UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF TEXAS
DALLAS DIVISION

DIFF SCALE OPERATION RESEARCH, LLC, ***Plaintiff,*** v. **MAXIM INTEGRATED PRODUCTS, INC.,** ***Defendant.***	**Civil Action No._____** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

DIFF Scale Operation Research, LLC ("Plaintiff"), by its undersigned counsel, bring this action and make the following allegations of patent infringement relating to U.S. Patent Nos.: 7,881,413 (the, "'413 patent") and 6,664,827 (the, "'827 patent") (collectively, the "patents-in-suit"). Defendant Maxim Integrated Products, Inc. ("Maxim" or "Defendant") infringes each of the patents-in-suit in violation of the patent laws of the United States of America, 35 U.S.C. § 1 *et seq*.

INTRODUCTION

1. This case arises from Maxim's infringement of a portfolio of semiconductor and network infrastructure patents. This patent portfolio arose from the groundbreaking work of ADC Telecommunications, Inc. ("ADC Telecommunications").

2. In 1935, ADC Telecommunications, then known as the Audio Development Company[1] was founded in Minneapolis, Minnesota by two Bell Laboratory engineers to create

[1] Audio Development Company was later renamed ADC Telecommunications, Inc. *U.S. Senate Executive Reports*, U.S. PRINTING OFFICE at 39 (1999) ("The story of ADC Telecommunications begins in 1935, the height of the great depression . . . . The company got its start with a new innovation called the audiometer, an electronic device designed to test hearing.").

custom transformers and amplifiers for the broadcast radio industry. In the 1950s, ADC Telecommunications began to produce jacks, plugs, patch cords, and jack fields, which would be cornerstones for ADC Telecommunications' later entry into telecommunications equipment.[2]

3. In the late 1990s, ADC Telecommunications pioneered the development of microchips and network switches for the burgeoning telecommunications industry.[3] ADC Telecommunications' products included fiber-optic video, data, and voice transmission systems, and its clients included all the major domestic cable TV operators, numerous phone companies, and a majority of TV broadcasters.[4]

4. Prior licensing of ADC Telecommunications' patents confirms the significant value of ADC Telecommunications' innovations. In 2011, HTC the Taiwan based smartphone manufacturer, bought a portfolio of 82 patents and 14 pending applications related to mobile technology from ADC Telecommunications.[5] HTC asserted two of these patents against Apple before the International Trade Commission.

> Apple Inc. may face a difficult task invalidating two HTC Corp. patents for data transmission in wireless devices, a U.S. Trade Judge said at a trial that could lead to import bans on the newest iPad and the next version of the iPhone. . . In this case, though, HTC acquired the patents at issue in April 2011, around the same time it began selling its first LTE phone, the Thunderbolt. ***The patents are part of a***

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[2] *High Fidelity Audio Devices Boost Capitol Diskery Sales*, BILLBOARD MAGAZINE at 12 (August 8, 1950) (describing Audio Development Company's amplifiers).

[3] David Beal, *Seeing the Light; ADC Telecommunications Has Grown From Making Telephone Jacks And Plugs Into A Force For The Global Fiber-Optic Future*, ST. PAUL PIONEER PRESS at E1 (December 25, 1995).

[4] George Lawton, *Fiber Optic Architecture Evolution Evident at Cable-TV Exhibition*, LIGHTWAVE MAGAZINE (August 1, 1995) ("Cable-Tec Expo's exhibition area featured new fiber-optic products and technologies for the optical-fiber and cable-TV industries. For example, Minneapolis-based ADC Telecommunications Inc.")

[5] *HTC Buys Patents from ADC Telecommunications for $75 million*, THE NATIONAL LAW REVIEW (April 19, 2011), *available at*: https://www.natlawreview.com/article/htc-buys-patents-adc-telecommunications-75-million ("HTC, the Taiwan based smartphone manufacturer, has bought a portfolio of 82 patents and 14 pending applications related to mobile technology from US based ADC Telecommunications.").

> ***portfolio HTC bought for $75 million from ADC Telecommunications Inc.*** [Judge] Pender told McKeon. "They are a property right."

Susan Decker, *HTC Patents Challenged by Apple Probably Valid, Judge Says*, BLOOMBERG NEWS (September 7, 2012) (emphasis added).

5. HTC's assertion of two patents acquired from ADC Telecommunications was described by commentators as forcing Apple to the negotiating table following a series of lawsuits between Apple and HTC:

> A separate case before the ITC may have ***forced Mr. Cook to the negotiating table*** after a judge at the agency said Apple would be likely to face difficulty getting a series of HTC patents invalidated. ***HTC bought those patents, which covered technology used in LTE high-speed wireless devices, from ADC Telecommunications for US $75 million***. "The settlement is a big surprise and is likely due to HTC's LTE patents, which is bought from ADC last year, as Apple's LTE patents are relatively weak," said Jeff Pu, an analyst from Fubon Financial Holding Co.

Apple Settles HTC Patent Suits, Signaling Shift from Jobs' War Plan, FINANCIAL POST / BLOOMBERG NEWS (November 12, 2012) (emphasis added).

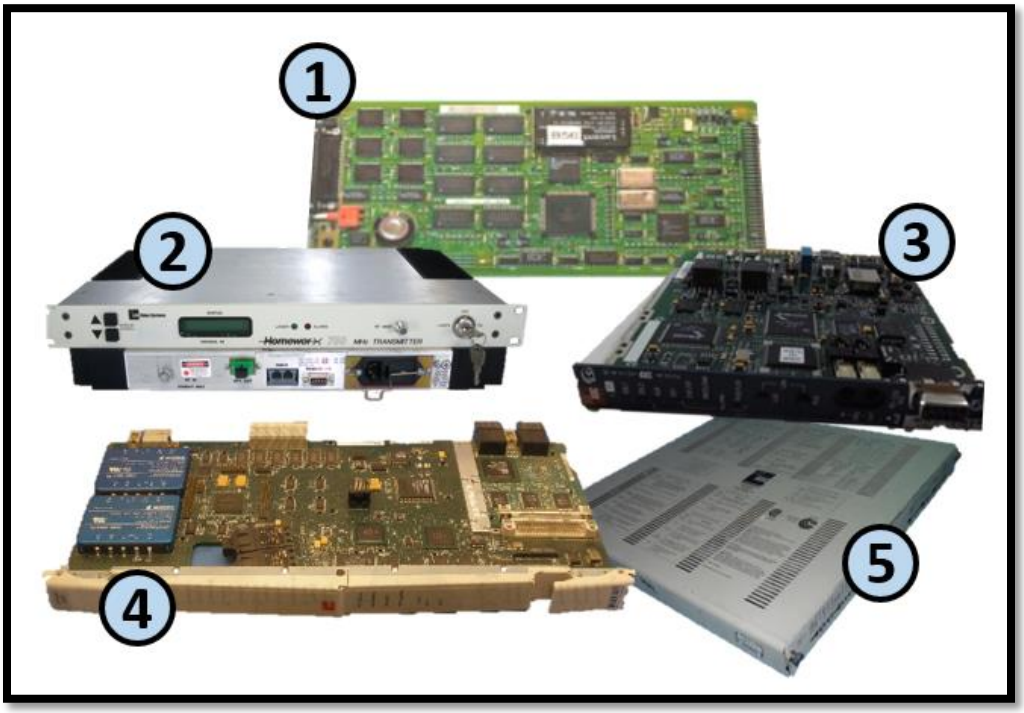
6. ADC Telecommunication's revolutionary products included Homeworx Hybrid Fiber/Coax Access Platform ("ADC Homeworx").[6] ADC Homeworx was an integrated broadband transport system that could deliver video, telephony, data, and other services over a network of fiber optic and coaxial cables.[7] The ADC Homeworx network utilized fiber-optic and radio frequency transmission technologies for transporting various services over a network.[8] ADC Telecommunications' groundbreaking products also included: the Soneplex Platform, CityCell,

[6] Sue Boyle, *Cable-Telephony Platform,* LIGHTWAVE MAGAZINE Vol. 17; No. 16 at 185 (September 1, 2000) ("The Homeworx cable-telephony system adds new features to the carrier-class hybrid fiber/coaxial telephony platform. The system offers improvements in flexibility, manageability, and robustness.").

