

**BEFORE THE UNITED STATES JUDICIAL PANEL
ON MULTIDISTRICT LITIGATION**

**In re: Brandywine Communications
Technologies, LLC Patent Litigation**

MDL No. 2462

**HICKORYTECH CORPORATION'S RESPONSE IN OPPOSITION TO
BRANDYWINE COMMUNICATIONS TECHNOLOGIES, LLC'S
MOTION TO TRANSFER**

Pursuant to L.R. 6.1(c), HickoryTech Corporation respectfully submits this Response in Opposition to Plaintiff Brandywine Communications Technologies, LLC's Motion to Transfer to the Middle District of Florida Pursuant to 28 U.S.C. § 1407 for Coordinated or Consolidated Pretrial Proceedings. HickoryTech is the defendant in a separate action brought last year in Minnesota, Court File No. 0:12-cv-03187-ADM-FLN ("Minnesota Action").

INTRODUCTION

Brandywine has not met its burden to make a factual showing to prove that forcing HickoryTech and forty other defendants to a single case in Florida is warranted. Brandywine's motion fails to show there will be facts in common to the defendants across all these actions. Further, Brandywine has misapplied 28 U.S.C. § 1407 by presuming that consolidation is appropriate just because multiple district courts are faced only with common questions of law (the scope and validity of asserted patents). Brandywine's motion also fails to show transfer to the Middle District of Florida would be convenient for anyone other than Brandywine—a non-practicing entity whose only business activity to date is filing infringement lawsuits against scores of defendants from coast to coast in a clear attempt to monetize untested (and apparently widely-licensed) intellectual property. Because the Panel should not facilitate the scheme,

Brandywine's motion should be denied. Brandywine has made 41 beds, and now it must lie in each one.

PROCEDURAL AND FACTUAL BACKGROUND

HickoryTech is a regional telecommunications company headquartered in rural Minnesota.¹ HickoryTech offers high-speed internet, digital television, and telephone services in Minnesota, Iowa, parts of western Wisconsin, and eastern portions of the Dakotas. HickoryTech purchases and deploys off-the-shelf networking components that implement various DSL standards.² HickoryTech does not manufacture or modify any of the accused DSL equipment it purchases and deploys in its network.³

Brandywine is not a competitor of HickoryTech; indeed, it is not an internet or telephone provider. It apparently has no customers and no research and development or sales facilities, in Florida or elsewhere. What it has are six DSL-related patents bought in August 2010 that it uses to threaten anyone who uses or offers "DSL service, modems, and equipment."⁴

On December 26, 2012, Brandywine filed the Minnesota Action against HickoryTech, alleging infringement of United States Patent Nos. 5,206,854; 5,251,328; 5,812,537; 5,828,657; 6,970,501; and 7,894,472 (collectively, "the Asserted Patents"). HickoryTech answered on February 12, 2013, denying any liability.⁵ The parties conducted a Rule 26(f) planning meeting and the Minnesota court issued a detailed pretrial scheduling order on April 12, 2013.⁶

¹ See June 6, 2013 Declaration of Lane Nordquist ("Nordquist Decl.") at ¶ 2, submitted herewith as Exhibit A.

² *Id.* ¶ 3.

³ *Id.* ¶ 5.

⁴ See Brandywine's Complaint in the Minnesota Action, MDL No. 2462, ECF No. 1, Ex. A-42, at ¶¶ 27, 37, 47.

⁵ A true and correct copy of HickoryTech's Answer is attached hereto as Exhibit B.

⁶ A true and correct copy of the Pretrial Scheduling Order is attached hereto as Exhibit C.

Additionally, the parties agreed to a stipulation for a protective order, which was entered on May 2, 2013.⁷

Fact discovery is underway in the Minnesota Action. Brandywine has propounded an initial set of interrogatories, to which HickoryTech has responded. HickoryTech will soon be serving its discovery requests to Brandywine. The Minnesota case has not been stayed pending resolution of this transfer motion.

Pursuant to District of Minnesota Local Rules, Brandywine was required to submit an infringement claim charts in May, 2013.⁸ On May 21, 2013, Brandywine served its infringement claim charts, which were designated Attorneys' Eyes Only.⁹ No specific DSL equipment or service used or sold by HickoryTech is accused of infringement. Instead Brandywine vaguely refers to public DSL operating protocols and International Telecommunication Union (ITU) standards that have been adopted for DSL and then posits "on information and belief" that if HickoryTech's unspecified DSL modems, equipment and services meet the standard or protocol recited, then HickoryTech is an infringer.

HickoryTech contends that these infringement charts Brandywine served violate the Minnesota federal court's Local Rules obligations and the specific patent contention procedures set forth in Form 4 of those Local Rules. HickoryTech will be seeking an appropriate remedy. HickoryTech is otherwise scheduled to serve its non-infringement claim chart by July 21, 2013.

⁷ A true and correct copy of the Protective Order is attached hereto as Exhibit D.

⁸ The Minnesota federal court has adopted specific procedures for patent cases, which implemented a detailed pretrial order. *See* D. Minn. L. R., Form 4.

⁹ It is not clear why Brandywine used this designation. The infringement charts it served do not contain any information of Brandywine's that one could consider to be trade secret or confidential information. Moreover, they are so vague and conclusory that they could not contain any detailed information of HickoryTech that is "Confidential-AEO."

ARGUMENT

The JPML has the power to transfer “civil actions involving one or more common questions of fact [] pending in different districts . . . for coordinated or consolidated pretrial proceedings.” 28 U.S.C. § 1407(a). To merit transfer under § 1407, the moving party must affirmatively demonstrate that (a) the actions involve common issues of fact, (b) the actions must be pending in more than one district, and (c) transfer would be convenient for the parties and promote the just and efficient conduct of the actions. *Id.*

Whether in a patent case or otherwise, transfer to create an MDL is not automatic. Transfer “must promote the mandate of Section 1407 by creating significant litigation efficiencies and judicial clarity.” *In re CVS Caremark Corp. Wage and Hour Employment Pracs. Litig.*, 684 F. Supp. 2d 1377, 1379 (J.P.M.L. 2010). The moving party, therefore, has the burden of demonstrating transfer is warranted. *In re Select Retrieval, LLC ('617) Patent Litig.*, 883 F. Supp. 2d 1353, 1354 (J.P.M.L. 2012). In the context of patent litigation, transfer under § 1407 is not appropriate where “the litigation has not progressed to a point that the parties have determined the specific nature of that alleged infringement or to what extent infringement allegations will be common to the defendants across these actions.” *Id.*

1. Brandywine Has Not Met Its Burden To Prove That Centralization Is Warranted.

The Plaintiff seeks to force HickoryTech and over forty defendants from Maine to Oregon to litigate in the Middle District of Florida. Brandywine has the burden of proving its entitlement to this relief. *See In re Advantage Investors Mortgage Corp. Funds Litig.*, 268 F. Supp. 2d 1379, 1380 (J.P.M.L. 2003) (movant bears the burden of meeting statutory requirements).

A. Brandywine Has Failed To Identify Common Questions Of Fact Justifying Transfer Under § 1407 Because Insufficient Common Questions Exist.

In any patent cases, there are issues of fact (e.g., infringement, license, laches, etc.) and issues of law (e.g., claim construction, validity, etc.). Brandywine's Motion fails to show there will be facts in common to the defendants across these actions. In its motion, Brandywine claims that these cases meet the statutory criteria "because the same six patents are asserted in each case." Brandywine is mistaken. MDL panels have rejected the argument that consolidation is warranted just because the same patents are being asserted in multiple cases. *See In re Droplets, Inc. Patent Litig.*, --- F. Supp. 2d. ---, MDL No. 2403, 2012 WL 6554422, at *1 (J.P.M.L. Dec. 12, 2012); *In re Select Retrieval* 883 F. Supp. 2d at 1354; *In re Genetic Techs. Ltd. ('179) Patent Litg.*, 883 F. Supp. 2d 1337, 1337-38 (J.P.M.L. 2012). Brandywine must do more than show common patents to meet its burden; it must show that common fact issues predominate the underlying infringement actions and that transfer would both be convenient for the parties and promote the just and efficient conduct of its myriad infringement actions. Brandywine has not met – and cannot meet – its burden because it is likely that multiple, discrete, and non-common questions of fact will predominate.

First, the liability of each defendant in each action is an individual question, implicating unique questions of fact about very different DSL providers. Brandywine has sued a wide variety of companies. Each company's business, while related to telecommunications, is different.

There appear to be three broad groupings of defendants caught so far in Brandywine's net: large, national telecommunications companies (e.g. AT&T, Verizon, CenturyTel), resellers of the national carriers' DSL service (e.g., Corporate West Computer Systems, Inc., Impulse Advanced Communications, LLC); and smaller, independent telephone companies who build and maintain their own facilities to serve localized, sometimes rural areas (e.g., HickoryTech,

Consolidated Communications Holdings Inc.). Brandywine must prove that each defendant is infringing the Asserted Patents based on that defendant's particular equipment, services and conduct. As is made clear by other defendants opposing the transfer request, there have also already been past licenses broadly granted by Brandywine to DSL component chipset vendors, so each defendant will have unique, and individually complicated, licensing histories.¹⁰ Moreover, the time periods of operation of each accused defendant will vary based on the technical specifications of each defendant's products or services through the years.^{11, 12} These myriad of factual differences will negate any purported efficiency to be gained by consolidation. *See In re Ambulatory Pain Pump-Chondrolysis Products Liability Litig.*, 709 F. Supp. 2d 1375, 1377 (J.P.M.L. 2010) (denying motion to transfer under § 1407 where "individual issues of causation and liability continue to appear to predominate, and remain likely to overwhelm any efficiencies that might be gained by centralization").

Second, the validity and enforceability defenses and counterclaims of each defendant do not justify transfer under § 1407, because validity and enforceability are questions of law. § 1407(a); *see, also, e.g., Quaker City Gear Works, Inc. v. Skil Corp.*, 747 F.2d 1446, 1453-54 (Fed. Cir. 1984) (holding that whether a patent satisfies the enablement requirement of 35 U.S.C. § 112 is a question of law that "may involve subsidiary questions of fact or of law").

¹⁰ HickoryTech has had different modem and DSLAM vendors over time. *See Nordquist Decl.*, ¶ 4. Identifying which vendors have licensed chipsets, and when, will require highly individualized discovery regarding each of the 41 defendants.

¹¹ As explained in the DSL overview document submitted with this opposition, the key components for working this proof appear to be DSL modems and central-office end DSLAMs. *See Exhibit E attached hereto.* Some DSLAM/modem manufacturers are licensed; some are not. Some defendants have equipment suppliers in common; some do not.

