United States District Court,
D. Massachusetts.

EMC CORPORATION,
Plaintiff.
v.
HEWLETT-PACKARD COMPANY, INCORPORATED,
Defendant.

Civil Action No. 00-40188-NMG

Sept. 12, 2003.

Leanne J. Fitzgerald, EMC Corporation, Hopkinton, MA, Richard W. O'Neill, William F. Lee, Elizabeth M. Reilly, Cynthia D. Vreeland, David B. Bassett, Wilmer Hale LLP, Boston, MA, for Plaintiffs.

Andrew R. Devought, Christopher D. Landgraff, Bartlit Beck Herman Palenchchar & Scott, Chicago, IL, Lawrence S. Delaney, Demeo & Associates PC, Boston, MA, for Defendants.

MEMORANDUM & ORDER

GORTON**, District Judge.**

Plaintiff, EMC Corporation ("EMC") is the holder of the following three United States patents, relating to various methods of storing, maintaining and using computerized data:

(1) Patent No. 5,544,347 ("the '347 Patent"), entitled "Data Storage System Controlled Remote Data Mirroring With Respectively Maintained Data Indices," issued by the Patent and Trademark Office ("PTO") on August 6, 1996;

(2) Patent No. 5,742,792 ("the '792 Patent"), entitled "Remote Data Mirroring," issued by the PTO on April 21, 1998; FN1 and

FN1. The '792 Patent is a continuation-in-part of the '347 Patent.

(3) Patent No. 6,101,497 ("the '497 Patent"), entitled "Method and Apparatus for Independent and Simultaneous Access To a Common Data Set," issued by the PTO on August 8, 2000.
On October 20, 2000, EMC filed a complaint in this Court alleging that defendant, StorageApps, Incorporated (now Hewlett-Packard Company, Incorporated) ("HP"), was infringing each of the aforementioned patents. HP, in response, filed a counterclaim seeking declaratory judgment that the subject patents are invalid, unenforceable and not infringed by HP's products. On July 21 and 22, 2003, this Court presided over a *Markman* hearing in order to construe the claims in the subject patents. This Memorandum

addresses the claim construction of the disputed terms in the asserted claims of the '347, '792 and '497 Patents.

I. *Principles of Claim Construction*

The resolution of a patent infringement claim requires a two-step analysis. Texas Instruments Inc. v. Cypress Semiconductor Corp., 90 F.3d 1558, 1563 (Fed.Cir.1996). First, the court must construe the asserted claims to determine their meaning and scope. *Id*. Only then can the trier of fact determine whether the properly interpreted claims are valid and infringed by the accused structure. *See id*.

A. *General Law of Claim Construction*

Claim construction is a question of law for the court. Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed.Cir.1997) (en banc), *aff'd,* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). The objective of claim construction is to ascertain the meaning that a person of ordinary skill in the art would give to the terms in dispute at the time of the filing of the patent application. Wiener v. NEC Elec., Inc. 102 F.3d 534, 539 (Fed.Cir.1996) (abrogated on other grounds). To ascertain the meaning of claim language, courts look initially to three sources of intrinsic evidence: (1) the claims themselves, (2) the specification and (3) the prosecution history of the patent. *See* Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582-83 (Fed.Cir.1996).

The Federal Circuit Court of Appeals has held that claim construction

must begin and remain centered on the language of the claims themselves, for it is that language that the patentee chose to use to particularly point out and distinctly claim the subject matter which the patentee regards as his invention.

Texas Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193, 1201-02 (Fed.Cir.2002) (internal quotation marks omitted). To that end, there is a heavy presumption that the claim terms mean what they say and unless compelled otherwise, a court should given those terms their "full range of [ ] ordinary meaning as understood by persons skilled in the relevant art." Id. at 1202. The first step in claim construction, therefore, is to determine the plain and ordinary meaning of the disputed claim terms. Abbott Lab. v. Syntron Bioresearch, Inc., 334 F.3d 1343, 1350 (Fed.Cir.2003).

It has long been recognized that dictionaries are useful in determining the ordinary and customary meanings of claim terms. Texas Digital, 308 F.3d at 1202; *see* Abbott, 334 F.3d at 1350. In fact, it is appropriate for a court to look to dictionary definitions for the plain and ordinary meaning of a claim term before consulting the patent specification or prosecution history. *See* Intellectual Prop. Dev., Inc. v. UA-Columbia Cablevision of Westchester, Inc., 336 F.3d 1308, 1315 (Fed.Cir.2003). Because words often have multiple dictionary definitions, however, a court must look to the surrounding text, the patent specification and the prosecution history to determine which definition is most consistent with the use of the disputed claim terms by the inventor. *See* Brookhill-Wilk v. Intuitive Surgical, Inc., 326 F.3d 1215, 1222 (Fed.Cir.2003); Texas Digital, 308 F.3d at 1203. If more than one dictionary definition is consistent with the use of a claim term in the intrinsic record, the term may be construed to encompass both or all such meanings. Brookhill-Wilk, 326 F.3d at 1222; Texas Digital, 308 F.3d at 1203.

The "heavy presumption" in favor of the ordinary meaning of a claim term may be overcome where the patentee has (1) acted as his own lexicographer and "clearly set forth a definition of the disputed claim term

in either the specification or prosecution history," (2) distinguished the subject claim term from the prior art on the basis of a particular embodiment, expressly disclaimed particular subject matter or described a particular embodiment as "important" to the invention or (3) chosen a claim term that is so devoid of clarity as to require resort to other intrinsic evidence for a definite meaning. CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366-67 (Fed.Cir.2002). Where a patentee chooses to become his own lexicographer, he may use the specification "to supply implicitly or explicitly new meanings for claim terms." Rambus Inc. v. Infineon Tech. AG, 318 F.3d 1081, 1088 (Fed.Cir.2003). Whether implicit or explicit, the patentee must define the claim terms "with reasonable clarity, deliberateness, and precision before it can affect the claim." Abbott, 334 F.3d at 1354 (internal quotation marks omitted). In other words, the patentee must demonstrate

an intent to deviate from the ordinary and accustomed meaning of a claim term by redefining the term or by characterizing the invention in the intrinsic record using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.

Sunrace Roots Enter. Co., Ltd. v. Sram Corp., 336 F.3d 1298, 1304 (Fed.Cir.2003) (internal quotation marks omitted).

Accordingly, although claim construction is focused primarily on the language of the claims, a court must look to the specification and the prosecution history in order to construe the disputed claim terms accurately. *See* Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1324 (Fed.Cir.2002) ("The words used in the claims are interpreted in light of the intrinsic evidence of record, including the written description, the drawings, and the prosecution history, if in evidence."). In so doing, however, a court must exercise caution that it does not import limitations from the specification into the claims. Rambus, 318 F.3d at 1088-89. For example, it is generally improper to limit the scope of the claims to preferred embodiments or specific examples in the specification. *See* RF Delaware, Inc. v. Pac. Keystone Tech., Inc., 326 F.3d 1255, 1263 (Fed.Cir.2003); Teleflex, 299 F.3d at 1328.

B. ***Claim Differentiation***

According to the doctrine of claim differentiation, there is a rebuttable presumption that different claims in a patent have a different scope. *See* Sunrace, 336 F.3d at 1302-03; Amgen, Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1326 (Fed.Cir.2003). In other words, when one patent claim does not contain a certain limitation and another claim does, that limitation generally cannot be read into the former claim in determining either validity or infringement. Amgen, 314 F.3d at 1326. The presumption that different patent claims have a different scope

is especially strong when the limitation in dispute is the only meaningful difference between an independent and dependent claim, and one party is urging that the limitation in the dependent claim should be read into the independent claim.

Sunrace, 336 F.3d at 1303. Thus, while the doctrine of claim differentiation is not determinative, a court may look to the language of other claims in the subject patent to help ascertain the plain and ordinary meaning of the disputed claim terms. *See id.*

C. ***Indefinite Claims:*** 35 U.S.C. s. 112***,*** 2

A patent claim must "particularly point[ ] out and distinctly claim[ ]" the subject matter of the invention. 35 U.S.C. s. 112, 2 (2003). Thus, to be valid, a claim must be "sufficiently precise to permit a potential

competitor to determine whether or not he is infringing." Amgen, 314 F.3d at 1342 (internal quotation marks omitted). The standard for indefiniteness under 35 U.S.C. s. 112, 2 is rather high. *Id*. Indeed, a claim is considered indefinite only if it is "insolubly ambiguous, and no narrowing construction can properly be adopted." *Id*. (internal quotation marks omitted).

II. ***The*** '***347 and*** '792 Patents

A. ***The Technology***

Today most businesses and individuals rely on computers to store valuable information. That information is often stored in disk drives, data storage devices which allow users to store large amounts of information in a small space. The price of such efficiency, however, is the potential to lose everything should the computer or disk drive fail. In an effort to decrease that risk, inventors began to develop methods to store multiple copies of data on different storage devices. The '347 and '792 patents describe such a method of data storage generally referred to as remote data mirroring.

Data mirroring is a process by which data is saved to one storage device and a replicate or "mirror" is saved to a second storage device. Early efforts at mirroring focused on a method called "local mirroring" whereby a product would automatically save information to two storage devices in the same location. Recognizing that local mirroring would not prevent data loss caused by major disasters such as fire or terrorist attack, later efforts, including the '347 and '792 Patents, focused on "remote mirroring" products which would automatically save information to storage devices in different locations.

