

**UNITED STATES DISTRICT COURT  
EASTERN DISTRICT OF TEXAS  
MARSHALL DIVISION**

CONVOLVE, INC.

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vs.

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CASE NO. 2:08-CV-244-CE

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DELL, INC., et al.

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**MEMORANDUM OPINION AND ORDER**

After considering the submissions and the arguments of counsel, the court issues the following order concerning the claim construction issues:

**I. Introduction**

In this case, plaintiff Convolve, Inc. contends that Defendants<sup>1</sup> infringe claims 1 and 7-15 of U.S. Patent No. 6,314,473 (“the ‘473 patent”). The patent addresses noise associated with the operation of data storage devices and specifically addresses the seek noise of disk drive data storage devices.<sup>2</sup> The asserted claims include independent claims directed toward a user interface, two methods for controlling a data storage device, two *Beauregard* claims, and three apparatus claims. One of the independent apparatus claims is directed to a disk drive and the remaining two are directed to an apparatus for controlling operation of a data storage device. Defendants are in the

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<sup>1</sup> Defendants include Dell, Inc. (“Dell”), Western Digital Corporation (“WD”), Hitachi Global Storage Technologies, Inc., and Hitachi LTD. (collectively “Hitachi”).

<sup>2</sup> This is a point of some contention between the parties. The patent uses non-limiting language when discussing storage devices and the sort of noise the patent sought to reduce, but the disclosure of the specification is tightly focused on disk drives and seek time noise.

business of manufacturing and/or selling hard disk drives.<sup>3</sup>

This memorandum addresses the parties' claim construction disputes. The memorandum will first briefly summarize the subject matter of the patents before addressing the merits of the parties' claim construction positions.

## **II. Technical Summary**

The patent-in-suit relates to control methods for data storage devices, specifically hard disk drives. In hard disk drives, data is written onto a thin magnetic coating on the surface of the disks inside the drive, called platters. On each platter, data is arranged in very narrow concentric rings called tracks. A platter may have thousands or tens of thousands of tracks for each inch of its radius. To read and write to these tracks, the drive uses a very small inductor<sup>4</sup> that can detect the magnetic polarization of each bit in each track. The disk also uses a very small electromagnet to change the magnetic polarization of the bits in the track one at a time.<sup>5</sup> The inductor and electromagnet are on a structure called the "head" which both accesses data from and writes data to the platter. The head is located on a mechanical structure called the "arm." A disk drive using multiple platters on the same axis will have multiple heads, typically on the same arm. To write data precisely, disk drives employ two motors. One motor, called the spindle, spins the platters, allowing the head to cover the entire platter area while traversing only over a line or arc. The spindle tends to spin at a single speed

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<sup>3</sup> Defendant Dell sells disk drives as part of computer systems. The remaining defendants manufacture and sell disk drives separately.

<sup>4</sup> In most cases, the inductor is a conductive loop or coil around a material with high relative permeability.

<sup>5</sup> The inductor and the electromagnet may be the same structure or may be different structures.

to allow for predictable operation. The second motor, called the voice coil motor, moves the arm across the spinning platters. The voice coil motor is controlled by a microcontroller or processor using feedback from the position of the arm. When the microcontroller receives a command indicating that the drive needs to write or read data to or from a particular portion of the drive, the microcontroller will execute a series of commands, in the form of currents to the voice coil motor which cause the head to move towards the target track. At all times, the head and/or arm sends positional information to the microcontroller. When the head nears the target track, the microcontroller computes and sends new commands to the voice coil motor to slow and stop the head, adjusting it to read/write over the target track as necessary. This process of moving the head from one track to another is called a “seek” or “seek operation.”

The time necessary to retrieve data from a data storage device is important. Because the same file or many related files that must be read at approximately the same time may be scattered across different tracks of the drive, a hard disk drive may have to perform many seek operations for any action the user of a computer wishes to perform. The time required to perform a seek operation can be multiplied many times over and result in a drive or computer seeming slow and unresponsive.

At the same time, fast seek operations can be noisy. The process of rapidly moving and stopping the head can cause the arm to vibrate and, depending on the impulse applied to the arm, create sound at various frequencies. This sound, considered noise, detracts from the usefulness of hard disk drives in certain environments where noise would be an unwelcome distraction to the user.

The patent-in-suit deals principally with audible noise generated by data storage devices, specifically the seek noise of hard disk drives. By altering the commands sent to the voice coil

motor, and ultimately the position<sup>6</sup> of the head over time, the patented methods and devices reduce the amount of extraneous noise produced as a result of the seek operation. As a byproduct, these methods also increase the seek time, creating a trade-off between seek noise and seek time.

The patent's abstract provides:

Techniques are provided herein for reducing vibrations in various modes of a dynamic system. One such technique comprises incorporating vibration limiting and sensitivity constraints into a partial fraction expansion model of the system so as to reduce vibrations to specific levels. Another technique comprises shaping a command determined using the partial fraction expansion equation model to produce a desired output. The entire command may be shaped or only selected portions thereof which produce vibrations. Another technique involves commanding in current to produce saturation in voltage. By doing this, it is possible to command voltage switches. The times at which the switches occur can be set to reduce system vibrations. Other techniques are also provided. These include varying transient portions at the beginning, middle, and/or end of a move and using Posicast inputs, among others.

Claim 1 is directed toward a user interface for controlling a data storage device:

1. User interface for operatively working with a processor to affect operation of a data storage device, the user interface comprising:

means for providing settings for controlling one of a seek time of the data storage device and an acoustic noise level of the data storage device in inverse relation;

means for indicating to the data storage device that one of the seek time settings of the data storage device and the acoustic noise level settings of the data storage device has been altered; and

means for causing the processor to output commands to the data storage device to alter seek trajectory shape by shaping input signals to to the data storage dice to reduce selected unwanted frequencies from a plurality of frequencies in accordance with the

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<sup>6</sup> As well as the time derivatives of the position of the head, e.g. the velocity of the head, the acceleration of the head, etc.

altered settings in the user interface.

Claim 7 is directed toward a method for controlling a data storage device:

7. A method of controlling operation of a data storage device, comprising:

generating a user interface, the user interface controlling one of a seek time of the data storage device and an acoustic noise level of the data storage device;

altering settings in the user interface for one of the seek time and the acoustic noise level of the data storage device in inverse relation; and

outputting commands to the data storage device to alter seek trajectory shape by shaping input signals to the data storage device to reduce selected unwanted frequencies from a plurality of frequencies in accordance with the altered set in the user interface.

Claim 8 is directed toward computer-executable process steps stored on a computer-readable medium for controlling a data storage device:

8. Computer-executable process steps stored on a computer-readable medium, the computer-executable process steps to control operation of a data storage device, the computer-executable process steps comprising:

code to generate a user interface, the user interface controlling one of a seek time of the data storage device and an acoustic noise level of the data storage device;

code to alter settings in the user interface for one of the seek time and the acoustic noise level of the data storage device in inverse relation; and

code to output commands to the data storage device causing the data storage device to alter seek trajectory shape by shaping input signals to the data storage device to reduce selected unwanted frequencies from a plurality of frequencies in accordance with the altered settings in the user interface.

Claim 11 is directed toward a disk drive:

11. A disk drive operatively controlled by a user interface, said user interface providing settings capable of altering one of a seek time of the disk drive and acoustic noise level of the disk drive in inverse relation, and indicating to the disk drive that one of the seek time settings of the disk drive and the acoustic noise level settings of the disk drive has been altered, the disk drive comprising:

means for performing a seek operation, the seek operation generating a plurality of frequencies; and

means for outputting commands to alter seek trajectory shape by shaping input signals to the means for performing the seek operation to reduce selected unwanted frequencies from said plurality of frequencies in accordance with the altered settings in the user interface.

### **III. General Principles Governing Claim Construction**

“A claim in a patent provides the metes and bounds of the right which the patent confers on the patentee to exclude others from making, using or selling the protected invention.” *Burke, Inc. v. Bruno Indep. Living Aids, Inc.*, 183 F.3d 1334, 1340 (Fed. Cir. 1999) (quoting *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989)). Claim construction is an issue of law for the court to decide. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 391 (1996).