¹² All Brandywine can offer to guide the Panel is that same undefined "DSL service, modems, and equipment" constitute on infringement. *See Brandywine's Complaint in the Minnesota Action*, MDL No. 2462, ECF No. 1, Ex. A-42, at ¶¶ 27, 37, 47.

Brandywine's argument is that these "background questions of fact concerning numerous anticipated issues regarding the interpretation, [], validity, and enforceability" justify transfer under § 1407. Brandywine's premise, however, is both wholly conclusory and totally fails to show that "any common questions of fact *as opposed to questions of law* . . . justify Section 1407 transfer." *In re Telecomm. Providers' Fiber Optic Cable Installation Litig.*, 199 F. Supp. 2d 1377, 1378 (J.P.M.L. 2002) (emphasis added). Brandywine has not cited a single case where an assumption about potentially common fact questions underlying purely legal questions are, by themselves, enough to support wholesale MDL transfer of a patent case.

Moreover, even the litigation activities for construction and validity of the six asserted patents creates inefficiencies in a single forum. Some litigations are so far ahead (and some have not even started the process) that it is unfair and inefficient to require a reset of all defendants in Florida. Corporate West has not even answered yet; HickoryTech is in the fact discovery and claim chart process; the ATT defendants are in the middle of claim construction arguments; CenturyTel has already argued and received a claim construction order on some terms – in a proceeding that Hickory never participated in. As a matter of federal law of preclusion, a final invalidity finding in the CenturyTel or ATT matter may bind Brandywine, but it does not bind HickoryTech or others. *See Blonder-Tongue Labs. v. Univ. of Illinois Foundation*, 402 U.S. 313, 350 (1971).

B. Brandywine Has Failed To Show Consolidation Would Be Convenient Because It Would Clearly Inconvenience The Defendants And The Courts.

Brandywine also had the burden to show that transfer to the Middle District of Florida would "be for the convenience of parties and witnesses" and would "promote the just and efficient conduct of such actions." § 1407(a). Brandywine failed to meet this burden. Brandywine makes two conclusory "justice and efficiency" arguments in support of its motion.

First, it alleges that transfer will allow a single transferee judge to schedule pretrial hearings to “consider all parties’ legitimate discovery needs while ensuring that common parties and witnesses are not subject to duplicative discovery demands.” What Brandywine leaves out is that the *only* common party here is Brandywine itself. Whether any of the named inventors on Brandywine’s patents would ever be witnesses in the case is – like other aspects of the transfer motion – speculative at this time. Brandywine’s self-interest does not justify transfer. Moreover, there are other procedures for cooperation among the multitude of differently-situated defendants can minimize duplicative discovery without transfer. *See In re Dollar Tree Stores, Inc.*, 829 F. Supp. 2d. 1376, 1377 (J.P.M.L. 2011) (denying transfer).

Second, Brandywine alleges that centralization offer substantial savings by having a single judge become acquainted with the Asserted Patents. This may be true, but Brandywine is seeking consolidation before its chosen judge that has already become acquainted with the Asserted Patents because of the CenturyTel case. Thus, what has recently been described by the Chief Judge of the Federal Circuit as “the single most important event in the course of a patent litigation” – claim construction – has already occurred without any other defendants in Florida. *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 659 F.3d 1369, 1370 (Fed. Cir. 2011) (en banc) (Moore, J., with whom Rader, C.J., joins). If Brandywine were to get its way, the now completed claim construction process in the Florida court threatens to practically deprives numerous defendants from making their own arguments on legal questions about the construction of asserted patents.

Because the variety of DSL systems and equipment in use by over forty defendants over time, there are unique claim construction issues that need to be decided. The substantive right to appear and be heard outweighs any one-and-done efficiencies. *Cf. In re Transdata, Inc. Smart*

Meters Patent Litig., 830 F. Supp. 2d. 1381, 1382 (J.P.M.L. 2011) (ordering transfer where claim construction had not yet taken place, and noting with approval that a previously-scheduled claim construction hearing was postponed pending resolution on the motion to transfer); *see also* *j2 Global Commc 'ns, Inc. v. EasyLink Servs. Int'l Corp.*, Case No. 09-04189, 2011 WL 1532048, at *2 (C.D. Cal. Apr. 21, 2011) (denying motion to amend complaint and add an additional patent already constructed in an accompanying case because “where the court has held a *Markman* hearing, each party must be afforded a full and fair opportunity to participate”)

Brandywine cannot meet its burden to show transfer would be for the convenience of parties and witnesses because centralization in Florida will significantly increase the costs and inconvenience of litigation of many, if not most, of the parties. For example, HickoryTech is a regional telecommunications provider headquartered in Mankato, Minnesota. All of its employees and customers reside in the upper Midwest.¹³ The burden of this litigation on HickoryTech in time and expense is substantial already. Forcing it from its local venue will impose even more hardship. *See In re Yellow Brass Plumbing Component Products Liability Litig.*, 844 F. Supp. 2d 1377, 1379 (J.P.M.L. 2012) (motion denied where significant inconvenience outweighed any benefits to centralization).

Brandywine chose to litigate simultaneously in a myriad of districts. This may be part of Brandywine’s business strategy, seeking to lead to early settlements under the cloud of uncertainty. *Cf. Eon-Net LP v. Flagstar Bancorp.*, 653 F.3d 1314, 1327 (Fed. Cir. 2011) (noting the strategy of extracting early, nuisance settlements from multiple targets to ensure that baseless infringement claims remain unexposed). But Brandywine’s enforcement strategy comes with a cost that it now wants to shift to widely disparate defendants. Neither HickoryTech nor any other

¹³ *See Nordquist Decl.*, ¶ 4.

defendant should have to bear increased and unnecessary costs to litigate all pretrial issues in a distant district federal court.

2. Brandywine's Conduct Flies In The Face Of Congress' Attempt To Limit Suits By Non-Practicing Entities.

The American Invents Act significantly narrowed the ability for patentees join multiple defendants based on identical allegations. *See* 35 U.S.C. § 299.¹⁴ The stated purpose of the anti-joinder provision of the America Invents Act was to end “the abusive practice of treating as codefendants parties who make completely different products and have no relation to each other.” 157 Cong. Rec. H4420-06, 2011 WL 2472415 (June 25, 2011) (statement of Rep. Goodlatte). Brandywine, following the path of non-practicing entities, is attempting an end-run around this clear prohibition.

Recent press reports describe even more governmental efforts to limit suits against multiple defendants, particularly downstream users like HickoryTech. Brandywine has sought to avoid technical joinder by seeking “de facto” transfer via MDL transfer for all pre-trial purposes. Brandywine’s “sue and consolidate” strategy is contrary to the clear intent of Congress to limit suits against multiple defendants. Brandywine found its way to Minnesota to make its case against HickoryTech, and Minnesota is where this case should stay.

CONCLUSION

Centralization is unwarranted because Brandywine has failed to meet its burden of showing common facts predominate the underlying litigation and transfer would be convenient to HickoryTech or to any of the parties. Brandywine’s motion should be denied.

¹⁴ HickoryTech recognizes that § 299 does not foreclose use of multidistrict litigation in the proper patent case. *See In re Bear Creek Techs. ('722) Patent Litig.*, 858 F. Supp. 2d 1375 (J.P.M.L. 2012). However, the equities here do not favor consolidation, and motions for transfer and consolidation by non-practicing entities such as Brandywine should require strict compliance with § 1407(a).

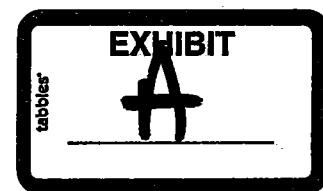
Dated: June 7, 2013.

Respectfully submitted,

By: s/Kevin D Conneely

Kevin D. Conneely (#192703)
Ruth Rivard (#327591)
Benjamin P. Freedland (#0391125)
Leonard, Street and Deinard
Professional Association
Suite 2300
150 South Fifth Street
Minneapolis, Minnesota 55402
612.335.1799
612.335.1657 (fax)
kevin.conneely@leonard.com
ruth.rivard@leonard.com
benjamin.freedland@leonard.com

ATTORNEYS FOR DEFENDANT
HICKORYTECH CORPORATION



**BEFORE THE UNITED STATES JUDICIAL PANEL
ON MULTIDISTRICT LITIGATION**

**In re: Brandywine Communications
Technologies, LLC Patent Litigation**

MDL No. 2462

**DECLARATION OF LANE NORDQUIST IN SUPPORT OF
HICKORYTECH CORPORATION'S RESPONSE IN OPPOSITION TO
BRANDYWINE COMMUNICATIONS TECHNOLOGIES, LLC'S
MOTION TO TRANSFER**

I, Lane Nordquist, declare and state as follows:

1. I am the Chief Information Officer of HickoryTech Corporation ("HickoryTech").

I am making this Declaration for the purpose of HickoryTech's Opposition to Brandywine Communication Technologies, LLC's Motion to Transfer. I am personally familiar with the matters addressed and the statements made in this declaration.

2. HickoryTech is a regional telecommunications company headquartered in Mankato, Minnesota. Additionally, HickoryTech has offices in the cities of Edina, Plymouth and Duluth, Minnesota; Rock Rapids and Urbandale, Iowa; and Fargo, North Dakota.

3. HickoryTech offers high-speed internet, digital television, and telephone services in Minnesota, Iowa, eastern portions of the Dakotas, and western portions of Wisconsin.

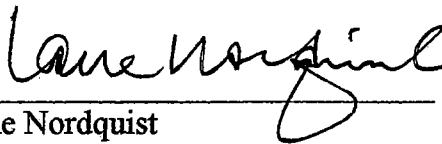
4. HickoryTech owns and operates its own fiber and copper-based telecommunications network. HickoryTech provides digital subscriber line ("DSL") services to some of its customers. To provide DSL services, HickoryTech purchases and deploys off-the-shelf networking components, including digital subscriber line access multiplexers ("DSLAMs") and DSL-compatible modems. Among HickoryTech's DSLAM and DSL-compatible modem suppliers are the following companies: Calix, Inc., Comtrend Corp., BEC Technologies, Inc., and

Westell Technologies, Inc. It is my understanding that some of these companies rely on computer chipsets made by Broadcom Corp.

5. HickoryTech does not manufacture or modify the DSLAMs, modems, or any other equipment that it purchases and deploys in its network. HickoryTech relies on its vendor to test their DSL components and products and selects equipment based on vendor statements regarding compatibility.

I declare under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge and belief.

Dated: June 7, 2013.



Lane Nordquist
Chief Information Officer
HickoryTech, Corporation

UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA



Brandywine Communications
Technologies, LLC,

Plaintiff,

Civ. No. 12-cv-3187-ADM/FLN

v.

HickoryTech Corporation,

Defendant.