B. ***The Disputed Claims***

EMC alleges infringement of eight claims of the '347 Patent (Claims 1-3 and 9-13) and eleven claims of the '792 Patent (Claims 10, 18, 19, 22-25, 27, 28, 33 and 34).FN2 Because the ' 792 Patent is a continuation-in-part of the ' 347 Patent, similar terms, used consistently, will be construed uniformly throughout both patents. *See* Epcon Gas Sys., Inc. v. Baur Compressors, Inc., 279 F.3d 1022, 1030-31 (Fed.Cir.2002) ("[T]he same term or phrase should be interpreted consistently [when used as such] where it appears in claims of common ancestry."). Likewise, the same term or phrase, if used consistently in one or more claims in a patent, will be given the same meaning throughout. *See id*. Among the 19 claims in dispute in the subject patents, the disputed claim terms are all found in Claim 1 of the ' 347 Patent and in Claims 10 and 18 of the ' 792 Patent. For purposes of context, those claims are set forth fully below with the disputed terms highlighted the first time they appear.

FN2. In their Stipulation Concerning Proposed Claim Constructions (Docket No. 92), the parties have agreed to the constructions of the following terms in the '347 and '792 Patents: (1) "host computer", (2) "geographically remote", (3) "data storage device", (4) "high speed communications link", (5) "data storage", (6) "link", (7) "asynchronous" and (8) "asynchronous mode."

(1) ***The*** '347 Patent ***: Claim 1***

A system for automatically providing and maintaining data, said system comprising:

a host computer located in a first geographic location;

a first data storage system located in a first geographic location and **coupled to** said host computer, for storing data to be accessed by at least said host computer;

a second data storage system located in a second geographic location geographically remote from said first location, coupled to said first data storage system, for receiving at least data from said first data storage system; and

said first data storage system enabling transfer of said data to said second data storage system, **concurrently with** said data received from said host computer, so as to **nearly simultaneously maintain a concurrent copy** of data stored on said first data storage system and on said second data storage system wherein both said first and said second data storage systems maintain **an index,** said index including at least a first **indicator** providing an indication of whether a **predetermined data element** stored on said first data storage system is **valid,** and at least a second indicator providing an indication of whether said predetermined data element stored on said second data storage system is valid.

(2) ***The*** '792 Patent***: Claim 10***

A method of operating a data storage system for providing remote data copying to remote data storage, said data storage system having primary data storage for storing a primary copy of data, and a data storage controller for controlling storage of data in said primary data storage and transmission of data over a link from said data storage system to said remote data storage to store a secondary copy of the data in said remote data storage, said method comprising:

maintaining, in storage of said data storage system, a first indicator providing an indication of whether a predetermined data element stored on said data storage system is valid;

maintaining, in said data storage system, a second indicator providing an indication of whether said predetermined data element stored in said data storage system is valid;

maintaining, in said data storage system, a third indicator providing an indiction of whether a **write is pending** to said predetermined data element stored on said data storage system; and

maintaining, in said data storage system, a fourth indicator providing an indication of whether a write is pending to said predetermined data element stored in said remote data storage.

(3) ***The*** '792 Patent***: Claim 18***

A system for automatically providing remote copy storage of data from a host computer, said system comprising:

a first data storage system for coupling to the host computer for storing data from the host computer; and

a second data storage system remotely coupled to the first data storage system for receiving a copy of the data from the first data storage system;

wherein the first data storage system is adapted to operate in an asynchronous mode wherein data is copied from the first data storage system to the second data storage system asynchronously from the time when the first data storage system returns an i/o completion signal for the data to the host computer, and the first data

storage system maintains, in the first data storage system, an index of information about the data as stored in the first data storage system and about the copy of the data as stored in the second data storage system, the index identifying data stored in the first data storage system and not yet copied to the second data storage system, the index including **additional information** about the copy of the data stored in the second data storage system so that the additional information is accessible by the first data storage system without retrieval from the second data storage system in order to reduce time for recovery from a failure to access the data stored in the first data storage system.

C. ***Claim Construction***

EMC and HP dispute the following terms common to both the '347 and '792 Patents: "data storage system"/"data storage system controller", "coupled", "index", "indicator", "pre-determined data element", "valid" and "concurrently." The parties also dispute the following terms which are unique to the '792 Patent: "write is pending" and "additional information ." Finally, with respect to the '792 Patent, the parties dispute whether the four indicators disclosed in Claim 10 must be contained within an index.

(1) "*Data Storage System*" & "*Data Storage System Controller*"

EMC contends that a "data storage system" is a set of associated components housed in one or more enclosures and working together to store data and a "data storage system controller," is a device that controls one or more data storage operations. HP claims, on the other hand, that (1) the term "data storage system" is so broad that it requires review of the specification for further definition and (2) in the relevant specifications, a data storage system is described as including a controller which contains cache memory. The primary dispute between the parties, therefore, is whether a data storage system or, more specifically, a data storage system controller is required to contain, as a component, cache memory.FN3

FN3. Although it was once in dispute, at the *Markman* hearing the parties agreed that the components of a "data storage system" are not required to be housed together in the same enclosure.

As a threshold matter, it is undisputed that the plain and ordinary meaning of the terms "data storage system" and "data storage system controller," do not require cache memory.FN4 Indeed, a "system" is defined as "a complex unity formed of many often diverse parts subject to a common plan or serving a common purpose." *Webster's Third International Dictionary,* 2322 (1981). In this case, that common purpose is data storage. In a more technical context, a "controller" is defined as

FN4. Even if, as HP contends, the phrase "data storage system," as a whole, is so broad as to lack a common meaning, this court is not inclined to "abandon its quest" for such and "disregard the meanings of the individual words." Altiris, Inc. v. Symantec Corp., 318 F.3d 1363, 1372 (Fed.Cir.2003) (holding that district court erred in disregarding the common meaning of the terms "boot" and "selection" after concluding that the disputed phrase "boot selection flag" was, as a whole, unclear on its face).

[t]he control logic in a storage subsystem that performs command transformation and routing, aggregation (RAID, mirroring, striping, or other), high-level error recovery, and performance optimization for multiple storage devices.
Dictionary of Storage Networking Technology, http:// www/snia.org/education/dictionary/c/. In this case, the controller performs its various functions within the data storage system. Therefore, the plain meanings of

neither the term "data storage system" nor the term "controller" require, as a component, cache memory. The only remaining question is whether EMC has acted as its own "lexicographer" by defining the terms "data storage system" and "data storage system controller" to require, as a component, cache memory. Before turning to the patent specifications, there is evidence in other claim language that EMC has not demonstrated

an intent to deviate from the ordinary and accustomed meaning of a claim term ... [by] using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.

Sunrace, 336 F.3d at 1304. (internal quotation marks omitted). Claim 10 of the '792 Patent, an independent method claim, contains the term "data storage system" with no reference to cache memory. Claim 12 of the '792 Patent (a dependent claim), however, discloses

the method as claimed in Claim 10 wherein said data storage system contains a cache memory and a disk data storage device ....

'792 Patent, Col. 62, ll. 52-54. Because, by virtue of the doctrine of claim differentiation, limitations from one claim cannot generally be read into another, there is a rebuttable presumption that, with respect to the '347 and ' 792 Patents, the term "data storage system" does not require cache memory.

As HP aptly contends, Claim 10 is also distinguishable from Claim 12 in that it discloses a data storage system including a "disk data storage device." That additional limitation does not, however, negate the presumption that the term "data storage system" as used in Claim 10 is not limited in scope to a system which requires cache. *See* Sunrace, 336 F.3d at 1302-03. Common sense, moreover, reinforces that presumption because if cache were a required component of a "data storage system" or a "data storage system controller", its inclusion in dependent Claim 12 would be wholly redundant.

That evidence notwithstanding, the Specifications of the '347 and '792 Patents provide significant support for HP's contention that a "data storage system" requires cache memory.FN5 In the "Detailed Description of the Invention," the Specification of the ' 347 Patent states, in relevant part,

FN5. Because similar claim terms must be construed uniformly in the ' 347 and '792 Patents, for purposes of efficiency this Court will cite only to the Specification of the '347 Patent in construing such terms.

The present invention is shown generally at **10,** FIG 1, and *includes* at site A ....
The primary data storage system controller **16** includes at least 1 channel adaptor (C.A.) **26** which is well known to those skilled in the art and interfaces with host processing system **12.** *Data received from the host is typically stored in cache* **28** before being transferred through disk adaptor (D.A.) **30** over data signal path **24** to the primary storage device **20.** *The primary data storage controller **16** also includes ... cache memory ....*

*The secondary data storage system controller **44** also includes cache memory ....*

'347 Patent, Col. 4, ll. 6-7, 21-30, Col. 5, ll. 64-65. (emphasis added). Furthermore, in Figure 1 of the Specification of the '347 Patent, described as a block diagram illustrating "the system with remote data mirroring according to the present invention," the controller is depicted as including cache memory. Those

references, in addition to similar references in the Specification of the '792 Patent, HP contends, demonstrate that EMC has acted as its own lexicographer and specifically defined a data storage system to include cache memory.
First, a simple comparison of other "definitions" in the Specification of the '347 Patent confirms that EMC has not *explicitly* redefined data storage system to include cache memory, i.e. by using definitional language. In "defining" the term "geographically removed site," for example, the Specification states, in relevant part,

[f]or this Patent Application, geographically removed site means not within the same building as the primary data storage system.

