United States District Court,
N.D. California.

In re TOWNSHEND PATENT LITIGATION

No. C 02-04833 JF

Aug. 26, 2004.

ORDER CONSTRUING CLAIMS OF UNITED STATES PATENTS NO. 5,801,695**, NO. 5,809,075, NO. 5,835,538, NO. 5,859,872, NO. 5,970,103, NO. 6,233,275, NO. 6,233,284, AND NO. 6,400,770**

FOGEL**, J.**

[Docket Nos. 166 & 171]

On May 5, 2004, the Court held a hearing for the purpose of construing disputed terms in the claims of United States Patents No. 5,801,695 ("the '695 patent"), No. 5,809,075 ("the '075 patent"), No. 5,835,538 ("the '538 patent"), No. 5,859,872 ("the '872 patent"), No. 5,970,103 ("the '103 patent"), No. 6,233,275 ("the '275 patent"), No. 6,233,284 ("the '284 patent"), and No. 6,400,770 ("the '770 patent"). After consideration of the arguments and evidence presented by the parties and the relevant portions of the record, the Court construes the disputed terms as set forth below.

I. BACKGROUND

On October 7, 2002, Plaintiff Townshend Intellectual Property, L.L.C. ("Townshend") filed suit against Defendants Agere Systems, Inc., Cisco Systems, Inc., Analog Devices, Inc., and Intel Corporation, alleging infringement of several of the claims of Townshend's '695, '075, '538, '872, '103, '275, '284, and '770 patents. Also at issue are Townshend's counterclaims against ESS Technology, Inc., which filed suit against Townshend on March 12, 2001. The Court consolidated the five actions on April 21, 2003. Subsequently, Analog Devices, Inc. was dismissed by stipulation of the parties. Townshend seeks compensatory damages, injunctive relief, treble damages for willful infringment, attorneys' fees, and other relief.

The patents share the same specification, with the exception of three of the patents ('872, '275, and '284), which are continuations-in-part of the original and thus contain some additional material. The invention generally relates to high-speed modem technology. A modem is used to translate digital signals from computers into analog signals, and vice versa, for transmission over and receipt from telephone lines. The patents describe a method of utilizing unique properties of Internet Service Provider ("ISP") computer connections to increase the speed of this data transmission process. In particular, the invention takes advantage of the fact that, because ISPs often are connected to the Internet via digital telephone lines, the modem at the ISP can transmit information more quickly. The patents describe a modem for use at the ISP site and one for use at the end-user site which together take advantage of the faster digital telephone lines to increase the speed of information transmission from ISP to end-user.

II. APPLICABLE LAW

Claim construction is a question of law to be decided by the Court. Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed.Cir.1995), *aff'd,* 517 U.S. 370 (1996). When assessing claim meaning the Court must ask what a person having ordinary skill in the art would understand the claim language to mean at the time of the invention. DeMarini Sports, Inc. v. Worth, Inc., 239 F.3d 1314, 1324 (Fed.Cir.2001). The Court must look first to the intrinsic evidence of record: the patent claims, the specification, and, if in evidence, the prosecution history. Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996). The general rule is that claim terms are to be given their ordinary and accustomed meaning. Johnson Worldwide Assocs. v. Zebco Corp., 175 F.3d 985, 989 (Fed.Cir.1999). However, the patentee may choose to be its own lexicographer and may use terms in a manner other than their ordinary meaning so long as the special definition is stated clearly in the patent specification or file history. Vitronics, 90 F.3d at 1582. The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication, and is considered to be "the single best guide to the meaning of a disputed term." *Id.*

In most situations, analysis of the intrinsic evidence will resolve any ambiguity regarding a disputed claim term. *Id.* at 1583. In such circumstances, the Court may not rely on extrinsic evidence. *Id.* However, where the intrinsic evidence is ambiguous as to a disputed term or the scope of the invention, the Court may turn to extrinsic evidence such as expert testimony, prior art, and inventor testimony. *Id.* at 1584. Such evidence may be used to help the Court understand the claims but may not be used to vary or contradict the claim language. *Id.*

Technical treatises and dictionaries may be used at any stage of the claims construction process. In fact, such sources likely should be used at the initial step of reading the claim language itself, because "[c]onsulting the written description and prosecution history as a threshold step in the claim construction process, before any effort is made to discern the ordinary and customary meanings attributed to the words themselves, invites a violation of [Federal Circuit] precedent counseling against importing limitations into the claims." Texas Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193, 1204 (Fed.Cir.2003), *cert. denied,* 123 S.Ct. 2230 (2003). In determining the ordinary meaning of a term, the Court may consult technical treatises and dictionaries publicly available at the time the patent is issued "at any time in order to better understand the underlying technology and may also rely on dictionary definitions when construing claim terms, so long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the patent documents." Vitronics, 90 F.3d at 1584 n.6; *see also* Teleflex, Inc. v. Ficosa N. Am. Corp ., 299 F.3d 1313, 1325 (Fed.Cir.2002). The intrinsic evidence and dictionaries must be considered together; because "words often have multiple dictionary definitions, some having no relation to the claimed invention, the intrinsic record must always be consulted to identify which of the different possible dictionary meanings of the claim terms in issue is most consistent with the use of the words by the inventor." Texas Digital Sys., Inc., 308 F.3d at 1203.

As a general claim construction principle, limitations found only in the written description of the specification of a patent should not be imported or read into a claim. *In re Donaldson,* 16 F.3d 189, 195 (Fed.Cir.1994); Laitram Corp. v. NEC Corp., 163 F.3d 1342, 1347 (Fed.Cir.1998). However, in some instances limitations from the specification may be imported into a claim. In such instances, the Court "looks to whether the specification refers to a limitation only as part of less than all possible embodiments or whether the specification read as a whole suggests that the very character of the invention requires the limitation be a part of every embodiment." Alloc Inc. v. Int'l Trade Comm'n, 342 F.3d 1361, 1370

(Fed.Cir.2003). Where "the specification makes clear at various points that the claimed invention is narrower than the claim language might imply, it is entirely permissible and proper to limit the claim." *Id*. A second exception applies if a claim is expressed in "means plus function" or "step plus function" format in accordance with 35 U.S.C. s. 112, para. 6, which states:

An element in a claim for a combination may be expressed as a means or a step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The first step in construing a means-plus-function limitation is to identify the function of the limitation recited in the claim. Texas Digital Sys., Inc., 308 F.3d at 1208. The next step is to identify the corresponding structure set forth in the written description necessary to perform that function. *Id*. "Structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id*. (quoting B. Braun Med., Inc. v. Abbott Labs., 124 F.3d 1419, 1424 (Fed.Cir.1997)). Corresponding structure is limited to that necessary to perform the recited function and its structural equivalents. Micro Chems., Inc. v. Great Plains Chem. Co., 194 F .3d 1250, 1257-58 (Fed.Cir.1999).

III. DISCUSSION

A. "analog signal"

This term appears in the claims of the '075, '695, and '103 patents. A representative claim of the '075 patent is set forth below with the disputed term highlighted in bold type.

1. A high speed data transfer system for communicating between a digital data source and an analog subscriber connected to a digital telephone network by an analog loop comprising:

an encoder coupled to said digital data source, said encoder converting an input from said data source into a series of codewords from a set of codewords corresponding to quantizer values utilized by said digital telephone network;

an interface for transmitting said series of codewords in digital form from said encoder to said digital telephone network; and

a decoder coupled by said analog loop to said digital telephone network, wherein said analog loop provides an analog signal to said decoder, which analog signal is an analog representation of said series of codewords, and wherein said decoder is responsive to said analog signal to reconstruct said series of codewords in digital form from said analog signal.

