CONFORM

Terry T. Tsai (SBN 277495)
ttsai@steptoe.com
STEPTOE & JOHNSON LLP
2121 Avenue of the Stars, Suite 2800
Los Angeles, CA 90067-5052
Telephone: (310) 734-3200
Facsimile:(310) 734-3300

Thomas G. Pasternak (*moving for pro hac vice admission*)
tpasternak@steptoe.com
STEPTOE & JOHNSON LLP
115 South La Salle Street, Suite 3100
Chicago, IL 60603
Telephone: (312) 577-1300
Facsimile: (312) 577-1370

John Caracappa (*moving for pro hac vice admission*)
jcaracappa@steptoe.com
STEPTOE & JOHNSON LLP
1330 Connecticut Avenue, NW
Washington, DC 20036
Telephone: (202) 429-3000
Facsimile: (202) 429-3902

Attorneys for Plaintiff, American Radio

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

AMERICAN RADIO LLC,
Plaintiff,
vs.
BROADCOM CORPORATION,
Defendants.

Case No.: SACV12-1123-DOC (RNBx)

COMPLAINT FOR PATENT INFRINGEMENT

JURY TRIAL DEMANDED

Plaintiff American Radio LLC ("American Radio"), by its attorneys, complains against defendant Broadcom Corporation ("Broadcom") as follows:

PARTIES

1. Plaintiff American Radio is a limited liability corporation organized under the laws of California with its principal place of business at 1007 Goldeneye View, Carlsbad, CA 92011. American Radio is the assignee of all right, title, and interest in and to the '942 Patent, U.S. Patent No. 8,045,942.

2. On information and belief, defendant Broadcom is a corporation organized under the laws of the state of California with its principal place of business at 5300 California Avenue, Irving, California 92617.

JURISDICTION

3. This is an action arising under the patent laws of the United States, Title 35 of the United States Code. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

4. Broadcom, directly and/or through intermediaries or established distribution channels (including distributors, online retailers, and others), ships, distributes, offers for sale, sells, provides instructions on how to use, and/or advertises its products in or into the United States, the State of California, and this District. Broadcom has purposefully and voluntarily placed one or more of its infringing products into the stream of commerce with the expectation that they will be purchased by customers within this District. These infringing products have been, and continue to be, purchased by customers within this District.

5. Broadcom derives substantial revenue from the sale of infringing products distributed within this District, and/or expects or should reasonably expect its actions to have consequences within this District, and derives substantial revenue from interstate and international commerce.

6. In addition, Broadcom actively induces infringement and contributes to infringement within this District by contracting with others to market and sell

infringing products with the knowledge and intention of facilitating infringing sales of the infringing products by others within this District.

7. Broadcom has a significant presence in this district by virtue of its corporate headquarters.

8. For these reasons this Court has personal jurisdiction over Broadcom.

VENUE

9. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b), (c) and (d) and 1400(b) because this is an action for patent infringement, and Broadcom resides in this District. Moreover, venue is proper because this State and District has personal jurisdiction over Broadcom.

'942 PATENT

10. United States Patent No. 8,045,942 ("the '942 Patent"), entitled "System And Method For Radio Signal Reconstruction Using Signal Processor," was duly and legally issued by the United States Patent and Trademark Office on October 25, 2011. A true and correct copy of the '942 Patent is attached as Exhibit A and is incorporated herein by reference.

11. American Radio is the owner of all right, title and interest in and to the '942 Patent and is entitled to sue for past and future infringement and recover damages

BROADCOM'S KNOWLEDGE OF THE '942 PATENT

12. Broadcom has actual notice of the '942 Patent since at least October 2011. Kelly Hale, Broadcom's in-house attorney, received notice of the '942 patent from Mr. Hotto at that time.

COUNT I – WILLFUL DIRECT INFRINGEMENT OF U.S. PATENT NO. 8,045,942

13. American Radio repeats and realleges the allegations in paragraphs 1-12, inclusive.

14. Broadcom has directly infringed, and is continuing to directly infringe, one or more of the '942 Patent claims, including but not limited to claims 1-3, by making, using, selling, offering for sale, and/or importing at least the following Broadcom Products and any similar products and related technology: Broadcom part no. BCM3124, BCM3128, BCM3138, BCM3140, BCM3383, BCM4528; products described or marketed by Broadcom as using or supporting the "Full Band Capture" technology or direct sampling; and any products incorporating any of the aforementioned devices.