[7] *Homeworx HFC Access Platform Outdoor ISU-32 Integrated Services Unit Installation Manual,* ADC Telecommunications Manual at 1-1 (July 1999).

[8] *ADC AT&T Bis Team for Cable Telephony,* CABLE WORLD MAGAZINE Vol. 11 at 28 (May 31, 1999) ("The company's Homeworx cable telephony platform has the largest capacity in the fledgling 6 MHz bandwidth channel compared to conventional telephone carriers.").

Cellworx STN Service, the EZT1 Voice Multiplexer, FOLENS (Fiber Optic Local Exchange Network System), and the DS3 Fiber Loop Converter. [9]



ANNOTATED GRAPHIC OF SELECTED ADC TELECOMMUNICATIONS PRODUCTS (numbered annotations showing: (1) ADC Soneplex SPX MPU Board MC68302; (2) ADC Homeworx 750MHz XMTR; (3) ADC HiGain HDSL4 Remote Unit H4TUR402L53; (4) ADC Cellworx BA4IKKLBAA; and (5) ADC Telecommunications EZT1 Access Multiplexer).

7. By 1999, ADC Telecommunications had almost 10,000 employees and annual sales of 1.5 billion dollars. Although ADC Telecommunications was a leading innovator in its field, it was a mid-sized company in a market dominated by multinational corporations.[10]

8. A 1999 New York Times article on the telecommunication industry foreshadowed the difficulties that ADC Telecommunications would face when competing against much large

[9] *Modems, Test Gear, Return Path Hot at Expo*, CED MAGAZINE (June 30, 1997), *available at:* https://www.cedmagazine.com/article/1997/06/modems-test-gear-return-path-hot-expo ("ADC Telecommunications introduced a new forward path receiver that extends performance to 860 MHz for cable TV and telephony applications.").

[10] Barnaby J. Feder, *Optical Fiber (Almost at Home)*, N.Y. TIMES at F-6 (March 24, 1991) ("AT&T's competitors range from giants like Alcatel of France and Fujitsu of Japan to mid-sized companies like ADC Telecommunications Inc.").

competitors who were able to use their market power to dominate the market at the expense of smaller players:

> Cisco's is not the only approach in the M.M.D.S. broad-band data market, however. The company's wireless competitors will include Spike Technologies, ADC Telecommunications and Adaptive Broadband. But ***Cisco's prominence as an Internet technology vendor, along with the powerful alliance it has built, could give the company an inside edge,*** some analysts said.

John Markoff, *Cisco to Offer More Details on Wireless Technology*, N.Y. TIMES a C-1 (November 29, 1999) (emphasis added).

9. In 2015, ADC Telecommunications (including its foundational intellectual property) were acquired by CommScope, Inc. ("CommScope"). CommScope, a spin-off of General Instrument Corporation, manufactures optical fiber cabling, multiplexers, and telecommunications antennas.

10. To facilitate the licensing of ADC Telecommunications' technology, CommScope assigned 73 patents and patent applications covering ADC Telecommunications' pioneering innovations relating to electronic circuits for timing and network traffic management to DIFF Scale Operation Research. DIFF Scale Operation Research protects and licenses ADC Telecommunications' inventions, which are widely adopted by leading technology companies.

11. Highlighting the importance of the patents-in-suit is the fact that the patents-in-suit have been cited by over 600 U.S. Patents and Patent Applications by a wide variety of the largest companies operating in the field. For example, the patents-in-suit have been cited by companies such as:

- International Business Machines Corporation[11]
- Apple, Inc.[12]

[11] *See, e.g.*, U.S. Patent Nos. 7,894,478; 8,270,296; 8,559,460; 7,398,326; 7,827,317; 7,321,648; and 7,746,777.

[12] *See, e.g.*, U.S. Patent Nos. 9,026,680; 7,457,302; and 8,275,910.

- Intel Corporation[13]
- Broadcom Corporation[14]
- Microsoft Corporation[15]
- Sony Corporation[16]
- Cisco Systems, Inc.[17]
- Hewlett-Packard Enterprise Company[18]
- Huawei Technologies Co., Ltd.[19]
- Alcatel-Lucent S.A.[20]
- Fujitsu Ltd.[21]
- Panasonic Corporation[22]
- Telefonaktiebolaget L.M. Ericsson[23]
- NEC Corporation[24]
- Marvell Technology Group, Limited[25]

THE PARTIES

DIFF SCALE OPERATION RESEARCH, LLC

12. DIFF Scale Operation Research, LLC ("DIFF Scale Operation Research") is a limited liability company organized under the laws of Delaware. DIFF Scale Operation Research is committed to advancing the current state of electronic circuitry and network infrastructure.

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[13] *See, e.g.*, U.S. Patent Nos. 7,248,246; 7046675; 7,263,557; 7,903,560; 8,233,506; 7,248,246; 6,507,915; 6,996,632; 7,346,099; and 7,673,073.

[14] *See, e.g.*, U.S. Patent Nos. 7,161,935; 7,203,227; 7,436,849; 7,724,661; 8,401,025; 8,411,705; 8,462,819; and 9,544,638.

[15] *See, e.g.*, U.S. Patent Nos. 7,526,677; 7,533,407; 7,793,096; 7,827,545; and 9,225,684.

[16] *See, e.g.*, U.S. Patent No. 8,200,873.

[17] *See, e.g.*, U.S. Patent Nos. 7,023,883; 7,523,185; 7,631,055; 7,653,924; 7,751,412; 8,144,591; 8,289,873; 8,379,648; and 8,811,281.

[18] *See, e.g.*, U.S. Patent Nos. 7,103,654; 7,187,674; 7,266,598; and 7,478,260.

[19] *See, e.g.*, U.S. Patent Nos. 7,664,051 and 7,916,758.

[20] *See, e.g.*, U.S. Patent Nos. 6,798,741; 6,895,004; 7,209,530; 7,525,913; 7,536,716; 7,583,689; 7,602,701; and 8,379,509.

[21] *See, e.g.*, U.S. Patent Nos. 6,647,012; 7,330,057; 7,450,505; 7,469,298; and 7,664,217.

[22] *See, e.g.*, U.S. Patent Nos. 8,648,632 and 7,457,979.

[23] *See, e.g.*, U.S. Patent Nos. 8,780,695 and 7,215,664.

[24] *See, e.g.*, U.S. Patent Nos. 6,218,875; 6,707,823; 6,810,497; 6,885,676; and 7,486,663.

[25] *See, e.g.*, U.S. Patent Nos. 7,733,588; 7,737,793; and 7,944,313.

13. Brooks Borchers, a former leader of research and development divisions at Boston Scientific Corporation, is the president and owner of DIFF Scale Operation Research, LLC.