To ascertain the meaning of claims, the court looks to three primary sources: the claims, the specification, and the prosecution history. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996) (quoting *Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 1561 (Fed. Cir. 1991)). Under the patent law, the specification must contain a written description of the invention that enables one of ordinary skill in the art to make and use the invention. 35 U.S.C. § 112; *id.* at 978. A patent’s claims “must be read in view of the specification,

of which they are a part.” *Markman*, 52 F.3d at 979. “For claim construction purposes, the description may act as a sort of dictionary, which explains the invention and may define terms used in the claims.” *Id.* “One purpose for examining the specification is to determine if the patentee has limited the scope of the claims.” *Watts v. XL Sys., Inc.*, 232 F.3d 877, 882 (Fed. Cir. 2000).

Nonetheless, it is the function of the claims, not the specification, to set forth the limits of the patentee’s claims. Otherwise, there would be no need for claims. *SRI Int’l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc). The patentee is free to be his own lexicographer, but any special definition given to a word must be clearly set forth in the specification. *Intellicall, Inc. v. Phonometrics*, 952 F.2d 1384, 1388 (Fed. Cir. 1992). And, although the specification may indicate that certain embodiments are preferred, particular embodiments appearing in the specification will not be read into the claims when the claim language is broader than the embodiments. *Electro Med. Sys., S.A. v. Cooper Life Scis., Inc.*, 34 F.3d 1048, 1054 (Fed. Cir. 1994). This court’s claim construction decision must be informed by the Federal Circuit’s decision in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). In *Phillips*, the court set forth several guideposts that courts should follow when construing claims. In particular, the court reiterated that “the *claims* of a patent define the invention to which the patentee is entitled the right to exclude.” *Id.* at 1312 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)) (emphasis added). To that end, the words used in a claim “are generally given their ordinary and customary meaning.” *Id.* (quoting *Vitronics Corp. v. Conceptoronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). “[T]he 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.”

*Id.* at 1313. This principle of patent law flows naturally from the recognition that inventors are usually persons who are skilled in the field of the invention. *Id.* The patent is addressed to and intended to be read by others skilled in the particular art. *Id.*

The primacy of claim terms notwithstanding, *Phillips* made clear that “the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Phillips*, 415 F.3d at 1313. Although the claims themselves may provide guidance as to the meaning of particular terms, those terms are part of “a fully integrated written instrument.” *Id.* at 1315 (quoting *Markman*, 52 F.3d at 978). Thus, the *Phillips* court emphasized the specification as being the primary basis for construing the claims. *Id.* at 1314-17. The Supreme Court stated long ago that “in case of doubt or ambiguity it is proper in all cases to refer back to the descriptive portions of the specification to aid in solving the doubt or in ascertaining the true intent and meaning of the language employed in the claims.” *Bates v. Coe*, 98 U.S. 31, 38 (1878). In addressing the role of the specification, the *Phillips* court quoted with approval its earlier observations from *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998):

Ultimately, 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. The construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be, in the end, the correct construction.

*Phillips*, 415 F.3d at 1316. Consequently, *Phillips* emphasized the important role the specification plays in the claim construction process.

The prosecution history also continues to play an important role in claim interpretation. The prosecution history helps to demonstrate how the inventor and the PTO understood the patent. *Id.*



at 1317. Because the file history, however, “represents an ongoing negotiation between the PTO and the applicant,” it may lack the clarity of the specification and thus be less useful in claim construction proceedings. *Id.* Nevertheless, the prosecution history is intrinsic evidence. *Id.* That evidence is relevant to the determination of how the inventor understood the invention and whether the inventor limited the invention during prosecution by narrowing the scope of the claims. *Id.*

*Phillips* rejected any claim construction approach that sacrificed the intrinsic record in favor of extrinsic evidence, such as dictionary definitions or expert testimony. *Id.* The *en banc* court condemned the suggestion made by *Texas Digital Systems, Inc. v. Telegenix, Inc.*, 308 F.3d 1193 (Fed. Cir. 2002), that a court should discern the ordinary meaning of the claim terms (through dictionaries or otherwise) before resorting to the specification for certain limited purposes. *Phillips*, 415 F.3d at 1319-24. The approach suggested by *Texas Digital* the assignment of a limited role to the specification was rejected as inconsistent with decisions holding the specification to be the best guide to the meaning of a disputed term. *Id.* at 1320-21 (quoting *Vitronics*, 90 F.3d at 1582). According to *Phillips*, reliance on dictionary definitions at the expense of the specification had the effect of “focus[ing] the inquiry on the abstract meaning of words rather than on the meaning of claim terms within the context of the patent.” *Id.* at 1321. *Phillips* emphasized that “[t]he patent system is based on the proposition that the claims cover only the invented subject matter.” *Id.* What is described in the claims flows from the statutory requirement imposed on the patentee to describe and particularly claim what he or she has invented. *Id.* The definitions found in dictionaries, however, often flow from the editors’ objective of assembling all of the possible definitions for a word. *Id.* at 1321-22.

*Phillips* does not preclude all uses of dictionaries in claim construction proceedings. *Phillips*,

415 F.3d at 1322. Instead, the court assigned dictionaries a role subordinate to the intrinsic record. *Id.* at 1317-19. In doing so, the court emphasized that claim construction issues are not resolved by any “magic formula.” *Id.* at 1324. The court did not impose any particular sequence of steps for a court to follow when it considers disputed claim language. *Id.* at 1323-25. Rather, *Phillips* held that a court must attach the appropriate weight to the intrinsic sources offered in support of a proposed claim construction, bearing in mind the general rule that the claims measure the scope of the patent grant. *Id.* at 1324.

The patents-in-suit include claim limitations that are argued to fall within the scope of 35 U.S.C. § 112, ¶ 6. “An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure. . . in support thereof, and such claim shall be construed to cover the corresponding structure . . . described in the specification and equivalents thereof.” 35 U.S.C. § 112, ¶ 6. When a claim uses the term “means” to describe a limitation, a presumption inheres that the inventor used the term to invoke § 112, ¶ 6. *Biomedino, LLC v. Waters Technologies Corp.*, 490 F.3d 946, 950 (Fed. Cir. 2007). “This presumption can be rebutted when the claim, in addition to the functional language, recites structure sufficient to perform the claimed function in its entirety.” *Id.*, citing *Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1375 (Fed. Cir. 2003). By contrast, when a claim term does not use “means,” the term is presumptively not subject to § 112, ¶ 6. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1369 (Fed. Cir. 2002); *MIT v. Abacus Software*, 462 F.3d 1344, 1353 (Fed. Cir. 2006). A limitation lacking the term “means” may overcome the presumption if it is shown that “the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function.” *MIT*, 462 F.3d at 1353, quoting *CCS Fitness*, 288 F.3d at 1369. “What

is important is whether the term is one that is understood to describe structure, as opposed to a term that is simply a nonce word or a verbal construct that is not recognized as the name of structure and is simply a substitute for the term ‘means for.’” *Lighting World, Inc. v. Birchwood Lighting, Inc.*, 382 F.3d 1354, 1360 (Fed. Cir. 2004).

Once the court has concluded the claim limitation is a means-plus-function limitation, the first step in construing a means-plus-function limitation is to identify the recited function. *See Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999). The second step in the analysis is to identify in the specification the structure corresponding to the recited function. *Id.* The “structure disclosed in the specification is ‘corresponding’ structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim.” *Medical Instrumentation and Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1210 (Fed. Cir. 2003), *citing B. Braun v. Abbott Labs*, 124 F.3d 1419, 1424 (Fed. Cir. 1997). The patentee must clearly link or associate structure with the claimed function as part of the quid pro quo for allowing the patentee to express the claim in terms of function pursuant to § 112, ¶ 6. *See id.* at 1211; *see also Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369, 1377 (Fed. Cir. 2001). The “price that must be paid” for use of means-plus-function claim language is the limitation of the claim to the means specified in the written description and equivalents thereof. *See O.I. Corp. v. Tekmar Co.*, 115 F.3d 1576, 1583 (Fed. Cir. 1997). “If the specification does not contain an adequate disclosure of the structure that corresponds to the claimed function, the patentee will have ‘failed to particularly point out and distinctly claim the invention as required by the second paragraph of section 112,’ which renders the claim invalid for indefiniteness.” *Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1382 (Fed. Cir. 2009), *quoting In re Donaldson Co.*, 16 F.3d 1189, 1195 (Fed. Cir. 1994) (en banc). It is

important to determine whether one of skill in the art would understand the specification itself to disclose the structure, not simply whether that person would be capable of implementing the structure. *See Atmel Corp. v. Info. Storage Devices, Inc.*, 198 F.3d 1374, 1382 (Fed. Cir. 1999); *Biomedino*, 490 F.3d at 953. Fundamentally, it is improper to look to the knowledge of one skilled in the art separate and apart from the disclosure of the patent. *See Medical Instrumentation*, 344 F.3d at 1211-12. “[A] challenge to a claim containing a means-plus-function limitation as lacking structural support requires a finding, by clear and convincing evidence, that the specification lacks disclosure of structure sufficient to be understood by one skilled in the art as being adequate to perform the recited function.” *Budde*, 250 F.3d at 1376-77.