15. Broadcom is liable for its infringement of the '942 Patent pursuant to 35 U.S.C. § 271.

16. Broadcom's direct infringement of the '942 Patent is willful.

17. Broadcom's willful direct infringement of the '942 Patent has damaged and will continue to damage American Radio.

18. Broadcom's willful direct infringement of the '942 Patent has caused and will continue to cause American Radio irreparable harm unless enjoined by the Court. American Radio has no adequate remedy at law. American Radio's damages from the infringing activities of Broadcom are not yet determined.

COUNT 2 – WILLFUL INDUCED INFRINGEMENT OF U.S. PATENT NO. 8,045,942

19. American Radio repeats and realleges the allegations in paragraphs 1-12, inclusive.

20. Broadcom has induced infringed infringement of, and is continuing to induce infringement of, one or more of the '942 Patent claims, including but not limited to claims 1-3, by making, using, selling, offering for sale, and/or importing at least the following Broadcom Products and providing directions for their use, as well as any similar products and related technology: Broadcom part no. BCM3124, BCM3128, BCM3138, BCM3140, BCM3383, BCM4528; products described or marketed by Broadcom as using or supporting the "Full Band Capture" technology

or direct sampling; and any products incorporating any of the aforementioned devices.

21. Broadcom is liable for its induced infringement of the '942 Patent pursuant to 35 U.S.C. § 271.

22. Broadcom's induced infringement of the '942 Patent is being done and has been done with knowledge of the '942 Patent or with willful blindness of the existence of the '942 Patent.

23. Broadcom's induced infringement of the '942 Patent is willful.

24. Broadcom's willful induced infringement of the '942 Patent has damaged and will continue to damage American Radio.

25. Broadcom's willful induced infringement of the '942 Patent has caused and will continue to cause American Radio irreparable harm unless enjoined by the Court. American Radio has no adequate remedy at law. American Radio's damages from the infringing activities of Broadcom are not yet determined.

COUNT 3 – WILLFUL CONTRIBUTORY INFRINGEMENT OF U.S. PATENT NO. 8,045,942

26. American Radio repeats and realleges the allegations in paragraphs 1-12, inclusive.

27. At least the following Broadcom Products and similar products and related technology are used in practicing the '942 Patent and constitute a material part of the invention: Broadcom part no. BCM3124, BCM3128, BCM3138, BCM3140, BCM3383, BCM4528; products described or marketed by Broadcom as using or supporting the "Full Band Capture" technology or direct sampling; and any products incorporating any of the aforementioned devices.

28. Broadcom knows these products to be especially made or especially adapted for use in an infringement of such patent, and these products are not a staple article or commodity of commerce.

29. Thus, Broadcom has contributed to the infringement of, and is continuing to contribute to the infringement of, one or more of the '942 Patent claims, including but not limited to claims 1-3 of the '942 Patent.

30. Broadcom is liable for its contributory infringement of the '942 Patent pursuant to 35 U.S.C. § 271.

31. Broadcom's contributory infringement of the '942 Patent is willful.

32. Broadcom's willful contributory infringement of the '942 Patent has damaged and will continue to damage American Radio.

33. Broadcom's willful contributory infringement of the '942 Patent has caused and will continue to cause American Radio irreparable harm unless enjoined by the Court. American Radio has no adequate remedy at law. American Radio's damages from the infringing activities of Broadcom are not yet determined.

WHEREFORE, American Radio LLC, respectfully requests that this Court enter judgment in its favor against Broadcom and grant the following relief:

A. Enter a judgment that Broadcom is directly infringing of the '942 Patent;

B. Enter a judgment that Broadcom's direct infringement is willful;

C. Enter a judgment that Broadcom is actively inducing infringement of the '942 Patent;

D. Enter a judgment that Broadcom's induced infringement is willful;

E. Enter a judgment that Broadcom is contributing to the infringement of the '942 Patent;

F. Enter a judgment that Broadcom's contributory infringement is willful;

G. Enter an order preliminarily and permanently enjoining Broadcom, its officers, directors, agents, servants, employees and all other persons in privity or

acting in concert with them who receive actual notice of the order by personal service or otherwise, from any further acts of infringement of the '942 Patent;