**HICKORYTECH CORPORATION'S ANSWER,
AFFIRMATIVE DEFENSES, AND DEMAND FOR JURY TRIAL**

Defendant HickoryTech Corporation ("HickoryTech"), for its Answer to the Amended Complaint (Docket No. 4) of Plaintiff Brandywine Communications Technologies, LLC ("Brandywine" or "Plaintiff"), states and avers as follows:

GENERAL DENIAL

Except as otherwise admitted, qualified or explained herein, HickoryTech denies the averments of Plaintiff's Amended Complaint. Referring specifically to the paragraphs of Plaintiff's Amended Complaint, HickoryTech further avers as follows:

JURISDICTION AND VENUE

1. HickoryTech admits only that part of Paragraph 1 of the Amended Complaint that alleges that this is an action alleging patent infringement, for which this Court has subject matter jurisdiction.

2. HickoryTech admits the allegations in Paragraph 2 of the Amended Complaint.

3. HickoryTech admits the allegations in Paragraph 3 of the Amended Complaint.

THE PARTIES

4. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the allegations in Paragraph 4 of the Amended Complaint and therefore denies the same.

5. HickoryTech admits the allegations in Paragraph 5 of the Amended Complaint.

FACTUAL BACKGROUND

6. Regarding Paragraph 6 of the Amended Complaint, HickoryTech admits only that U.S. Patent No. 5,206,854 (“the ‘854 patent”) states on its face that it is titled “Detecting Loss of Echo Cancellation” and states on its face that it issued to William L. Betts and Robert A. Day II on April 27, 1993. HickoryTech admits that Exhibit A to the Amended Complaint is a copy of the ‘854 patent. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the remaining allegations of Paragraph 6 of the Amended Complaint and therefore denies the same.

7. Regarding Paragraph 7 of the Amended Complaint, HickoryTech admits only that U.S. Patent No. 5,251,328 (“the ‘328 patent”) states on its face that it is titled “Predistortion Technique for Communications Systems” and states on its face that it issued to David G. Shaw on October 5, 1993. HickoryTech admits that Exhibit B to the

Amended Complaint is a copy of the '328 patent. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the remaining allegations of Paragraph 7 of the Amended Complaint and therefore denies the same.

8. Regarding Paragraph 8 of the Amended Complaint, HickoryTech admits only that U.S. Patent No. 5,812,537 ("the '537 patent") states on its face that it is titled "Echo Canceling Method and Apparatus for Data Over Cellular" and states on its face that it issued to William Lewis Betts, Ramon B. Hazen, and Robert Earl Scott on September 22, 1998. HickoryTech admits that Exhibit C to the Amended Complaint is a copy of the '537 patent. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the remaining allegations of Paragraph 8 of the Amended Complaint and therefore denies the same.

9. Regarding Paragraph 9 of the Amended Complaint, HickoryTech admits only that U.S. Patent No. 5,828,657 ("the '657 patent") states on its face that it is titled "Half Duplex Echo Canceler Training Using a Pilot Signal" and states on its face that it issued to William Lewis Betts, Ramon B. Hazen, and Robert Earl Scott on October 27, 1998. HickoryTech admits that Exhibit D to the Amended Complaint is a copy of the '657 patent. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the remaining allegations of Paragraph 9 of the Amended Complaint and therefore denies the same.

10. Regarding Paragraph 10 of the Amended Complaint, HickoryTech admits only that U.S. Patent No. 6,970,501 ("the '501 patent") states on its face that it is titled "Method and Apparatus for Automatic Selection and Operation of a Subscriber Line

Spectrum Class Technology” and states on its face that it issued to Gordon Bremer and Philip J. Kyees on November 29, 2005. HickoryTech admits that Exhibit E to the Amended Complaint is a copy of the ‘501 patent. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the remaining allegations of Paragraph 10 of the Amended Complaint and therefore denies the same.

11. Regarding Paragraph 11 of the Amended Complaint, HickoryTech admits only that U.S. Patent No. 7,894,472 (“the ‘472 patent”) states on its face that it is entitled “Method and Apparatus for Automatic Selection and Operation of a Subscriber Line Spectrum Class Technology” and states on its face that it issued to Gordon Bremer and Philip J. Kyees on February 22, 2011. HickoryTech admits that Exhibit F to the Amended Complaint is a copy of the ‘472 patent. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the remaining allegations of Paragraph 11 of the Amended Complaint and therefore denies the same.

12. Regarding Paragraph 12 of the Amended Complaint, HickoryTech admits only that it received written correspondence for the first time from the Plaintiff dated December 10, 2012, and that the one-page letter referred to merely listed the six patents in suit but otherwise failed to give any detailed notice of the infringement alleged with any reasonable particularity (other than to mention that HickoryTech provides DSL service and equipment). The vague content of that correspondence speaks for itself, and HickoryTech denies the Plaintiff’s allegation in Paragraph 12.

**FIRST CAUSE OF ACTION:
INFRINGEMENT OF U.S. PATENT NO. 5,206,854**

13. In response to the allegations of Paragraph 13 of the Amended Complaint, HickoryTech hereby realleges and incorporates by reference its responses contained in Paragraphs 1-12 above as if fully set forth herein.

14. The allegations in Paragraph 14 of the Amended Complaint are so vague and conclusory that there is no factual averment that can be readily admitted or denied. Plaintiff has failed to identify by product name or number, service description, or even relevant business activity what – or how – it is that HickoryTech supposedly infringes any claim of any patent. The allegation lacks the kind of specificity required under the Federal Rules, preventing HickoryTech from doing anything other than deny the allegations.

15. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the allegations in Paragraph 15 of the Amended Complaint, and it therefore denies the same and incorporates its response to Paragraph 14, above. Merely using the vague term “DSL service and equipment” does not put HickoryTech on notice of anything with the required particularity. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 15 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

16. HickoryTech denies the allegations in Paragraph 16 of the Amended Complaint.

17. HickoryTech denies the allegations in Paragraph 17 of the Amended Complaint.

**SECOND CAUSE OF ACTION:
INFRINGEMENT OF U.S. PATENT NO. 5,251,328**

18. In response to the allegations of Paragraph 18 of the Amended Complaint, HickoryTech hereby realleges and incorporates by reference its responses contained in Paragraphs 1-17 above as if fully set forth herein.

19. The allegations in Paragraph 19 of the Amended Complaint are so vague and conclusory that there is no factual averment that can be readily admitted or denied. Plaintiff has failed to identify by product name or number, service description, or even relevant business activity what – or how – it is that HickoryTech supposedly infringes any claim of any patent. The allegation lacks the kind of specificity required under the Federal Rules, preventing HickoryTech from doing anything other than deny the allegations.

20. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the allegations in Paragraph 20 of the Amended Complaint, and therefore denies the same and incorporates its response to Paragraph 19, above. Merely using the vague term “DSL service and equipment” does not put HickoryTech on notice of anything with the required particularity. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 20 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

21. HickoryTech denies the allegations in Paragraph 21 of the Amended Complaint.

22. HickoryTech denies the allegations in Paragraph 22 of the Amended Complaint.

**THIRD CAUSE OF ACTION:
INFRINGEMENT OF U.S. PATENT NO. 5,812,537**

23. In response to the allegations of Paragraph 23 of the Amended Complaint, HickoryTech hereby realleges and incorporates by reference its responses contained in Paragraphs 1-22 above as if fully set forth herein.

24. The allegations in Paragraph 24 of the Amended Complaint are so vague and conclusory that there is no factual averment that can be readily admitted or denied. Plaintiff has failed to identify by product name or number, service description, or even relevant business activity what – or how – it is that HickoryTech supposedly infringes any claim of any patent. The allegation lacks the kind of specificity required under the Federal Rules, preventing HickoryTech from doing anything other than deny the allegations.

25. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the allegations in Paragraph 25 of the Amended Complaint, and therefore denies the same and incorporates its response to Paragraph 24, above. Merely using the vague term “DSL service, modems, and equipment” does not put HickoryTech on notice of anything with the required particularity. Answering further, HickoryTech

states that no response is required for the allegations of Paragraph 25 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

26. HickoryTech denies the allegations in Paragraph 26 of the Amended Complaint.

27. HickoryTech denies the allegations in Paragraph 27 of the Amended Complaint. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 27 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

28. HickoryTech denies the allegations in Paragraph 28 of the Amended Complaint. Because Plaintiff cannot identify even one modem by manufacturer, type, brand name or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 28 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

29. HickoryTech denies the allegations in Paragraph 29 of the Amended Complaint. Because Plaintiff cannot identify even one modem or other “Accused Services or Products” by name, type, supplier, brand, or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 29 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

30. HickoryTech denies the allegations in Paragraph 30 of the Amended Complaint. Because Plaintiff cannot identify even one “instruction material, training or consulting service” or any “Accused Service or Product” by name, type, supplier, brand, or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 30 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

31. HickoryTech denies the allegations in Paragraph 31 of the Amended Complaint.

32. HickoryTech denies the allegations in Paragraph 32 of the Amended Complaint.

**FOURTH CAUSE OF ACTION:
INFRINGEMENT OF U.S. PATENT NO. 5,828,657**

33. In response to the allegations of Paragraph 33 of the Amended Complaint, HickoryTech hereby realleges and incorporates by reference its responses contained in Paragraphs 1-32 above as if fully set forth herein.

34. The allegations in Paragraph 34 of the Amended Complaint are so vague and conclusory that there is no factual averment that can be readily admitted or denied. Plaintiff has failed to identify by product name or number, service description, or even relevant business activity what – or how – it is that HickoryTech supposedly infringes any claim of any patent. The allegation lacks the kind of specificity required under the

Federal Rules, preventing HickoryTech from doing anything other than deny the allegations.

35. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the allegations in Paragraph 35 of the Amended Complaint, and therefore denies the same and incorporates its response to Paragraph 34, above. Merely using the vague term “DSL service, modems, and equipment” does not put HickoryTech on notice of anything with the required particularity. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 35 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

36. HickoryTech denies the allegations in Paragraph 36 of the Amended Complaint.

37. HickoryTech denies the allegations in Paragraph 37 of the Amended Complaint. Because Plaintiff cannot identify even one of the “Accused Services or Products” by name, type, supplier, brand, or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 37 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

38. HickoryTech denies the allegations in Paragraph 38 of the Amended Complaint. Plaintiff cannot identify even one modem by manufacturer, type, brand name or model number that is supposedly the infringing instrumentality. Also, plaintiff has failed to state how any such modem is “a especially (sic) adapted component to receive

Defendant's DSL service." The Amended Complaint therefore lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 38 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

39. HickoryTech denies the allegations in Paragraph 39 of the Amended Complaint. Because Plaintiff cannot identify even one modem by manufacturer, type, brand name or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 39 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

40. HickoryTech denies the allegations in Paragraph 40 of the Amended Complaint. Because Plaintiff cannot identify even one "instruction manual, training or consulting service" or any "Accused Services or Products" by name, type, supplier, brand, or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 40 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

41. HickoryTech denies the allegations in Paragraph 41 of the Amended Complaint.

42. HickoryTech denies the allegations in Paragraph 42 of the Amended Complaint.

**FIFTH CAUSE OF ACTION:
INFRINGEMENT OF U.S. PATENT NO. 6,970,501**

43. In response to the allegations of Paragraph 43 of the Amended Complaint, HickoryTech hereby realleges and incorporates by reference its responses contained in Paragraphs 1-42 above as if fully set forth herein.