At issue in this case is whether certain claims of the patents-in-suit are indefinite. A claim is invalid for indefiniteness if it fails to particularly point out and distinctly claim the subject matter that the applicant regards as the invention. 35 U.S.C. § 112, ¶ 2. To prevail on an indefiniteness argument, the party seeking to invalidate a claim must prove “by clear and convincing evidence that a skilled artisan could not discern the boundaries of the claim based on the claim language, the specification, and the prosecution history, as well as her knowledge of the relevant art area.” *Halliburton Energy Services, Inc. v. M-I LLC*, 514 F.3d 1244, 1249-50 (Fed. Cir. 2008). The primary purpose of the definiteness requirement is to ensure public notice of the scope of the patentee's legal right to exclude, such that interested members of the public can determine whether or not they infringe. *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1347 (Fed. Cir. 2005); *Halliburton*, 514 F.3d at 1249; *Honeywell Int'l Inc. v. Int'l Trade Comm'n*, 341 F.3d 1332, 1338 (Fed. Cir. 2003). Courts apply the general principles of claim construction in their efforts to construe allegedly indefinite claim terms. *Datamize*, 417 F.3d at 1348; *Young v. Lumenis, Inc.*, 492

F.3d 1336, 1346 (Fed. Cir. 2007). A claim is indefinite only when a person of ordinary skill in the art is unable to understand the bounds of the claim when read in light of the specification. *Miles Labs., Inc. v. Shandon, Inc.*, 997 F.2d 870, 875 (Fed. Cir. 1993); *Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*, 537 F.3d 1357, 1371 (Fed. Cir. 2008). A determination of claim indefiniteness is a conclusion of law. *Exxon Research & Eng'g Co. v. United States*, 265 F.3d 1371, 1375-76 (Fed. Cir. 2001); *Datamize*, 417 F.3d at 1347.

A claim is indefinite only if the claim is “insolubly ambiguous” or “not amenable to construction.” *Exxon*, 265 F.3d at 1375; *Young*, 492 F.3d at 1346; *Halliburton*, 514 F.3d at 1249; *Honeywell*, 341 F.3d at 1338-39. A court may find a claim indefinite “only if reasonable efforts at claim construction prove futile.” *Datamize*, 417 F.3d at 1347. A claim term is not indefinite solely because the term presents a difficult claim construction issue. *Id.*; *Exxon*, 265 F.3d at 1375; *Honeywell*, 341 F.3d at 1338. “If the meaning of the claim is discernable, even though the task may be formidable and the conclusion may be one over which reasonable persons will disagree, ... the claim [is] sufficiently clear to avoid invalidity on indefiniteness grounds.” *Exxon*, 265 F.3d at 1375; *Halliburton*, 514 F.3d at 1249.

Bearing these standards in mind, the Court now considers the terms presented for construction.

#### **IV. Agreed Terms**

- The parties agree that “acoustic noise level” means “Acoustic noise generated as a result of the seek operation.” The term “acoustic noise level” appears in claims 1 and 7-15 of the patent-in-suit.
- The parties agree that “operatively controlled” means “being controlled.” The term “operatively controlled” appears in claim 11 of the patent-in-suit.

- The parties agree that “seek operation” means “movement of the disk drive head from an initial position to rest at a position where the head can perform a read/write operation on a particular track of a magnetic disk.” The term “seek operation” appears in claim 11 of the patent-in-suit.
- The parties agree that the means-plus-function term “means for providing settings for controlling one of a seek time of the data storage device and a seek acoustic noise level of the data storage device in inverse relation” has a function of “providing settings for controlling one of a seek time of the data storage device and a seek acoustic noise level of the data storage device in inverse relation,” but disagree as to the associated structure. The term appears in claim 1 of the patent-in-suit.
- The parties agree that the means-plus-function term “means for indicating to the data storage device that one of the seek time settings of the data storage device and the seek acoustic noise level settings of the data storage device has been altered” has a function of “indicating to the data storage device that one of the seek time settings of the data storage device and the seek acoustic noise level settings of the data storage device has been altered.” This term appears in claim 1 of the patent-in-suit.
- The parties agree that the means-plus-function term “means for performing a seek operation” has a function of “performing a seek operation.” The term “means for performing a seek operation” appears in claim 11 of the patent-in-suit.

## **V. Disputed Terms**

The parties’ principal disagreements relate to which processors may carry out the steps of the claims and send commands to the voice coil motor, whether adequate structure is disclosed to support the patent’s means-plus-function claims, whether terms reciting “code” contain sufficient structure or require construction under 35 U.S.C. § 112 ¶ 6, whether the term “user interface” requires action by an end user, and whether various terms as used in the claims are indefinite.

### **A. User Interface Claim Terms**

The parties dispute several aspects of the term “user interface” as it appears in the asserted claims of the ‘473 patent. The parties’ disagreements relate, generally, to whether the user interface must be accessible to the user, whether a specific processor must be used for the user interface, and

whether someone other than an end user can practice the method claims that require a user interface.

### **1. User Interface**

- Plaintiff's proposed construction: "software, hardware, firmware, or a combination thereof that allows a person, directly or indirectly, to alter parameters"
- Defendants' proposed construction: "control (e.g., a graphical user interface and/or mechanical switch(es)) through which an end-user alters operational parameters. Devices that are configured by the manufacturer are not configured by a 'user interface.'"

The term "user interface" appears in asserted claims 1 and 7-15 of the '473 patent. The parties' principal disagreement over this term is whether devices configured by the manufacturer are configured by a "user interface." Upon a review of the intrinsic record and the briefing of the parties, the Court concludes that neither party's proposed construction adequately defines the term.

Plaintiff's proposed construction would cover the situation where a manufacturer configured its own devices but did not allow users to alter those settings. Defendants argue, the summary of the invention teaches,<sup>7</sup> and common sense requires that a user interface must be capable of interfacing with the user. The "user interface" of the claims must be accessible to the end user.

Defendants' proposed construction, however, goes too far. The negative limitation of Defendants' proposed construction would exclude a manufacturer that used the same interface accessible to the end user to configure its devices. The portion of the summary of the invention that Defendants use for support in their argument that the user interface must be accessible to an end user provides no support for their argument that manufacturers who use the same interface to configure

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<sup>7</sup> "The present invention ... [provides] a GUI and/or mechanical switch(es) through which an end-user may alter operational parameters of a disk drive." 4:6-8.

their drives are absolved from infringement. Accordingly, the Court declines to add this limitation.

Defendants also object to the use of “directly or indirectly” in Plaintiff’s proposed construction. Defendants argue that this construction would allow unrelated user interfaces, such as a computer’s “on” button or its power cord, to be the user interface of the claim. The Court does not read “directly or indirectly” to be that encompassing, but also finds the phrase to be superfluous to Plaintiff’s proposed construction.<sup>8</sup> For example, in claim 1, the user interface must include a means for providing settings, a means for indicating its settings, and a means for implementing its settings. Similarly, in claims 7-10 and 15 the user interface must be “generated” or “provided.” In claim 11 and its dependent claims, the user interface must provide settings. In claim 15, a processor must control settings “through a user interface.” Plaintiff’s proposed construction would not allow an “on” button or power cord to serve as the “user interface” of the claims because neither a button nor a power cord could meet the necessary limitations.

Defendants also argue that Plaintiff disclaimed “firmware” when traversing a rejection involving the Ray reference during reexamination. The Court reviewed the reexamination prosecution history and found no surrender of claim scope. The patentee argued that Ray did not, in fact, provide a user interface. Ray replaced the microcode resident on the drive with microcode that implemented two different seek algorithms, alternating every 256 seeks automatically. Ray did not implement this altered microcode using a host computer or accessing the drive itself, but by using a specialized utility to reprogram the DSP on the disk drive. Further, Ray had no means to alter the settings of the drive but by reprogramming the DSP again. The distinction between Ray and

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<sup>8</sup> “Directly or indirectly” neither narrows nor expands the scope of the construction proposed by Plaintiff.



the claims at issue was not that Ray used firmware but that Ray had no user interface, and to the extent Ray had a user interface, it was not used to alter seek time and noise level as required by the patent.