'347 Patent, Col. 4, ln. 67-Col. 5, ln. 2. Nowhere in the Specification of the '347 Patent does EMC so explicitly define the term "data storage system" or "data storage system controller."

A patentee, however, can *implicitly* supply new meanings for claim terms. Here, HP contends, EMC has implicitly redefined the term "data storage system" by consistently describing the "present invention" as including cache memory. Although "clear language characterizing the present invention may limit the ordinary meaning of claim terms," such language must be read in context of the entire specification and the prosecution history to determine whether the patentee clearly limited the plain meaning of a claim. Rambus, 318 F.3d at 1095.

In *Brookhill-Wilk,* for example, the patentee disclosed only one embodiment in the patent specification which was referred to therein as "the present invention". *See* U.S. Patent 5,217,003. In fact, the only figure in that specification was described as "a diagram ... in accordance with the present invention" and the "Detailed Description" section specifically described the illustration in that figure. Id. Nonetheless, the Federal Circuit Court of Appeals reversed the district court's decision to limit the claim scope on the basis of the sole embodiment disclosed in the specification holding that

[t]he statements from the description of *the preferred embodiment* are simply that-descriptions of a preferred embodiment .... Those statements do not indicate that the invention can only be used in such a manner. Absent a clear disclaimer of particular subject matter, the fact that the inventor anticipated that the invention may be used in a particular manner does not limit the scope to that narrow context.

Brookhill-Wilk, 326 F.3d at 1223 (emphasis added). Notwithstanding the Federal Circuit's obvious and continuous reference to the patentee's "preferred embodiment", where that term is not used in the patent specification, the Court makes clear that a patentee must clearly disclaim a particular subject matter before the plain meaning of the claim terms are so limited.

Similarly, in *Rambus,* the district court found that the patentees had acted as their own lexicographers by redefining the claim term "bus" to be a "multiplexed bus". Rambus, 318 F.3d at 1094. Although the patentees had described the "present invention" at various times throughout the specification as including a multiplexed bus, the Federal Circuit reversed the district court's decision and held that while "clear language characterizing the present invention may limit the ordinary meaning of claim terms," the remainder of the specification and the prosecution history did not evince a clear intent to disclaim or disavow the plain and ordinary meaning of the term "bus." Id. at 1094-95. *See also* Sunrace, 336 F.3d at 1304-05 (patentee did not clearly redefine the term "shift actuator" to include "cam" where, in patent specification, he stated that each shift actuator "contains a ... cam member" and that "[a] rotary cam member ... is the heart of the rear

handgrip shift actuator").

HP contends that this case is, however, distinguishable from *Brookhill-Wilk* and *Rambus* because, in those cases, the Federal Circuit found that parts of the specification and the prosecution history supported a broader construction of the disputed claim terms. Here, HP claims, the subject specifications implicitly define a "data storage system" as including cache memory. There are at least three problems with that contention:

1. Although the relevant specifications do, in various places, refer to a data storage system as including cache, in each instance the patentee is clearly describing "the present invention ... shown generally at **10,** FIG. 1." *See* ' 347 Patent, Col. 4, ln. 6. As the Federal Circuit impliedly found in *Brookhill-Wilk,* EMC's use of the term "present invention" can be considered synonymous with "preferred embodiment" and the fact that the patent discloses only one embodiment does not necessarily limit the claim terms to a description thereof. Moreover, it is well-established that limits from the preferred embodiment are not to be read into the claim terms. *See* RF Delaware, 326 F.3d at 1263.

2. The Specification of the '347 Patent is not without its ambiguities with respect to whether the terms "data storage system" and "data storage system controller" must be defined to include cache memory. As both parties note, the Specification states, at one point, that

[d]ata received from the host *is typically stored in cache* **28** before being transferred through the disk adapter (D.A.) **30** over data signal path **24** to the primary storage device **20.**

'347 Patent, Col. 4, ll. 24-27 (emphasis added). Although the word "typically" may modify the word "stored," i.e. cache memory is always present but data is only "typically" stored there, it also implies that data is stored in cache if the data storage system contains such memory.

3. The prosecution history reveals that the PTO considered, as prior art, numerous patents disclosing controllers that did not include cache memory. The PTO did not, however, distinguish EMC's invention on those grounds. Although not dispositive, such evidence indicates that EMC did not clearly disclaim or disavow data storage systems without cache memory during the prosecution of the subject patents.

For each of those reasons and because of the presumption that different patent claims are to be accorded a different scope, EMC has not, either implicitly or explicitly, demonstrated "an intent to deviate from the ordinary and accustomed meaning" of the term "data storage system" or "data storage system controller" by "using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope." *See* Sunrace, 336 F.3d at 1304. In accordance with its plain and ordinary meaning, therefore, a "data storage system" is a set of associated components working together to store data and a "data storage system controller" is a device that controls data storage operations. Neither is required to include cache memory.

(2) "*Coupled*"

EMC contends that the term "coupled" means connected by a communications path. While HP does not dispute that "coupled" means connected, it contends that the requisite connection must be direct, i.e. without the intervention or interposition of any additional system or device. The parties agree that the requisite connection may be physical or logical.

The plain and ordinary meaning of the term "coupled" is "mechanically or electrically connected." *Webster's Third International Dictionary,* 522 (1981). There is no requirement that such connection be direct rather than indirect. Moreover, there is no indication in the Specification that the term "coupled" is limited only to "direct" connections. The Specification states, in relevant part,

[t]he primary system controller **16** *is coupled* to the storage device **20** *by means of a data signal path* **24.**

[t]he ... second disk adaptor **36** *is coupled, via a high speed communication link* **40** to disk adapter **42** on a secondary data storage system controller ....

[u]tilizing network connections, the primary and secondary data storage system controller **16** and **44** *may be connected to* FDDI networks, T1 or T3 based networks and SONET networks.

'347 Patent, Col. 4, ll. 18-20, 53-56 and 62-65 (emphasis added). Although Figure 1 in the Specification of the '347 Patent depicts the aforementioned "couplings" as direct connections, EMC has not demonstrated, either in the Specification or in the prosecution history, a clear intent to disavow or disclaim the plain and ordinary meaning of the term "coupled." Consequently, the term coupled will be construed to mean connected, directly or indirectly, by a communication path.

(3) "*Index*"

EMC contends that an "index" is an organized collection of information, e.g. tables, lists, hierarchical structures or directories. HP responds that, to the contrary, "index" means a single data structure that contains indicators about predetermined data elements and that the indices located on the respective data storage systems must be simultaneously maintained. HP also asserts, with respect to Claim 10 of the '792 Patent, that the four indicators described therein must be contained within "an index." As illustrated by the parties respective definitions, there are four primary disputes with respect to the claim term "index:"

(1) whether the data storage systems must "simultaneously maintain" their respective indices,

(2) whether each data storage system can contain more than one index,

(3) whether an index must be a "single data structure," and

(4) whether, in Claim 10 of the '792 Patent, the four described indicators must be contained within "an index."

The parties do not, however, dispute that an index can take multiple forms such as tables, lists or directories.

(a) "*Simultaneously Maintained*"

While the parties do not dispute that both the local and remote data storage systems must "maintain" an index, HP contends that those indices must be "simultaneously maintained". One need look no farther than the claim language to discredit that contention. Indeed, Claim 1 of the '347 Patent states, in relevant part,

said first data storage system enabling transfer of said data to said second data storage system, concurrently with said data received from said host computer, *so as to nearly simultaneously maintain a concurrent copy of data* stored on said first data storage system and on said second data storage system wherein both said

first and said second data storage systems maintain an index ....

'347 Patent, Col. 8, ll. 60-66 (emphasis added). The phrase "simultaneously maintain" refers only to the copies of data stored on each data storage system and not to the respective indices. Although a requirement that the indices be simultaneously maintained makes sense in light of the purposes of the invention, i.e. efficient error recovery, neither the claim language, nor the Specification nor the prosecution history limits the term "index" to one that is simultaneously maintained on both systems.

(b) *Whether There Can Be More Than One Index*

EMC contends that the term "an index" denotes *at least* one index but could include more than one. Although HP does not dispute that the disclosed invention may contain more than one index, it contends that there may be only one index which contains the requisite indicators providing an indication of the validity of a predetermined data element. Claim 1 of the '347 Patent states, in relevant part,

wherein both said first and said second data storage systems maintain *an index,* said index including at least a first indicator ... and at least a second indicator providing an indication of whether [a] predetermined data element ... is valid.

'347 Patent, Col. 8, ln. 65-Col. 9, ln. 5 (emphasis added). Similarly, other claims in the '347 and '792 Patents as well as the respective patent specifications refer to the required indices as "an index."