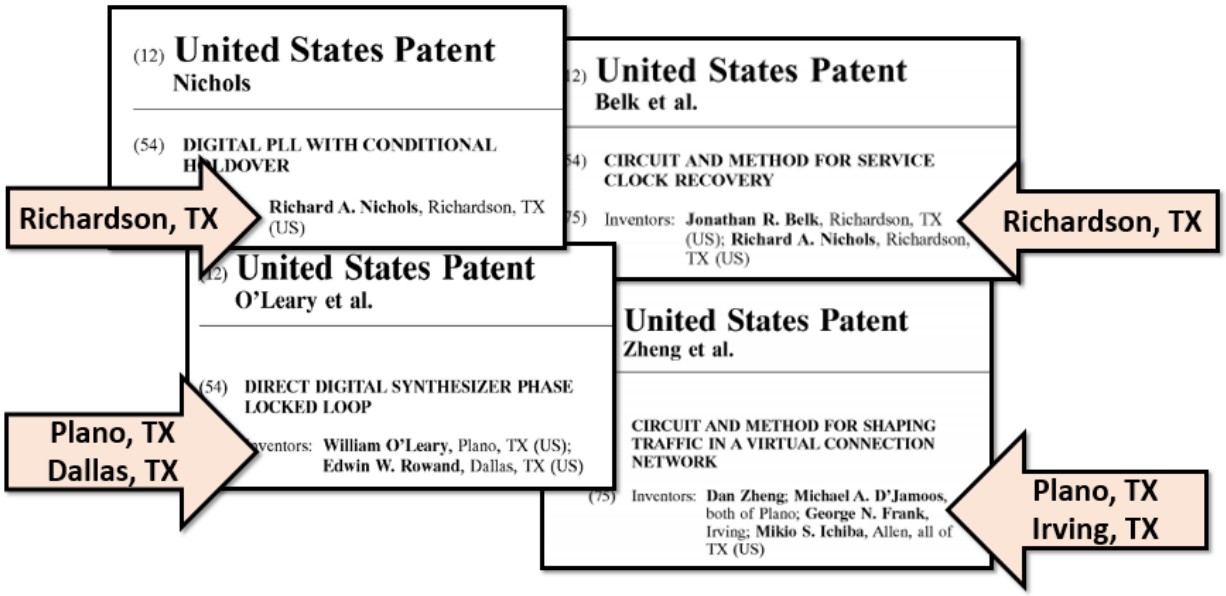
14. In an effort to obtain compensation for ADC Telecommunications' pioneering work in the fields of semiconductors, electronic circuitry, and network infrastructure, CommScope assigned the following patents and patent application to DIFF Scale Operation Research: U.S. Patents and Application Nos. 5,986,486; 6,008,734; 6,157,646; 6,216,166; 6,233,221; 6,363,073; 6,407,983; 6,433,988; 6,664,827; 6,721,328; 6,757,247; 6,847,609; 6,859,430; 6,940,810; 6,959,006; 6,980,565; 6,990,110; 7,106758; 7,170,894; 7,239,627; 7,881,413; 8,121,455; US20010000071A1; US20020150108A1; US20020163886A1; US20020176411A1; US20020180498A1; US20020190764A1; US20030063625A1; US20030118033A1; US20070019686A1; US20100061686A1; US20100150515A1 and International Patents and Application Nos. AT519138T; AU199914551A; AU199923274A; AU199923353A; AU200134402A; AU2002309562A1; CA2442738A1; CA2447983A1; CA2447983C; CN1278969A; CN1289489A; CN1291414A; DE102007010863A1; DE102007010863B4; DE102007032186A1; DE202007008151U1; DK2132589T3; EP1031185A1; EP1050125A1; EP1057361A1; EP1386450A2; EP1386450A4; EP2132589A1; EP2132589B1; ES2368361T3; JP03811007B2; JP2001523059A; JP2002502146A; JP2002504793A; JP3811007B2; WO1999025066A1; WO1999038285A1; WO1999043184A1; WO2001037468A2; WO2001037468A3; WO2002084927A2; WO2002084927A3; WO2002101959A1; WO2008104282A1; WO2008104284A1.[26]

[26] The patents were assigned to DIFF Scale Operation Research by CommScope DSL Systems, LLC and CommScope Technologies, LLC.

15. DIFF Scale Operation Research pursues the reasonable royalties owed for Maxim's use of ADC Telecommunications' and CommScope's groundbreaking technology both here in the United States and throughout the world.

16. CommScope maintains 79,950 square feet of office space at 2601 Telecom Pkwy, Richardson, Texas. Over 200 CommScope employees are employed at its Richardson, Texas location. CommScope maintains off-site document storage at its Richardson, Texas office where hard-copy documents are stored, at least some of which are relevant to this case. CommScope also maintains a datacenter located in Richardson, Texas, where at least some information and software relating to the patents-in-suit in this action are stored. In addition, CommScope maintains a Wide Band Multimode Fiber testing facility in Richardson, Texas.

17. ADC Telecommunications had a significant presence in Richardson, Texas and many of the inventions disclosed in the ADC Telecommunications patent portfolio were made at its Richardson location. On information and belief, many of the named inventors of the ADC Telecommunications patent portfolio continue to be located in and in close proximity to the Northern District of Texas.



U.S. PATENT NOS. 7,881,413; 6,664,827; 7,106,758; 6,407,983 (annotations added) (showing the named inventors located in and in close proximity to the Northern District of Texas).

MAXIM INTEGRATED PRODUCTS, INC.

18. On information and belief, Maxim Integrated Products, Inc. ("Maxim"), is a Delaware corporation with its principal place of business at 160 Rio Robles, San Jose, California 95134. Maxim may be served through its registered agent CSC – Lawyers Incorporating Service Co., 211 E. 7th Street, Suite 620, Austin, Texas 78701. On information and belief, Maxim is registered to do business in the State of Texas and has been since at least December 16, 1994.

19. On information and belief, Maxim conducts business operations within the Northern District of Texas in its facilities at 14675 Dallas Parkway, Suite 300, Dallas, Texas 75254.

20. On information and belief, Maxim has offices in the Northern District of Texas where it sells, develops, and/or markets its products including sales offices in Dallas.

JURISDICTION AND VENUE

21. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has exclusive subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338(a).

22. Upon information and belief, this Court has personal jurisdiction over Maxim in this action because Maxim has committed acts within the Northern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Maxim would not offend traditional notions of fair play and substantial justice. Defendant Maxim, directly and/or through subsidiaries or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the patents-in-suit. Moreover, Maxim is registered to do business in the State of Texas, has offices and facilities in the State of Texas and the Northern District of Texas, and actively directs its activities to customers located in the State of Texas.

23. Venue is proper in this district under 28 U.S.C. §§ 1391(b)-(d) and 1400(b). Defendant Maxim is registered to do business in the State of Texas, has offices in the State of Texas and the Northern District of Texas, and upon information and belief, has transacted business in the Northern District of Texas and has committed acts of direct and indirect infringement in the Northern District of Texas.

ADC TELECOMMUNICATIONS LANDMARK SEMICONDUCTOR AND NETWORKING TECHNOLOGIES

24. In 1935, ADC Telecommunications, then known as the Audio Development Company was founded in Minneapolis, Minnesota by two Bell Laboratory engineers to create custom transformers and amplifiers for the radio broadcast industry. In 1941, while participating

in a project to develop a sophisticated audio system for Coffman Union at the University of Minnesota, ADC Telecommunications began to produce jacks, plugs, patch cords, and jack fields, which would be cornerstones for ADC Telecommunications' later entry into telecommunications equipment.[27]

The Billboard

High-Fidelity Audio Devices Boost Capitol Diskery Sales

WASHINGTON, July 29. — High fidelity listening equipment to spur disk sales and please the customers is fast becoming a byword in retail diskeries here, with considerable credit for the trend going to a local firm, the Shrader Manufacturing Company, which specializes in high-fidelity installations. The Shrader company is doing a land-office business not only in store installations but in even greater volume in high fidelity custom sets for homes, a two-way course of operation which, as one enthusiastic dealer has commented, "has been literally filling the Washington air with good music and filling the record shops with good customers."

With customers showing more and more discrimination in choosing recordings ever since the battle of the disk speeds, disk dealers figure that by using high-fidelity equipment in their listening booths they are satisfying a natural trade need. They point out that results of high-fidelity gear are being shown not only in volume of improved high-fidelity recordings.

Among numerous retail diskeries here equipped by Shrader with high-fidelity gear are the Super Music Company, which has three outlets in the city; the Disc Shop, the Hollywood Music Shop and the John Learmont record and book store. The Super Music Company group and the Disc Shop have recently undergone expansion (*The Billboard*, July 22) and are completely rigged with high-fidelity equipment. The Disc Shop alone has half a dozen listening booths, each equipped with individual high-fidelity amplifiers and speakers. The Super Music group has a total of nearly 70 disk listening posts rigged to high-fidelity equipment. Particularly popular with dealers who have installed high-fidelity gear are the Livingston tone arm, the Rek-O-Kut heavy transcription turntable, Audio Development Company (ADC) amplifiers and Altec 15-inch speakers.