After reviewing the parties' arguments and the intrinsic record, the Court construes "user interface" to mean "control (e.g. software, hardware, firmware, or a combination thereof) accessible to the end user that allows a person to alter operational parameters." If, for example, an end user had to replace a ROM chip in order to alter settings, open the hard drive enclosure, or purchase a specialized device and write code to alter the drive's settings, that would not constitute a user interface because those methods are not accessible to the end user or require additional devices. If, on the other hand, a user could access switches or jumpers on the outside of his drive, or through a host computer access a utility that allowed him to select different settings as required by the remainder of the claims, that would constitute a user interface because those methods typically are accessible to the end user.

**2. User Interface for Operatively Working With a Processor to Affect Operation of a Data Storage Device**

- Plaintiff's proposed construction: "user interface" and "data storage device" should be construed, but this term requires no further construction
- Defendants' proposed construction: "a user interface to affect operation of a data storage device that is generated by, and running on, an external host processor such as a PC, and not on a processor that is part of the data storage device itself"

This term appears in asserted claim 1 of the '473 patent. Plaintiff contends that this term requires no further construction beyond its component terms while Defendants seek to limit this term

to user interfaces generated by and running on processors external to the disk drive. In making this argument, Defendants rely on a strained reading of the patentee's response to an office action rejecting the asserted claims over Ray during reexamination. As noted in this Court's construction of "user interface," Ray did not disclose a user interface as covered by the claims of the '473 patent. Additionally, Ray made no mention of a user interface of any kind "operatively working with a processor" on a data storage device. Rather, Ray replaced the resident microcode on a disk drive with new microcode that automatically alternated between two different seek modes. This court reads no disclaimer of scope into the patentee's remarks characterizing and distinguishing Ray on these grounds. Accordingly, the Court declines to import Defendants' proposed negative limitation and declines to construe this term, aside from construing its disputed component terms.

### **3. Generat[e/ing] a User Interface**

- Plaintiff's proposed construction: This term should not be construed beyond the construction of "user interface;" alternatively, this term should mean "bringing a user interface into existence."
- Defendants' proposed construction: "generat[e/ing] and run[ning] a user interface on an external host processor such as a PC, and not on a processor that is part of the disk drive itself"

This term appears in asserted claims 7, 8, and 9 of the '473 patent. As with the previous term, Plaintiff seeks no construction while Defendants argue that a disclaimer when the patentee traversed the patent office's rejection over Ray should read an additional limitation into the claim. As above, the Court disagrees with Defendants' interpretation of the prosecution history and declines to construe this term.

#### **4. A Disk Drive Operatively Controlled by a User Interface**

- Plaintiff's proposed construction: no further construction is necessary beyond the construction of the term's component parts; "disk drive" should have its ordinary meaning.
- Defendants' proposed construction: "A disk drive operatively controlled by a user interface generated by, and running on, an external host processor such as a PC, and not on a processor that is part of the disk itself"

This term appears in asserted claim 11 of the '473 patent. As with the previous two terms, Plaintiff seeks no construction while Defendants argue that a disclaimer when the patentee traversed the patent office's rejection over Ray should read an additional limitation into the claim. As above, the Court disagrees with Defendants' interpretation of the prosecution history and declines to construe this term.

#### **5. Providing a User Interface**

- Plaintiff's proposed construction: no further construction is required beyond the Court's construction of "user interface;" if the court construes this term, it should be defined to mean "supplying, or making available, a user interface"
- Defendants' proposed construction: "providing a user interface generated by, and running on, an external host processor such as a PC, and not on a processor that is part of the data storage device itself"

This term appears in asserted claims 10 and 14 of the '473 patent. As with the previous three terms, Plaintiff seeks no construction while Defendants argue that a disclaimer when the patentee traversed the patent office's rejection over Ray should read an additional limitation into the claim. As above, the Court disagrees with Defendants' interpretation of the prosecution history and declines

to construe this term.

**6. Altering settings in the user interface/operating the user interface**

- Plaintiff's proposed construction: neither term needs to be construed beyond the Court's construction of "user interface"
- Defendants' proposed construction: "the end user [altering settings in the user interface/operating the user interface]"

This term appears in asserted claim 7 (as "altering...") and 10 (as "operating...") of the '473 patent. Plaintiff seeks no construction beyond the construction of "user interface" while Defendants seek to require these limitations to be practiced by an "end user." Defendants seek to require these actions be performed by the end user because, in their interpretation, a user interface is only a user interface when being used by an end user. The Court disagrees with this interpretation. Although the user interface must be accessible to an end user, someone other than the end user may operate the user interface. If a manufacturer alters settings on its drives using the same interface accessible to end users, it is altering the settings in the user interface and/or operating the user interface. If, on the other hand, a manufacturer uses some other method to configure the drive, it is not altering settings in the user interface or operating the user interface. Because the Court's construction of "user interface" includes the requirement that it be accessible to end users, no further construction is necessary. Accordingly, the Court declines to construe these terms beyond its construction of "user interface."

**B. Disk Drive/Data Storage Device Terms**

The parties disagree on several aspects of the claim terms related to the device upon which the disclosed input shaping techniques operate. These disputes include whether the term "data

storage device” is limited to “disk drive” and whether the processors which are typically included with disk drives constitute part of the disk drives or data storage devices of the claims.

### 1. Data Storage Device

- Plaintiff’s proposed construction: “the computer disk drive, including all electronic and mechanical components, which receives shaped commands from a processor, which may be integrated into the drive”
- Defendants’ proposed construction: “a device for storing data”

The term “data storage device” appears in asserted claims 1, 7 through 10, 14, and 15 of the ‘473 patent. Plaintiff seeks to limit this term to essentially what is disclosed in the specification in figures 10A and 10B. The specification, however, contains one passage that strongly supports a broader construction than Plaintiff now seeks.<sup>9</sup> Defendants therefore argue that Plaintiff’s proposed construction is too narrow. Defendants’ position is, however, inconsistent with the terms the parties have construed by agreement. The agreed constructions appear influenced by the fact that the overall thrust of the patent, as reflected by the balance of the specification, is directed to the problem of seek time and acoustic noise in magnetic disk drives.

The parties agreed to define “[seek] acoustic noise” as “acoustic noise generated as a result of the seek operation” and “seek operation” as “movement of the disk drive head from an initial

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Moreover, although the invention has been described in the context of computer disk drives, it may apply equally to other types of data storage devices (of which a computer disk drive is one), including, but not limited to, optical drives, tape drives, dual-activated disk drives, and holographic storage media devices which read from, and write to, data storage media other than magnetic disks.

‘473 patent, 43:1-7

position to rest at a position where the head can perform a read/write operation on a particular track of a magnetic disk.” “[Seek] acoustic noise” appears in every asserted claim, so by the parties’ agreed construction “seek operation” also appears in each asserted claim. By the parties’ agreed construction of “seek operation,” a “data storage device” must comprise a disk drive head and a magnetic disk, and the head must be able to move across the surface of the disk and read and write data. In light of this agreement between the parties concerning other terms in the claims, the Court construes “data storage device” to mean “a device for storing data comprising a magnetic disk and a disk drive head wherein the disk drive head is operative to move across the surface of the disk and read and write data.” The Court declines to construe “data storage device” to require a processor because, in the specification, the patentee never described a processor as being part of a disk drive. Instead, the patentee described a processor *dedicated to* a disk drive as a possible embodiment or part of a possible embodiment of processor 73 depicted in Figure 10B, the disk drive engine. Figure 10A, the only depiction of a disk drive, discloses no processor.