The Federal Circuit Court of Appeals has consistently emphasized that "the indefinite articles 'a' or 'an', when used in a patent claim, mean 'one or more' in claims containing open-ended transitional phrases such as 'comprising'." Crystal Semiconductor Corp. v. Tritch Microelectronics Int'l, Inc., 246 F.3d 1336, 1347 (Fed.Cir.2001). Thus, the claim limitation "a" requires a construction of "at least one." *Id*.FN6

FN6. In *Crystal Semiconductor,* the disputed claim contained the transitional phrase "having", which the Court found does not necessarily convey the same open-ended meaning as the phrase "comprising" but the Court construed that claim as being open-ended and found that the phrase "a capacitator *having* ... a first conductive layer disposed over *a portion of*" meant "disposed over at least one portion." *Id*. at 1348.

Here, Claim 1 of the '347 patent includes the transitional phrase "comprising," meaning, as the Federal Circuit has made clear, that it is an open-ended claim. Because nothing in the Specification or the prosecution history indicates a clear intent to limit the term "an index" to only one index, the disputed claims will be construed to include at least one index, said index having the requisite indicators which provide an indication of the validity of a predetermined data element.

(c) *Whether "An Index" Must Be a Single Data Structure*

EMC contends that "an index" can include multiple data structures as illustrated by the language of the Specification of the '347 Patent and Figures 2 and 3 therein. HP, on the other hand, claims that "an index" means at least one data structure, i.e. one table, one list or one directory, that contains the required indicators.FN7

FN7. It is noted that in its post-Markman claim construction memorandum, HP admits, in the section entitled "Said Predetermined Data Element", that "an index" can consist of multiple tables combined

together.

The plain and ordinary meaning of the term "index", that would be relevant in the context of the subject patents, is "something that serves as a pointer or indicator." *Webster's Third International Dictionary,* 1148 (1981). Accordingly, "an index" does not require that it consist of a single data structure.

Moreover, the language of the '347 Patent supports EMC's contention that "an index" can consist of multiple data structures. Claim 1, for example, discloses a first and second data storage system that

maintain an index, said index including at least a first indicator providing an indication of whether a predetermined data element stored on said first data storage system is valid, and at least a second indicator providing an indication of whether said predetermined data element stored on said second data storage system is valid.

'347 Patent, Col. 8, ln. 66-Col. 9, ln. 5. Although one might, initially, presume that "an index" refers to one data structure including both required indicators, further perusal of the claim language weakens that presumption. For example, dependent Claim 8 discloses the system of Claim 5 (a dependent claim to Claim 1) wherein,

said maintained index [the index referred to in Claims 1 and 5] includes at least a list of data which must be copied from said first data storage storage [sic] to said second data storage system *and,* a list of data storage device storage locations for which a format command is pending and for which an invalid track exists.

'347 Patent, Col. 9, ll. 32-37 (emphasis added). Because claim terms must be construed similarly throughout the subject patent, the language of dependent Claim 8 illustrates that the term "an index" can refer to more than one data structure, i.e. at least two lists. Consequently, in Claim 1, "an index" including at least a first and at least a second indicator could be comprised of two separate structures each of which contains at least one of the required indicators.

The Specification of the '347 Patent also indicates that "an index" can be comprised of multiple data structures when it states, in relevant part,

[a]ccordingly ... data integrity must be maintained by maintaining *an index or list of various criteria including a list of data* which has not been mirrored or copied, data storage locations for which a reformat operation is pending, *a list of invalid data storage device locations* or tracks, whether a given device is ready, or whether a device is write-disabled.

'347 Patent, Col. 7, ll. 21-28 (emphasis added). The term "include" means "to place, list, or rate as a part or component of a whole or of a larger group, class, or aggregate." *Webster's Third International Dictionary,* 1143 (1981). Thus, the Specification illustrates that "an index," in the context of the subject patent, can refer to more than one data structure, i.e. it may refer to at least two lists.

(d) ***Whether the four indicators disclosed in Claim 10 of the*** '792 patent ***must be contained within an index***

HP asserts that, with respect to Claim 10 of the '792 patent, the four described indicators must be contained

within "an index." The claim language, however, requires no such thing. While Claim 1 of the '792 Patent clearly discloses a "system" which maintains "an index" including at least four indicators, nothing in Claim 10, *a method claim,* requires the four indicators described therein to be contained within an index.

As HP aptly points out, the Specification of the '792 Patent states that the present system "maintains a list or index." Similarly, the PTO's statement of reasons for allowance of the '792 Patent provides that the applicant's instant claims set forth a system comprised of, *inter alia,* a first and second data storage system wherein the first data storage system controls the copying of data to the second data storage system by "maintaining an index" which includes at least four indicators. Notwithstanding the well-established premise that one cannot import limitations from the specification or prosecution history into the ordinary claim terms (unless one of the previously described specific circumstances exists), neither of the cited statements limits the terms of Claim 10 (a method claim) so as to require an index. Indeed, in utilizing the term "index," as the above-quoted portions illustrate, the Specification and the PTO specifically refer to *the system* described in the ' 792 Patent, e.g., Claim 1, and not to any of the methods disclosed therein. Because the language of Claim 10 does not require that the subject indicators be contained in an index and because neither the Specification nor the prosecution history implicitly or explicitly refute that omission, no index is required.

(e) *Conclusions:* "*An Index*"

For the foregoing reasons, the term "an index" as used in the subject patent claims will be construed to mean an organized collection of information which may be contained in one or more data structures, including but not limited to tables, lists or directories, which contains the requisite indicators providing an indication about the validity of predetermined data elements. Because the terms "a" or "an," in the context of patent claim language, mean at least one, the subject patents will be construed to include at least one index having the characteristics described above. For purposes of illustration, an index containing at least a first and second validity indicator could therefore include two lists, each containing one of the respective validity indicators. Moreover, the invention might include a second index, containing two different validity indicators comprised of two tables, each containing one of the respective validity indicators. Finally, there is no requirement for "an index" in Claim 10 of the '792 Patent.

(4) "*Indicator*"

EMC contends that an "indicator" is information that gives an indication and an indication is a sign or suggestion of some thing or fact. HP claims that (1) an indicator is a flag bit or binary indicator which provides information about the data and is not the data itself and (2) an indicator provides information with certainty, i.e. the data storage system containing the relevant indicator treats the information provided as definitive thereby determining whether the relevant data is valid or invalid based on the indicator. Although not apparent from the alternative definitions, there are three primary disputes with respect to the claim term "indicator:"

(1) whether an indicator must indicate data validity with certainty;

(2) whether an indicator may indicate data validity not only at the track level but also at the device level; and

(3) whether the required first and second indicators on each data storage system must indicate data validity at the same level, i .e. whether they both must indicate validity at either the track or the device level.

(a) *Whether an indicator must indicate data validity with certainty*

The plain and ordinary meaning of the term "indicator" is "one that indicates." *Webster's Third International Dictionary,* 1150 (1981). The term "indicate" means

to point out or point to or toward with more or less exactness: show or make known with a fair degree of certainty ... to show the probable presence or existence or nature or course of: give fair evidence of: be a fairly certain sign or symptom of: reveal in a fairly clear way ....

Id. Nothing in the dictionary definition requires an indicator to indicate data validity with certainty. Indeed, an indication, by nature, provides only a "fair degree" of certainty.

The claim language supports the plain meaning of the term "indicator." In Claim 1 of the '347 Patent, the required index includes "at least" a first and "at least" a second validity indicator with respect to a particular predetermined data element. As EMC persuasively contends, if an "indicator" provided a certain indication of data validity, the inclusion of any further indications would be unnecessary and inefficient, and the inclusion of the claim language "at least" would be surplusage.

Moreover, neither the subject specifications nor the prosecution histories explicitly or implicitly limit the term "indicator" to that which provides information with certainty. In fact, the specifications clearly illustrate numerous kinds of information related to "validity", including invalid track information, device pending information and write disable drive information. *See* '347 Patent, Col. 7, ln. 32-Col. 8, ln. 29; '792 Patent, Col. 11, ln. 10-Col. 12, ln. 7. The fact that the subject specifications contemplate more than one kind of "indicator" with respect to data validity supports EMC's contention that an indicator does not provide an indication of data validity with "certainty."

Although the described indicators provide indications of data validity at different levels, e.g. at the track and device level, the information provided may overlap. That is, the device-disabled indicator may indicate that the second data storage system is disabled and, therefore, that the data thereon is invalid. That "validity indication" may be supplemented by an invalid track indicator which indicates that all tracks on the second data storage device are invalid. *See* '347 Patent, Col. 8, ll. 25-27. That the subject invention envisions, in some instances, the use of overlapping indicators of data validity, is itself an "indication" that the term "indicator" does not connote certainty.

That evidence notwithstanding and as HP counters, there is some suggestion in the specifications that a validity indicator is treated as "certain" by the respective data storage systems. For example, in addressing the invalid track indicator, the Specification in the '347 Patent notes, in relevant part,

[a]nother background task running on the data storage system such as in the service processor or storage system controller constantly checks invalid track bits on each data storage device and if a bit is found to be set, the copy task is invoked to copy the data from the known good device to the device with the invalid flag track set.

'347 Patent, Col. 8, ll. 13-18.