High-fidelity gear is considered by

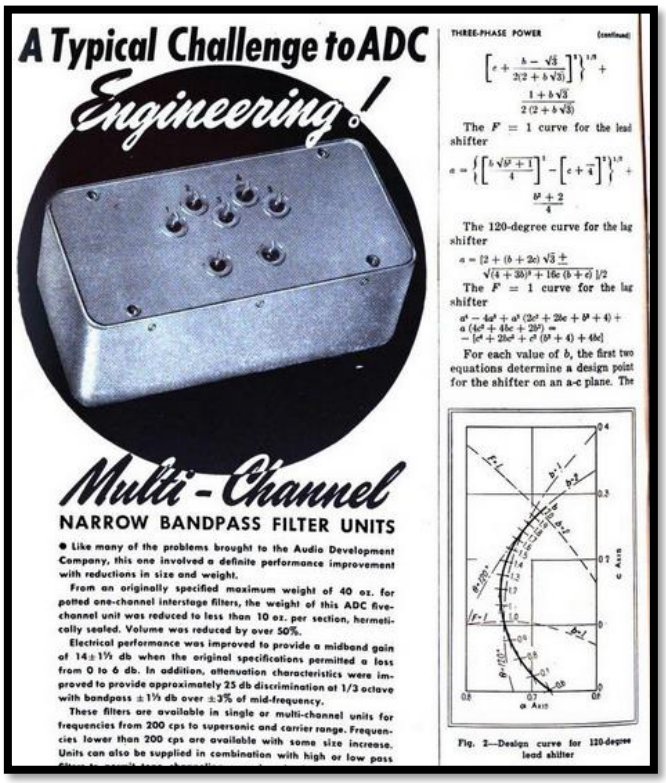
(See High-Fidelity Audio, page 38)

High Fidelity Audio Devices Boost Capitol Diskery Sales, BILLBOARD MAGAZINE at 12 (August 8, 1950) (describing Audio Development Company's amplifiers).

25. In 1961, ADC Telecommunications released the Bantam jack. This product was an amalgam of miniaturized components and became standard for telephone circuit access and patching.[28]

[27] James F. Mauk, INDUSTRIAL RESEARCH LABORATORIES OF THE UNITED STATES at 47 (1947) (listing the research activities of the Audio Development Company as "high temperature electronic transformers; miniaturization of electronic transformers; high frequency electrical wave filters, encapsulation techniques; epoxies").

[28] Steven Titch, *ADC Unveils Loop Product Strategy*, TELEPHONY at 9 (February 24, 1992).



A Typical Challenge to ADC Engineering!

Multi-Channel

NARROW BANDPASS FILTER UNITS

● Like many of the problems brought to the Audio Development Company, this one involved a definite performance improvement with reductions in size and weight.

From an originally specified maximum weight of 40 oz. for potted one-channel interstage filters, the weight of this ADC five-channel unit was reduced to less than 10 oz. per section, hermetically sealed. Volume was reduced by over 50%.

Electrical performance was improved to provide a midband gain of 14 ± 1½ db when the original specifications permitted a loss from 0 to 6 db. In addition, attenuation characteristics were improved to provide approximately 25 db discrimination at 1/3 octave with bandpass ±1½ db over ±3% of mid-frequency.

These filters are available in single or multi-channel units for frequencies from 200 cps to supersonic and carrier range. Frequencies lower than 200 cps are available with some size increase. Units can also be supplied in combination with high or low pass

THREE-PHASE POWER (continued)

The $F = 1$ curve for the lead shifter

The 120-degree curve for the lag shifter

The $F = 1$ curve for the lag shifter

For each value of b, the first two equations determine a design point for the shifter on an a-c plane. The

Fig. 2—Design curve for 120-degree lead shifter

A Typical Challenge To ADC Engineering, ELECTRONICS MAGAZINE Vol. 18 at 288 (August 1945) (describing one of the early innovations of ADC Telecommunications).

26. In the 1960s, ADC Telecommunications began an ongoing partnership with NASA's space missions, designing and manufacturing sensors for the Columbia space shuttle.

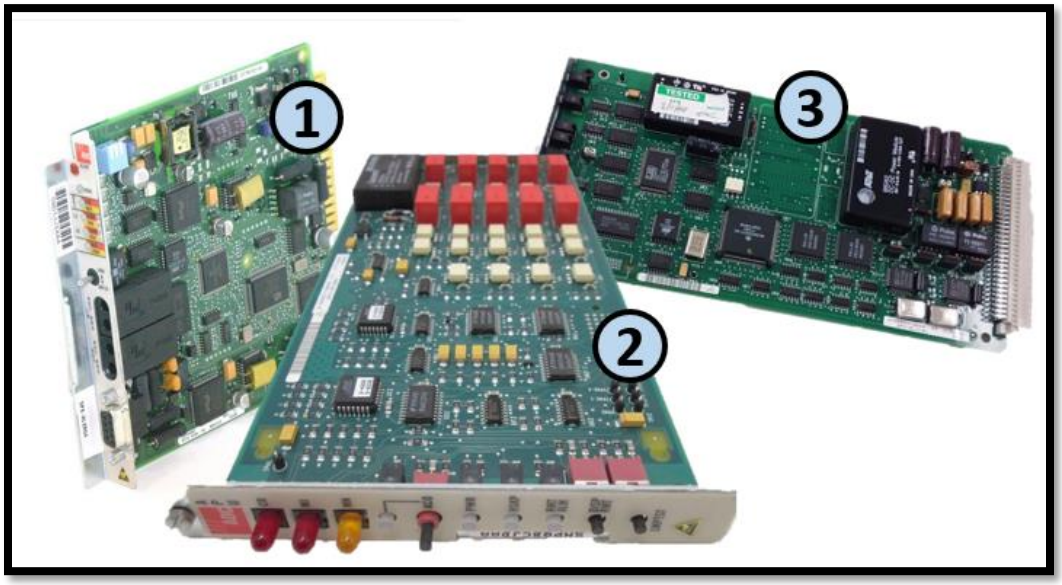
power supply board. The transceivers used are the CAF model manufactured by ADC Telecommunications, Inc.. The transceiver use bidirectional, full-duplex signal transmission over a single optic fiber. The transceiver is a self-contained, circuit-board-mountable device that contains the transmitting LED, the receiving photodetector, and the beam splitter. The transceivers are a matched pair which utilize two different light frequencies for receiving and transmitting. This configuration allows for full-duplex and bidirectional operation over a single fiber optic line. The optic fiber connects to the transceivers with SMA-type connectors.

R. L. Glassell et al., *Custom Electronic Subsystems For The Laboratory Telerobotic Manipulator*, PROCEEDINGS OF THE FOURTH ANS TOPICAL MEETING ON ROBOTICS AND REMOTE SYSTEMS at 151 (1991) (describing the work ADC Telecommunications was doing for NASA).

27. The 1970s and 1980s ushered in technological advancement in all areas of telecommunications and data processing. Public and private computer use increased, and

telecommunications evolved into the computer age, with telephonic digital transmission and the expansion of data communications. As a leading innovator in these fields, ADC Telecommunications grew dramatically. ADC Telecommunications entered the video services delivery market and was a leading supplier of fiber-optic video transmission equipment for cable operators.[29]

28. In the 1990's ADC Telecommunications utilized its fiber-optics expertise to develop a local loop system with the goal of providing economical fiber directly to private homes. ADC Telecommunications also created Networx, a novel transmission platform that integrated cable management and private networking products, using synchronous optical network and the asynchronous transfer mode (ATM). The cornerstone of Networx was Sonoplex, a multi-rate, multimedia system that brought fiber to the customer's work or residence site, while making use of existing copper lines.



ANNOTATED GRAPHIC OF SELECTED ADC SONOPLEX TELECOMMUNICATIONS PRODUCTS (numbered annotations showing: (1) SPX-HLXRG4 Sonoplex HDSL Module; (2) ADC SPX-APU0B1 SONEPLEX ALM Processor Module; and (3) ADC SPX-RLX1B1 CARD.).

[29] Carol Wilson, *ADC Launches Fiber-Coax Platform*, TELEPHONY AT 11 (May 24, 1993).

29. In the 1990s, ADC Telecommunications partnered with South Central Bell, Mississippi Educational Television, Northern Telecom, IBM, and Apple Computer to create Fibernet, a network linking students at four high schools in Clarksville, Corinth, West Point, and Philadelphia, Mississippi, with teachers at Mississippi State University, Mississippi University for Women, and Mississippi School for Mathematics and Science to create "electronic classrooms."