44. The allegations in Paragraph 44 of the Amended Complaint are so vague and conclusory that there is no factual averment that can be readily admitted or denied. Plaintiff has failed to identify by product name or number, service description, or even relevant business activity what – or how – it is that HickoryTech supposedly infringes any claim of any patent. The allegation lacks the kind of specificity required under the Federal Rules, preventing HickoryTech from doing anything other than deny the allegations.

45. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the allegations in Paragraph 45 of the Amended Complaint, and therefore denies the same and incorporates its response to Paragraph 44, above. Merely using the vague term “DSL service, modems, and equipment” does not put HickoryTech on notice of anything with the required particularity. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 45 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

46. HickoryTech denies the allegations in Paragraph 46 of the Amended Complaint.

47. HickoryTech denies the allegations in Paragraph 47 of the Amended Complaint. Because Plaintiff cannot identify even one modem by manufacturer, type, brand name or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 47 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

48. HickoryTech denies the allegations in Paragraph 48 of the Amended Complaint. Because Plaintiff cannot identify even one of the “Accused Services or Products” by name, type, supplier, brand, or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 48 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

49. HickoryTech denies the allegations in Paragraph 49 of the Amended Complaint.

50. HickoryTech denies the allegations in Paragraph 50 of the Amended Complaint.

**SIXTH CAUSE OF ACTION:
INFRINGEMENT OF U.S. PATENT NO. 7,894,472**

51. In response to the allegations of Paragraph 51 of the Amended Complaint, HickoryTech hereby realleges and incorporates by reference its responses contained in Paragraphs 1-50 above as if fully set forth herein.

52. The allegations in Paragraph 52 of the Amended Complaint are so vague and conclusory that there is no factual averment that can be readily admitted or denied. Plaintiff has failed to identify by product name or number, service description, or even relevant business activity what – or how – it is that HickoryTech supposedly infringes any claim of any patent. The allegation lacks the kind of specificity required under the Federal Rules, preventing HickoryTech from doing anything other than deny the allegations.

53. HickoryTech is without knowledge or information sufficient to form a belief about the truth of the allegations in Paragraph 53 of the Amended Complaint, and therefore denies the same and incorporates its response to Paragraph 52, above. Merely using the vague term “DSL service, modems, and equipment” does not put HickoryTech on notice of anything with the required particularity. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 53 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

54. HickoryTech denies the allegations in Paragraph 54 of the Amended Complaint.

55. HickoryTech denies the allegations in Paragraph 54 of the Amended Complaint. Because Plaintiff cannot identify even one of the “Accused Services or Products” by name, type, supplier, brand, or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 55 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

56. HickoryTech denies the allegations in Paragraph 56 of the Amended Complaint. Because Plaintiff cannot identify even one “instruction manual, training or consulting service” or any “Accused Services or Products” by name, type, supplier, brand, or model number that is supposedly the infringing instrumentality, the Amended Complaint lacks the requisite specificity to permit a more specific denial. Answering further, HickoryTech states that no response is required for the allegations of Paragraph 56 of the Amended Complaint, as they call for legal conclusions, and therefore denies those allegations.

57. HickoryTech denies the allegations in Paragraph 57 of the Amended Complaint.

58. HickoryTech denies the allegations in Paragraph 58 of the Amended Complaint.

AFFIRMATIVE DEFENSES

In further Answer to Plaintiff's Amended Complaint, HickoryTech pleads and affirmatively sets forth the following defenses, undertaking the burden of proof on such defenses only to the extent required by law:

**FIRST AFFIRMATIVE DEFENSE
(FAILURE TO STATE A CLAIM)**

1. Plaintiff fails to state a claim against HickoryTech upon which relief can be granted.

**SECOND AFFIRMATIVE DEFENSE
(PATENT INVALIDITY)**

2. On information and belief, the claims of the patents in suit are invalid for failure to meet one or more of the conditions of patentability, including but not limited to those set out in 35 U.S.C. §§ 102, 103, and/or 112.

**THIRD AFFIRMATIVE DEFENSE
(LICENSE)**

3. Plaintiff's claims for patent infringement against HickoryTech are precluded to the extent that any allegedly infringing products or services are supplied, directly or indirectly, to HickoryTech or by HickoryTech to an entity or entities having and express or implied license to any of the patents being asserted in this action.

**FOURTH AFFIRMATIVE DEFENSE
(PATENT EXHAUSTION)**

4. Plaintiff's claims for patent infringement against HickoryTech are precluded pursuant to the doctrine of patent exhaustion.

**FIFTH AFFIRMATIVE DEFENSE
(AFFIRMATIVE DEFENSES BASED ON LATER DISCOVERED EVIDENCE)**

5. HickoryTech reserves all affirmative defenses under Rule 8(c) of the Federal Rules of Civil Procedure, the Patent Laws of the United States and any other defenses, at law or in equity, that may now exist or in the future be available based on discovery and further factual investigation in this case.

DEMAND FOR A JURY TRIAL

HickoryTech hereby demands a trial by jury on all issues so triable, pursuant to Federal Rule of Civil Procedure 38.

PRAYER FOR RELIEF

WHEREFORE, HickoryTech asks this Court for all appropriate relief, including:

A. Entering judgment dismissing Plaintiff's Amended Complaint with prejudice in its entirety;

B. Entering Judgment for HickoryTech declaring the rights of the parties to this controversy and finding that the claims of the '854 patent, the '328 patent, the '537 patent, the '657 patent, the '501 patent, and/or the '472 patent are not infringed by HickoryTech;

C. Entering Judgment for HickoryTech declaring the rights of the parties to this controversy and finding that the claims of the '854 patent, the '328 patent, the '537 patent, the '657 patent, the '501 patent, and/or the '472 patent are invalid or unenforceable against HickoryTech and/or all other persons or entities;

D. Awarding HickoryTech its costs in defending this matter; and

E. Awarding to HickoryTech such other and further relief as its just and proper, including without limitation awarding attorneys' fees and expenses in accordance with 35 U.S.C. § 285 (or other applicable law).

Dated: February 13, 2013

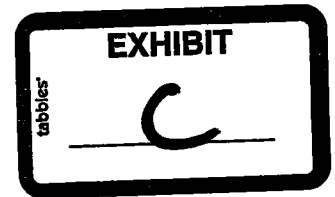
Respectfully submitted,

By: s/ Kevin D. Conneely

Kevin D. Conneely (#192703)
Ruth Rivard (#327591)
Benjamin P. Freedland (#0391125)
Leonard, Street and Deinard
Professional Association
Suite 2300
150 South Fifth Street
Minneapolis, Minnesota 55402
612.335.1799
612.335.1657 (fax)
kevin.conneely@leonard.com
ruth.rivard@leonard.com
benjamin.freedland@leonard.com

ATTORNEYS FOR DEFENDANT
HICKORYTECH CORPORATION

UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA



Brandywine Communications Technologies,

Civil 12-3187 ADM/FLN

Plaintiff,

v.

SCHEDULING ORDER

Hickory Tech Corporation,

Defendant.

Pursuant to Rule 16 of the Federal Rules of Civil Procedure and the Local Rules of this Court, and in order to secure the just, speedy, and inexpensive determination of this action, the following schedule shall govern this proceeding. The schedule may be modified only upon formal motion and a showing of good cause as required by Local Rule 16.3.

A. PLEADINGS:

1. Discovery and Pleading of Additional Claims and Defenses:

- (a) Discovery is permitted with respect to claims of willful infringement and defenses of patent invalidity or unenforceability not pleaded by a party, where the evidence needed to support these claims or defenses is in whole or in part in the hands of another party.
- (b) Once a party has given the necessary discovery, the opposing party may seek leave of Court to add claims or defenses for which it alleges, consistent with Fed.R.Civ.P. 11, that it has support, and such support shall be explained in the motion seeking leave. Leave shall be liberally given where prima facie support is present, provided that the party seeks leave as soon as reasonably possible following the opposing party providing the necessary discovery.

B. FACT DISCOVERY

1. All pre-discovery disclosures required by Fed.R.Civ.P. 26(a) shall be completed on or before April 16, 2013.
2. Fact discovery shall be commenced in time to be completed by June 1, 2014.
3. The Court will limit the use and numbers of discovery procedures as follows:
 - a) No more than 30 Interrogatories, including all discrete subparts, shall be served by any party.
 - b) No more than 10 depositions shall be taken by any party.
 - c) No more than 100 Requests for Admission shall be served by any party.
 - d) No more than 100 Document Requests shall be served by any party.

C. EXPERT DISCOVERY

The parties anticipate that they will require expert witnesses at time of trial.

1. The Plaintiff anticipates calling 4 experts.
2. The Defendant anticipates calling 4 experts.
3. By May 15, 2014, the parties shall identify to the opposing party the experts who will provide a report that deals with the issues on which that party has the burden of persuasion.
4. On or before June 15, 2014, the parties shall exchange initial expert reports, which reports shall be in accordance with Fed.R.Civ.P. 26(a)(2)(B) ("Initial Expert Reports"). The Initial Expert Reports from each party shall deal with the issues on which that party has the burden of persuasion.
5. On or before July 15, 2014, Rebuttal Expert Reports shall be exchanged. Rebuttal Expert Reports shall also be in accordance with Fed.R.Civ.P. 26(a)(2)(B).
6. Anything shown or told to a testifying expert relating to the issues on which he/she opines, or to the basis or grounds in support of or countering the opinion, is subject to discovery by the opposing party.
7. Drafts of expert reports will not be retained and produced; Inquiry is not permitted into whom, if anyone, participated in the drafting of the report.

8. All expert discovery shall be completed by September 1, 2014.

D: DISCOVERY RELATING TO CLAIM CONSTRUCTION HEARING

- (1) Deadline for Plaintiff's Claim Chart: May 14, 2013.

Plaintiff's Claim Chart shall identify: (1) which claim(s) of its patent(s) it alleges are being infringed; (2) which specific products or methods of defendant's it alleges literally infringe each claim; and (3) where each element of each claim listed in (1) is found in each product or method listed in (2), including the basis for each contention that the element is present. If there is a contention by Plaintiff that there is infringement of any claims under the doctrine of equivalents, Plaintiff shall separately indicate this on its Claim Chart and, in addition to the information required for literal infringement, Plaintiff shall also explain each function, way, and result that it contends are equivalent, and why it contends that any differences are not substantial.