Although that excerpt *indicates* that the presence of one invalid flag is enough to prompt a copy response

(and thus that each individual indicator is treated as certain by the data storage system on which it is maintained), *that indication,* to use a term with which the parties are intimately familiar, is far from certain. Indeed, the Specification merely states that

[a] background task running on the data storage system ... checks invalid track bits *on each data storage device* ... and if a bit is found to be set, the copy task is invoked to copy the data from the known good device to the device with the invalid flag track set.

'347 Patent, Col. 8, ll. 13-18. That provision could be read to imply that the background task checks the indicators on both data storage devices before employing the copy function.

Moreover, even if that part of the Specification indicates that invalid track indicators are treated as certain by the data storage systems in which they reside, there is no suggestion that they or other validity indicators *must* be so treated. Thus, because limitations from the Specification cannot be imported into the claim language, HP's argument is unavailing.

(b) ***Whether an indicator indicates data validity at both the track and device levels***

EMC asserts that an "indicator" may indicate data validity at either the track level or the device level. In other words, according to the patentee, the subject patents disclose validity indicators which provide information about data stored at a particular storage location on each respective storage device as well as validity indicators which provide information about a particular storage device. The device-level indicators indirectly provide information about all of the data stored on a particular data storage device. HP claims that, to the contrary, the subject patents disclose only indicators of the validity of data stored at a particular location on a storage device, e.g. data stored on a particular track or cylinder.

As a threshold matter, the claim itself does not restrict the application of the term "indicator" to that which provides information about data validity at the track (as opposed to the device) level. Moreover, the Specification of the '347 Patent clearly contemplates validity indicators that provide information about the data located on a particular "track" as well as data located on an entire data storage device. First, the Specification contemplates the inclusion of multiple data storage devices. *See* '347 Patent, Col 4, ll. 14-17. That fact alone supports the contention that an "indicator" not only provides information about data stored at a particular location on an individual storage device but also information about the data located on an entire storage device (because, where a system contains multiple storage devices each device is merely a larger storage location than a track).

That evidence notwithstanding, the Specification also states, in relevant part,

[a] feature of the present invention is that both the primary or secondary data storage systems maintain a table of the validity of data in the other storage system.... Thus, as illustrated in the partial list or table **100,** FIG. 2, each data storage system maintains an indication of write or copy pending .... Similarly, an index is maintained of a pending format change .... In addition to the write pending and format pending bits described above, the present invention also includes several additional general purpose flags to assist in error recovery. As shown in FIG. 3, invalid track flags **120** ... are utilized ... to indicate that the data storage location such as a track, does not contain valid data.... Additional flags may be provided such as device ready flags ... which serve to indicate that the device is ready. Similarly, write disable flags **132** may be provided which indicate that a particular ... drive **136** can presently not be written to. Data can still be

copied to the good or enabled drive then later copied to the disabled drive. If one drive or device is bad, the present invention will set all tracks of that drive as not valid to later cause a copy of all the data. Accordingly, each data storage device keeps data validity information about it's [sic] mirrored device.

'347 Patent, Col. 7, ln. 32-Col. 8, ln. 30.

That part of the Specification makes it abundantly clear that the disclosed invention contemplates validity indicators which provide information about data stored in a particular storage location as well as information about a particular data storage device. Such device-level indicators indirectly provide information about all of the data stored on a particular data storage device. Moreover, nothing in the subject specifications or prosecution histories contradicts that construction or suggests that EMC so limited the term "indicator".

(c) *Whether the first and second indicators on each data storage system must both indicate data validity at the same level*

EMC contends, apparently for the first time in its post- *Markman* claim construction memoranda, that the first and second indicators on each data storage system do not have to be organized at the same level. EMC proposes, rather, that the patent requires only that each indicator provide an indication of whether the same predetermined data element is valid. In other words, the first indicator on a data storage system could provide an indication of data validity at the track level while the second indicator provides an indication of data validity at the device level. Both indicators, so EMC asserts, are providing information about a particular track of data, the second indication is merely giving more information than necessary, i.e. information about the data on an entire storage device.

HP responds that, to the contrary, the first and second indicators on each data storage system must provide information at the same level. Under HP's proposed construction, therefore, if the first indicator on a data storage system provides an indication of data validity at the track level, the second indicator must also provide validity information at the track level.

Here the claim language itself is most instructive. Claim 1 of the '347 Patent discloses an index,

said index including at least a first indicator providing an indication *of whether a predetermined data element* stored on said first data storage system is valid, and at least a second indicator providing an indication *of whether said predetermined data element* stored on said second data storage system is valid.

'347 Patent, Col. 8, ln. 67-Col. 9, ln. 5 (emphasis added). Although that language makes clear that the two indicators must provide an indication of the validity of the same predetermined data element, it does not require that the two indicators be the same, i.e. that the index include two track level or two device level indicators. Moreover, nothing in the claim language requires that the indicators provide a direct, rather than an indirect, indication of data validity.

Thus, as EMC convincingly argues, one embodiment of the disclosed invention could include an index with a first indicator at the track level, indicating the validity of a piece of data on a particular track and a second indicator at the device level, indicating whether a particular storage device which contains the subject data track is disabled and, therefore, whether all of the data on that device is valid. Because the second indicator provides information with respect to all of the data stored on the second data storage device, it would, albeit

indirectly, provide information about each track of data stored on that device.FN8

FN8. Indeed, the Specification of the '347 Patent states, in relevant part,
If one drive or device is bad, the present invention will set all tracks of that drive as not valid to later cause a copy of all the data.

'347 Patent, Col. 8, ll. 25-27. That provision indicates that the device-level indicators indirectly provide validity information about each individual track of data on the subject device.
If the device level indicator indicated that the particular storage device was not functioning, that would be an indication that a particular track of data had not been properly stored on that device. Conversely, if the device-level indicator indicated that the subject storage device was functioning properly, that would be an indication that a particular track of data had been stored correctly in the second storage device. In short, the second device-level indicator would provide "an indication of whether said predetermined data element stored on said second storage system is valid."

Finally, there is nothing in the subject specifications or prosecution histories that requires the two indicators to be organized at the same level. Although Figures 2 and 3 of the Specifications of the '347 and '792 Patents depict such indicators, it is well-established that the claim terms are not to be limited by the specification unless the patentee has chosen to become his own lexicographer. *See* Rambus, 318 F.3d at 1088-89. There is no evidence of that here.

(d) *Conclusions: "Indicator"*

For the foregoing reasons, the term "indicator," as used in the subject patents, will be construed to mean information which provides a fairly certain sign or symptom of the validity of a predetermined data element. An indicator can include information about data located at a particular storage location on a storage device, such as a track, or about data stored in an entire storage device via a device-level indicator. The requisite first and second indicators may be organized at different levels so long as the second provides information with respect to the validity of the same predetermined data element as the first even if that information is provided indirectly.

(5) "*Predetermined Data Element*"

EMC contends that a predetermined data element is a particular piece of data, of any size, that may be identified in some predetermined way, for example, by the address where it is stored. HP counters that a predetermined data element is a subunit of host data, such as a track or record, which is stored on the data storage system. The issue is, therefore, whether a predetermined data element includes subunits of data as well as the data on an entire data storage device.

Although the term "predetermined data element" as a whole means little, the plain meaning of each word in the phrase is instructive. The ordinary meaning of the word "predetermine" is "to determine beforehand." *Webster's Third International Dictionary,* 1786 (1981) and the word "element" means "one of the constituent parts, principles, materials, or traits of anything." *Id*. at 734. Thus, in the context of the subject patents, a predetermined data element is a part or unit of data the identity of which is determined beforehand and which is stored on the first or second data storage system. Nothing in that definition excludes the data contained in an entire data storage device. Indeed, such data has been identified beforehand as all of the data stored on a particular storage device. Moreover, that data is a part or unit of all of the data stored on all of

the data storage devices (of which there may be hundreds) within a data storage system.

The explicit language of the Specification of the '347 Patent (set forth at length in the preceding section of this Memorandum) is also instructive here. *See* '347 Patent, Col. 7, ln. 32-Col. 8, ln. 30; *see also* '347 Patent, Col. 3, ll. 19-32; Col. 7, ll. 13-31. Although the phrase "predetermined data element" is conspicuously absent from the Specification, if an "indicator", which indicates data validity, includes both invalid track and device level information, a predetermined data element can also include data at the track level or the device level. Additionally, Figures 2 and 3 in the Specification of the '347 Patent illustrate that a predetermined data element can include both track level data and the data stored in an entire storage device.

Finally, EMC did not, explicitly or implicitly, limit the meaning of the term "predetermined data element" in the prosecution of the subject patents. Accordingly, the term "predetermined data element" will be construed to mean a part or unit of data, including the data on an entire storage device, which identity is determined beforehand and which is stored in the first or second data storage system.

(6) "*Valid*"

EMC contends that the term "valid" can mean either correct or in-synchronization, i.e. data is valid where it is the same on both systems. HP responds that "valid" means the subject data is up to date, i.e. it is correct. Although it is unclear from the face of the parties' proposed constructions, apparently the substantive dispute with respect to the term "valid" is HP's contention that the term applies to more than the consistency or synchronization of the data between the two data storage systems. Indeed, HP asserts that the requisite indicators do not merely indicate that data is inconsistent between the two storage systems but rather that each particular data element has been correctly stored on each.