Townshend asks the Court to construe the term as "a continuously changing signal, as distinguished from a 'digital signal,' which pertains to a discrete or discontinuous signal. 'Digital signals' and 'analog signals' may be thought of as opposites." Defendants propose: "An electrical signal that varies continuously over a given range in both time and amplitude." Defendants assert that, because the term appears only in the preamble of the asserted claim of the '103 patent, it should be construed only for the '075 and '695 patents.

Townshend argues that the Court only need resort to a dictionary to construe the term. The dictionary

provided by Townshend contains two definitions for "analog signal": (1) a "signal that is solely dependant upon magnitude to express information content" and (2) a "continuously changing signal." *See* Declaration of Jennifer Ochs in Support of Townshend's Opening Claim Construction Brief ("Ochs Decl."), Ex. I (The IEEE Standard Dictionary of Electrical and Electronics Terms, 6th ed., ("IEEE Dictionary")). The word "analog" is used in other definitions to signify continuity or continuous change. Defendants look to alternative dictionaries to support their proposed construction. The Academic Press Dictionary of Science and Technology defines the term as "a signal whose parameters (such as amplitude, frequency, or phase) can change continuously over a given range as distinguished from a digital signal where only some discrete values (usually 2) are considered significant." *See* Declaration of Todd M. Friedman in Support of Defendants' Joint Claim Construction Brief ("Friedman Decl."), Ex. 10. In the Dictionary of Communications Technology, "analog signaling" is defined as "one that varies in a continuous manner, such as voice or music." Friedman Decl., Ex. 11. In the ITU-T's Vocabulary of Digital Transmission and Multiplexing, and Pulse Code Modulation (PCM) Terms, "analogue signal" is defined as "a signal one of whose characteristic quantities follows continuously the variations of another physical quantity representing information." Friedman Decl., Ex. 16. The Modern Dictionary of Electronics, 6th ed ., defines "analog signal" as

1. An electrical signal that varies continuously in both time and amplitude, as obtained from temperature or pressure, or speed transducers. A voltage level that changes in proportion to the change in a physical variable. 2. A signal representing a variable which may be continuously observed and continuously represented.

Friedman Decl., Ex. 20.

The specification does not define the term explicitly, and the claim language indicates only that "analog signal" is an analog representation of a series of codewords. *See also* '872:Fig. 11. Thus, the patent assumes that one of ordinary skill in the art would understand the meaning of "analog," and it is appropriate to consider dictionary definitions. At their core, all of the definitions reviewed above would indicate to a person of ordinary skill in the art that an analog signal continuously changes according to a changing input of information. *See also* Transcript of May 5, 2004 Hearing, 113:13-15 & 186:16-19. In contrast, a digital signal does not vary continuously, but rather is discontinuous or comprises discrete portions. *See* '872:Fig. 11; Ochs Decl., Ex. I. In other words, a digital signal varies with time, but only certain points are considered.

Defendants suggest two limitations, however. First, they propose that the signal must vary "over a given range." Nothing in the intrinsic or extrinsic evidence supports this additional limitation. While the signal may vary over a given range, it also may vary continuously over more than that range. Moreover, the meaning of "given range" is ambiguous, and the purpose of claim construction is to clarify the claim language, not to add ambiguous limitations. Indeed, Defendants appear to concede this issue. *See* Transcript of May 5, 2004 Hearing, 186:24-187:21. Second, Defendants assert that the signal must vary "in both time and amplitude." The additional phrase adds little, as an analog signal by definition is measured according to the parameters of time and magnitude. *See* '872:Fig. 11A; Ochs Decl., Ex. I. Finally, it is evident that the changes of an analog signal correlate with the changes of the input information that the signal represents. For example, the language of claim 1 of the '075 patent makes clear that "analog signal" is an analog representation of said series of codewords. Similarly, the IEEE dictionary indicates that the signal expresses information content. Ochs Decl., Ex. I; *see also* Transcript of May 5, 2004 Hearing, 119:7-8.

Defendants also assert that, because it appears only in the preamble of the asserted claim of the '103 patent, the term should be construed only for the '075 and '695 patents.

It is well settled that if the body of the claim sets out the complete invention, and the preamble is not necessary to give life, meaning and vitality to the claim, then the preamble is of no significance to claim construction because it cannot be said to constitute or explain a claim limitation.

Schumer v. Lab. Computer Sys., Inc., 308 F.3d 1304, 1310 (Fed.Cir.2002). Claim 6 of the '103 patent is set forth below, with the disputed term highlighted in bold type.

A high speed decoder for recovering a digital data stream from an analog signal transmitted to said decoder from a digital source connected to a digital telephone network interface via an analog loop connected to said decoder, comprising:

a clock recovery circuit including a clock estimator coupled to a clock synchroziner, said clock recovery circuit being coupled to receive an input signal from the analog loop;

an inverse filter coupled to receive a[sic] output from the clock recovery circuit; and

a converter coupled to the inverse filter, the converter providing an estimated code steam [sic] in response to an output of the inverse filter, wherein said code stream comprises a sequence of codewords associated with a codeword set utilized by the digital telephone network.

The preamble indicates that an analog signal is transmitted from a digital source to a decoder. The body of the claim lists elements of the decoder, but does not specify other aspects of the system including the analog signal. Because the preamble is not redundant, the Court's construction this term applies to claim 6 of the '103 patent.

Accordingly, the Court construes "analog signal" as "a signal (as measured by parameters of time and amplitude) that continuously changes."

B. "digital form"; "digital connectivity"; "digital connection"

This term appears in the '075, '695, '275, '284, '872, and '538 patents. Representative claims of the '075 patent are set forth below with the disputed terms highlighted in bold type.

1. A high speed data transfer system for communicating between a digital data source and an analog subscriber connected to a digital telephone network by an analog loop comprising:

an encoder coupled to said digital data source, said encoder converting an input from said data source into a series of codewords from a set of codewords corresponding to quantizer values utilized by said digital telephone network;

an interface for transmitting said series of codewords in digital form from said encoder to said digital telephone network; and

a decoder coupled by said analog loop to said digital telephone network, wherein said analog loop provides

an analog signal to said decoder, which analog signal is an analog representation of said series of codewords, and wherein said decoder is responsive to said analog signal to reconstruct said series of codewords in digital form from said analog signal.

30. A high speed data transfer method for a communications system connecting a data source to a subscriber, wherein said subscriber is connected to a digital telephone network by an analog loop and said data source is connected through a digital connection to said digital telephone network, said method comprising the steps of:

selecting a subset of digital codewords from a set of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied at a line interface which couples said digital telephone network to said analog loop;

mapping a data stream produced by said data source into a sequence of digital codewords from said subset of digital codewords;

transmitting said sequence of codewords through said digital connection to said digital telephone network;

converting said sequence of codewords into an analog signal at said line interface; and

at said subscriber, reconstructing said sequence of codewords from said analog signal.

Townshend asks the Court to construe "digital form" as

Pertaining to quantities in the form of discrete or integral values, as distinguished from "analog form," which pertains to data in the form of continuously variable physical quantities. ("Digital form" and "analog form" may be thought of as opposites. For example, a signal in digital form may not be input to a device that expects an analog signal, such as an analog-to-digital converter, however it may be put into a digital-to-analog converter and thereby be converted into an analog signal. Similarly, a signal in digital form does not require analog-to-digital conversion before transmission within the digital telephone network.)

Defendants ask the Court not to construe this term, asserting that it can be understood without any further clarification. In the alternative, they propose the following dictionary definition: "Digital: Represented by discrete digits, each distinct from the next ...." and "Form: The shape and structure of something as distinguished from its material...." Declaration of Todd M. Friedman in Support of Defendants' Joint Claim Construction Brief ("Friedman Decl."), Ex. 23.