- (2) Deadline for Defendant's Claim Chart: July 14, 2013.

Defendant's Claim Chart shall indicate with specificity which elements on Plaintiff's Claim Chart it admits are present in its accused device or process, and which it contends are absent. In the latter regard, Defendant will set forth in detail the basis for its contention that the element is absent. As to the doctrine of equivalents, Defendant shall indicate on its chart its contentions concerning any differences in function, way, and result, and why any differences are substantial.

- (3) On or before September 15, 2013, the parties shall simultaneously exchange a list of claim terms, phrases, or clause that each party contends should be construed by the Court. On or before October 15, 2013, the parties shall meet and confer for the purpose of finalizing a list, narrowing or resolving differences, and facilitating the ultimate preparation of a joint claim construction statement. During the meet and confer process, the parties shall exchange their preliminary proposed construction of each claim term, phrase or clause which the parties collectively have identified for claim construction purposes.

At the same time the parties exchange their respective "preliminary claim construction" they shall also provide a preliminary identification of extrinsic evidence, including without limitation, dictionary definitions, citations to learned treatises and prior art, and testimony of percipient and expert witnesses that they contend support their respective claim constructions. The parties shall identify each such items of extrinsic evidence by production number or produce a copy of any such item not previously produced. With respect to any such witness,

percipient or expert, the parties shall also provide a brief description of the substance of that witness' proposed testimony.

- (4) Following the parties' meet and confer described above, and no later than December 1, 2013, the parties shall notify the Court as to whether they request that the Court schedule a Claim Construction hearing to determine claim interpretation. If any party believes there is no reason for a Claim Construction hearing, the party shall provide the reason to the Court.

At the same time, the parties shall also complete and file with the Court a joint claim construction statement that shall contain the following information:

- (A) The construction of those claim terms, phrases, or clauses on which the parties agree;
 - (B) Each party's proposed construction of each disputed claim term, phrase, or clause together with an identification of all references from the specification of prosecution history that support that construction, and an identification of any extrinsic evidence known to the party on which it intends to rely either in support of its proposed construction of the claim or to oppose any other party's proposed construction of the claim, including, but not limited, as permitted by law, dictionary definitions, citation to learned treatises and prior art, and testimony of percipient and expert witnesses.
 - (C) Whether any party proposes to call one or more witnesses, including experts at the Claim Construction hearing, the identity of each such witness and for each expert, a summary of each opinion to be offered in sufficient detail to permit a meaningful deposition of that expert.
- (5) A hearing on claim construction shall be held on or before February 1, 2014.

E. DISCOVERY RELATING TO VALIDITY/PRIOR ART

- (1) Within 90 days of its receipt of Plaintiff's Claim Chart, Defendant shall serve on Plaintiff a list of all of the prior art on which it relies, and a complete and detailed explanation of what it alleges the prior art shows and how that prior art invalidates the claim(s) asserted by Plaintiff ("Defendant's Prior Art Statement").
- (2) Within 60 days of its receipt of Defendant's Prior Art Statement, Plaintiff

shall serve on Defendant "Plaintiff's Prior Art Statement", in which it will state in detail its position on what the prior art relied upon by Defendant shows, if its interpretation differs from Defendant's, and its position on why the prior art does not invalidate the asserted patent claims.

- (3) Plaintiff's and Defendant's "Prior Art Statements" can be, but need not be, in the form of expert reports.
- (4) Defendant can add prior art to its original Statement only by leave of the Court.

F. OTHER DISCOVERY ISSUES:

(1) Defendant may postpone the waiver of any applicable attorney-client privilege on topics relevant to claims of willful infringement, if any, until April 1, 2014, provided that all relevant privileged documents are produced no later than May 1, 2014. All additional discovery regarding the waiver will take place after May 1, 2014, and shall be completed by June 1, 2014.

(2) Protective Order Issues:

(3) Discovery Definitions:

In responding to discovery requests, each party shall construe broadly terms of art used in the patent field (e.g. "prior art", "best mode", "on sale"), and read them as requesting discovery relating to the issue as opposed to a particular definition of the term used. Compliance with this provision is not satisfied by the respondent including a specific definition of the term of art in its response, and limiting its response to that definition.

G. MOTION AND TRIAL SCHEDULE

- 1. All motions that seek to amend the pleadings or add parties must be heard by September 1, 2013.
- 2. All nondispositive motions and supporting documents, including those which relate to discovery, shall be filed and served by September 1, 2014. Nondispositive motions may be scheduled for hearing by calling Cathy Orlando, Calendar Clerk to Magistrate Judge Franklin L. Noel, 612-664-5110. All nondispositive motions shall be scheduled, filed and served in compliance with the Local Rules.
- 3. Dispositive motions shall be filed and served by November 1, 2014. Counsel are reminded that they must anticipate the time required for scheduling this hearing by calling Calendar Clerk to Judge Montgomery, Gertie Simon, at

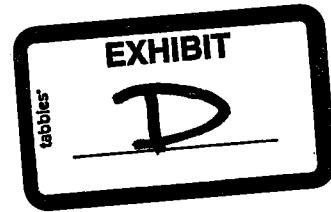
612-664-5093. All dispositive motions shall be scheduled, filed and served in compliance with the Electronic Case Filing Procedures for the District of Minnesota and in compliance with Local Rule 7.1. Two paper copies of the pleading and all supporting documents shall be mailed or delivered to Calendar Clerk Gertie Simon, contemporaneously with the documents being posted on ECF.

4. Trial Ready Date

- (A) The case will be ready for trial on or after January 1, 2015, to be placed on the jury trial calendar.
- (B) Trial is estimated to last 8-10 days.

DATED: April 12, 2013.

s/ Franklin L. Noel
FRANKLIN L. NOEL
United States Magistrate Judge



IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MINNESOTA

BRANDYWINE COMMUNICATIONS
TECHNOLOGIES, LLC,

Plaintiff,

v.

HICKORYTECH CORPORATION,

Defendant.

Civil Action No. 12-cv-3187-ADM/FLN

**STIPULATION FOR PROTECTIVE
ORDER**

Upon stipulation of the parties for an order pursuant to Fed. R. Civ. P. 26(c) that trade secret or other confidential information be disclosed only in designated ways:

1. As used in the Protective Order, these terms have the following meanings:

“Attorneys” means counsel of record from the firms of Farney Daniels, PC, Alan Anderson Law Firm LLC, and Leonard, Street and Deinard, P.A.;

“Confidential” documents are documents designated pursuant to paragraph 2;

“Confidential - Attorneys’ Eyes Only” documents are the subset of Confidential documents designated pursuant to Paragraph 6;

“Documents” are all materials, information, and things, including electronically stored information, that falls within the scope of Fed. R. Civ. P. 34 or Fed. R. Evid.

1001(a) – (e); and

“Written Assurance” means an executed document in the form attached hereto as Exhibit A.

2. By identifying a document “Confidential,” a party may designate any document, including interrogatory responses, other discovery responses, or transcripts,

that it in good faith contends to constitute or contain trade secret or other confidential information as those terms are used in Fed. R. Civ. P. 26(c)(1)(G).

3. All Confidential documents, along with the information contained in the documents, shall be used solely for the purpose of this action, and no person receiving such documents shall, directly or indirectly, transfer, disclose, or communicate in any way the contents of the documents to any person other than those specified in Paragraph 5.

4. Prohibited purposes include, but are not limited to, use for competitive purposes or the prosecution of additional intellectual property rights or asserting claims in any other action or presenting defenses to such claims.

5. Access to any Confidential document shall be limited to:

- A. the Court and its officers;
- B. Attorneys and their office associates, legal assistants, and stenographic and clerical employees; independent persons who are retained by a party or its attorneys to provide assistance as mock jurors or focus group members or the like; independent vendors retained to copy, convert, or process discovery material or retained to review discovery material, provided that such independent persons and independent vendors execute a "Written Assurance" in the form attached as Exhibit A;
- C. persons shown on the face of the document to have authored or received it;
- D. court reporters retained to transcribe testimony;

E. no more than two (2) employees of the parties, each of whom have executed the form attached hereto as Exhibit A; and

F. outside independent persons (i.e., persons not currently or formerly employed by, consulting with, or otherwise associated with any party) who are retained by a party or its attorneys to furnish technical or expert services, and/or to give testimony in this action. An individual shall not be considered a person “currently or formerly employed by, consulting with, or otherwise associated with any party” under this paragraph simply because that individual is currently retained or was formerly retained by the party as an expert or consultant in connection with litigation.

6. The parties shall have the right to further designate Confidential documents or portions of documents as “Confidential – Attorneys’ Eyes Only”. “Confidential – Attorneys’ Eyes Only” information means and is limited to Confidential Information that constitutes:

- A. unpublished, pending patent applications;
- B. information, documents, or things (including specifically source code, software, firmware and other computer generated information) that disclose or describe new product designs that have not been introduced to the market, commercialized, or otherwise disclosed to the public;
- C. information or documents or things (including specifically source code, software, firmware and other computer generated information) that describe or disclose the materials, methods or processes used by

or on behalf of the designating party to design, develop, or manufacture any of its products;

- D. information or documents, including third-party vendor agreements, settlement agreements, licenses, or other agreements by which a party has in good faith been previously bound to a confidentiality obligation to some non-party; or
- E. highly sensitive financial, sales, marketing, and non-public strategic business planning information.

Disclosure of such information designated as “Confidential – Attorneys’ Eyes Only” shall be limited, unless otherwise authorized by the Court or by stipulation of the parties, to the persons designated in and under the restrictions of paragraphs 5(A), (B), (C), (D), and (F).

7. Any Confidential or Confidential – Attorneys’ Eyes Only information which a party wishes to be made subject to this Protective Order shall be marked with “Confidential” or “Confidential – Attorneys’ Eyes Only” at the time it is turned over to the receiving party. Any copy made of such document or thing or document or thing created (e.g., any abstract, summary, memorandum, or exhibit) containing information designated pursuant to this Protective Order shall bear on its face the appropriate legend, i.e., “Confidential Information” or “Confidential – Attorneys’ Eyes Only Information” or an equivalent marking.

8. Non-parties producing documents in the course of this action may also designate documents as “Confidential” or “Confidential – Attorneys’ Eyes Only”, subject

to the same protections and constraints as the parties to the action. A copy of the Protective Order shall be served along with any subpoena served in connection with this action. All documents produced by such non-parties shall be treated as “Confidential - Attorneys’ Eyes Only” for a period of 14 days from the date of their production, and during that period any party may designate such documents as “Confidential” or “Confidential - Attorneys’ Eyes Only” pursuant to the terms of the Protective Order whether or not the producing party has so designated it. Non-party materials designated as “Confidential” or “Confidential – Attorneys’ Eyes Only” by a non-party or party shall be governed by the terms of this Protective Order. Any party seeking to challenge the designation of non-party information as Confidential or Confidential – Attorneys’ Eyes Only, or seeking to use such information in proceedings where it may become a part of the public record, shall provide, not less than 10 days prior, written notice to the non-party of such challenge or intended use so that such non-party may appear and seek continued protection of its Confidential or Confidential – Attorneys’ Eyes Only information.