The plain meaning of the term "valid" is "correctly derived" from the premises of an inference. *Webster's Third International Dictionary,* 2530, 1981. Nothing in the subject specifications or prosecution histories indicates that the patentee intended the term to be defined in any way other than by its customary definition nor do those sources limit the term. Thus, although an indication that a data element on the second data storage system is not valid may be the same as an indication that such data is not consistent (or not in-synchronization) with data on the first storage system, the plain meaning of the term "valid" describes more than consistency. It describes which data has been stored correctly to the subject storage system.FN9

FN9. The Specification of the '347 Patent states, in relevant part, that "[a] utility operating on the service processors will give the user a report of all the non-valid (out of sync) tracks." '347 Patent, Col. 8, ll. 38-40.

Indeed, in order to provide for efficient error recovery, which is one purpose of the subject invention, each indicator must provide a fairly certain suggestion of whether each data element stored on each respective data storage system has been correctly stored. Such an indication does not simply mean that the data is consistent between the two storage systems. For example, if an indicator on the first data storage system indicates that the data stored there is valid that indication, alone, is not a sign that the data is consistent between the first and second data storage systems. Rather, it indicates that the data has been correctly stored to the first data storage system. It is only if the second indicator provides an indication that the data is valid that the term "valid" become synonymous with consistent.

Similarly, where the first data storage system is write disabled such that the data must be copied, in the first

instance, to the second data storage system, the second data storage system may indicate that a particular data element is invalid on the first system but valid on its own system. The latter indication does not signify consistency between the two systems, because, as previously described, the first data storage system is write disabled. These examples illustrate that the term "valid" is not simply a synonym of "consistent" but must be construed in accordance with its broad plain meaning, i.e. correctly stored in a particular data storage system.

(7) "*Concurrently" and "Concurrent*"

EMC asserts that the term "concurrently" means operating in parallel while HP argues that it means at the same time. The term "concurrent" is defined as "running parallel" and "occurring, arising, or operating at the same time often in relationship, conjunction, association, or cooperation." *Webster's Third International Dictionary,* 472 (1981). Although both proposed definitions appear to be correct, the most appropriate construction depends upon the context in which the term is used.

Claim 1 of the '347 Patent states, in relevant part,

said first data storage system enabling transfer of said data to said second data storage system, *concurrently with* said data received from said host computer, so as to nearly simultaneously maintain *a concurrent copy* of data stored on said first data storage system ....

'347 Patent, Col. 8, ll. 60-64 (emphasis added). Because the use of both "concurrently" and "concurrent" refer, generally, to the copying of data by the first data storage system to the second data storage system after such data is received from the host computer, they should be construed uniformly. *See* Epcon Gas, 279 F.3d at 1030-31 (where the same claim term is used consistently throughout a claim or claims, it should be given the same meaning throughout).

Given the context in which both terms are used, it is illogical to define "concurrently" and "concurrent" as "at the same time" because the phrase "nearly simultaneously" already describes the time element in the relevant claim. Moreover, to define the subject terms as "at the same time" would contradict the phrase "nearly simultaneously" because the latter term implies that one event occurs at *almost* the same time as another but not exactly at the same time. Accordingly, the claim terms "concurrently" and "concurrent" will be construed to mean "in parallel with" and "parallel" respectively.FN10

FN10. For the definition of "parallel" and the construction of that claim term see *infra,* section III. C. (2) of this Memorandum.

(8) "*Write is Pending*"

EMC contends that the phrase "write is pending," which is used solely in the claims of the '792 patent, means that a write operation has not yet been completed. Although HP does not specifically dispute that definition, it maintains that the phrase "write is pending" means that data for a predetermined data element is stored in cache memory on the controller and waiting to be "de-staged" to the storage device. The prevailing dispute, therefore, is whether "write is pending" includes only write operations pending from cache memory.

As an initial matter, this Court has already determined that the '347 and '792 patents do not disclose an invention that requires cache memory. Likewise, neither the claim language nor the Specification of the '792

Patent defines the phrase "write is pending" to mean data stored in the cache memory of the controller and waiting to be "de-staged" to a storage device. Indeed, Claim 10 of the '792 Patent states, in relevant part,

maintaining, in said data storage system, a third indicator providing an indication of whether *a write is pending* to said predetermined data element stored on said data storage system ....

'792 Patent, Col. 62, ll. 32-35 (emphasis added). Nothing in that language explicitly or implicitly requires that the third indicator provide an indication of whether there is data stored in the cache memory of the controller waiting to be "de-staged" to the storage device. Moreover, dependent Claim 12 of the '792 patent states, in relevant part,

[t]he method as claimed in claim 10, wherein said data storage system contains a cache memory and a disk data storage device, *said third indicator provides an indication of whether a write is pending from said cache memory* to said disk data storage device....

'792 Patent, Col. 62, ll. 52-56 (emphasis added). Pursuant to the doctrine of claim differentiation, therefore, there is a presumption that the phrase "write is pending," as used in Claim 10 of the '792 patent, includes more than write operations pending from cache memory.

Although the Specification of the '792 Patent refers, in some instances, to cache memory when discussing the "write pending" indicators, EMC did not become its own lexicographer by redefining the term "write is pending" to mean a write pending from cache memory. For example, the Specification states that

when a host computer writes data to a primary data storage system, *it sets both the primary and secondary bits ... of the write pending bits ... when data is written to cache*.

'792 Patent, Col. 11, ll. 31-33 (emphasis added). Prior to that statement, however, the patentees explain that data for which a write is pending can be stored in places other than the cache memory of the controller when they state that

the primary data storage system must maintain a log file of pending data which has yet to be written to the secondary data storage device. *Such data may be kept on removable, non-volatile media, in the cache memory of the primary or secondary data storage system controller ... or in the service processor ....*

'792 Patent, Col. 10, ll. 51-57 (emphasis added).

Neither the plain and ordinary meaning of the phrase "write is pending" nor the language of the Specification of the '792 Patent require that it be defined as data stored in the cache memory of the controller and waiting to be "de-staged" to the storage device. As used in the '792 Patent, therefore, the phrase "providing an indication of whether a write is pending" will be construed to mean providing an indication of whether a write operation is in progress but not yet completed.FN11

FN11. HP contends, as it does with respect to numerous claim terms in the subject patents, that its claim construction is supported by the construction advocated by EMC in prior proceedings before the International Trade Commission ("ITC") with respect to the same patents. Assuming *arguendo* that HP is correct, because it is undisputed that EMC is not "judicially estopped" from making allegedly inconsistent arguments to this Court and because, in this case, the intrinsic evidence provides sufficient guidance to

construe the disputed claim terms, HP's references to positions taken by EMC in the ITC are in vain.

(9) "*Additional Information*"

Claim 18 of the '792 Patent states, in relevant part,

[t]he first data storage system maintains ... an index of information ... the index identifying data stored in the first data storage system and not yet copied to the second data storage system, the index *including additional information about the copy of the data stored in the second data storage system* so that *the additional information is accessible by the first data storage system without retrieval from the second data storage system* in order to reduce time for recovery from a failure to access the data stored in the first data storage system.

'792 Patent, Col. 63, ll. 54-67 (emphasis added). EMC contends that the term "additional information" as used in the '792 Patent means information in addition to the information "identifying data stored in the first data storage system and not yet copied to the second" including, for example, whether a predetermined data element stored in the second data storage system is valid. HP contends that the term "additional information" is vague and indefinite but, in any event, relates to the copy of the data on the second data storage system and cannot refer to general information about the status of that system or devices in that system, e.g. device pending or write-disable drive information. The operative dispute is, therefore, whether the term "additional information" is vague and indefinite and, if not, whether it includes device-level information.

Because the parties do not dispute the plain and ordinary meaning of the term "additional information", dictionary definitions are not helpful. Nor do the terms of Claim 18 shed any light on the dispute at issue. The language of dependent Claim 19, however, provides some clarification wherein it states, in relevant part,

[t]he system as claimed in claim 18, wherein the index includes a first indicator of whether a write to a predetermined data element is pending to the second data storage system ... and the additional information about the copy of the data stored in the second data storage system includes a second indicator of whether the predetermined data element is valid in the second data storage system.

'792 Patent, Col. 64, ll. 1-9. Accordingly, the index in dependent Claim 19 of the '792 Patent includes at least a first indicator of write pending information with respect to a predetermined data element and a second indicator of the validity of that predetermined data element on the second data storage system. Under the doctrine of claim differentiation, again, there is a presumption that the term "additional information" as used in Claim 18 includes, at least, validity information about a predetermined data element. As more thoroughly discussed earlier in this Memorandum, an indicator of the validity of a predetermined data element can include both track and device level information, i.e. information about data located at a specific track on a storage device and about all of the data stored in a particular storage device.

Finally, consistent with the claim language itself, the Specification of the '792 Patent does not explicitly or implicitly limit "additional information" to track-level information. Indeed, in many instances the Specification refers to device-level information as "additional". For example, in describing Figure 3, which depicts an index including invalid track, device pending and write disable drive information, the

Specification states that

FIG 3 is a schematic representation of an additional list or index ... to keep track of *additional items* including an invalid data storage device track, device ready status and write disable device status ....