**2. Output[ting] Commands to the Data Storage Device [Causing The Data Storage Device] to Alter Seek Trajectory Shape by Shaping Input Signals to the Data Storage Device**

- Plaintiff’s proposed construction: “send[ing] shaped input signals to the data storage device to alter the seek trajectory shape, where such input signals may originate from within the device”
- Defendants’ proposed construction: “send[ing] shaped input signals to the data storage device to alter the seek trajectory shape”

This term appears in asserted claims 1, 7 through 10, 14, and 15 of the ‘473 patent. The parties’ primary dispute regarding this term, and those related to it, is whether the shaped input

signals must originate from outside the data storage device. Defendants rely on the use of the phrase “to the data storage device” in arguing that these claims require that the signals sent to the disk drive be shaped. The parties agree that, in the specification, only the processor/controller 73 of disk drive engine 10, depicted in figure 10B, provides the shaped input signals. They disagree as to whether processor/controller 73 is part of the data storage device. The patent explains that processor/controller comprises the processor of the host computer, or, in the alternative, a separate controller “*dedicated to the disk drive*” which receives commands from the processor of the host computer. 10:5-8. During prosecution, the patentee also argued that the invention covered a disk drive engine wherein a combination of the host computer processor and a controller dedicated to the disk drive performed the input signal shaping. The patent makes no distinction between disk drives wherein the dedicated controller is attached to and sold with the disk drive and disk drives that are not sold with dedicated controllers.

In view of the Court’s construction of data storage device, which does not require the source of input signals to be present, the additional limitation proposed by Plaintiff is unnecessary. Plaintiff and Defendants’ constructions are otherwise similar. Therefore, the Court adopts Defendants’ construction and defines this term to mean “send[ing] shaped input signals to the data storage device to alter seek trajectory shape.”

### **3. Outputting Commands to Alter Seek Trajectory Shape by Shaping Input Signals to the Means for Performing the Seek Operation**

- Plaintiff’s proposed construction: “sending shaped input signals to the means for performing the seek operation to alter the seek trajectory shape, where such input signals may originate from within the disk drive”

- Defendants’ proposed construction: “sending shaped input signals to the means for performing the seek operation to alter the seek trajectory shape”

This term appears in asserted claim 11 of the ‘473 patent, and, by incorporation, in asserted dependent claims 12 and 13. The parties’ principal disagreement is whether the term “where such input signals may originate from within the disk drive” should be added to their otherwise agreed construction. The Court finds Plaintiff’s additional language superfluous based on its construction of “means for performing a seek operation.” Accordingly, the Court adopts Defendants’ proposed construction and construes this term to mean “sending shaped input signals to the means for performing the seek operation to alter the seek trajectory shape.”

#### **4. Seek Time of the [Data Storage Device/Disk Drive]**

- Plaintiff’s proposed construction: “the time it takes for the disk drive head to move from an initial position to rest at a position where the head can perform a read/write operation on a particular track of the disk; seek time includes both move time plus settle time”
- Defendants’ proposed construction: “the time it takes for a head to move from an initial position to rest at a position where the head can perform a read/write operation”

This term appears in asserted claims 1, 7 through 12, 14, and 15 of the ‘473 patent. The parties’ constructions are essentially in agreement, and both essentially incorporate the agreed construction for “seek operation.” Accordingly, the Court construes “seek time of the [data storage device/disk drive] to mean “the time it takes to complete a seek operation.”

#### **C. Frequency Terms**

During prosecution, the patentee submitted claims directed both to “vibrations” as well as to “frequencies.” The patentee ultimately canceled claims directed to “vibrations” while his claims



using the term “frequency” issued. Plaintiff now seeks to construe “frequencies” as “vibrations that can be characterized in terms of cycles per second.” Defendants ask the Court to hold that these terms are indefinite. Plaintiff also seeks a construction wherein a frequency is “reduced” when the amplitude of the vibration at that frequency is reduced. Defendants do not seek to construe the term “reduce,” but do seek to exclude “smoothing” from the methods used to reduce frequencies. Neither party has sought a construction for “smoothing.”

**1. Frequencies<sup>10</sup>**

- Plaintiff’s proposed construction: vibrations that can be characterized in terms of cycles per second
- Defendants’ proposed construction: indefinite

“Frequencies” appears in each asserted claim of the ‘473 patent, either directly or as a term in a dependent claim’s parent claim. Plaintiff argues that the term “frequencies” should be construed to mean vibrations characterized in terms of cycles per second, i.e. frequencies. Defendants argue that, because the patentee used “vibrations” in the specification but “frequencies” in its claim, Plaintiff should not be allowed to rewrite its claims during construction.

The art of the patent is electrical engineering, and specifically, control theory. A person of ordinary skill in electrical engineering would be familiar with the term “frequency,” and know that, generally, “frequency” refers to the number of cycles per second of a wave. That person would know that, to give the term context, he must look to the specification to know what medium propagated or generated the wave. In the field of the invention, frequencies are often used to characterize

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<sup>10</sup> The parties did not identify “frequencies” as a separate term to be construed, but their dispute over its construction underlies several other disputed terms. The Court synthesized the parties’ proposed construction from their positions on other disputed terms.

alternating current signals, electromagnetic radiation, and mechanical oscillation or vibration. The disclosure of the '473 patent deals exclusively with mechanical vibrations—the vibration of the arm of a disk drive and the associated vibration of air that constitutes acoustic noise. The Court concludes that one of ordinary skill in the art, reading the claims in light of the specification, would know that “frequencies” referred to mechanical vibrations characterized in terms of cycles per second.

Defendants’ argument, however, is not without force. Defendants maintain that, because the specification refers to the vibrations of the arm of the disk drive as “vibrations at a plurality of frequencies” and not merely “frequencies,” the patentee knew the difference in meaning between the terms and chose to use the vague and possibly indefinite “frequencies” in his claims. In support of the proposition that the Court should not rescue the patentee from his clearly chosen claim language, Defendants cite *Chef Am., Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1374 (Fed. Cir. 2004). However, in *Chef Am.*, the claim terms were clear and susceptible to only one meaning, without any ambiguity. Here, by contrast, the term “frequency” clearly communicates an oscillation, but one of ordinary skill in the art must look to the specification to learn what is oscillating. Unlike in *Chef Am.*, Plaintiff’s proposed construction would not change the claim from one with a clear meaning that lacks practical application to one with a clear meaning that has practical application, but from a claim that, in isolation, lacks meaning but, when construed in context, has a clear meaning. Accordingly, the Court construes “frequencies” to mean “vibrations which can be characterized by cycles per second.”

## **2. Unwanted Frequencies**

- Plaintiff’s proposed construction: “those frequencies, i.e. vibrations that can be characterized

in terms of cycles per second, which are undesired”

- Defendants’ proposed construction: indefinite

The term “unwanted frequencies” appears in all asserted claims of the ‘473 patent, either directly or in the parent of a dependent claim. The Court’s construction of “frequencies” resolves any indefiniteness argument in this term related to that term, leaving only “unwanted” as a potential source of indefiniteness. Plaintiff’s construction, which essentially substitutes “undesired” for “unwanted,” offers no clarity. Defendants argue that the use of the term “unwanted vibrations” in the patent does not give meaning to the term “unwanted frequencies” in the asserted claims. The Court disagrees with this argument, having found that one of ordinary skill in the art would know that the “frequencies” of the claims refer to the “vibrations” of the specification. Defendants also argue that the term “unwanted” makes these claims indefinite, citing *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350 (Fed. Cir. 2005).

In *Datamize*, the Federal Circuit held invalid for indefiniteness a claim containing the term “aesthetically pleasing.” The Federal Circuit explained that “some objective standard” must be provided to notify the public of the patentee’s right to exclude. *Id.* Defendants argue that the term “unwanted” leaves the public without an objective standard to determine the limits of the claims of the ‘473 patent. The Court disagrees. A difficult issue of claim construction does not, *ipso facto*, result in a holding of indefiniteness. *Datamize*, 417 F.3d at 1347 (citing *Exxon Research & Eng’g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 2001)). Unlike in *Datamize*, where the claim required a necessarily subjective “aesthetically pleasing” test of the accused instrumentality, or worse, a test of whether the accused infringer intended to make an aesthetically pleasing product, the specification of the ‘473 patent clearly identifies what frequencies or vibrations are unwanted. There

is no evident arbitrary distinction between “good” acoustic noise and “bad” acoustic noise in the ‘473 specification. Rather, all acoustic noise generated by the seek operation of the data storage device is “unwanted,” and the disclosed invention provides different methods for trading off seek time against seek acoustic noise. Accordingly, the Court concludes that one of ordinary skill in the art reading the claims in light of the specification would know which frequencies were unwanted. The Court construes “unwanted frequencies” to mean “those frequencies which produce audible noise.”