9. It is contemplated that a party may make available certain of its files for inspection by the other party, which files may contain confidential as well as non-confidential material, and that following such inspection the inspecting party will identify documents to be copied and request the copies furnished or produced to it. In order to protect any Confidential information contained in the files produced for inspection, all documents made available for such inspection shall be assumed Confidential information and shall be treated as Confidential – Attorneys’ Eyes Only information at the time of the

inspection. When the inspecting party identifies the documents it wishes copied, the producing party will mark appropriate documents as “Confidential” or “Confidential – Attorneys’ Eyes Only” and then provide copies of the designated documents to the inspecting party.

10. If, during the course of discovery in this action, a party hereto, or its representatives, is authorized to inspect the other’s facilities, or processes of any product manufacture, any documents or things generated as a consequence of any such inspection shall be deemed Confidential – Attorneys’ Eyes Only and shall be treated as such.

11. Confidential or Confidential – Attorneys’ Eyes Only information may be disclosed (1) by the designating party or (2) to any employee of the designating party who is or was involved with the matters to which the item is directed, or (3) to any non-party entity who authored or received the item prior to its production to the receiving party. Disclosure of Confidential or Confidential – Attorneys’ Eyes Only information to former employees of the designating party who were involved with the matters to which the item is directed may be done in a court proceeding (e.g., deposition). If there is not a court proceeding, disclosure of Confidential or Confidential – Attorneys’ Eyes Only information to former employees of the designating party may not be done without prior notice and approval from the party who designated the item Confidential or Confidential – Attorneys’ Eyes Only.

12. Each person appropriately designated pursuant to Paragraph 5(F) to receive Confidential or Confidential – Attorneys’ Eyes Only information shall execute a “Written Assurance” in the form attached as Exhibit A. The party seeking disclosure to a person

designated pursuant to Paragraph 5(F) shall provide written notice to opposing counsel at least five (5) days prior to disclosure of Confidential or Confidential – Attorneys’ Eyes Only information to any such person. Such notice shall identify the name of the individual and attach a copy his or her resume or curriculum vitae that includes the individual’s past and present occupations, employers, and positions, and any other business affiliations related to the subject matter of the litigation. Opposing counsel shall state any objections to the proposed disclosure and state the reasons therefore in writing to the party seeking disclosure within five (5) days of receipt of the notice. Upon the making of any such objection, opposing counsel shall have ten (10) days from sending its objection to the party seeking disclosure to file an expedited motion with the court. Unless opposing counsel files an expedited motion in accordance with the notice and timing provisions of this Section, opposing counsel waives its right to challenge the disclosure to the identified person. Should opposing counsel timely object and file its expedited motion, Confidential or Confidential – Attorneys’ Eyes Only information will not be disclosed to the identified person pending resolution of the motion. In any motion in accordance with this Section, the party seeking disclosure shall have the burden of proving that the identified person is within the scope of Paragraph 5(F). The disclosure of an individual or business under this paragraph shall not constitute a disclosure of that person or business as a witness to be called at trial, not shall it commit a party to identifying or utilizing the individual or business as an expert or witness at trial, not shall it give the producing party the right to comment on the absence of the individual or business from trial. A non-testifying expert consultant, who would not otherwise be

subject to deposition, does not become subject to deposition solely because that individual or business is disclosed pursuant to this paragraph.

13. All depositions or portions of depositions taken in this action that contain trade secret or other confidential information may be designated “Confidential” or “Confidential - Attorneys’ Eyes Only” and thereby obtain the protections accorded other “Confidential” or “Confidential - Attorneys’ Eyes Only” documents. Confidentiality designations for depositions shall be made either on the record or by written notice to the other party within twenty-one (21) days of receipt of the transcript. Unless otherwise agreed, depositions shall be treated as “Confidential - Attorneys’ Eyes Only” during the 21-day period following receipt of the transcript. The deposition of any witness (or any portion of such deposition) that encompasses Confidential information shall be taken only in the presence of persons who are qualified to have access to such information.

14. Any party who inadvertently fails to identify documents as “Confidential” or “Confidential - Attorneys’ Eyes Only” shall have fourteen (14) days from the discovery of its oversight to inform the receiving party and the receiving party shall thereafter treat the information as Confidential or Confidential – Attorneys’ Eyes Only. Such failure shall be corrected by providing written notice of the error and substituted copies of the inadvertently produced documents. Any party receiving such inadvertently unmarked documents shall make reasonable efforts to retrieve documents distributed to persons not entitled to receive documents with the corrected designation.

15. Subject to the standards set forth in Fed. R. Evid. 502, any party who inadvertently discloses documents that are privileged or otherwise immune from

discovery shall, promptly upon discovery of such inadvertent disclosure, so advise the receiving party and request that the documents be returned, and no party to this action shall thereafter assert that such disclosure waived any privilege or immunity. The receiving party shall return such inadvertently produced documents, including all copies, within fourteen (14) days of receiving such a written request. The party returning such inadvertently produced documents may thereafter seek re-production of any such documents pursuant to applicable law.

16. If a party files a document containing Confidential information with the Court, it shall do so in compliance with the Electronic Case Filing Procedures for the District of Minnesota. Prior to disclosure at trial or a hearing of materials or information designated “Confidential” or “Confidential - Attorneys’ Eyes Only”, the parties may seek further protections against public disclosure from the Court.

17. Any party may request a change in the designation of any information designated “Confidential” and/or “Confidential - Attorneys’ Eyes Only”. Any such document shall be treated as designated until the change is completed. If the requested change in designation is not agreed to, the party seeking the change may move the Court for appropriate relief, providing notice to any third party whose designation of produced documents as “Confidential” and/or “Confidential - Attorneys’ Eyes Only” in the action may be affected. The party asserting that the material is Confidential shall have the burden of proving that the information in question is within the scope of protection afforded by Fed. R. Civ. P. 26(c).

18. Unless the parties, through counsel, agree otherwise in writing, within 60 days of the final disposition of this action, counsel for parties shall:

A. return all documents designated as Confidential or Confidential – Attorneys’ Eyes Only, all documents incorporating Confidential or Confidential – Attorneys’ Eyes Only information, and all copies made thereof, including all documents or copies of documents provided by the party to any other person, other than attorney work product;

B. return all DVDs, CDs, or other media containing or incorporating Confidential or Confidential – Attorneys’ Eyes Only information;

C. return all Confidential or Confidential – Attorneys’ Eyes Only information that has been stored on any portable media (DVD, CD, USB flash drive, etc.);

D. provide certification of deletion of Confidential or Confidential – Attorneys’ Eyes Only information from all systems, applications, hard drives, servers, web-based or other storage repositories of any type; and

E. provide assurance that no steps will be taken at any time in the future to restore deleted Confidential or Confidential – Attorneys’ Eyes Only information, and that any inadvertent violation of this assurance and steps taken to remedy it will be promptly reported to the other party.

The deletion required under subpart (D) of this paragraph shall not require deletion of backup tapes. Notwithstanding the foregoing, counsel of record shall be permitted to

retain one file copy of materials made part of the trial record of which have been filed under seal with the Court, and a copy of all depositions and deposition exhibits.

19. Any party may apply to the Court for a modification of the Protective Order, and nothing in the Protective Order shall be construed to prevent a party from seeking such further provisions either enhancing or limiting confidentiality or amending the procedures called out in this Order as may be appropriate, and the parties may do so either by joint stipulation or by motion to the Court. Without limiting the foregoing, it is contemplated that from time to time during the pendency of this case, a party may seek to have one of its designated employees (Paragraph 5(E)) be given access to “Confidential – Attorneys Eyes Only” documents and materials produced by another party or a by a disclosing person. In such event, the requesting party shall: first, seek consent of the party or person that made the designation to either change the “Confidential –Attorneys Eyes Only” designation of the specified documents (as contemplated under Paragraph 17, above); or, second, request permission to disclose the specified documents or materials to specific identified persons listed in Paragraphs 5(E) and 5(F). If the parties cannot mutually agree on terms for such specific requested disclosure(s) after a good-faith meet and confer, the requesting party may seek modification of this Order or other relief from the Court.

20. No action taken in accordance with the Protective Order shall be construed as a waiver of any claim or defense in the action or of any position as to discoverability or admissibility of evidence.

21. The obligations imposed by the Protective Order shall survive the termination of this action. Within 60 days following the expiration of the last period for appeal from any order issued in connection with this action, the parties shall remove any materials designated “Confidential” or “Confidential – Attorneys’ Eyes Only” from the office of the Clerk of Court. Following that 60-day period, the Clerk of Court shall destroy all “Confidential” or “Confidential Attorneys’ Eyes Only” materials.

Stipulated to on May 2, 2013

By: s/ Lei Sun
Alan M. Anderson (149500)
Aaron C. Nyquist (0392394)
Alan Anderson Law Firm LLC
Suite 1260 The Colonnade
5500 Wayzata Blvd.
Minneapolis, MN 55416
Tel: (612) 756-7000
Fax: (612) 756-7050
Email: aanderson@anderson-lawfirm.com
anyquist@anderson-lawfirm.com

and

Tim Devlin (admitted *pro hac vice*)
Farney Daniels PC
1220 North Market Street
Suite 850
Wilmington, DE 19806
Tel: (302) 300-4626
Email: tdevlin@farneydaniels.com

and

Lei Sun (admitted *pro hac vice*)
Farney Daniels PC
800 S. Austin Ave.
Suite 200
Georgetown, TX 78626
Tel: (512) 582-2828
Email: lsun@farneydaniels.com

Attorneys for Plaintiff
Brandywine Communications
Technologies, LLC

By: s/ Benjamin P. Freedland
Kevin D. Conneely (#192703)
Ruth Rivard (#327591)
Benjamin P. Freedland (#0391125)
Leonard, Street and Deinard
Professional Association
Suite 2300
150 South Fifth Street
Minneapolis, Minnesota 55402
612.335.1799
612.335.1657 (fax)
kevin.conneely@leonard.com
ruth.rivard@leonard.com
benjamin.freedland@leonard.com

Attorneys for Defendant
HickoryTech Corporation

EXHIBIT A

WRITTEN ASSURANCE

_____ declares that:

I reside at _____ in the city of _____,
county _____, state of _____;

I am currently employed by _____ located at
_____ and my current job title is _____.