'792 Patent, Col. 6, ll. 23-26 (emphasis added). Later, the Specification also adds,

[i]n addition to the write pending and format pending bits described above, the data storage system **10** also includes *several additional general purpose flags to assist in error recovery*. As shown in FIG. 3, *invalid track flags* ... are utilized and maintained on each data storage device .... *Additional flags* may be provided such as the *device ready flags* .... Similarly, *write disable flags* **132** may be provided ....

'792 Patent, Col. 11, ll. 51-56, Col. 11, ll. 63-67 (emphasis added).

With respect to the '792 Patent, therefore, the term "additional information" has not been limited to track level validity information but rather can include device level information such as device pending or write disable drive information because such information refers, albeit indirectly, to the copy of the data stored on an entire storage device in the second data storage system. As with track level information, moreover, device-level information "assist[s] in error recovery" as required by the language of Claim 18. *See* '792 Patent, Col. 11, ln. 51-Col. 12, ln. 5. Accordingly, the term "additional information" will be construed to include device level validity information.

Finally, the term "additional information" is neither vague nor indefinite. A claim is considered indefinite only if it is "insolubly ambiguous, and no narrowing construction can properly be adopted." Amgen, 314 F.3d at 1342 (internal quotation marks omitted). Here, both the claim language and the Specification make clear that the term "additional information" refers to any information beyond that which identifies data stored in the first storage system but not yet copied to the second and which is about the copy of data stored in the second data storage system. The language of dependent Claim 19 and the Specification instruct that such "information" can include information about the validity of a predetermined data element and the '347 and '792 Patents disclose numerous validity indicators at both the track and device levels. HP's claim that the term "additional information" is vague or indefinite is, therefore, unavailing.

III. *The* '497 Patent

A. *The Technology*

As illustrated by the '347 and '792 Patents, remote data mirroring technology guards against the loss of data caused by major disasters, such as fire, and more common occurrences such as system failure or user error. Remote data mirroring, however, also can be used to serve other purposes such as providing users with simultaneous access to primary and saved copies of data. Such access allows users to run tests or perform other necessary operations on the saved copy of the data without affecting the primary copy of the data or applications running on that data. That ability is crucial to many businesses such as airlines, banks and various internet web sites which require access to their stored data in order to conduct daily business operations. The '497 Patent addresses that issue and discloses methods that permit independent and simultaneous access to both saved and primary data allowing each to be used for different applications.

B. *The Disputed Claims*

EMC alleges that HP is infringing eight claims of the '497 Patent (Claims 1 through 9, excluding Claim 6). Among those claims, there were originally multiple terms in dispute but the parties have since stipulated to the construction of some and declined to contest others in their pleadings or at the Markman hearing.FN12 That leaves a core of substantially disputed terms each of which is used in Claim 1 of the ' 497 Patent and, for purposes of context, that claim is set forth in full below with each of the disputed claim terms highlighted for ease of reference.

FN12. As set forth in their Stipulation Concerning Proposed Claim Construction (Docket No. 92), the parties have stipulated to the constructions of the following terms in the '497 Patent: (1) "access," (2) "applications," (3) "data set," (4) "establishing ... a copy of the data set in the second data storage facility as a mirror for the first data storage facility by attaching the second data storage facility in parallel with the first data storage facility" and (5) "independently of operations."

Claim 1 of the '497 Patent states,

A method for controlling access to a data set by first and second applications wherein the data is stored in a first data storage facility that is addressable by the first application, said method comprising the steps of:

A) configuring a second data storage facility to correspond to the first data storage facility,

B) establishing independently of operations in response to the first application and in response to a first **command,** a copy of the data set in the second data storage facility as a mirror for the first data storage facility by **attaching** the second data storage facility **in parallel with** the first data storage facility,

C) in response to a second command:

i) **detaching** the second data storage facility from the first data storage facility independently of operations in response to the first application thereby terminating the memory mirror function of the second data storage facility, and

ii) **attaching** the second storage facility to be addressed by the second application whereby the first and second applications thereafter can access the data sets in the first and second data storage facilities respectively and concurrently, and

D) in response to a third command terminating the operations in response to the second command.

C. ***Claim Construction***

(1) "***Command***"

EMC contends that the term "command" means an instruction to initiate an action. HP responds that a command is an instruction issued by the user through the host computer and, specifically, that the '497 Patent requires at least three commands which accomplish the steps described therein. EMC does not appear to dispute that contention but rather claims that a command can consist of more than a single instruction or a single word.

To the extent that there is a separate dispute with respect to whether Claim 1 of the '497 Patent requires at

least three commands, the language of the claim is dispositive. Unquestionably, the plain language of Claim 1 requires three commands which accomplish the steps described therein. Although the term "command" is preceded by the indefinite article "a", it still requires that the disclosed invention contain at least one "first command", at least one "second command" and at least one "third command" each of which accomplishes the successive functions described in the claim.

That issue notwithstanding, there appear to be two substantive disputes with respect to the term "command":

(1) whether a command can include more than one instruction, and

(2) whether a command must be issued by the host computer.

The plain and ordinary meaning of the term "command" is "an order given". *Webster's Third International Dictionary,* 455 (1981). Nothing in that definition nor in the claim language limits the term "command" to a single instruction or a single word. In fact, the claim language contemplates that each command may involve more than one word or instruction. The second command (also called the split command), for example, produces two distinct results, namely, it detaches the second data storage facility from the first and subsequently attaches it to be addressed by the second application. That more than one result is contemplated by virtue of the split command supports the notion that, when the host adaptor, as depicted in Figures 12 and 14 of the ' 497 Patent, receives the split command, such command may be comprised of more than one single instruction or word. Indeed, the command-initiating device may issue a number of words or instructions each of which form a part of the first, second or third commands. Nothing in the Specification or prosecution history either implicitly or explicitly limits the term "command" to a single word or instruction.

Likewise, nothing in the claim language, Specification or prosecution history limits the term "command" to an instruction issued by the host computer. While the Specification and the relevant figures therein often describe a "command" as issued by the host computer, it is well-established that such a limitation cannot be imported into the claim terms unless EMC has acted as its own lexicographer. There is no implicit or explicit evidence of that here.

The described evidence notwithstanding, the Specification of the '497 Patent clearly contemplates that a user can initiate the subject commands through something other than a host computer when it states that, "[i]n accordance with one embodiment of this invention ... the host **220** in FIG. 9 can issue a number of commands ...." '497 Patent, Col. 16, ll. 64-67. More specifically, the Specification contemplates that a user may initiate commands through a device called a "system manager" (which is depicted, in Figure 1, as separate from the host computer). *See* '497 Patent, Col. 11, ll. 24-55 (discussing, albeit not explicitly, the functions of the split command); Col. 12, ll. 34-41 (discussing, albeit not explicitly, the functions of the re-establish command).

Consequently, based on the claim language, the Specification and the prosecution history, the term "command" will be construed to mean one or more words or instructions to initiate, terminate or otherwise control the execution of an operation. A "command" may be issued by a host computer, a service manager or other initiating device.

(2) "*In Parallel With*"

EMC contends that the term "in parallel with," as used in the first command, means concurrently with. HP maintains that the term is vague. The plain and ordinary meaning of the term "parallel" is

marked by likeness or correspondence esp. in time, direction, course, tendency, or development: similar, analogous, or interdependent in line followed: tending toward the same point or result[.]

Webster's Third International Dictionary, 1637 (1981). Nothing in that plain meaning nor in the claim language renders the term "in parallel with" vague or indefinite in the context of the subject patent. Indeed, the claim language clearly states that, in response to a first command, the second data storage facility is attached "in parallel with" the first in order to establish a mirrored copy of the data in the second data storage system. Given the objective of the subject attachment, it would be obvious to one skilled in the art that the phrase "in parallel with" means that the two data storage devices are attached together so that they correspond to one another in time, i.e. they are attached such that a mirroring relationship is created whereby changes made to the data in the second storage facility are made concurrently with changes to the data in the first storage facility. *See* '497 Patent, Col. 17, ln 56-Col. 18, ln. 5. Thus, the phrase "in parallel with", as used in Claim 1 of the '497 Patent, describes the result of the attachment of the two data storage devices rather than the attachment itself.

Although that construction may not be obvious from a cursory review of the claim terms, because one of ordinary skill in the art would likely understand such use of the disputed term, the phrase "in parallel with" is not "insolubly ambiguous" and HP has not met its weighty burden of proving that a claim term is vague or indefinite. In accordance with the claim language and the Specification, therefore, the term "in parallel with" will be construed to mean that the two data storage systems are attached to correspond to one another in time such that a mirroring relationship is established whereby the two data storage facilities receive data from the first application concurrently. FN13

FN13. Although used in a different context, that construction is also consistent with this Court's construction of the disputed claim term "concurrently" in the '347 and '792 Patents.

(3) "*Attaching*" *and* "*Detaching*"

For purposes of efficiency, the following analysis will focus on the term "attaching" but is meant to apply to the converse term "detaching" as well. EMC contends that the term "attaching" means making a device logically available, i.e. by setting that device to a "ready state." HP, however, asserts that the term "attaching" means establishing an actual and complete connection between the two data storage facilities such that, in the context of the second command, the second application can read and write to the second data storage facility without any additional "bookkeeping operations," i.e. without any further commands or instructions by the host computer. The parties do not dispute that an attachment may be physical or logical, but rather whether the subject attachment must be, in HP's jargon, "complete".