30. ADC Telecommunications became an "early leader" in the asynchronous transfer mode (ATM) market, developing some of the first ATM switches. The ADC Telecommunications ATM switch enabled the handling the massive flows of simultaneous high-speed digital information that the industry projected would be generated during the latter half of the 1990s and into the 21st century, arising from the blending of the communications, computing, and entertainment industries. ADC Telecommunications also landed a coup in March 1994 when Ameritech chose ADC to supply equipment for its fiber-optic video system. This $4.4 billion project would bring 70 channels of analog television and 40 channels of digital video to customers, with unlimited program choices and interactive, customer-controllable programming. By 1999, ADC Telecommunications employed 9,700 people and was selling $1.5 billion dollars in communications equipment.

THE ASSERTED PATENTS

U.S. PATENT NO. 7,881,413

31. U.S. Patent No. 7,881,413 (the "'413 patent") entitled, *Digital PLL With Conditional Holdover*, was filed on March 1, 2002, and claims priority to March 2, 2001. The '413 patent is subject to a 35 U.S.C. § 154(b) term extension of 2,127 days. DIFF Scale Operation Research is the owner by assignment of the '413 patent. A true and correct copy of the '411 patent is attached hereto as Exhibit A.

32. The ‘413 patent teaches novel phase locked loops (PLL) that provide for conditional holdover that is especially suited for use in communications networks.

33. The ‘413 patent and its underlying patent application have been cited by 24 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘413 patent and its underlying patent application as relevant prior art:

- Fujitsu Ltd.
- Infineon Technologies Ag
- Mediatek Inc.
- Schweitzer Engineering Laboratories, Inc.
- Silicon Laboratories Inc
- Sony Corporation
- Thomas & Betts International, LLC
- National Semiconductor Corporation
- L3 Communications Integrated Systems, L.P.
- Xilinx, Inc.
- Nortel Networks Limited
- Lattice Semiconductor
- Emerson Electric Co., Ltd.
- Furuno Electric Co., Ltd.
- Panasonic Corporation
- Huawei Technologies Co., Ltd

U.S. PATENT NO. 6,664,827

34. U.S. Patent No. 6,664,827 (the “‘827 patent”) entitled, *Direct Digital Synthesizer Phase Locked Loop,* was filed on March 1, 2002, and claims priority to March 2, 2001. DIFF Scale Operation Research is the owner by assignment of the ‘827 patent. A true and correct copy of the ‘827 patent is attached hereto as Exhibit B.

35. The ‘827 patent discloses phase locked loops for establishing a timing signal for signal communication synchronization. The various embodiments of the invention make use of phase locked loops adapted to filter and store data indicative of the control signal applied to an oscillator. Such phase locked loops permit suppression of tracking in the event of a step change

in the phase difference between the reference clock signal and the feedback signal in the phase locked loop. Such phase locked loops further facilitate compensation for drift of the oscillator.

36. The ‘827 patent teaches, in one embodiment, a phase locked loop that includes a digital phase comparator having a first input for receiving a reference clock signal, a second input for receiving a feedback signal, and an output for providing an error signal; a digital loop filter having an input for receiving the error signal and an output for providing a control signal; a numerically-controlled oscillator having an input for receiving the control signal and an output for providing a timing signal, wherein the feedback signal is derived from the timing signal.

37. The ‘827 patent teaches detecting a step change in a phase relationship between the reference clock signal and the feedback signal, and to recenter the digital phase comparator if a step change is detected.

38. The ‘827 patent teaches the sampling of data from a low-pass filter indicative of an average control signal and comparing the average control signal to a threshold limit. The ‘827 patent describes trimming the oscillator if the average control signal is outside the threshold limit.

39. The ‘827 patent further teaches monitoring a phase comparator for a step change in the phase difference between the reference clock signal and the feedback signal; and recentering the phase comparator if a step change in the phase difference between the reference clock signal and the feedback signal is detected.

40. The ‘827 patent and its underlying patent application have been cited by 48 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘827 patent and its underlying patent application as relevant prior art:

- Advantest Corporation
- Agilent Technologies Inc.,

- Air Products and Chemicals, Inc.
- Broadcom Corporation
- Datang Group
- Freescale Semiconductor, Inc.
- NXP Semiconductors
- Infineon Technologies AG
- International Business Machines Corporation
- Marvell International Ltd.
- Cavium
- Metrotech Corporation
- Nvidia Corporation
- Siemens Aktiengesellschaft
- Standard Microsystems Corporation
- Western Digital Technologies, Inc.
- Hewlett-Packard Development Company, L.P.
- Rambus, Inc.
- Panasonic Corporation
- National Semiconductor Corporation
- Alcatel
- Lightlab Imaging, Inc.
- Matsushita Electric Industrial Co., Ltd.
- National Aeronautics and Space Administration ("NASA")
- Advanced Micro Devices, Inc.
- Nihon Dempa Kogyo Co., Ltd.

COUNT I
INFRINGEMENT OF U.S. PATENT NO. 7,881,413

41. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

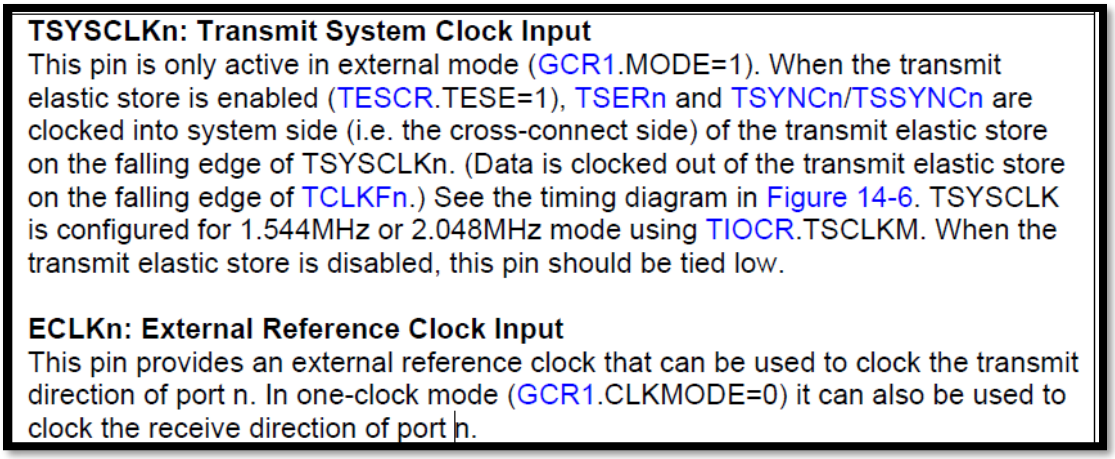
42. Maxim designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for generating a timing signal in a phase locked loop.

43. Maxim designs, makes, sells, offers to sell, imports, and/or uses products incorporating timing devices, including the following products: DS34T101 Single/Dual/Quad/Octal TDM-Over-Packet Chip (DS34T101GN, DS34T101GN+); DS34T102 Single/Dual/Quad/Octal TDM-Over-Packet Chip (DS34T102GN+); DS34T104 (DS34T104GN,

DS34T104GN+); and DS34T108 (DS34T108GN, DS34T108GN+) (collectively, the "Maxim '413 Product(s)").

44. On information and belief, one or more Maxim subsidiaries and/or affiliates use the Maxim '413 Products in regular business operations.

45. On information and belief, one or more of the Maxim '413 Products include technology for generating a timing signal from a reference clock signal.



TSYSCLKn: Transmit System Clock Input
This pin is only active in external mode (GCR1.MODE=1). When the transmit elastic store is enabled (TESCR.TESE=1), TSERn and TSYNCn/TSSYNCn are clocked into system side (i.e. the cross-connect side) of the transmit elastic store on the falling edge of TSYSCLKn. (Data is clocked out of the transmit elastic store on the falling edge of TCLKFn.) See the timing diagram in Figure 14-6. TSYSCLK is configured for 1.544MHz or 2.048MHz mode using TIOCR.TSCLKM. When the transmit elastic store is disabled, this pin should be tied low.

ECLKn: External Reference Clock Input
This pin provides an external reference clock that can be used to clock the transmit direction of port n. In one-clock mode (GCR1.CLKMODE=0) it can also be used to clock the receive direction of port n.

DS34T101, DS34T102, DS34T104, DS34T108 Single/Dual/Quad/Octal TDM-over-Packet Chip, MAXIM DATASHEET at 32 (August 2009).