Townshend asks the Court to construe "digital connectivity" and "digital connection" as

A connection in digital form, without analog-to-digital conversion. "Digital form" pertains to quantities in the form of discrete or integral values, as distinguished from "analog form," which pertains to data in the form of continuously variable physical quantities. ("Digital form" and "analog form" may be thought of as opposites. For example, a signal in digital form may not be input to a device that expects an analog signal, such as an analog-to-digital converter, however it may be put into a digital-to-analog converter and thereby be converted into an analog signal. Similarly, a signal in digital form does not require analog-to-digital conversion before transmission within the digital telephone network.

Defendants again ask the Court not to construe this term, asserting that it can be understood without any further clarification. In the alternative, they propose the following dictionary definition: "Digital: Represented by discrete digits, each distinct from the next...."; "Connection: The act of connecting: the state of being connected (connected: joined or linked together)"; and "Connectivity: The quality or state of being connective or connected." Friedman Decl., Ex. 23.

Although the plain language of the claims does not define the terms, the meaning of "digital" is clear to one of ordinary skill in the art. As stated previously, the invention involves the transfer of digital and analog signals. The cited dictionaries indicate that a digital signal is comprised of discrete, distinct, and discontinuous digits. Thus, Defendants' proposal as to the meaning of "digital" is sufficient.

The heart of the parties' dispute centers on the construction of "digital connection" or "digital connectivity." (The Court will consider the two terms together, and the terms will be used interchangeably.) Townshend seeks to clarify that a "digital connection" does not include the process of conversion from analog to digital or digital to analog. That is, it only includes transmission of digital to digital, with no intervening analog conversion. Defendants contend that Townshend is attempting to import a limitation from the specification.

However, by construing "digital connection" as excluding an analog conversion step, Townshend does not import a limitation from the specification, but rather defines the term consistent with the disclosed and claimed invention. Claims 1 and 30 in combination indicate that digital data is transmitted in "digital form" through a "digital connection" to the "digital telephone network." Similarly, in claim 30, digital codewords are transmitted through a digital connection to a digital telephone network, and only after that transmission are the digital codewords converted into an analog signal for transmission to the end-user. The claim language alone thus indicates that "digital connection" signifies transfer absent analog conversion. The term would be meaningless if it included an analog conversion step. "Digital connection" clearly is distinct from "analog loop," and the claim drafter must have intended the term to exclude an analog conversion step. The specification is wholly consistent with this view. For example, it describes the advantage of the system compared to the prior art as eliminating an analog conversion step at the site of the upstream data provider. *Compare, e.g.,* '695:Figure 3 *with* '695:Figure 2.

Accordingly, the appropriate construction of "digital connection" and "digital connectivity" is "a connection for transmission of information that remains in digital form throughout the connection." "Digital form" is "a structure represented by discrete, distinct, and discontinuous digits."

C. "high speed"

This term appears in the preambles of a variety of claims in the patents. Townshend asks the Court to construe "high speed"-along with the terms "high speed communication," "communication," "high speed data transfer," and "transferring data"-as "data are transferred from a digital data source to an analog subscriber at a rate higher than that of conventional modems, such as those described in ITU-T V.34 and previous ITU standards (i.e., higher than 33.6 Kbps), up to a theoretical maximum rate of 64 Kbps." Defendants ask the Court not to construe this term, asserting that it is not limiting because it appears only in claim preambles. In the alternative, they propose a dictionary definition, directing the Court to Exhibit 23 of the Declaration of Todd M. Friedman. However, that Exhibit includes no definition of "high speed."

It is well settled that if the body of the claim sets out the complete invention, and the preamble is not necessary to give life, meaning and vitality to the claim, then the preamble is of no significance to claim

construction because it cannot be said to constitute or explain a claim limitation.

Schumer, 308 F.3d at 1310. The body of the claims does not always include reference to the "high speed" nature of the invention. *See, e.g.,* '075:claim 1. Thus, it cannot be said that the body of the claim always sets out the complete invention: a claim with "high speed" in the preamble is limited to "high speed" systems.

Although the claim language does not define "high speed," the specification provides guidance. In describing the goal of the invention, the patentees state that with the prior art devices "it was not possible to transmit data at rates greater than approximately 35,000 bits/second," '695:8/13-14, and that the internal speed within a "digital telephone network [was] typically 56,000 or 64,000 bits/second," '695:8/48-49. Townshend also asserts that although the theoretical maximum speed of the prior art inventions was 36,000 bits/second, in practice, the upper limit was 33.6 Kpbs. Opening Brief, p. 7. "High speed" thus was not used as a precise term but rather as a term distinguishing the present invention from the prior art based on the speed of data transfer. As such, and as the patentee so described, the invention is capable of transferring data greater than the prior art speed-33.6 Kpbs-and potentially up to the theoretical maximum of "64,000 bits/second." This ranges constitutes "high speed" transmission as distinguished from the prior art. Finally, because the "system" includes the entire process of transferring data, it must include data transfer from the information provider to the end-user.

Accordingly, a person of ordinary skill in the art would understand "high speed" (as well as the speed aspect of the corresponding terms listed above) for the purposes of the invention to mean "a speed of data transfer from the provider to the end-user between approximately 33,600 and 64,000 bits/second."

D. "digital source"; "data source"

These terms appear in the '075, '695, and '538 patents. A representative claim of the '075 patent is set forth below with the disputed term highlighted in bold type.

1. A high speed data transfer system for communicating between a digital data source and an analog subscriber connected to a digital telephone network by an analog loop comprising:

an encoder coupled to said digital data source, said encoder converting an input from said data source into a series of codewords from a set of codewords corresponding to quantizer values utilized by said digital telephone network;

an interface for transmitting said series of codewords in digital form from said encoder to said digital telephone network; and

a decoder coupled by said analog loop to said digital telephone network, wherein said analog loop provides an analog signal to said decoder, which analog signal is an analog representation of said series of codewords, and wherein said decoder is responsive to said analog signal to reconstruct said series of codewords in digital form from said analog signal.

Defendants ask the Court not to construe these terms, asserting that they can be understood without any further clarification. In the alternative, they propose the following dictionary definition. "Data source: a device capable of originating signals for a data-transmission system." Friedman Decl., Ex. 23. Although it is not clear, they appear to propose, for "digital source," "a device capable of originating signals that are

represented by discrete digits, each distinct from the next, for a data-transmission system." Townshend asks the Court to construe the terms as "the originating source of the digital data (also called source data stream, digital data stream, etc.) which the end user desires to receive." Townshend thus seeks to exclude the possibility that the data source can be any intermediate component; instead, it interprets these terms as applying only to the *originating* source of the digital data. Defendants appear to share this concern. They direct the Court to Exhibit 23 of the Friedman Declaration, which defines "data source" as "a device capable of originating signals for a data-transmission system." The plain language of the claim also indicates that the signal originates at the data source and then is transmitted through several steps to the end user.

Townshend proposes an additional limitation: the data source is limited to that which provides data "which the end user desires to receive." Because nothing in the intrinsic or extrinsic evidence supports this proposed limitation, the Court declines to adopt it.

Accordingly, the Court construes this term as "a non-intermediary device capable of originating digital signals for a data-transmission system."

E. "data stream"; "bitstream"; "digital data"

These terms appear in the '075 and '538 patents. Representative claims of the '075 patent are set forth below with disputed terms highlighted in bold type

30. A high speed data transfer method for a communications system connecting a data source to a subscriber, wherein said subscriber is connected to a digital telephone network by an analog loop and said data source is connected through a digital connection to said digital telephone network, said method comprising the steps of:

selecting a subset of digital codewords from a set of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied at a line interface which couples said digital telephone network to said analog loop;

mapping a data stream produced by said data source into a sequence of digital codewords from said subset of digital codewords;

transmitting said sequence of codewords through said digital connection to said digital telephone network;

converting said sequence of codewords into an analog signal at said line interface; and

at said subscriber, reconstructing said sequence of codewords from said analog signal.