I have read and believe I understand the terms of the Protective Order dated May 2, 2013, filed Case No. 12-cv-3187-ADM/FLN, pending in the United States District Court for the District of Minnesota. I agree to comply with and be bound by the provisions of the Protective Order. I understand that any violation of the Protective Order may subject me to sanctions by the Court.

I shall not divulge any documents, or copies of documents, designated "Confidential" or "Confidential - Attorneys' Eyes Only" obtained pursuant to such Protective Order, or the contents of such documents, to any person other than those specifically authorized by the Protective Order. I shall not copy or use such documents except for the purposes of this action and pursuant to the terms of the Protective Order.

As soon as practical, but no later than 30 days after final termination of this action, I shall return to the attorney from whom I have received them, any documents in my possession designated "Confidential" or "Confidential - Attorneys' Eyes Only", and all

copies, excerpts, summaries, notes, digests, abstracts, and indices relating to such documents.

I submit myself to the jurisdiction of the United States District Court for the District of Minnesota for the purpose of enforcing or otherwise providing relief relating to the Protective Order.

I declare under penalty of perjury that the foregoing is true and correct.

Executed: _____
(Date)

(Signature)



ADSL TUTORIAL

Matthew J. Langlois, University of New Hampshire InterOperability Laboratory
121 Technology Drive, Suite 2, Durham, NH 03824 USA.

Extracted from the Introduction and Chapter 1 of A G.hs Handshaking Protocol Analyzer For ADSL,
a Master's Project by Matthew J. Langlois, May 2002.

INTRODUCTION

The demand for high-speed data networks in the "last mile" has driven the need for robust, interoperable, and easy to use multi-vendor Digital Subscriber Line (DSL) access solutions. DSL collectively refers to a group of technologies that utilize the unused bandwidth in the existing copper access network to deliver high-speed data services from the distribution center, or central office, to the end user. DSL technology is attractive because it requires little to no upgrading of the existing copper infrastructure that connects nearly all populated locations in the world. In addition, DSL is inherently secure due to its point-to-point nature. A simple diagram of a typical DSL system is shown in Figure 1 below:

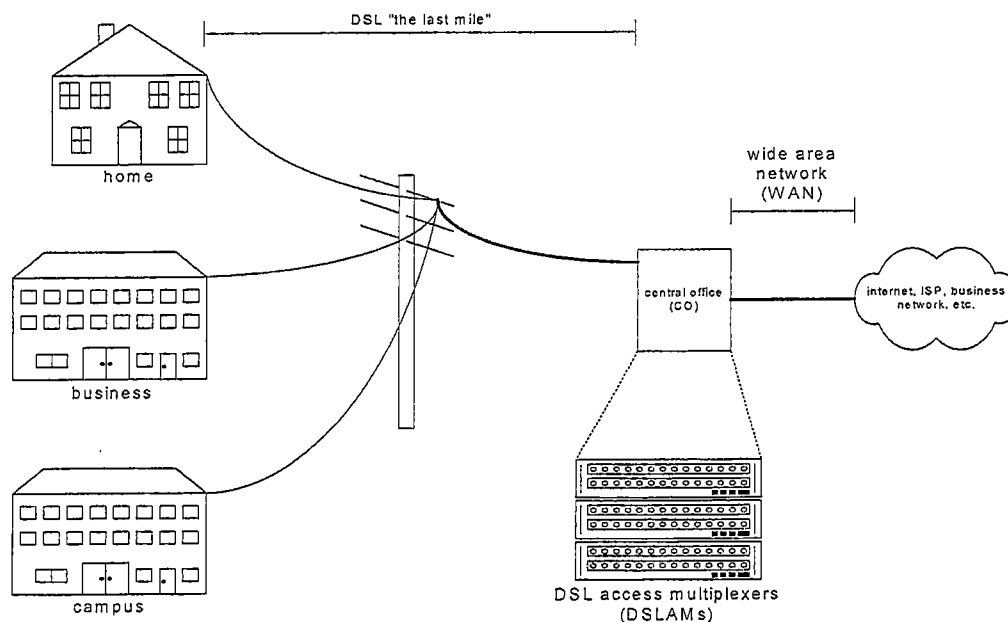


Figure 1: Typical DSL system.

There are many variations of DSL, each aimed at particular markets, all designed to accomplish the same basic goals. ADSL, or Asymmetric DSL, is aimed at the residential consumer market. ADSL provides higher data rates in the downstream direction, from the central office to the end user, than in the upstream direction, from the end user to the central office. Within the Internet connectivity-based residential environment, small requests by the end user often result in large transfers of data in the downstream direction. ADSL is a direct result of the asymmetric nature of the Internet and the needs of the end user, and was originally designed for video-on-demand applications.

Similarly, a maximum of 31 low frequency sub-carriers can be used to modulate data in the upstream direction. Sub-carrier 32, the upstream Nyquist frequency, and sub-carrier 16, the upstream pilot frequency, are again not available for user data, limiting the total number of available upstream sub-carriers to 30. Each of these 30 sub-carriers can support the modulation of 0 to 15 bits. Since the ADSL DMT data frame rate is 4000 frames per second, the maximum theoretical upstream data rate of an ADSL system is 1.8Mbps. Again, due to limitations in system architecture, specifically the POTS splitter cut-off frequencies and the duplexing method used (FDM or echo cancellation), the maximum achievable upstream data rate is typically less than 1Mbps. Figure 3 shows the basic plot of a DMT ADSL system in the frequency domain with approximate frequencies.

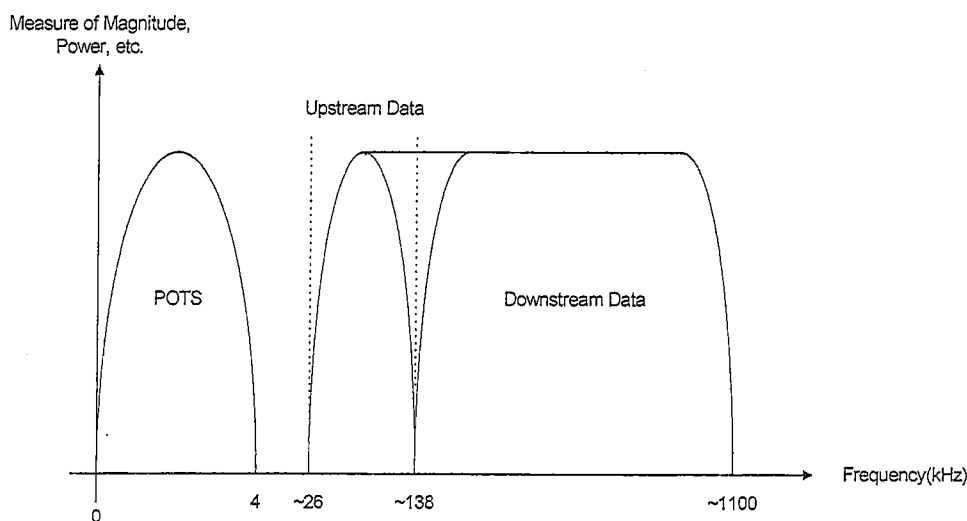


Figure 3. DMT based ADSL in the frequency domain.

Frequency Division Multiplexing (FDM) is a duplexing method that splits the available spectrum into two non-overlapping parts, one for upstream data and one for downstream data. FDM requires the analog hybrid circuit in each transceiver to effectively decouple, or split, the upstream and downstream portions of the analog DMT signal. The cut-off frequencies of these splitters are not formally defined and are therefore left to the discretion of the vendor. As a result, FDM splitting can adversely effect the upstream and downstream portions of the spectrum.

An optional duplexing method, echo cancellation, can also be utilized in ADSL systems. Echo cancellation allows the upstream and downstream portions of the spectrum to overlap, improving downstream performance by allowing more low attenuation low frequency sub-carriers to be utilized for downstream data transport. "An "echo" is a reflection of the transmit signal into the near end received. Echoes are of concern because the signals that correspond to both directions of digital transmission coexist on the twisted-pair transmission line, so that the echo is unwanted noise.¹" The upstream and downstream portions of the signal are again decoupled by the analog hybrid circuit. Echo cancellation is then achieved by subtracting an estimate of the unwanted echo from the decoupled receive signal. In ADSL systems, good echo cancellers can, and must, achieve 70dB of rejection.

¹ Understanding Digital Subscriber Line Technology, pages 140 and 141.

with merged fast and sync bytes, respectively. Starting with framing mode 0, each mode requires progressively less overhead. For STM transport, support for framing mode 0 is required and support for framing modes 1, 2, and 3 is optional. Likewise, for ATM transport, support for framing modes 0 and 1 is required while support for framing modes 2 and 3 is optional. Reduced overhead framing modes apply “when there are only single channels in each direction, or secondarily, when only a single fast channel is in use and a single interleaved channel is used.”³ All framing modes are formally defined in section 6.4 of ANSI T1.413-1998.

The basic structures of the fast and interleaved data buffers, in both the downstream and upstream directions, with full overhead framing (mode 0), are shown in Figures 4, 5, 6, and 7. These figures show representations of data frames at various stages in the transceiver reference model of Figure 9. These figures were taken from ANSI T1.413-1998, sections 6.4.1.2 and 7.4.1.2. The upstream data buffers differ from the downstream data buffers because only the duplex LSx bearer channels are available for upstream data transmission; therefore no ASx bytes are required. It should be noted that allocation of the AEX, LEX, fast, and sync bytes depend upon the selected framing mode and data buffer allocation; AEX and LEX bytes are used to identify the bearer channels used, fast and sync bytes are reserved for overhead. The use of these fields within the fast and interleaved data buffers is formally defined in ANSI T1.413-1998, sections 6.4.1.2 and 7.4.1.2.

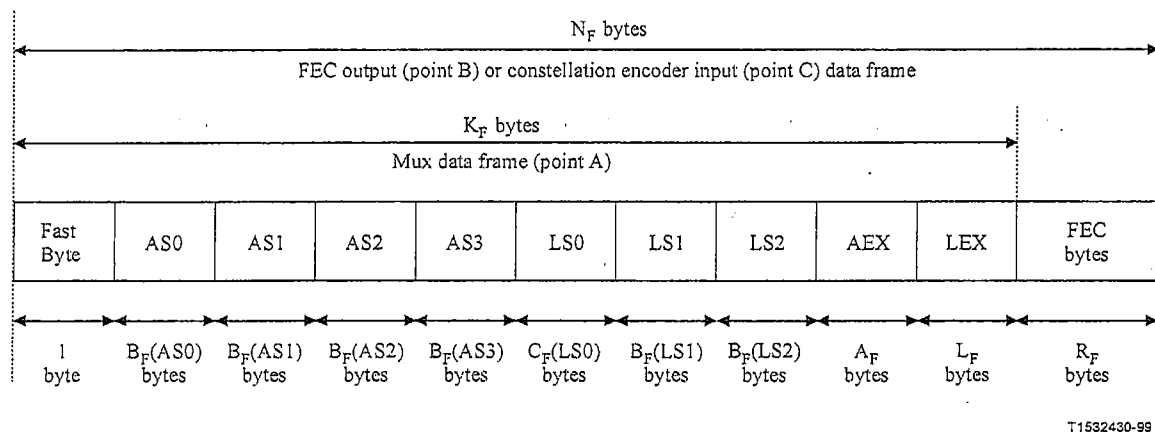


Figure 4. Fast data buffer – ATU-C transmitter.