46. On information and belief, one or more of the Maxim '413 Products contain a phase comparator.

47. On information and belief, one or more of the Maxim '413 Products contain a low-pass filter.

48. On information and belief, one or more of the Maxim '413 Products comprise an oscillator coupled in a feedback arrangement.

49. On information and belief, one or more of the Maxim '413 Products comprise a control system that generates an output signal where the phase of the output signal is related to the phase of an input signal.

> In T1 mode, LOS is declared when no pulses are detected (i.e., when the signal level is 3dB below the Rx sensitivity level set by LRISMR.RSMS[1:0]) in a window of 192 consecutive pulse intervals. When LOS occurs, the receiver sets the real-time LOS status bit in LRSR and the latched LOS status bit in LLSR. LLSR.LOS in turn can cause and interrupt request if enabled by LSIMR.LOS. LOS is cleared when 24 or more pulses are detected (amplitude greater than Rx sensitivity threshold) in a 192-bit period (pulse density above 12.5%) and there are no occurrences of 100 or more consecutive zeroes during that period. This algorithm meets the requirements of ANSI T1.231. For example, if Rx sensitivity is set at 18dB below nominal (LRISMR.RSMS[1:0], the LOS set threshold is 24dB below nominal, and the LOS clear threshold is 22dB below nominal.

DS34T101, DS34T102, DS34T104, DS34T108 Single/Dual/Quad/Octal TDM-over-Packet Chip, MAXIM DATASHEET at 140 (August 2009).

50. On information and belief, the Maxim '413 Products are available to businesses and individuals throughout the United States.

51. On information and belief, the Maxim '413 Products are provided to businesses and individuals located in the Northern District of Texas.

52. On information and belief, Maxim has directly infringed and continues to directly infringe the '413 patent by, among other things, making, using, offering for sale, and/or selling technology for generating a timing signal in a phase locked loop, including but not limited to the Maxim '413 Products, which include infringing technology for generating a timing signal in a phase locked loop. Such products and/or services include, by way of example and without limitation, the Maxim '413 Products.

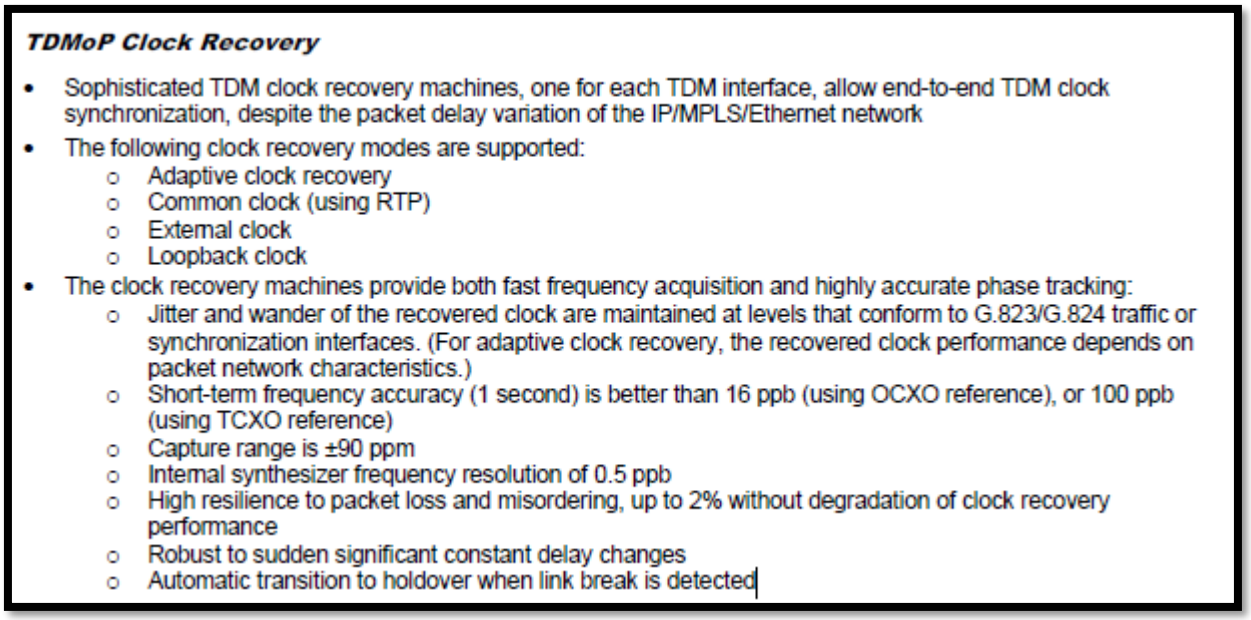
53. On information and belief, the Maxim '413 Products comprise a system for generating a timing signal from a reference clock signal in a phase locked loop.

> When clock recovery is enabled (Clock_recovery_en=1 in General_cfg_reg0), the clock recovery machines of the TDM-over-packet block require a 38.88MHz clock. This clock can come directly from the CLK_HIGH pin, or the CLAD1 block (see Figure 6-1) can convert a 10MHz, 19.44MHz or 77.76MHz clock on CLK_HIGH to 38.88MHz using an analog PLL. The frequency of CLK_HIGH must be specified in GCR1.FREQSEL.
>
> When common clock (differential) mode is enabled (RTP_timestamp_generation_mode=1 in General_cfg_reg1), the clock recovery block requires a clock on the CLK_CMN pin *in addition to* the clock on the CLK_HIGH pin. See the CLK_CMN pin description for recommendations for the frequency of this clock. Often the same clock signal can be applied to both CLK_CMN and CLK_HIGH, for example 19.44MHz.

DS34T101, DS34T102, DS34T104, DS34T108 Single/Dual/Quad/Octal TDM-over-Packet Chip, MAXIM DATASHEET at 52 (August 2009.

54. On information and belief, the Maxim '413 Products include functionality for monitoring a status message received from a source of the reference clock signal indicative of a quality level of the reference clock signal.

55. On information and belief, the Maxim '413 Products are a system containing functionality for placing the phase locked loop in a holdover condition if the quality level indicated by the status message is below a target level.



TDMoP Clock Recovery

- Sophisticated TDM clock recovery machines, one for each TDM interface, allow end-to-end TDM clock synchronization, despite the packet delay variation of the IP/MPLS/Ethernet network
- The following clock recovery modes are supported:
  - Adaptive clock recovery
  - Common clock (using RTP)
  - External clock
  - Loopback clock
- The clock recovery machines provide both fast frequency acquisition and highly accurate phase tracking:
  - Jitter and wander of the recovered clock are maintained at levels that conform to G.823/G.824 traffic or synchronization interfaces. (For adaptive clock recovery, the recovered clock performance depends on packet network characteristics.)
  - Short-term frequency accuracy (1 second) is better than 16 ppb (using OCXO reference), or 100 ppb (using TCXO reference)
  - Capture range is ±90 ppm
  - Internal synthesizer frequency resolution of 0.5 ppb
  - High resilience to packet loss and misordering, up to 2% without degradation of clock recovery performance
  - Robust to sudden significant constant delay changes
  - Automatic transition to holdover when link break is detected

DS34T101, DS34T102, DS34T104, DS34T108 Single/Dual/Quad/Octal TDM-over-Packet Chip, MAXIM DATASHEET at 52 (August 2009) ("Automatic transition to holdover when link break is detected.")

56. The Maxim '413 Products comprise a system for performing the elements in a proscribed order.

57. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Maxim '413 Products, Maxim has injured DIFF Scale Operation Research and is liable to the Plaintiff for directly infringing one or more claims of the '413 patent, including at least claim 21 pursuant to 35 U.S.C. § 271(a).

58. On information and belief, Maxim also indirectly infringes the '413 patent by actively inducing infringement under 35 USC § 271(b).

59. Maxim has had knowledge of the '413 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Maxim knew of the '413 patent and knew of its infringement, including by way of this lawsuit.