46. A method for transferring data between a first party having digital connectivity to a telephone system and an analog subscriber to said telephone system comprising the steps of:

encoding digital data at the first party into a sequence of symbols from a set of quantization symbols corresponding to quantizer values utilized by said telephone system and utilized at a line interface connecting a digital portion of said telephone system to said analog subscriber;

transmitting said sequence via said telephone system, said transmitting step comprising the step of

converting said sequence at said line interface into an analog signal for reception by said subscriber; and

at said analog subscriber, decoding the received analog signal to recover said digital data.

Townshend asks the Court to construe these terms as "the data which the end user desires to receive; this data is in digital form." Defendants ask the Court not to construe these terms, asserting that the terms can be understood without any further clarification. In the alternative, they propose the following dictionary definitions: "Data stream: serial data being transmitted over a channel"; "bitstream: a binary signal without regard to groupings in character; often used in connection with synchronous transmission"; and "digital data: data represented by a sequence of code characters." Friedman Decl., Ex. 23.

As to the prior term, Defendants contest the addition of a subjective limitation. They cite examples from the specification in which data that the user does not necessarily "desire" may be transmitted. Townshend appears only to want to clarify that the data stream, bitstream, or digital data comes from the originating source, not some intermediary step, and that it is put into the encoder. It defines the intermediary source as "data stream input to the encoder, and not any data stream occurring anywhere in the system." Reply Brief, p. 9. The language of claim 30 indicates that the data stream is produced by a data source that is connected to a subscriber through a digital connection to a digital telephone network. Likewise, the language of claim 46 indicates that the digital data *at the first party* is encoded for transmission to and receipt by the analog subscriber. However, while other claim language may further limit them, the terms themselves need not incorporate limitations. Accordingly, the Court will construe "data stream" as "serial data being transmitted over a channel," "bitstream" as "a binary signal without regard to groupings in character, often used in connection with synchronous transmission," and "digital data" as "data in digital form."

F. "digital telephone network"

This term appears in the '075, '695, '770, and '538 patents. A representative claim of the '075 patent is set forth below with the disputed term highlighted in bold type.

49. A high speed data transfer system for communicating between a digital data source and an analog subscriber connected to a digital telephone network by an analog loop, comprising:

an encoder operatively associated with said digital data source, said encoder converting an input from said data source into a series of codewords from a set of codewords associated with quantizer values determined by said digital telephone network;

an interface for transmitting said series of codewords in digital form from said encoder to said digital telephone network;

a digital-to-analog converter located at a line interface between said digital telephone network and said analog loop, wherein said converter provides an analog signal to said subscriber over said analog loop, which analog signal is a representation of said series of codewords; and

a decoder associated with said subscriber and connected to said analog loop, said decoder being responsive to said analog signal provided to said subscriber by said converter to reconstruct, from said analog signal, said input from said data source.

Townshend asks the Court to construe the term as "the portion of the telephone network that carries digital signals." Defendants propose "the portion of the telephone system that carries digital signals between Central Offices (COs)." The plain language of the claim indicates that "digital telephone network" is a telephone network that transmits digital signals. For example, the claim describes a transfer system for communicating via a digital telephone network using digital data that must be converted to analog form after transfer over the digital telephone network. Nothing in the claim language supports a limitation that the digital telephone network is located "between Central Offices." Moreover, the specification, while clearly indicating that the digital telephone network *logically* is between the end user and the data source, does not support limiting the digital telephone network *physically*. The Court therefore declines to adopt Defendants' proposal.

However, the Court agrees with Defendants to the extent that they mean to argue that the interface (or digital network connection 132) is not part of the digital telephone network. The claim language clearly indicates that there is an interface for transmitting the digital signal (in the format of "codewords" in claim 49) to the digital telephone network. The specification similarly discusses a "digital network connection 132" to the digital telephone network. *See* '695:9/45-48. Thus, it cannot be true that any part of the system that carries digital signals is part of the digital telephone network. Nevertheless, the Court will adopt Townshend's proposal because, by limiting it to "the portion of the *telephone network,*" the term does not include the "interface" of claim 49 or the digital network connection 132 as described in the specification.

G. "codeword(s)"

This term appears in claims of all of the patents. A representative claim from the '075 patent is set forth below with the disputed term highlighted in bold type.

1. A high speed data transfer system for communicating between a digital data source and an analog subscriber connected to a digital telephone network by an analog loop comprising:

an encoder coupled to said digital data source, said encoder converting an input from said data source into a series of codewords from a set of codewords corresponding to quantizer values utilized by said digital telephone network;

an interface for transmitting said series of codewords in digital form from said encoder to said digital telephone network; and

a decoder coupled by said analog loop to said digital telephone network, wherein said analog loop provides an analog signal to said decoder, which analog signal is an analog representation of said series of codewords, and wherein said decoder is responsive to said analog signal to reconstruct said series of codewords in digital form from said analog signal.

Townshend proposes: "a 'codeword' or 'digital telephone network codeword' is a set of signal elements representing the quantized value of a sample in PCM; there are multiple possible representations of the same codeword. Particular requirements for these codewords are specified or described in the G.712, G.711, and G.701 Standards." Defendants propose:

a character signal, which is a set of signal elements representing the quantized value of a sample in PCM. Particular requirements for character signals are specified or described in the G.712, G.711, and G.701

Standards, including that each character signal consists of 8 bits according to (mu)-law or A-law coding. (Ex. 9 at 4).

Defendants contend that it is improper to add the limitation that "there are multiple possible representations of the same codewords," while Townshend argues that it is unnecessary to include the limitation that "each character signal consists of 8 bits according to (mu)-law or A-law coding."

The claim language indicates that "codewords" correspond to quantizer values and that data from the data source are converted into codewords that are transmitted in digital form via the digital telephone network to the analog subscriber. The specification indicates that, while the signal is represented in eight-bit format, it also may be converted to a linear representation. *See* '695:11/43-48. The parties agree that "codewords" "is a set of signal elements representing the quantized value of a sample in PCM" and that "particular requirements for these codewords are specified or described in the G.712, G.711, and G.701 Standards." *See also* Transcript of May 5, 2004 Hearing, 171:10-13 & 172:5-8. The G.701 Standard Vocabulary provides further explication of the relevant terms. Friedman Decl., Ex. 16 ("ITU-T's Vocabulary of Digital Transmission and Multiplexing, and Pulse Code Modulation (PCM) Terms"). "PCM" is an acronym for "pulse code modulation," which is "a process in which a signal is sampled, and each sample is quantized independently of other samples and converted by encoding to a digital signal." *Id*. "Signal element" is a "part of a digital signal, characterized by its discrete timing and its discrete value, and used to represent a digit." *Id*. In the PCM technique, a signal is quantized. "Codewords" is a set of signal elements corresponding to the quantized values. A "signal element" represents a digit and is part of a digital signal.

The G.711 Standard describes a "character signal before inversion of the even bits" as consisting of a group of combinations of eight binary digits, providing a total of 256 possible representations of quantized values. Friedman Decl., Ex. 17. However, the G.711 Standard merely makes a recommendation, for example, stating that "eight binary digits per sample should be used for international circuits." *Id*. A-law and (mu)-law are *recommended* encoding laws. *Id*. (It also mentions a 13(14) bit uniform law. *Id*.) The conversion from uniform PCM values is left to the individual equipment specification.

