation here, as the specification does not use a word in place of "decoder[s]" that would suggest a more limited scope (instead, the specification also uses the same word, "decoder[s]," which is agnostic to hardware or software implementation). *See generally* '087 patent, 1:7-17:13. In addition, many of the hardware-focused embodiments discussed above are only disclosed once in the specification; thus, they are not a "repeated[] . . . characteriz[ation]" in the way that "pagers" was in *GPNE*. *See generally id*.

Moreover, even if the Court had determined that the "decoder[s]" should be limited to the

specification's hardware-focused embodiments, this would not necessarily require that each of the recited "coupl[ings]" must also be hardware connections. As discussed above in Section III.A, hybrid hardware/software implementations of video decoders were known at the time of invention. Thus, even if some of the claimed components were limited to hardware—e.g., the system controller were limited to a "MIPS RISC CPU," '087 patent, 8:36, and the external memory or single unified memory were limited to a "Samsung KM416S1120AT-12," *id*., 8:45-46—this would still permit a hybrid implementation where, for example, the transport logic or the channel receiver were partially or fully implemented in software. As such, the "coupl[ing]" of those components could also be software-based. For this reason as well, the specification leaves open whether "coupled to" is a hardware or software connection.

The parties do not identify anything in the prosecution history that would clarify whether "coupled to" requires a hardware connection. Thus, with only equivocal guidance from the intrinsic record, the Court turns to extrinsic evidence.

Extrinsic evidence confirms that "coupled to" can be either a hardware or software connection. As discussed above in Section III.A, at the time of invention, it was known in the art that video decoders could be implemented in hardware, software, or some hybrid of the two. It stands to reason, then, that if an entire video decoder could be implemented in pure software, the "coupl[ing]" of the components within it could also be purely software. Indeed, the Court's previous constructions of other terms is consistent with this: as discussed above, the "transport logic" can be implemented in either hardware or software. Thus, at least the claimed "coupl[ing]" between the "system controller" and the "transport logic" cannot be a hardware-only connection.

This conclusion is consistent with other extrinsic evidence submitted by the parties. Dictionary definitions submitted by the parties show that "coupling" has meanings in both the software and hardware contexts. *Compare* Responsive Br. 22 (citing the *McGraw-Hill Dictionary of Engineering and Science* as defining "couple" as "… [ELEC] To connect two circuits so signals are transferred from one to another"), *with* Ex. G to Action Decl. (excerpt from the *Authoritative Dictionary of IEEE Standards Terms* (Seventh Edition) defining "coupling(software)" as "[t]he manner and degree of interdependence between software modules. Types include common-

environment coupling, content coupling, control coupling, data coupling, hybrid coupling, and pathological coupling."),[5] Ex. I to Acton Decl. (excerpt from the *Dictionary of Computer and Information Technology* defining "coupling" as "[i]n software development, coupling refers to the degree to which software components are dependent"), Ex. J to Acton Decl. (excerpt from *Blackie's Dictionary of Computer Science* defining "coupling" as "The degree to which components depend on one another. There are two types of coupling, loose and tight. Loose coupling is desirable for good software engineering but tight coupling may be necessary for maximum performance. Coupling is increased when the data exchanged between components becomes larger or more complex.").[6] Thus, this too suggests that "coupled to" can be either a hardware or software connection.

In sum, because the intrinsic evidence does not provide clear guidance on the meaning of "coupled to" but extrinsic evidence shows that "coupled to" can be either a hardware or software connection, the Court concludes that "coupled to" should be construed to encompass both of these meanings.

In arriving at this conclusion, the Court finds that it is confronted with a situation that is similar to that which confronted the Federal Circuit in *SuperGuide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870 (Fed. Cir. 2004). There, the principle issue in construing the claim term "regularly received television signal" was whether this term was broad enough to cover television digital signals. *Id*. at 876. At the time of invention (1985), television signals were broadcasted as analog signals and no television existed at that date that could receive digital signals. *Id*. at 878.

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[5] The *Authoritative Dictionary of IEEE Standards Terms* (Seventh Edition) was published in December 2000. Ex. G to Action Decl. However, according to supplemental authority submitted by Defendants, this same definition of "coupling(software)" appeared in the *IEEE Standard Dictionary of Electrical and Electronics Term*s (Sixth Edition), which was approved in December 1996. ECF 125-1. In addition, this definition was included in the 1990 version of the 610.12 standard, which defines "coupling" in the same language. ECF 125-2. Thus, the Court finds that this definition contemporaneous with the time of invention (1996).

[6] The *Dictionary of Computer and Information Technology* was published in 2000. Ex. I to Acton Decl. *Blackie's Dictionary of Computer Science* appears to be dated 2008, although not entirely clear. Ex. J to Action Decl. Both of these dates are later than the time of invention (1996). However, Funai does not appear to object to the fact that these dictionaries are not contemporaneous, and it seems to the Court that it is at least possible that these definitions were consistent with perspectives in 1996. Thus, the Court finds this evidence at least weakly relevant and will not exclude it from its considerations.

The Court nevertheless found that "regularly received television signal" should not be limited to analog because "the claim language does not limit the disputed phrases to any particular type of technology or specify a particular type of signal format, such as analog or digital." *Id.* In addition, even though they were not predominant in the market, digital television signals were known in the art: "the first digital television standard was created in 1981, and as early as 1983, systems were used to transmit digital data to provide videoconferencing and videotext." *Id.* at 879. Thus, the court concluded that there was "no reason . . . to limit the scope of the claimed invention to analog technology, when 'regularly received television signals,' i.e., video data, is broad enough to encompass both formats and those skilled in the art knew both formats could be used for video." *Id.* at 880.

The same observations can be made here. Although, as discussed above, hardware implementations predominated the video decoding market in 1996, software-only and hardware/software hybrid implementations were also known in the art. *See* Section III.A, *supra*. Nothing in the claims, specification, or prosecution history limits the claimed "decoder[s]" or the way their components are "couple[d]" to either hardware or software. Thus, as in *SuperGuide*, the Court must conclude that the claims are broad enough to encompass both.

In sum, the Court finds that "coupled to" can be either a hardware or software connection. It thus adopts Defendants' proposal and construes this term to mean "having an interdependence with."

IV. ORDER

For the foregoing set forth above, the Court construes the disputed terms as follows:

Claim Term	Court's Construction
"single memory" and "first unified memory"	"memory functioning as a unit"
"transport logic"	"a component of the video decoding system, which operates to demultiplex received data into a plurality of individual multimedia streams"
"system controller"	"a hardware component of the video decoding system that can execute software, which controls operations in the system and executes programs or applets comprised in the video stream"

"channel receiver for receiving and [sic] MPEG encoded stream"	The phrase "channel receiver" is construed to mean "a digital data receiver that receives data from a channel." The remaining language requires no construction.
"coupled to"	"having an interdependence with"

IT IS SO ORDERED.

Dated: October 23, 2017

BETH LABSON FREEMAN
United States District Judge

United States District Court
Northern District of California