60. On information and belief, Maxim intended to induce patent infringement by third-party customers and users of the Maxim '413 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Maxim specifically intended and was aware that the normal and customary use of the accused products would infringe the '413 patent. Maxim performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '413 patent and with the knowledge that the induced acts would constitute infringement. For example, Maxim provides the Maxim '413 Products that have the capability of operating in a manner that infringe one or more of the claims of the '413 patent, including at least claim 21, and Maxim further provides documentation and training materials that cause customers and end users of the Maxim '413 Products to utilize the products in a manner that directly infringe one or more claims of the '413 patent.[30] By providing instruction and training to customers and end-users on how to use the Maxim '413 Products in a manner that directly infringes one or more claims of the '413 patent, including at least claim 21, Maxim specifically intended to induce infringement of the

[30] *See, e.g.*, DS34T101, DS34T102, DS34T104, DS34T108 SINGLE/DUAL/QUAD/OCTAL TDM-OVER-PACKET CHIP, DOCUMENT NO. 19-4835 (Aug. 2009); DS34T108DK; *Bridging Two Worlds: IC Solutions Optimize Transportation of Data Between Network Infrastructures*, COMMUNICATIONS DESIGN GUIDE 7TH ED. (2007); *Frequently asked questions about Maxim's time-division multiplexing over packet (TDMoP) techniques,* MAXIM PRODUCTS APPLICATION NOTE 4892 (January 14, 2011); *DS34T108DK Evaluation Kit for 1- to 8-Port TDM-over-Packet ICs,* MAXIM PRODUCT DOCUMENTATION (November 10, 2008).

‘413 patent. On information and belief, Maxim engaged in such inducement to promote the sales of the Maxim ‘413 Products, e.g., through Maxim user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the ‘413 patent. Accordingly, Maxim has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the ‘413 patent, knowing that such use constitutes infringement of the ‘413 patent.

61. The ‘413 patent is well-known within the industry as demonstrated by multiple citations to the ‘413 patent in published patents and patent applications assigned to technology companies and academic institutions. Maxim is utilizing the technology claimed in the ‘413 patent without paying a reasonable royalty. Maxim is infringing the ‘413 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

62. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ‘413 patent.

63. As a result of Maxim’s infringement of the ‘413 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Maxim’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Maxim together with interest and costs as fixed by the Court.

COUNT II
INFRINGEMENT OF U.S. PATENT NO. 6,664,827

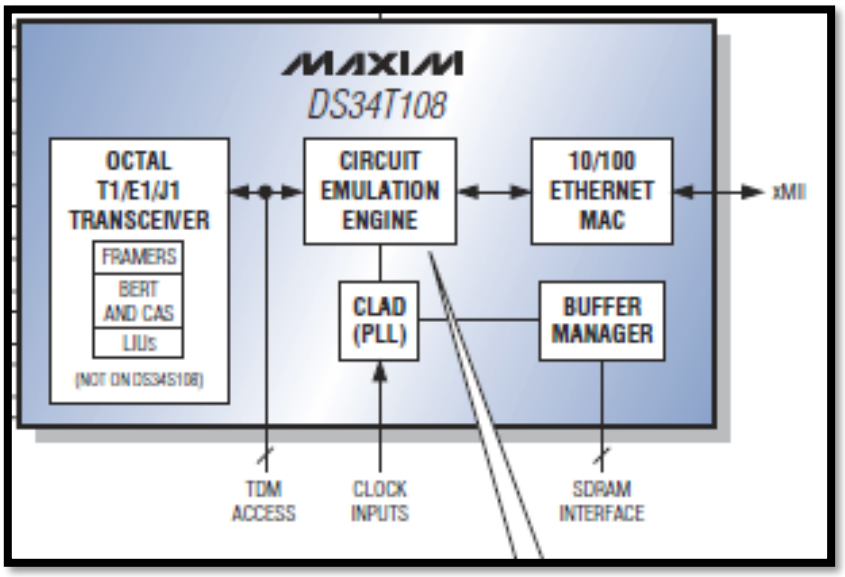
64. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

65. Maxim designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for timing circuitry.

66. Maxim designs, makes, sells, offers to sell, imports, and/or uses products incorporating timing devices, including the following products: MAX3872 Multirate Clock and Data Recovery with Limited Amplifier (MAX3872ETJ+, MAX3872EVKIT#, MAX3872ETJ+T, MAX3872EGJ, MAX3872AETJ+, MAX3872AETJ+T); DS34T101 Single/Dual/Quad/Octal TDM-Over-Packet Chip (DS34T101GN, DS34T101GN+); DS34T102 Single/Dual/Quad/Octal TDM-Over-Packet Chip (DS34T102GN+); DS34T104 (DS34T104GN, DS34T104GN+); and DS34T108 (DS34T108GN, DS34T108GN+) (collectively, the "Maxim '827 Product(s)").

67. On information and belief, one or more Maxim subsidiaries and/or affiliates use the Maxim '827 Products in regular business operations.

68. On information and belief, one or more of the Maxim '827 Products include technology for a phase locked loop.

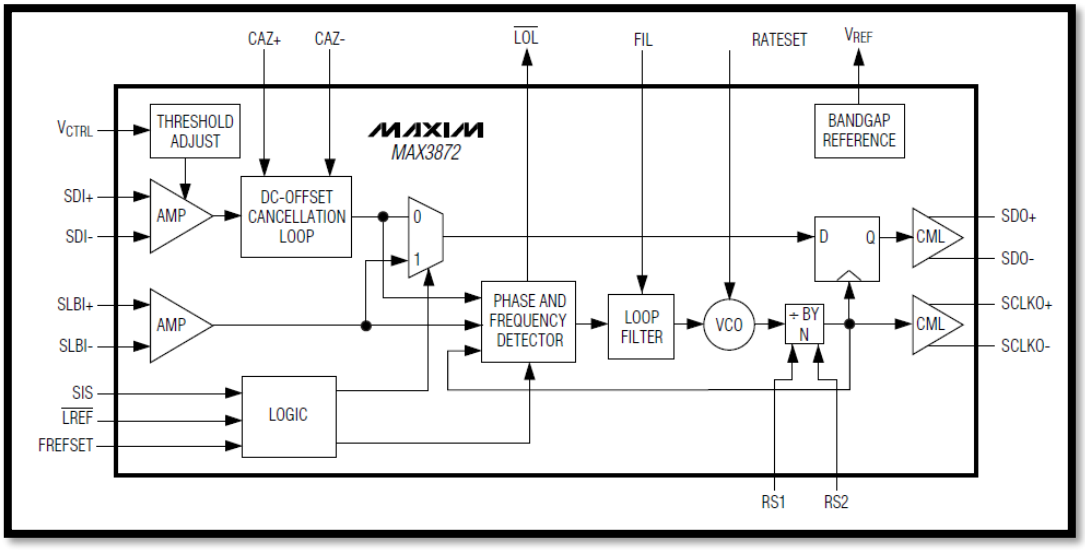


Bridging Two Worlds: IC Solutions Optimize Transportation Of Data Between Network Infrastructures, COMMUNICATIONS DESIGN GUIDE 8TH EDITION at 3 (April 2009).

69. On information and belief, the Maxim '827 Products are available to businesses and individuals throughout the United States.

70. On information and belief, the Maxim '827 Products are provided to businesses and individuals located in the Northern District of Texas.

71. On information and belief, the Maxim '827 Products comprise a phase locked loop adapted to filter and store data indicative of a control signal.

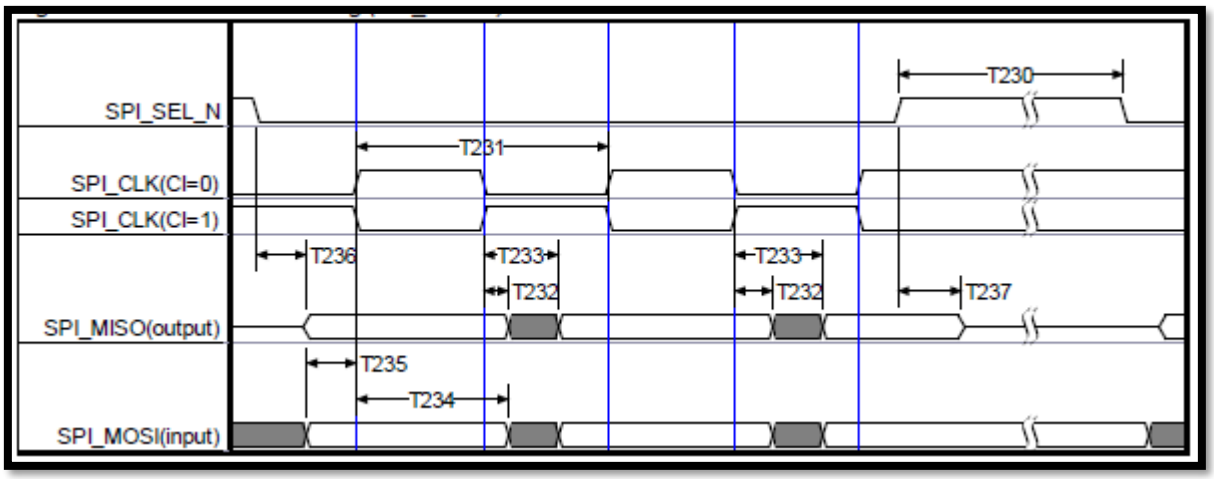


MAX3872 Multirate Clock and Data Recovery with Limiting Amplifier, MAXIM DATASHEET V.0 at 8 (2003) ("The PLL consists of a phase/frequency detector, a loop filter, and a voltage controlled oscillator (VCO) with programmable dividers.").