The extrinsic evidence is consistent with the definition of codewords as "a set of signal elements corresponding to the quantized levels." Nothing in this definition or the extrinsic evidence limits the term to a certain eight-bit embodiment. Even if Defendants are correct in arguing that only eight-bit codes may be transmitted over a digital telephone network, the codewords might exist in other formats when not traversing the digital telephone network. For example, in the above representative claim, the codewords are transmitted from the encoder to the digital telephone network in digital form via an interface, which then could translate the codewords into eight-bit format. It thus is entirely possible, although not required, that there are at least two codeword representations of a quantizer value: one representation existing within the encoder and another existing in the digital telephone network. Defendants concede that they only seek to clarify that the eight-bit code is the standard presently used in the digital telephone network and that they would not object to the claim including other formats, should such formats exist. *See* Transcript of May 5, 2004 Hearing, 173:8-25 & 174:23-24. In other words, they appear to define the term according to whatever standards exist or may evolve over time. Defining a term according to such a principle would lead to a hopelessly indefinite construction; other inventors would not be able to discern what such a continuously evolving description of intellectual property would include.

Accordingly, the Court concludes that one of ordinary skill in the art would have understood "codewords" to include any digital representation of a signal element corresponding to the associated quantized value.

Although the specification may have referred to the eight-bit standard for convenience, other standards are not necessarily precluded. The Court will adopt Townshend's construction, keeping in mind that this issue likely will be revisited in any infringement analysis.

H. "a set of digital telephone network codewords ... corresponding to a set of quantization values applied in a line interface"; "[a subset of ...] digital telephone network codewords corresponding to a set of quantization values applied in/at a line interface"; "a set of quantization symbols corresponding to quantizer values utilized by said telephone system and utilized at a line interface"

These terms appear in the '695 (claim 25), '538 (claims 4 and 22), and '075 (claims 30 and 46) patents. Representative claims, from the '075 patent, are set forth below, with the disputed terms highlighted in bold type

30. A high speed data transfer method for a communications system connecting a data source to a subscriber, wherein said subscriber is connected to a digital telephone network by an analog loop and said data source is connected through a digital connection to said digital telephone network, said method comprising the steps of:

selecting a subset of digital codewords from a set of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied at a line interface which couples said digital telephone network to said analog loop;

mapping a data stream produced by said data source into a sequence of digital codewords from said subset of digital codewords;; and

transmitting said sequence of codewords through said digital connection to said digital telephone network;

converting said sequence of codewords into an analog signal at said line interface; and

at said subscriber, reconstructing said sequence of codewords from said analog signal.

46. A method for transferring data between a first party having digital connectivity to a telephone system and an analog subscriber to said telephone system comprising the steps of:

encoding digital data at the first party into a sequence of symbols from a set of quantization symbols corresponding to quantizer values utilized by said telephone system and utilized at a line interface connecting a digital portion of said telephone system to said analog subscriber;

transmitting said sequence via said telephone system, said transmitting step comprising the step of converting said sequence at said line interface into an analog signal for reception by said subscriber; and

at said analog subscriber, decoding the received analog signal to recover said digital data.

The parties agree that the three terms should be considered synonymous for the purposes of claim construction. Townshend asks the Court to construe them as "a set of digital telephone network codewords ('codewords')." Townshend proposes the following definition of "codewords": "a 'codeword' is a set of signal elements representing the quantized value of a sample in PCM; there are multiple possible

representations of the same codeword. Particular requirements for these codewords are specified or described in the G.712, G.711, and G.701 Standards." Defendants propose: "the set of digital telephone network codewords that correspond to the set of discrete values used by a line interface to represent the continuous range of an analog signal, where each discrete value represents a non-overlapping section of the continuous range."

As they did with respect to the previous term, Defendants seek to add language to Townshend's proposal. According to Defendants, this term comprises only the codewords "that correspond to the set of discrete values used by a line interface to represent the continuous range of an analog signal, where each discrete value represents a non-overlapping section of the continuous range." Townshend concedes that Defendants' proposal is technically accurate, and disputes it only because it believes that its own construction is "more useful (and less confusing) to the factfinder." Reply, p. 14. However, because the Court finds that Defendants' language usefully clarifies the meaning of the term, it will adopt Defendants' proposal.

I. "encoder"; "encoding"

This term appears in the '538 (claim 13), '075 (claim 49), '872 (claim 1), '275 (claim 1), and '284 (claims 1 and 11) patents. Townshend asks the Court to construe it as "a device or method for converting digital data precisely and without error into a format compatible with the digital telephone network, i.e., into digital telephone network codewords ('codewords')." Defendants propose the following construction of "encoder": "a device that performs encoding." They propose the following dictionary definition of "encoding": "A means of producing a unique combination of bits (a code) in response to an analog input signal." Friedman Decl., Ex. 23.

The claim language and the specification indicate that the encoder, for the purposes of this invention, takes digital data and converts them into codewords for transmission over a digital telephone network. Thus, it obviously is incorrect to limit the encoder to "respon[ding] to an analog signal. It also is inappropriate to import the limitation of converting the data "precisely and without error." Nothing in the claim language supports such a limitation. Finally, Defendants argue that "encoder" is a generic term, that should not be further limited to input of only digital data. Townshend argues that the word encoder is never used in the specification or claims other than to convert digital data into codewords. Although this is an appealing argument, the term "encoder" is never explicitly defined. Moreover, the claims as a whole limit the meaning of "encoder" by limiting its use, for example, to "convert[ ] an input from [a digital] data source into a series of codewords." '075:claim 49/32-33. The claim further states that the codewords are transmitted via the digital telephone network. Dictionaries support this view; they define "encode" generally and specifically. For example, to "encode" may mean "to convert data by the use of a code or a coded character set in such a manner that reconversion to the original form is possible," Friedman Decl., Ex. 27 (American National Dictionary for Information Processing Systems), or the "generation of a code word to represent a quantized value," Ochs Decl., Ex. P (ITU-T's Vocabulary of Digital Transmission and Multiplexing, and Pulse Code Modulation (PCM) Terms). Thus, for the purposes of the claimed invention, the term "encoder" evokes a general meaning that is further limited by the claim language.

Accordingly, the Court construes this term as "a device for or method of converting data by the use of a code or a coded character set in such a manner that reconversion to the original form is generally possible."

J. "subset"

This term appears in the '538 patent (independent claims 4, 21, and 22). Townshend asks the Court to

construe it as "as used in the context of the patents and claims, the term 'subset' refers to a 'proper subset'; that is, a subset which contains some but not all of the members of a larger set." Defendants propose "a set all the members of which are members of some given set."

Townshend asserts that Defendants' proposal is flawed because it could include the possibility of a subset composed of all of the members of the larger set. However, Defendants correctly assert that the definition of subset is "a set each element of which is an element of a specified other set." Friedman Decl., Ex. 27; *see also* Webster's Ninth New Collegiate Dictionary ("[A] set each of whose elements is an element of an inclusive set."). For example, a subset is defined according to more restrictive terms-pertaining to the elements' characteristics, not number-than the set from which it obtains its elements. Thus, to use Townshend's example, a subset of three apples need not only consist of two or fewer apples; it could be green apples. If it happens that all three apples are green, then the subset of apples would contain the same number as the group from which the subset is derived. It is thus entirely possible that an occasion may arise in which all of the elements of the set meet the more restrictive terms of the subset.

At first glance, the claim language appears inconsistent with this common definition of subset. For example, the relevant claims state:

4. A high speed data transfer encoder that generates digital signals for transmission over a digital telephone network and an analog loop to a subscriber, comprising:

a converter for converting a source data stream into a sequence of codewords selected from a predetermined set of codewords, wherein said predetermined set of codewords comprises a subset of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied in a line interface which couples said digital telephone network to said analog loop; and

an interface to the digital telephone network, said interface being coupled to said converter.

21. A high speed data transfer encoder for generating a plurality of digital signals for transmission over a digital telephone network to a plurality of analog subscribers, comprising:

means for converting at least two source data streams into at least two corresponding sequences of codewords selected from a predetermined set of codewords, wherein said predetermined set of codewords comprises a subset of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied in a line interface which couples said digital telephone network to said analog subscribers; and

a server connection coupling said converting means to said digital telephone network.