³ Summers, page 58.

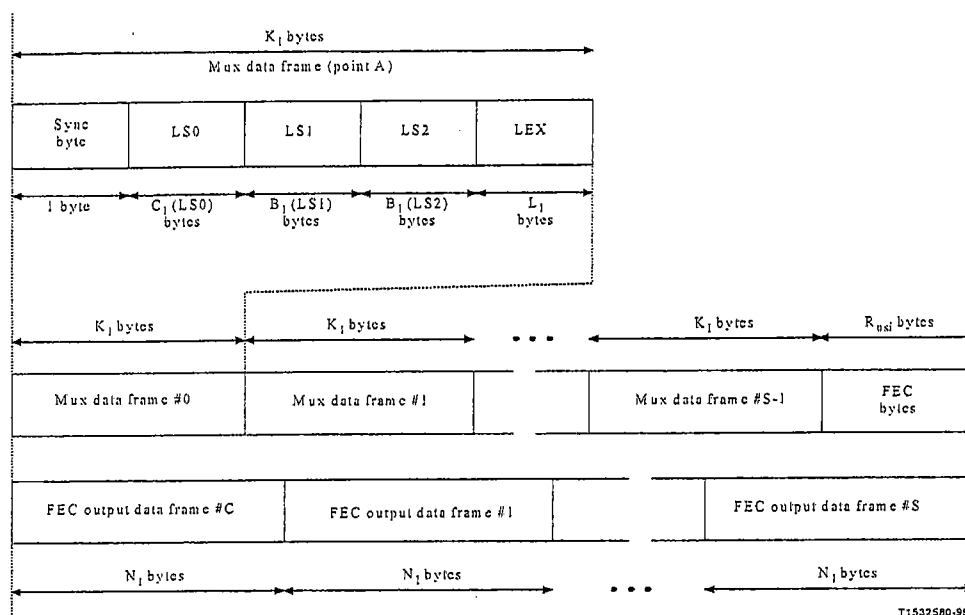
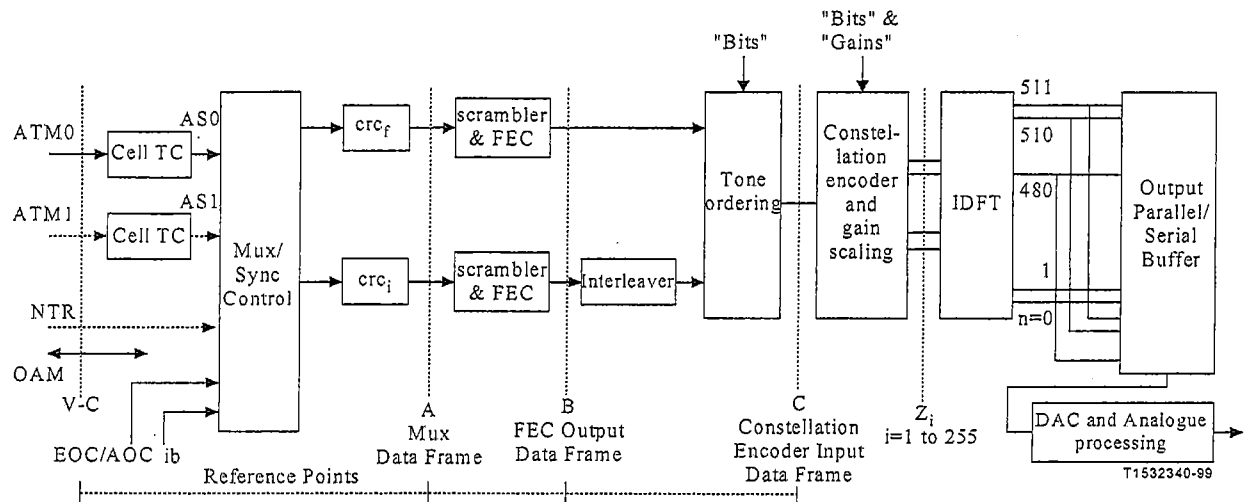


Figure 7.

Interleaved data buffer – ATU-R transmitter.

ADSL utilizes a superframe structure for data frame transmission. 68 DMT data frames, numbered from 0 to 67, are grouped together to form a superframe, as shown in Figure 8. Each superframe is actually 69 data frames; the 69th data frame is a synchronization symbol inserted by the DMT modulator to establish superframe boundaries. To allow for insertion of the synchronization symbol (while maintaining the 4000 frames per second data frame rate) the transmit frame rate is actually increased to $69/68 * 4000$ frames per second. Figure 8 was taken from section 6.4.1.1 of ANSI T1.413-1998.

Figure 9 shows a basic block diagram of a typical DMT based ADSL transceiver.



NOTE – Solid versus dashed lines are used to indicate required versus optional capabilities respectively. This figure is not intended to be complete in this respect, see clauses 6 and 7 for specific details.

Figure 9. Reference model for an ATU-C transceiver supporting ATM transport.

A cyclic redundancy check (CRC) is performed on the contents of each data buffer on a superframe basis. The CRC that is generated from each data buffer per superframe will be transmitted in the fast and sync bytes, of the fast and interleaved data buffers, respectively, of the first data frame (frame 0) of the following superframe. The fast and sync bytes of the remaining data frames within a specific superframe are used to transmit embedded operations channel (EOC), synchronization, ADSL overhead control (AOC) channel, and indicator bit information.

The following algorithm is used to scramble the contents of each data buffer:

$$d_n' = d_n \oplus d_{n-18}' \oplus d_{n-23}'$$

where d_n is the n-th output from the fast or interleaved data buffer, and d_n' is the n-th output from the corresponding scrambler. “Scrambling . . . eliminates repetitious data patterns such as all 0's or 1's. Random bit patterns reduce both radio frequency interference and signal crosstalk from one pair to another pair in the cable.” Forward error correction (FEC) capabilities are also applied to the scrambled data in each data buffer through the use of Reed-Solomon (RS) Coding. RS check bytes are added to a certain number of data bytes to produce an RS codeword. As mentioned earlier, the maximum RS codeword size is 255 bytes. Sections 6.6 and 7.6 of ANSI T1.413-1998 outline the minimum RS coding capabilities of an ATU-C and ATU-R, respectively.

Convolutional interleaving is performed only on data in the interleaved data buffer. Data in the fast data buffer differs only in that it is not interleaved, and therefore “fast” because there is no latency associated with the interleaving process. Interleaving essentially “weaves” RS codewords (data frames with RS check bytes appended) together to reduce the effects of noise on data transmission. Interleaving spreads the damage, if you will, from an impulsive noise hit across multiple RS codewords, reducing the likelihood that consecutive data bytes within a

⁴ From the UNH-IOL VG-AnyLAN online tutorial.
<http://www.iol.unh.edu/training/vganylan/teach/vgconcepts/pmi/datascrea.html>

modulation by the IDFT in more detail. Parallel to serial conversion, DAC processing, and analog processing follow the modulation block.

Many of the functional blocks mentioned above require parameters to be determined and set that depend on specific knowledge of the communication channel. These parameters are negotiated during initialization, when an ADSL ATU-R is first connected to an ATU-C (DSLAM). Initialization will be discussed in detail later.

ADSL: ITU-T G.992.1 (G.dmt):

ITU-T G.992.1 (G.dmt) is the ITU's nearly identical version of ANSI T1.413-1998. The major differences between G.dmt and ANSI T1.413-1998 are: G.dmt defines DMT based ADSL operation in different regions such as North America, Europe, and Asia, whereas ANSI T1.413-1998 defines operation only in North America, and G.dmt utilizes ITU-T G.994.1 (G.hs) for the handshaking portion of initialization, whereas ANSI T1.413-1998 does not. G.dmt addresses different region specific requirements for DMT based ADSL systems because of the inherent differences in telecommunications systems in different parts of the world. For example, the telecommunication infrastructure in Asia is quite different than that of North America or even Europe. There are also different requirements in different parts of the world, such as support for DMT based ADSL systems operating in the frequency band above ISDN, which is very common in Europe. Since G.dmt is an international specification it must address all of these differences and issues. The use of G.hs in G.dmt compliant devices is necessitated by the need to negotiate through all of the possible options defined in G.dmt, which may all be supported by a single ATU-R or ATU-C.

ADSL: ITU-T G.992.2 (G.lite)

ITU-T G.992.2 (G.lite) is a variation of G.dmt and ANSI T1.413-1998. The intent of G.lite is to provide a less complicated version of DMT based ADSL that can be easily deployed and installed by the end user. The tradeoff associated with decreased complexity is decreased bandwidth. G.lite supports maximum data rates of about 2Mbps downstream and 800kbps upstream – far less than its “full rate” counterpart. There are a few other major differences between G.lite and G.dmt, such as: G.lite does not require a splitter at the remote end (ATU-R); G.lite utilizes only the interleaved data path, thus eliminating many options associated with dual latency and with the fast data path in general; G.lite incorporates extra measures to combat impedance problems due to the omission of the remote splitter. It should be noted that unlike G.dmt, there is no ANSI based G.lite type specification.

SHDSL: ITU-T G.991.2 (G.shdsl)

ITU-T G.991.2 (G.shdsl) is a symmetric type of DSL that, like G.dmt and G.lite, utilizes G.hs as a handshake procedure. G.shdsl is rate adaptive, providing from 192kbps to 2.312Mbps, in increments of 8kbps, in both directions. G.shdsl does not support analog splitting and simultaneous POTS or ISDN in the same pair of wires, but is designed to be spectrally compatible with other DSL technologies. G.shdsl does allow for an optional 4 wire mode of operation, and also defines signal regenerators, or repeaters, for the purpose of alleviating the most common limitation in DSL systems: loop length. G.shdsl is based on 16-level trellis coded pulse amplitude

REFERENCES

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- [2] American National Standards Institute, Inc., Standards Committee T1 – Telecommunications. Standard/Recommendation T1.413-1998, Network and Customer Installation Interfaces – Asymmetric Digital Subscriber Line (ADSL) Metallic Interface. November 1998.
- [3] Summers, Charles K. ADSL: Standards, Implementation, and Architecture. New York, NY: CRC Press LLC, 1999. [58]