**3. Reduce Selected Unwanted Frequences [From a Plurality of Frequencies]**

- Plaintiff’s proposed construction: “Decrease the amplitude of at least the chosen unwanted frequencies”
- Defendants’ proposed construction: “Reduce intentionally chosen frequencies identified as unwanted, but not by smoothing”

This term appears in asserted claims 1, 7 through 11, 14, and 15 of the ‘473 patent. The parties disagree whether “[reducing] ... frequencies” requires a reduction in amplitude, whether the frequencies must be intentionally chosen, and whether this reduction can be accomplished by “smoothing.” Neither party has defined smoothing.

In light of the Court’s construction of “frequency” to mean “vibrations that can be characterized by cycles per second,” the parties’ amplitude dispute becomes clear. A vibration at a certain frequency can be “reduced” only by reducing its amplitude. Defendants make no argument against Plaintiff’s “amplitude” position in their briefing. Accordingly, the Court will construe “[reducing] ... frequencies” to mean “reducing the amplitude of vibrations which can be

characterized in terms of cycles per second.”

In support of their argument that the term “selected” requires that some subset of unwanted frequencies be intentionally chosen, Defendants cite the ‘473 patent’s voluminous prosecution history. The only support they cite, however, is a quote from the New York court’s claim construction<sup>11</sup> and a passage from an office action that is shortly followed by the patentee’s argument that “reducing selected unwanted frequencies” must mean “reducing any unwanted frequencies.” Plaintiff did not disclaim claim scope to limit “selected” to mean “intentionally chosen.” Further, the specification provides no support for a user intentionally choosing specific frequencies to reduce, and provides only a user interface where frequencies are chosen implicitly through preference for speed or quiet operation. Defendants’ construction would thus exclude the embodiments of the specification. Accordingly, the Court rejects this limitation to the claim. Plaintiff’s construction essentially replaces “selected” with “chosen.” Although the Court sees little difference between “chosen” and “selected,” the parties appear to agree that “chosen” is the superior construction.

Defendants also seek to insert the limitation “but not by smoothing.” In support of their argument, they cite a cancelled claim wherein “input shaping” and “filtering” were listed in the alternative. However, the summary of the invention section states that one of the disclosed techniques “comprises shaping (e.g., convolving or filtering) [an input] command.” 2:66-3:1. Further, the specification’s brief description of Figures 15-20 refer to various filters as a “shaping techniques” (4:41-59) and section 5.3 explicitly states that filters should be used in conjunction with

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<sup>11</sup> Convolve has a separate case pending in the United States District Court for the Southern District of New York. *See Convolve, Inc., et al. v. Compaq Computer Corp., et al.*, 1:00-cv-5141. The New York court’s construction of this term is consistent with the construction presently adopted. *Id.*, Dkt. No. 397 at 28.

the newly disclosed techniques to achieve the aims of the invention, and that “good moves” determined by the disclosed methods could be generated by conventional filtering alone. (22:60-67). The Court concludes that one of ordinary skill in the art reading the claims, the specification, and the prosecution history would not understand the claims to exclude filtering or “smoothing” of inputs. Accordingly, the Court declines to import that negative limitation into the claim.

In summary, the Court construes “reduce selected unwanted frequencies” to mean “decrease the amplitude of the chosen unwanted frequencies.” The asserted claims of the ‘473 patent use the transition phrase “comprising;” therefore, Plaintiff’s proposed “at least” construction is redundant.

#### **4. The Seek Operation Generating a Plurality of Frequencies**

- Plaintiff’s proposed construction: “The seek operation generating multiple frequencies, i.e. vibrations which can be characterized in terms of cycles per second”
- Defendants’ proposed construction: indefinite

This term appears in asserted claim 11 of the ‘473 patent. Asserted claims 12 and 13 depend from claim 11, and incorporate its limitations. The parties’ principal disagreement is whether “frequencies” is indefinite. The Court construed “frequencies” to mean “vibrations which can be characterized in terms of cycles per second.” The parties agree that a seek operation can generate vibrations. Accordingly, the Court construes this term to mean “the seek operation generating multiple frequencies.”

#### **D. Computer Code Claims**

Claims 8, 9, 14, and 15 resemble *Beauregard* claims, reciting both a machine-readable memory and computer process steps stored on or executed from that memory. Defendants argue that these claims are invalid because they are mixed apparatus and method claims, citing *O.I. Corp. v.*

*Tekmar Company Inc.*, 115 F.3d 1576, 1582-83 (Fed. Cir. 1997) and *IPXL Hldings, LLC v. Amazon.com, Inc.*, 430 F.3d 1377, 1379 (Fed. Cir. 2005). The parties additionally disagree whether the “code to ...” and “code providing ...” phrases in claims 8 and 14 recite sufficient structure or should be construed according to 35 U.S.C. § 112 ¶ 6.

### **1. Indefiniteness Under *IPXL Holdings***

Defendants argue that asserted claims 8, 9, 14, and 15 of the ‘473 patent resemble the claims invalidated as mixed apparatus and method claims in *IPXL Holdings* and thus should be invalid as indefinite under 35 U.S.C. § 112 ¶ 2. The Court disagrees. In *IPXL Holdings*, the Federal Circuit invalidated a claim because it claimed both an apparatus and a method for using the apparatus. *IPXL*, 430 F.3d, at 1383-1384. Claim 25 of U.S. Patent No. 6,149,055 depended from an apparatus claim and contained the limitation “the user uses the input means to either change the predicted transaction information or accept the displayed transaction type and transaction parameters.” Thus claim 25 could not be infringed unless and until a user performed the required action. The claims at issue here, however, contain no such conflict between apparatus and method of use, and do not give rise to indefiniteness concerns under *IPXL*.

Claims 8 and 14 share a common preamble and structure. Each recites three “code to ...” or “code providing ...” limitations preceded by the following preamble:

Computer executable process steps stored on a computer-readable medium, the computer-executable process steps to control operation of a data storage device, the computer-executable process steps comprising:

Unlike *IPXL Holdings*, where an accused infringer would have no knowledge of infringement of the method limitations at the time a device meeting the apparatus claim limitations was sold, an

accused infringer would know whether it met the limitations at the time its device was sold because the accused infringer would know whether the device stored code that met the remaining limitations of the patent. Claims 9 and 15 similarly recite an apparatus containing memory storing computer-executable process steps and limitations on those stored steps. Accordingly, the Court finds that asserted claims 8, 9, 14, and 15 are not indefinite as mixed apparatus and process claims under 35 U.S.C. § 112 ¶ 2.

**2. “Code to ...” and “Code Providing ...” Phrases**

Defendants argue that the “code to ...” and “code providing ...” limitations of claims 8 and 14 are purely functional and thus should be held to require construction under 35 U.S.C. § 112 ¶ 6 in accordance with *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1213-14 (Fed. Cir. 1998). In *Mas-Hamilton*, the Federal Circuit held that where purely functional language was used and a claim would cover all possible means for achieving a result if not construed in accordance with § 112 ¶ 6, that term should be subject to construction under 35 U.S.C. § 112 ¶ 6. The “code to ...” and “code providing ...” limitations of claims 8 and 14 recite structure and thus are easily distinguishable.

Although Defendants argue that “code” is not structure, the Court concludes that, here, “code” does connote structure. Unlike in *Mas-Hamilton*, where all possible methods for implementing the recited function would have been covered by the asserted claim, only software implementations are covered by this claim. For example, the “code [to generate/providing] a user interface” limitation excludes the hardware user interface (electro-mechanical switches or jumpers) disclosed in the specification. Accordingly, the Court finds these “code to ...” and “code providing ...” limitations do not require construction under § 112 ¶ 6.

Plaintiff also seeks a construction of the term “code” as found in asserted claims 8 and 14.



Plaintiff seeks a construction of “software and/or firmware.” However, Plaintiff also seeks to construe “computer-executable process steps” to mean “computer-executable code.” To reduce the number of synonymous terms introduced to the jury in construing the claims, the Court construes “code” to mean “computer-executable process steps” and gives the term “computer-executable process steps,” found in asserted claims 8, 9, 14, and 15, its plain and ordinary meaning. The Court construes the remainder of the “code to ...” and “code providing ...” terms by reference to their component parts.