22. A high speed data transfer encoding method for communicating from a data source to a subscriber, wherein said subscriber is connected to a digital telephone network by an analog loop and said data source is connected through a digital connection to said digital telephone network, said method comprising the steps of:

selecting a subset of digital codewords from a set of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied at a line interface which couples said digital telephone network to said analog loop;

converting a data stream produced by said data source into a sequence of digital codewords from said subset of digital codewords;

sampling said sequence of digital codewords at a predetermined rate; and

transmitting said samples through said digital connection to said digital telephone network.

Thus, a subset of digital codewords is selected from a set of digital telephone network codewords. Similarly, a predetermined set of codewords comprises a subset of digital telephone network codewords. The subset thus is not further defined by property or characteristic. The only qualifier is that it is digital, which is also true for the digital telephone network codewords. This would suggest to a person of ordinary skill in the art that subset signifies a limited number of digital telephone network codewords.

However, Townshend did not act as its own lexicographer. The additional limitation of deriving a subset remains meaningful even if the subset, in some instances, is identical to the set. For example:

Although there are 256 possible (mu)-law codewords available for data transmission, the (mu)-law mapping results in these words being unequally spaced in the linear domain. Thus, some pairs of codewords will be more easily confused by decoder 156 due to line noise or other impairments. The source coder can restrict its output to a subset of these codewords to improve the accuracy of decoder 156 at the expense of reduced gross data rate. This can also be used to adapt decoder 156 to poor line conditions by reducing the codeword alphabet if the decoder detects that it is unable to separate code words within a given error criterion. By reducing the codeword set, improved error margins will result at the cost of decreased data rate. Thus, the system can handle degraded connections by lowering the data rate.

'538:24/51-64. Although the number of codewords may be reduced, it need not be if the connections are not degraded or the codewords will not be easily confused by the decoder. In fact, at one point in the prosecution history, Townshend used the word "proper" to modify "set," indicating that he understood the significance of omitting it. *See* Friedman Decl., Ex. 41.

Accordingly, the Court construes "subset," for the purposes of its application to the set of digital telephone codewords as used in this patent, as "a set that contains some or all of the elements of the set from which it is derived."

K. "analog loop"; "analog subscriber loop"

These terms appear in all of the patents. The parties agree that the terms are synonymous. Townshend asks the Court to construe them as "that portion of the signal path which includes the analog portion of a D/A converter at the line interface, the local loop, and ending at the A/D converter of the analog subscriber. The analog loop carries an analog signal." Defendants propose: "a circuit between the subscriber's premises and the central office that carries an analog signal. (Ex. 9 at 1)." Townshend seeks to include not only the "local loop 122," but also parts of the line interface and the decoder in its construction of analog loop, thus contending that any part of the signal path that contains an analog signal is the "analog loop." In contrast, Defendants label this part the "analog signal path" and argue that the "analog loop" is a portion of this path.

The claims provide insight into the distinction. First, it must be noted that the claims use "analog loop,"

"local loop," and "analog local loop" interchangeably. For example, in claim 1 of the '695 patent the antecedent reference is "analog local loop." In a subsequent clause, the claim uses the term "said local loop" referring to "analog local loop." In dependant claim 2, the term "said analog loop" also refers to "analog local loop." (The specification does not refer to "analog loop" and refers to "analog local loop" only twice.) Claim 49 of the '075 patent includes the element of "a digital-to-analog converter located at a line interface between said digital telephone network and said analog loop," clearly indicating that the analog loop is distinct from the line interface and the digital-to-analog converter. Similarly, claim 25 of the '695 patent specifies that the "line interface ... couples said digital telephone network to said analog loop."

Similarly, in the specification, "local loop" clearly does not include all portions of the analog signal path. For example,

Line interface 140 converts the digital data on digital network connection 138 into an analog form in a manner conforming to the standardized specifications of digital telephony. The analog form is carried on local loop 122 to the client's premises where a hybrid network 152 terminates the line and produces analog signal 154.

'695:9/56-61. The abstract describes a single telephone line interface and a single analog local loop. '695:abstract. The specification states where the signal becomes analog:

Line interface 140 converts the digital data on digital network connection 138 into an analog form.... The analog form is carried on local loop 122 to the client's premises where a hybrid network 152 terminates the line and produces analog signal 154. Hybrid network 152 is a standard part which converts the two-wire bidirectional signal to a pair of one-way signals. Decoder 156 uses analog signal 154 to estimate and compensate for the distortion introduced by the conversion to analog form performed by line interface 140, resulting in an estimate of the digital data at digital network connection 138, which is assumed to be identical to the digital data that was applied at digital network connection 132. The transformation performed by encoder 150 is then inverted and decoder 156 outputs data stream 126, which is a delayed estimate of the original data stream 100.

'695:9/56-10/5. Thus, the analog signal travels over a path that consists only partially of the analog local loop.

The intrinsic evidence clearly indicates that "analog loop" includes only the "local loop" described here and not all other portions of the pathway that carry analog signal. Accordingly, the Court construes these terms as "that portion of the signal path that includes only the local loop and carries an analog signal."

L. "subscriber"; "analog subscriber"

These terms appear in the '075, '695, and '538 patents. The parties agree that the terms are synonymous. Townshend asks the Court to construe them as "a customer or user of the telephone system, who is connected to the telephone network via the 'analog loop' (also called 'analog subscriber connection' or 'analog subscriber loop'); alternatively, the 'client modem' or 'client receiver' belonging to such a customer or user." Defendants propose: "anyone who pays for and/or uses the services of a communications system."

Defendants' proposal requires the subscriber to be a person. Townshend contends that it must also include the device used by the person. Not only is there nothing in the intrinsic evidence limiting the subscriber to a

person, but during prosecution Townshend declared to the USPTO that "an analog subscriber [is] represented by the 'client modem' or 'client receiver." ' Friedman Decl., Ex. 25, para. 8.

Townshend also argues that the term must be limited to *analog* subscribers. Although the intrinsic evidence does not define the term expressly, the specification and claims clearly indicate that the term is limited to analog subscribers that are connected to the telephone network via an analog connection. For example, claim 1 of the '075 patent states in part: "A high speed data transfer system for communicating between a digital data source and an analog subscriber connected to a digital telephone network by an analog loop. Similarly, the written description states:

An aspect of the present invention can also be used in conjunction with any application that can make use of ISDN or digital telephony. This can provide a functional equivalent to ISDN for transmission from a digitally connected party to a second party who has only analog connectivity to the telephone network. This could be done either directly using a system such as shown in FIG. 17, or by use of a mediating relay as shown in FIG. 20. A digital subscriber 480 can make a digital call to an *analog subscriber 490, who does not have direct digital access to the digital telephone network but has instead an analog subscriber connection* 488.

'695:24/49-59 (emphasis added). The specification thus indicates that an analog subscriber connects to the system via an analog connection.

Townshend's argument is persuasive. There is nothing in the intrinsic evidence limiting the term to a person, and the prosecution history and the specification support a construction limiting the term to analog connections, but extending it to both persons and client modems or receivers. Accordingly, the Court construes these terms as: "a customer or user-or device used by the customer or user-of the telephone system who is connected to the telephone network via the 'analog loop." '

M. "rate in excess of 33 kbps"

This term appears in the '538 (claim 34) and '695 (claim 48) patents. Townshend asks the Court to construe it as "at a rate higher than that of conventional modems, such as those described in ITU-T V.34 and previous ITU standards (i.e., higher than 33.6 Kbps), up to a theoretical maximum rate of 64 Kbps." Defendants contend that the term need not be construed. The Court agrees. The meaning of the term is self-evident.