The claim language is particularly instructive here. Although the parties focus primarily on the use of the term "attaching" in the context of the second command, Claim 1 of the '497 Patent uses the term "attaching" twice and, because the term is used similarly in both instances, it must be construed uniformly. In describing the first command, Claim 1 states,

establishing ... in response to the first application and in response to a first command, *a copy of the data set*

in the second data storage facility as a mirror for the first data storage facility *by attaching* the second data storage facility in parallel with the first data storage facility ....

'497 Patent, Col. 31, ll. 9-14 (emphasis added). In describing the second command, Claim 1 states,

in response to a second command ... *attaching* the second storage facility *to be addressed by the second application whereby the first and second applications thereafter can access the data sets* in the first and second data storage facilities respectively and concurrently ....

'497 Patent, Col. 31, ll. 15-25 (emphasis added).

With respect to the second command, the italicized language implies that the term "attaching" does not denote a "complete" attachment after which the second application can, without additional steps, access the second data storage facility. In fact, such language specifically implies that the purpose of the "attaching" function is to allow the second storage facility "to be addressed," i.e. at some time in the future perhaps after other steps have been completed, by the second application. "Thereafter," i.e. after that attachment, the first and second applications can access the data sets in both data storage facilities.

Nor does the language with respect to the first command imply that the term "attaching" requires a "complete" attachment. Although the language of the first command seems to suggest that the direct result of the subject "attaching" is the establishment of a mirrored copy of the data in the second data storage device, that language must be read in light of the preamble to Claim 1 which states, in relevant part,

[a] method for controlling access to a data set ... *wherein the data set is stored in a first data storage facility that is addressable by the first application* ....

'497 Patent, Col. 31, ll. 3-6. At the outset of this method claim, therefore, the patentee acknowledges that the first application already can address the data stored in the first data storage facility and no further "bookkeeping operations" are needed to make the first data storage facility available to it. Consequently, the attachment of the first and second data storage systems can, without further ado, "establish" a mirrored copy of the data in the second data storage facility. Use of the term "attaching" in the context of the first command, therefore, does not *require* that term to be defined as a "complete" attachment.

Moreover, the language of dependent Claim 9 of the '497 Patent unambiguously suggests that the term "attaching" can be defined as, at least, "producing a ready status." Claim 9 states

[a] method as recited in claim 1 wherein each of the first and second data storage facilities comprises first and second logical volumes on first and second disk drives, respectively, each of the disk drives connecting through a corresponding device controller *to be attached to the first and second data storage facilities by producing a ready status to the first and second applications* ....

'497 Patent, Col. 32, ll. 29-38 (emphasis added). Because similar claim terms, comparably used, must be construed uniformly within the same patent, Claim 9 provides some evidence that the term "attaching" ought to be defined as making a device physically or logically available by, for example, producing a ready status. As illustrated above, the language of Claim 1 does not hinder that construction.

Although the Specification of the '497 Patent does not specifically refer to the term "attaching," it clearly

describes that process in terms of making a device physically or logically available by producing a ready state. Indeed, with respect to the first command (called "the establish command"), the Specification states

the ESTABLISH command *effectively connects* the BCV [Business Continuation Volume] device **226** as an M3 mirror volume to define a BCV pair with the mirrored storage Volume A. *Now the BCV device **226** status as seen by the Volume B application **222** is Not Ready (NR). The status as seen by the Volume A application 221 and copy program is Ready.*

'497 Patent, Col. 17, ll. 58-64 (emphasis added).FN14

FN14. A Business Continuation Volume is described in the Specification of the '497 Patent as a device comprised of a standard disk controller and related disk storage devices especially configured to independently support applications and processes. *See* '497 Patent, Col. 16, ll. 8-15.

The plain and ordinary meaning of the term "attach" is to "make fast or join." *Webster's Third International Dictionary,* 140 (1981). Although the quoted portion of the Specification uses the term "connect" rather than its synonym "attach," it clearly illustrates that such "connection" is marked by a device status of "Ready" or "Not Ready", depending upon the subject application. Moreover, although the phrase "bookkeeping operations" is mentioned with respect to the first command, it appears wholly unrelated to the function of establishing a mirrored copy and, in any event, the Specification clearly states that such operations "do not form part of this invention." *See* '497 Patent, Col. 18, ll. 26-28.

Likewise, in the context of the second command (also called "the split command"), the Specification implies that the term "attaching" includes making a device physically or logically available by producing a ready state. In fact, in describing the first response to the split command the Specification states

[n]ext the status of the BCV device **226** in the context of its mirror operation is discontinued by setting the device to a Not Ready (NR) state with respect to the system responsive to the Volume A application **221.**

'497 Patent, Col. 19, ll. 8-12. Later, in describing the second response to the split command, the Specification states,

[*s]tep **262** then sets the BCV device **226** to a ready state with respect to the Volume B application **222.*** In step **263** the device controller posts a complete status as a return message. The host adapter [which is part of the data storage system and not affiliated with the host computer], in step **264,** receives that status and reconnects. When this occurs, the Volume B application **222** now accesses the data set as it stood at the instant of the SPLIT command.

'497 Patent, Col. 19, ll. 56-62 (emphasis added). Each of the prior descriptions related to the dual prongs of the split command reinforce EMC's contention that the term "attaching" includes making a device, such as a BCV, physically or logically available to a particular application (by setting the device to a ready state) and contradicts the supposition that it includes any additional "bookkeeping operations" on the part of the host computer. Thus, although the Specification mentions that other "bookkeeping procedures" may be required, such as updating device records on the data storage system, such procedures "do not form part of this invention." *See* '497 Patent, Col. 18, ll. 26-28.

In conclusion, both the claim language and the language of the Specification support EMC's construction of the term "attaching" and "detaching". Consequently, the term "attaching" will be construed to mean making physically or logically available such as by producing a ready state. Conversely, the term "detaching" means to make physically or logically unavailable such as by producing a not ready state.

(4) ***Other Miscellaneous Terms***

In at least one of its three claim construction memoranda and in its oral presentation at the *Markman* hearing, EMC proposed constructions of the following terms of the '497 Patent: (1) "data storage facility", (2) "configuring ... to correspond", (3) "data sets", (4) "blocks", (5) "reestablishing" and "restoring" and (6) "device controller." Although HP provided, in its initial claim construction memorandum, a chart with its own proposed constructions for each claim of the subject patents, it did not, at any time, including in its most recent proposed order on claim construction, directly challenge any of EMC's proposed constructions of those particular terms. Because this Court discerns no dispute with respect to such terms, it declines to address them at this juncture.

Finally, although EMC initially proposed to have this Court construe the claim term "terminating the memory mirror function", that term was not addressed in any subsequent memoranda nor at the *Markman* hearing. Although HP included that term in its proposed order on claim construction, its proposed definition ("halting, or stopping") is not inconsistent with EMC's initial proposal. There being no apparent dispute with respect to that claim term, this Court declines to construe it now.

ORDER

For the reasons described in the foregoing Memorandum, the disputed claim terms in the '347 and '792 Patents are construed as follows:

(1) a "data storage system" is a set of associated components working together to store data and a "data storage system controller" is a device that controls data storage operations and neither is required to include cache memory;

(2) "coupled" means connected, directly or indirectly, by a communication path;

(3) "an index" means at least one organized collection of information which may be contained in one or more data structures, including but not limited to tables, lists or directories, and which contains the requisite indicators providing an indication about the validity of predetermined data elements;

(4) Claim 10 of the '792 Patent does not require "an index";

(5) an "indicator" means information which provides a fairly certain sign or symptom of the validity of a predetermined data element. An indicator can include information about data located at a particular storage location on a storage device, such as a track, or about data stored in an entire storage device via a device-level indicator. The requisite first and second indicators may be organized at different levels so long as the second provides information with respect to the validity of the same predetermined data element as the first, even if that information is provided indirectly;

(6) "predetermined data element" means a part or unit of data, including the data on an entire storage device, which identity is determined beforehand and which is stored in the first or second data storage system;

(7) "valid" means correctly stored in a particular data storage system;

(8) "concurrently" and "concurrent" mean in parallel with and parallel, respectively;

(9) "providing an indication of whether a write is pending" means providing an indication of whether a write operation is in progress but not yet completed; and

(10) "additional information" means information in addition to the information identifying data stored on the first data storage system and not yet copied to the second, including device-level validity information.

The disputed claim terms in the '497 Patent are construed as follows:

(1) "command" means one or more words or instructions to initiate, terminate or otherwise control the execution of an operation which may be issued by a host computer, a service manager or other initiating device;

(2) "in parallel with" means that the two data storage systems are attached to correspond to one another in time such that a mirroring relationship is established whereby the two data storage facilities receive data from the first application concurrently; and

(3) "attaching" means making physically or logically available such as by producing a ready state and, conversely, the term "detaching" means to make physically or logically unavailable such as by producing a not ready state.

So ordered.

D.Mass.,2003.
EMC Corp. v. Hewlett-Packard Co., Inc.