### **3. Computer-Readable Medium**

- Plaintiff’s proposed construction: “a medium capable of storing data that can be interpreted by a computer processor”
- Defendants’ proposed construction: none (this is a component of a term Defendants argued was indefinite)

The term “computer-readable medium” appears in claims 8 and 14 of the ‘473 patent. Plaintiff seeks a construction that, in the Court’s opinion, fails to add clarity to the terms of the patent. Defendants offer no construction. In the Court’s view, the term “computer-readable medium” was well understood to one of ordinary skill in the art at the time of the invention. “Computer-readable medium” refers to those media, such as hard disk drives, memories, compact disks, and floppy disks, that are commonly used to store and retrieve binary data and instructions for computer processors. Because the parties have not briefed a dispute over the construction of this particular term, and the plain language of the term is coextensive with the scope of Plaintiff’s proposed construction, the Court declines to construe this term at this time.

### **E. Miscellaneous Terms not Subject to 35 U.S.C. § 112 ¶ 6**

The parties additionally disagree on the meanings of “seek trajectory shape,” “shaping input signals,” and “in inverse relation.” Defendants argue that “seek trajectory shape” is indefinite. The parties disagree whether an input signal can originate within a device that receives the input signal, and whether an inverse relation is reciprocal.

### **1. Seek Trajectory Shape**

- Plaintiff’s proposed construction: “the profile of the movement of a disk head for the duration of a seek”
- Defendants’ proposed construction: indefinite

The term “seek trajectory shape” appears in all asserted claims of the ‘473 patent, either directly or by incorporation from an independent claim. Defendants ask the Court to rule this term indefinite while Plaintiff’s proposed construction offers little additional clarity. In determining whether a claim term is indefinite, the Court must consider whether a person having ordinary skill in the field of the invention would understand the scope of the disputed term in the context of the claims, the specification, the prosecution history, and the prior art.

One having ordinary skill in the field of the invention would be familiar with conventional methods of characterizing dynamic systems, such as the one used in the specification to control the head of a disk drive. Where the patent discusses controlling trajectory of the system as a function of time (26:7-34:6), and describes the state of the system using its position, velocity, and acceleration and the relationship between these state variables over time, one of ordinary skill in the art would know that “seek trajectory” referred to the change in position, velocity, and acceleration relative to time during a seek operation, and that the “shape” of that “seek trajectory” is the graphical representation of those variables. Any of the state variables plotted against time would give an

equivalent<sup>12</sup> “seek trajectory shape.” Accordingly, the Court construes “seek trajectory shape” to mean “the shape of the plot relating time to the position, velocity, or acceleration of the disk drive head during a seek operation.”

## 2. Shaping Input Signals

- Plaintiff’s proposed construction: “applying a transformation to a signal to the data storage device (an input signal can originate from within the device)”
- Defendants’ proposed construction: “applying a transformation to input signals, but not by smoothing”

The term “shaping input signals” appears in all asserted claims of the ‘473 patent, either directly or by incorporation from an independent claim. The parties appear to agree that “shaping” in this context means “applying a transformation to.” Although Defendants seek to import the limitation “but not by smoothing,” the Court has declined to import that limitation. Plaintiff seeks to import the parenthetical “an input signal can originate from within the device” with supporting argument similar to those the Court rejected in construing the “outputting commands ...” limitations. Accordingly, the Court declines to add Plaintiff’s proposed parenthetical to the construction of “shaping input signals.” Additionally, Plaintiff’s proposed construction of “input signals” to mean “a signal to the data storage device” is redundant in the context of the claims, which already read “shaping input signals to the data storage device.” Accordingly, the Court construes “shaping input signals” to mean “applying a transformation to input signals.”

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<sup>12</sup> Acceleration is the first time derivative of velocity, and velocity is the first time derivative of position. Because the parties agree that, in a seek operation, the final velocity and acceleration are zero, one of ordinary skill in the art would be able to use the plot of the system’s position, velocity, or acceleration versus time during the seek operation to determine the shape of the plots of the other two states.

### 3. In Inverse Relation

- Plaintiff's proposed construction: "such that as one variable increases, the other variable decreases, and vice versa"
- Defendants' proposed construction: "so that as 'seek time' increases, 'seek acoustic noise level' is ensured to decrease for all seek operations"

The term "in inverse relation" appears in all asserted claims of the '473 patent. "In inverse relation" is always used to describe the relationship between "seek time" and "[seek] acoustic noise level." The parties' disagreement is whether "and vice versa" and/or "is insured to decrease for all seek operations" are proper limitations to include in the construction of this term. The Defendants' use of "seek time" and "[seek] acoustic noise level" in its construction of this term is helpful in the context of the claim, but the additional language "is ensured to decrease for all seek operations" is potentially confusing. For example, some seek operations that already consist of "good moves" will have no additional shaping applied and a change in settings will have no affect on seek time or noise for the corresponding input command. Seek operations vary in the necessary distance traveled, so very long seeks are likely slowed and quieted more by the quiet setting than very short seeks. The prosecution history cited by Defendants is cited out of context and fails to support the limitation they seek.<sup>13</sup> Defendants' proposed "for all seek operations" is unsupported by the intrinsic record and potentially confusing. Accordingly, the Court construes "in inverse relation" to mean "so that as

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<sup>13</sup> Defendants cited an expert report submitted to the patent office by Convolve. Convolve's expert opined that the Koizumi reference fails to teach or suggest "a method ensuring that the inverse relationship between the seek time and acoustic noise level is maintained when the seek time is changed by the user interface." Dkt. No. 176-20 at ¶ 39. In the next paragraph, Convolve's expert explained that Koizumi's noise reduction was unrelated to seek operations, and resulted from a two-fold difference in spindle speed between the two modes disclosed by Koizumi.

seek time increases, seek acoustic noise level decreases, and vice versa.”

**F. Terms Subject to 35 U.S.C. § 112 ¶ 6**

Asserted claims 1 and 11 of the ‘473 patent employ explicit means plus function claiming. These limitations are also incorporated into asserted claims 12 and 13, which depend from claim 11. Claim 1 requires a “means for providing settings ...,” a “means for indicating ...,” and a “means for causing the processor to output commands ...” Claim 11 requires a “means for performing a seek operation” and a “means for outputting commands ...”

**1. Means for Causing the Processor to Output Commands to the Data Storage Device to Alter Seek Trajectory Shape by Shaping Input Signals to the Data Storage Device to Reduce Selected Unwanted Frequencies from a Plurality of Frequencies in Accordance with the Altered Settings in the User Interface**

**a. Function**

Plaintiff’s proposed construction:

causing the processor to output commands to the data storage device to alter seek trajectory shape by shaping input signals to the data storage device

Defendants’ proposed construction:

causing the processor to output commands to the data storage device to alter seek trajectory shape by shaping input signals to the data storage device to reduce selected unwanted frequencies from a plurality of frequencies in accordance with the altered settings in the user interface

This term appears in asserted claim 1 of the ‘473 patent. The parties disagree over both the function and the associated structure of this means-plus-function limitation. The parties’ disagreement as to the function revolves around the phrase “to reduce selected unwanted frequencies from a plurality of frequencies in accordance with the altered settings in the user interface.” Both

parties cite *Lockheed* to support their constructions, but the Court finds that the Defendants' reading is the correct one. *Lockheed Martin Corp. v. Space Sys./Loral, Inc.*, 324 F.3d 1308, 1319 (Fed. Cir. 2003). Plaintiff argues that this phrase is equivalent to the "whereby" clause in *Lockheed*, where the Federal Circuit ruled that language in a whereby clause was read to not be part of a claimed function if the whereby clause only stated the result of the previously claimed function. *Id.* In the disputed claim in *Lockheed*, a "means for rotating ..." a wheel in accordance with a fixed schedule was recited, and the following whereby clause explained the result of that limitation. 324 F.3d at 1315, 1319. The Federal Circuit held that a whereby clause in the disputed means-plus-function limitation added no substance to the claim because it merely recited the result of the preceding function. *Id.* Here, in contrast, Plaintiff seeks to remove a clause from the claimed function that describes how the function is implemented but retain that language as a limitation on the claim. Specifically, the claimed invention "[causes] the processor to output commands to the data storage device to alter seek trajectory shape ... in accordance with the altered settings in the user interface." The clause Plaintiff wishes to exclude is not the result of the recited function, but the essence of the function itself. Claim 1 of the '473 patent is drawn to a "user interface for operatively working with a processor to affect operation of a data storage device." The limitations Plaintiff seeks to exclude from the function of the "means for causing the processor to output commands" limit how the user interface "operatively [works] with [the] processor to affect operation of a data storage device." Further, the *Lockheed* court held that an "in accordance with ..." clause similar to the one at issue here was a part of the claimed function in the disputed means-plus-function limitation. 324 F.3d at 1315, 1319. Under *Lockheed*, Defendants' proposed construction is correct. Accordingly, the Court construes the "means for causing the processor to output commands ..." to have the following

function:

causing the processor to output commands to the data storage device to alter seek trajectory shape by shaping input signals to the data storage device to reduce selected unwanted frequencies from a plurality of frequencies in accordance with the altered settings in the user interface.