N. "sampling"

This term appears in the '538 (claim 22) and '275 (claim 1) patents. Claim 22 of the '538 patent is set forth below, with the disputed term highlighted in bold type.

A high speed data transfer encoding method for communicating from a data source to a subscriber, wherein said subscriber is connected to a digital telephone network by an analog loop and said data source is connected through a digital connection to said digital telephone network, said method comprising the steps of:

selecting a subset of digital codewords from a set of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied at a line interface which couples said digital telephone network to said analog loop;

converting a data stream produced by said data source into a sequence of digital codewords from said subset of digital codewords;

sampling said sequence of digital codewords at a predetermined rate; and transmitting said samples through said digital connection to said digital telephone network.

Townshend asks the Court to construe the term as "the process of taking samples of a signal, usually at equal time intervals." Defendants propose: "obtaining a sequence of instantaneous values of a wave."

The claim language indicates only that sampling occurs at a predetermined rate. However, this limitation is provided by extra claim language. In fact, such limitation does not apply to "sampling" as it is used in claim 1 of the '275 patent. Dictionary definitions support this view. The ITU-T G.701 Vocabulary defines "sampling" as the "process of taking samples of a signal, usually at equal time intervals." "Sample" is defined as a "representative value of a signal at a chosen instant, derived from a portion of that signal." Defendants appear to have obtained their proposal from one of several definitions in The Academic Press Dictionary of Science and Technology. However, that dictionary also defines "sample" as "a representative segment of a larger whole that is studied in order to gain information about the characteristics of the whole." Friedman Decl., Ex 10. Nothing in the intrinsic evidence supports choosing a definition that limits sampling to a "wave."

According to the claim language, sampling clearly may involve digital or analog signals. For example, claim 22 of the '538 patent includes: "sampling said sequence of digital codewords." The specification also uses the term to indicate sampling of both analog and digital signals at discrete points in time. For example: "Encoder 150 converts this bitstream into a sequence of eight-bit words sampled, preferably, at the telephone system's clock rate of 8,000 samples/second," '538:10/47-50; "[a]nalog signal 154 from FIG. 3 is sampled by an analog-to-digital converter 240," '538:12/18-19; and a "clock synchronizer 260 ... resamples digital input signal 246," '538:12/53-54.

Accordingly, the Court construes this term as: "the process of collecting representative values of a signal, each derived from a portion of the signal (which may include both digital and analog signals), usually at equal time intervals."

O. "where M and N are integers that are known to the decoder"

This term appears in claim 1 of the '275 patent, which is set forth below, with the disputed term highlighted in bold type.

In a communication system that includes an encoder and a decoder, wherein the encoder has a digital connection to a digital portion of a telephone network and the digital portion of the telephone network is connected by an analog loop to the decoder, a training method comprising the steps of:

transmitting M repetitions of N codewords from the encoder to the decoder, where M and N are integers that are known to the decoder and said codewords correspond to PCM codes utilized by the digital portion of the telephone network;

at the decoder, sampling a received sequence of analog voltage levels corresponding to said transmitted

codewords;

storing a value associated with each sample;

analyzing the stored values; and

adjusting a parameter of the decoder in accordance with the analysis.

Townshend asks the Court to construe the term as "where M and N are integers that the decoder knows." Defendants propose: "the values of the integers M and N are determined and stored in the decoder before the codewords are transmitted." The parties thus agree on the construction except that Defendants seek to add the limitation that M and N are determined and stored in the decoder before the codewords are transmitted. In other words, Defendants appear to interpret the claim as requiring a communication from the encoder to the decoder of the specific values of M and N prior to the transmission of the codewords, whereas Townshend appears to believe that as long as the decoder is capable of comprehending the value of M after the repetitions are completely transmitted, then it could be said that the integer value of M is known to the decoder. Specifcially, Townshend argues that "are known" is not a past participle, but rather is a predicate adjective and is used in the present tense, and "the definition of 'known' in its *adjective* sense is 'generally recognized." ' Reply, p. 27. Defendants contend that "known" is the past participle of "know," which they define as the "fact of knowing, knowledge, intelligence." Opposition, p. 15.

Although the intrinsic evidence does not define the term, it supports Defendants' proposed construction. First, the claim describes a method for "training" a communication system in which a certain number of repetitions of a certain number of codewords is transmitted to a decoder, and the certain numbers "are known" to the decoder. This language strongly suggests that the decoder is aware of the *precise* number of codewords and repetitions contained in a transmission prior to the transimission. Townshend appears to argue that the decoder must be aware of integer values in the abstract. According to the argument, if, for example, there are three repetitions in a transmission, the decoder generally understands the meaning of the number three, although it did not know that there would only be three repetitions until the transmission ceased. Such an interpretation, however, renders the term irrelevant. Obviously, for the invention to work as claimed, the decoder must be able to understand the number of codewords and repetitions that it receives (as proposed by Townshend). If construed as Townshend proposes, the term would add nothing to the claim.

The specification also supports Defendants' proposal. For example, it states that "the decoder 156 receives the analog signal 154, which is the analog equivalent of the PCM codeword pattern, and stores it using prior knowledge of M and N." '872:21/4-6 (this language also is present in the '275 patent). The plain meaning of "prior knowledge of M and N" is that the decoder is aware of the values of M and N. There is no basis for interpreting this language as meaning that the decoder is capable of comprehending integers in general. However, nothing in the claim language indicates a step of storing or determining. The claim language merely indicates that the decoder must know the M and N prior to receiving the codewords.

Accordingly, the Court will construe the term as "where M and N are integers that the decoder knows prior to receiving the codewords ."

P. Claim 25 of the '695 Patent

1. The claim language

A high speed data transfer decoding method for use in communicating from a data source to a subscriber having a decoder, wherein said decoder is connected to a digital telephone network by an analog loop and said data source is connected through a digital connection to said digital telephone network, said method comprising the steps of:
initializing said decoder in response to an analog signal received by said decoder from said analog loop;

converting said analog signal into a sequence of codewords, wherein each of said codewords is selected from a set of digital telephone network codewords, said digital telephone network codewords corresponding to a set of quantization values applied in a line interface which couples said digital telephone network to said analog loop; and

extracting a data stream from said sequence of codewords.

2. "initializing said decoder in response to an analog signal"

Townshend asks the Court to construe this term as "setting parameters in the decoder to their starting values in response to the portion of an analog signal received before the commencement of normal operation, or data mode." Defendants propose: "setting parameters in the decoder to their starting values in response to an analog signal." The Court agrees with the parties that initialization must include "setting parameters to starting values," and this language is consistent with dictionary definitions. *See, e.g.,* Friedman Decl., Exs. 10 (Academic Press Dictionary of Science and Technology) & 11 (Dictionary of Communications Technology, 2d ed.).

Townshend, however, seeks to add a limitation defining the timing of the initialization. Townshend argues that the word "initializing" indicates that this step must be performed during the initial part of the communication and before the decoder begins its "normal" operation. The specification supports this view. For example, "[w]hen a connection is first established between a server and a client, both encoder 150 and decoder 156 of FIG. 3 must commence in a state known to each other." '695:17/25-27. The specification also describes an embodiment in which an eleven-step initialization process is "performed before the first sample is read from analog signal 154." '695:17/60-61. The written description thus uses the word "initialize" consistently with its plain meaning, which is "to set (as a computer program or counter to a starting position or value)." Webster's Ninth New Collegiate Dictionary. Defendants' proposal appears to be consistent with Townshend's to the extent that it implies that parameters are set to starting values one an analog signal is detected.