72. On information and belief, the Maxim '827 Products comprise a control system that generates an output signal whose phase is related to the phase of an input signal.

73. On information and belief, the Maxim '827 Products comprise a frequency-selective circuit.

74. On information and belief, the Maxim '827 Products include a phase comparator.

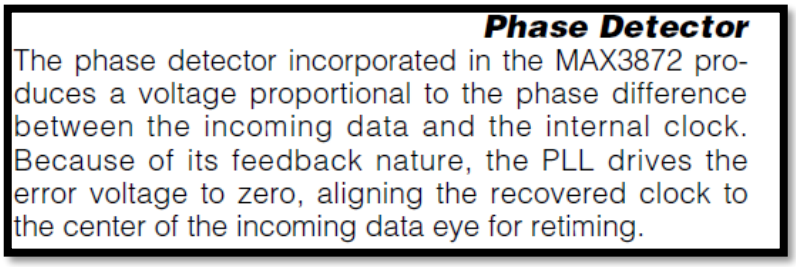


DS34S101, DS34S102, DS34S104, DS34S108 Single/Dual/Quad/Octal TDM-over-Packet Chip, MAXIM DATASHEET at 166 (March 26, 2009) (showing the clock phase input in SPI interface mode).

75. On information and belief, the Maxim '827 Products contain a low-pass filter.

76. On information and belief, the Maxim '827 Products comprise an oscillator coupled in a feedback arrangement.

77. On information and belief, the Maxim '827 Products include a phase comparator having a first input for the reference clock signal and a second input for the feedback signal.



Phase Detector

The phase detector incorporated in the MAX3872 produces a voltage proportional to the phase difference between the incoming data and the internal clock. Because of its feedback nature, the PLL drives the error voltage to zero, aligning the recovered clock to the center of the incoming data eye for retiming.

MAX3872 Multirate Clock and Data Recovery with Limiting Amplifier, MAXIM DATASHEET V.0 at 8 (2003) ("The phase detector incorporated in the MAX3872 produces a voltage proportional to the phase difference between the incoming data and the internal clock. Because of its feedback nature, the PLL drives the error voltage to zero.").

78. On information and belief, the Maxim '827 Products contain functionality for sampling values of an error signal.

79. On information and belief, the Maxim ’827 Products contain functionality for sampling an error signal where the error signal is indicative of a phase relationship between a reference clock signal and a feedback signal.

80. On information and belief, Maxim has directly infringed and continues to directly infringe the ’827 patent by, among other things, making, using, offering for sale, and/or selling timing circuitry, including but not limited to the Maxim ’827 Products, which include infringing technology for monitoring the sampled error signal values for a step change in the phase difference between the reference clock signal and the feedback signal. Such products and/or services include, by way of example and without limitation, the Maxim ’827 Products.

81. On information and belief, the ‘827 Products comprise a system for monitoring the sampled error signal values for a step change in the phase difference between the reference clock signal and the feedback signal.

82. On information and belief, the ‘827 Products include functionality for recentering a phase comparator if a step change in the phase difference between the reference clock signal and the feedback signal is detected.

83. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Maxim ’827 Products, Maxim has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the ’827 patent, including at least claim 28, pursuant to 35 U.S.C. § 271(a).

84. On information and belief, Maxim also indirectly infringes the ’827 patent by actively inducing infringement under 35 USC § 271(b).

85. On information and belief, Maxim has had knowledge of the '827 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Maxim knew of the '827 patent and knew of its infringement, including by way of this lawsuit.

86. On information and belief, Maxim intended to induce patent infringement by third-party customers and users of the Maxim '827 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Maxim specifically intended and was aware that the normal and customary use of the accused products would infringe the '827 patent. Maxim performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '827 patent and with the knowledge that the induced acts would constitute infringement. For example, Maxim provides the Maxim '827 Products that have the capability of operating in a manner that infringe one or more of the claims of the '827 patent, including at least claim 28, and Maxim further provides documentation and training materials that cause customers and end users of the Maxim '827 Products to utilize the products in a manner that directly infringe one or more claims of the '827 patent.[31] By providing instruction and training to customers and end-users on how to use the Maxim '827 Products in a manner that directly infringes one or more claims of the '827 patent, including at least claim 28, Maxim specifically intended to induce infringement of the '827 patent. On information and belief, Maxim engaged in such inducement to promote the sales

[31] *See, e.g.*, Wafa Iqbal, *Understanding The Operation Of The Frequency Synthesizer In Maxim's Rf Transceivers*, MAXIM APPLICATION NOTE 6269 (2014); *Choosing an Optimal Filter Capacitor for the MAX3872 Multi-Rate CDR*, MAXIM DESIGN NOTE HFDN-25.0 (April 2008); *Design Challenges of GPON FEC Receivers*, MAXIM TECHNICAL ARTICLE HFTA-14.0 REV.1 (April 2008); DS33X162/DS33X161/DS33X82/DS33X81/DS33X42/DS33X41/DS33X11/ DS33W41/DS33W11 ETHERNET OVER PDH MAPPING DEVICES, DATA SHEET (2008); DS34T101, DS34T102, DS34T104, DS34T108 SINGLE/DUAL/QUAD/OCTAL TDM-OVER-PACKET CHIP, DOCUMENT NO. 19-4835 (Aug. 2009); DS34T108DK; *Bridging Two Worlds: IC Solutions Optimize Transportation of Data Between Network Infrastructures*, COMMUNICATIONS DESIGN GUIDE 7TH ED. (2007).

of the Maxim '827 Products, e.g., through Maxim user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '827 patent. Accordingly, Maxim has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '827 patent, knowing that such use constitutes infringement of the '827 patent.

87. The '827 patent is well-known within the industry as demonstrated by multiple citations to the '827 patent in published patents and patent applications assigned to technology companies and academic institutions. Maxim is utilizing the technology claimed in the '827 patent without paying a reasonable royalty. Maxim is infringing the '827 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

88. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '827 patent.

89. As a result of Maxim's infringement of the '827 patent, DIFF Scale Operation Research has suffered monetary damages, and seek recovery in an amount adequate to compensate for Maxim's infringement, but in no event less than a reasonable royalty for the use made of the invention by Maxim together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

WHEREFORE, DIFF Scale Operation Research respectfully requests that this Court enter:

A. A judgment in favor of DIFF Scale Operation Research that Maxim has infringed, either literally and/or under the doctrine of equivalents, the '413 and '827 patents;

B. An award of damages resulting from Maxim's acts of infringement in

accordance with 35 U.S.C. § 284;

C. A judgment and order finding that Maxim's infringement was willful, wanton, malicious, bad-faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate within the meaning of 35 U.S.C. § 284 and awarding to DIFF Scale Operation Research enhanced damages.

D. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to DIFF Scale Operation Research their reasonable attorneys' fees against Maxim.

E. Any and all other relief to which DIFF Scale Operation Research may show themselves to be entitled.

JURY TRIAL DEMANDED

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, DIFF Scale Operation Research, LLC requests a trial by jury of any issues so triable by right.

Dated: March 15, 2018

Respectfully submitted,

/s/ Elizabeth L. DeRieux

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