**b. Associated structure(s)**

- Plaintiff's proposed construction:

The corresponding structure disclosed by the '473 specification includes the following alternatives:

- (1) disk drive engine 16 (i.e. computer code) or portions thereof running on controller/processor 73 and/or processor 25 and/or fuzzy logic controller with an embedded fuzzy logic block and/or neural network controller to execute the algorithms represented by Blocks S303 and S304 in Figure 3 and described at 9:12-31, implementing any of the techniques taught in §§ 2-11 (9:45-42:64); and/or
- (2) one or more electro-mechanical switches/jumpers; and equivalents thereof

- Defendants' proposed construction:

Processor 25 executing an undisclosed algorithm to perform the recited functions AND either a GUI 27 (generated by Processor 25 executing an undisclosed algorithm) or alternately a jumper/switch

After a careful review of the specification, the Court concludes that the '473 patent discloses adequate structure for "causing the processor to output commands to the data storage device to alter seek trajectory shape by shaping input signals to the data storage device to reduce selected unwanted frequencies from a plurality of frequencies." Section 2 of the specification contains a description of how the processor outputs commands to the data storage device and §§ 3-11 contain extensive disclosure of different methods for "shaping input signals to the data storage device to reduce selected unwanted frequencies from a plurality of frequencies." In a computer-implemented means-

plus-function claim limitation, a patentee may express the necessary algorithm structure as mathematical formulae and/or prose. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1340 (Fed. Cir. 2008). Though the specification does not provide a highly detailed description of the numeric methods used or a sufficient listing of source code, that level of disclosure is unnecessary under 35 U.S.C. § 112 ¶ 6. *See Aristocrat*, 521 F.3d at 1338.

If the Court agreed with Plaintiff's construction of this term's function, this disclosure would be adequate and Plaintiff's construction would be correct. Because the Court's construction incorporates the phrase "in accordance with the altered settings in the user interface," however, some additional structure is required. The Court's reading of the specification yields no structure that shapes input commands in accordance with altered settings in the user interface. The specification's disclosure on this point is reproduced below:

Next, in step S303, commands (e.g., electrical signals) are generated for controlling disk drive 10 in accordance with the settings in the GUI. Exactly how these commands are generated may vary, depending upon the way in which the disk drive is controlled. Assuming, for illustration's sake, that the disk drive is being controlled via Input Shaping™, step S303 comprises convolving various inputs to the disk drive with predetermined functions which are selected based on settings in the GUI in order to produce disk drive inputs that achieve the results specified in the GUI. These functions may be stored, e.g., in memory 11 or in another memory on the system. Sections 2 to 11 below describe a variety of methods that may be used in step S303 based on the GUI setting and other factors.

9:12-25.

Processor 73 determines which of these techniques to apply based on a variety of factors, such as user inputs to the GUI and the identity of the disk drive.

10:45-47.



Essentially, the specification recites the same “processor with appropriate programming” structure rejected by the Federal Circuit in *Aristocrat*. See 521 F.3d at 1334. Although the specification provides ample description of algorithms for altering seek trajectory shape, shaping input signals, and reducing unwanted frequencies, the specification provides no algorithm for how altered settings in the user interface translate into altered input commands. Without an algorithm for shaping input signals in accordance with altered settings in the user interface, this means-plus-function claim limitation lacks structure and is thus indefinite under 35 U.S.C. § 112 ¶ 2. Claim 1 is thus indefinite. In light of this conclusion, it is unnecessary to consider the remaining means plus function terms from Claim 1.

**2. Means for Outputting Commands to Alter Seek Trajectory Shape by Shaping Input Signals to the Means for Performing the Seek Operation to Reduce Selected Unwanted Frequencies from Said Plurality of Frequencies in Accordance with the Altered Settings in the User Interface**

**a. Function**

Plaintiff’s proposed construction:

The function is outputting commands to alter seek trajectory shape by shaping input signals to the means for performing the seek operation

Defendants’ proposed construction:

outputting commands to alter seek trajectory shape by shaping input signals to the means for performing the seek operation to reduce selected unwanted frequencies from said plurality of frequencies in accordance with the altered settings in the user interface

This term appears in asserted claim 11 of the ‘473 patent and is incorporated into asserted dependent claims 12 and 13. This term is similar to the “means for causing the processor to output commands ...” limitation of claim 1. The Court adopts its prior reasoning for this limitation.

Accordingly, the Court adopts Defendants' construction and construes the function of the "means for outputting commands ..." term of claim 11 to be:

outputting commands to alter seek trajectory shape by shaping input signals to be the means for performing the seek operation to reduce selected unwanted frequencies from said plurality of frequencies in accordance with the altered settings in the user interface.

**b. Associated Structure(s)**

- Plaintiff's proposed construction:

The corresponding structure disclosed by the '473 specification includes the following alternatives:

A hardware circuit, such as controller/processor 73, counter chip, counter register, and/or programmable logic array that outputs voltage and/or current in accordance with the commands generated by disk drive engine 16 (i.e. computer code) or portions thereof running on controller/processor 73 and/or processor 25 and/or fuzzy logic controller with an embedded fuzzy logic block and/or neural network controller to execute the algorithms represented by Blocks S303 and S304 in Figure 3 and described at 9:12-31, implementing any of the techniques taught in 2-11 (9:45-42:64); and equivalents thereof

- Defendants' proposed construction:

Jumper/switch, and controller/processor 73 executing an undisclosed algorithm

The parties' arguments relating to the associated structure of this limitation are similar to their arguments relating to the associated structure of the "means for causing the processor to output commands ..." limitation of claim 1. In concluding that term was indefinite under 35 U.S.C. § 112 ¶ 2, the Court noted that the specification lacked sufficient algorithmic structure associated with the claimed function when "in accordance with the altered settings in the user interface" was construed to be a part of the function. The Court likewise construed "in accordance with the altered settings in the user interface" to be a part of the function of this means-plus-function limitation. Accordingly,

for the same reasons the Court found the “means for causing the processor to output commands ...” limitation of claim 1 indefinite, the Court also finds the “means for outputting commands ...” limitation of claim 11 to be indefinite. Accordingly, claim 11 is indefinite under 35 U.S.C. § 112 ¶ 2. Dependent claims 12 and 13, which incorporate this limitation from claim 11, are also indefinite. In light of this conclusion, it is unnecessary to consider the remaining means plus function terms of claim 11.

## **VI. Change in Claim Scope**

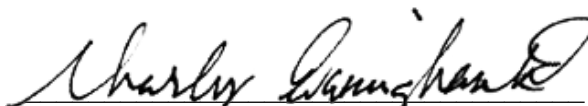
Defendants also seek a ruling that an amendment made during reexamination to all asserted claims narrowed the scope of the claims. Specifically, Defendants argue that inserting “seek” in front of “acoustic noise” changes the scope of the claims and resets the date of first infringement to the date those amended claims issued from reexamination. The claims were not narrowed by the amendment. The “in inverse relation” limitation, present in all asserted claims, requires the seek time and the acoustic noise of the drive to vary inversely. All asserted claims also require reduction of selected unwanted frequencies, which the court has identified as the frequencies associated with acoustic noise from seek operations. Accordingly, the “acoustic noise” of the original claims was that generated by and associated with seek operations. Because the Court’s construction would have limited the claim term “acoustic noise” to mean “seek acoustic noise” by virtue of the claims’ other limitations, Plaintiff’s amendment during prosecution did not narrow claim scope.

## **VII. Conclusion**

The court adopts the constructions set forth in this opinion for the disputed terms of the ‘473 patent. The parties are ordered that they may not refer, directly or indirectly, to each other’s claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from

mentioning any portion of this opinion, other than the actual definitions adopted by the court, in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the definitions adopted by the court.

SIGNED this 5th day of January, 2011.

  
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CHARLES EVERINGHAM IV  
UNITED STATES MAGISTRATE JUDGE