Townshend also seeks to add a limitation defining the portion of the analog signal that is involved in initializing. Indeed, it may be true that the early part of the analog signal must be used to initialize the decoder, because by definition initialization occurs prior to the other steps, and the same "said analog signal" is used in each of the steps. Alternatively, perhaps the decoder receives and stores information from an analog signal that contains the initialization information last in time, yet it does not act on the other portions of the analog signal until after the initialization occurs; that is, it stores the entire analog signal, and reacts only after the signal is completely received. Thus, although the claim specifies that a sequence of events occurs in the decoder, nothing in the claim itself requires a particular sequence of temporal information within the analog signal itself. The claim language permits both possibilities.

Finally, although the proposed terms "normal operation" and "data mode" are ambiguous, it appears that Townshend simply meant to state that initialization occurs prior to "converting" and "extracting." The claim

language clearly indicates such a sequence.

Accordingly, the Court construes this term as "setting parameters in the decoder to their starting values in response to the portion of an analog signal received before the commencement of the subsequent conversion and extraction steps."

3. "converting said analog signal into a sequence of codewords"

Townshend asks the Court to construe this term as "an analog signal is converted into a sequence of codewords." Defendants ask the Court not to construe the term, asserting that it can be understood without any further clarification. In the alternative, they propose: "converting the analog signal used to initialize the decoder into a sequence of codewords."

Townshend's construction is persuasive. There is no basis for limiting conversion to an initialization portion of the analog signal. The claim indicates that the decoder initializes, converts, and extracts in response in response to the receipt of an analog signal. It does not require conflation of the three steps or that the three steps to be performed using the same portion of the signal. The antecedent basis of "said analog signal" is "analog signal." Although the analog signal must have, in at least some portion of it, the basis for each of the three steps, the three very well could be distinct. Defendants' proposal appears to require conversion of the very portion that contains initialization information. However, as with the previous term, the Court points out that the two steps are performed on the same analog signal, although it is possible that they are performed on different temporal portions of that signal.

Accordingly, the Court construes this term as "all or part of the analog signal (all or part of which was used to initialize the decoder) is converted into a sequence of codewords."

4. "extracting a data stream from said sequence of codewords"

Townshend asks the Court to construe this term as "extracting from the sequence of codewords a delayed estimate of the data stream provided by the data source." Defendants propose: "extracting a data stream from the sequence of codewords converted from the analog signal used to initialize the decoder." Again, Defendants' proposal appears to require extraction of the very portion of the sequence that contains initialization information. For the reasons stated above, this view is unpersuasive; although the claim language states that all steps are performed on the same analog signal, it does not require all three to be performed on the same *portion* of the signal. Townshend also adds a "delayed estimate" limitation. Not only is the proposed limitation unsupported by the claim language, but Townshend provides no basis for including it. Accordingly, the Court construes this term as "extracting from the sequence of codewords a data stream provided by the data source."

Q. "training said decoder"

This term appears in claim 37 of the '695 patent. The claim language with the disputed term in bold is: "A high speed data transfer decoding method as claimed in claim 25, further comprising the step of training said decoder using a predetermined training pattern." *See* supra, p. 28 for claim 25.

Townshend asks the Court to construe it as "adjusting parameters in the decoder during a training or initialization period." Defendants propose: "a process for updating parameters in the decoder that follows initialization." The parties thus dispute whether training exclusively follows initialization or whether it can

be part of initialization. Townshend's view is supported by the intrinsic evidence. First, nothing in the claim specifies when training occurs. Second, the specification describes the use of training patterns or sequences during initialization. '695:13/10-12, 17/62-18/49, 19/5-22, 20:40-42. Townshend's construction would not render claim 25 superfluous. That is, initialization could occur with or without the more specifically defined training protocols; claim 37 merely describes a more detailed method-"using a predetermined training pattern-for initialization. Moreover, the training step could occur at other times as well. The Court will adopt Townshend's proposal.

R. Claim 6 of the '103 patent

1. The claim language

A high speed decoder for recovering a digital data stream from an analog signal transmitted to said decoder from a digital source connected to a digital telephone network interface via an analog loop connected to said decoder, comprising:
a clock recovery circuit including a clock estimator coupled to a clock synchroziner [sic], said clock recovery circuit being coupled to receive an input signal from the analog loop;

an inverse filter coupled to receive a output from the clock recovery circuit; and

a converter coupled to the inverse filter, the converter providing an estimated code steam [sic] in response to an output of the inverse filter, wherein said code stream comprises a sequence of codewords associated with a codeword set utilized by the digital telephone network.

2. "inverse filter"

Townshend asks the Court to construe it as "a filter that operates on an input signal to produce a compensated output signal." Defendants propose: "a device that operates to perform linear filtering operations on an input signal to produce a compensated output signal."

Defendants thus seek to add the limitations of "linear" filtering and "device." Townshend contends that nonlinear filtering can be performed and that software, instead of a device, may perform the filtering operations. Defendants concede that the filtering may be performed by something other that a "device," Opposition, p. 13; Transcript of May 5, 2004 Hearing, 154:20-24, and the Court agrees. There is nothing in the claim language supporting the importation of a "device" limitation.

The meaning of "inverse filter," however, is unclear from reading the claim language alone. The claim merely describes the logical position of the inverse filter in the decoder. It also implies that the inverse filter "inverts" the signal in some way. The specification provides sufficient clarification. It clearly indicates that the inverse filter "invert[s] the transformation performed by line interface 140 of FIG. 3 of which the primary component is lowpass filter 218 if FIG. 8," '695:12/58-60, and "also outputs a delay error estimate 270 giving the timing error inherent in synchronized signal 266," '695:12/61-62. That is, it undoes certain transformations that were performed on the signal when it was converted to analog form, and it prepares the signal to be converted once again to digital form. Such a description is sufficient to give meaning to the term consistent with the claim language.

The "Detailed Description of the Preferred Embodiments" section, specifically in Figure 12, also "shows the internal details of inverse filter 268 of FIG. 10." '695:13/48-49. It states that "[i]nverse filter 268 is an

example of an equalization means, which operates by performing linear filtering operations on an input signal ... to produce an output signal." '695:13/49-52. However, because this is not a means-plus-function claim, it would be improper to limit the term to a specific embodiment described in the specification. The claim language indicates that the inverse filter receives input from the clock recovery circuit and provides output to the converter. The specification makes clear that, in doing so, the inverse filter inverts the transformation performed by the line interface. Nothing in the claim specification or claim language requires limiting this process to a "linear operartion."

Accordingly, the Court construes this term as "a filter that operates on an input signal to produce a compensated output signal."

3. "converter coupled to the inverse filter, the converter providing an estimated code stream in response to an output of the inverse filter"

Townshend asks the Court to construe this term as "the converter estimates a sequence of codewords from the output of the inverse filter." Defendants contend that this element is a means-plus-function limitation and should be construed pursuant to 35 U.S.C. s. 112, para. 6. They propose that the function is "providing an estimated code stream in response to an output of the inverse filter" and the structure is a " 'linear-to-(mu) law converter 276' (Ex. 1 at col. 12:64 to 13:4; Ex. 9 at 7)."

The claim is not written in means-plus-function format, and thus there is a presumption against construing it as such. Apex, Inc. v.. Raritan Computer, Inc., 325 F.3d 1364, 1371-72 (Fed.Cir.2003). Moreover, the claim language cites sufficient structure: the "converter." *See e.g.,* Sage Prods., Inc. v. Devon Indus., Inc., 126 F.3d 1420, 1427-28 (Fed.Cir.1997). According to the claim language, the converter receives output from the inverse filter, which it converts into an estimated code stream. The general use of the term "converter" indicates that the patentee did not wish to limit it to a particular embodiment. Nevertheless, the patentee provided sufficient description of the term in the specification to render it definite. *See, e.g.,* '695:12/65-13/4. Accordingly, the Court will adopt Townshend's proposal.

IT IS SO ORDERED.

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In re Townshend Patent Litigation

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