H. Award American Radio damages in the amount adequate to compensate American Radio for Broadcom's infringement of the '942 Patent;

I. Enter an order trebling any and all damages awarded to American Radio by reason of Broadcom's willful infringement of the '942 Patent, pursuant to 35 U.S.C. § 284;

J. Enter an order awarding American Radio interest on damages awarded and its costs pursuant to 35 U.S.C. § 284;

K. Enter an order finding that this is an exceptional case and awarding American Radio its reasonable attorneys' fees pursuant to 35 U.S.C. § 285; and

L. Award American Radio such other relief as the Court may deem appropriate and just under the circumstances.

JURY DEMAND

Plaintiff American Radio LLC respectfully demands trial by jury of all matters triable to a jury.

Dated: July 6, 2012

STEPTOE & JOHNSON LLP

By: _____

Terry T. Tsai (SBN 277495)
ttsai@steptoe.com
STEPTOE & JOHNSON LLP
2121 Avenue of the Stars, Suite 2800
Los Angeles, CA 90067-5052
Telephone: (310) 734-3200
Facsimile:(310) 734-3300

Thomas G. Pasternak (*moving for pro hac vice admission*)
tpasternak@steptoe.com
STEPTOE & JOHNSON LLP
115 South La Salle Street, Suite 3100
Chicago, IL 60603
Telephone: (312) 577-1300
Facsimile: (312) 577-1370

John Caracappa (*moving for pro hac vice admission*)
jcaracappa@steptoe.com
STEPTOE & JOHNSON LLP
1330 Connecticut Avenue, NW
Washington, DC 20036
Telephone: (202) 429-3000
Facsimile: (202) 429-3902

Attorneys American Radio LLC

EXHIBIT A

US008045942B2

(12) **United States Patent**
Hotto

(10) **Patent No.: US 8,045,942 B2**
(45) **Date of Patent: *Oct. 25, 2011**

(54) **SYSTEM AND METHOD FOR RADIO SIGNAL RECONSTRUCTION USING SIGNAL PROCESSOR**

(75) Inventor: **Robert Hotto**, Carlsbad, CA (US)

(73) Assignee: **American Radio LLC**, Carlsbad, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/702,498**

(22) Filed: **Feb. 9, 2010**

(65) **Prior Publication Data**

US 2010/0142655 A1 Jun. 10, 2010

Related U.S. Application Data

(63) Continuation of application No. 11/928,585, filed on Dec. 10, 2007, now Pat. No. 7,831,233, which is a continuation of application No. 11/068,585, filed on Apr. 13, 2005, now Pat. No. 7,433,664, which is a continuation of application No. 10/255,438, filed on Sep. 26, 2002, now Pat. No. 7,043,219, which is a continuation of application No. 09/771,821, filed on Jan. 29, 2001, now Pat. No. 6,577,854, which is a continuation of application No. 09/178,229, filed on Oct. 23, 1998, now Pat. No. 6,236,845, which is a continuation of application No. 08/596,551, filed on Feb. 5, 1996, now Pat. No. 5,864,754.

(51) **Int. Cl.**
H04B 1/18 (2006.01)

(52) **U.S. Cl.** **455/280**; 455/295; 455/296; 455/303; 455/307

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,543,532	A	9/1985	Kasser	
4,733,403	A	3/1988	Simone	
4,878,029	A	10/1989	Saulnier et al.	
4,902,979	A	2/1990	Puckette, IV	
4,972,436	A	11/1990	Halim et al.	
5,058,107	A	10/1991	Stone et al.	
5,079,550	A	1/1992	Sooch et al.	
5,230,011	A *	7/1993	Gielis et al.	375/344
5,375,146	A	12/1994	Chalmers	
5,386,438	A	1/1995	England	
5,387,913	A	2/1995	Park et al.	
5,451,899	A	9/1995	Lawton	
5,479,449	A	12/1995	Patel et al.	
5,559,514	A	9/1996	Thomson	
5,564,097	A *	10/1996	Swanke	455/302
5,579,347	A	11/1996	Lindquist et al.	

(Continued)

OTHER PUBLICATIONS

Jacky S. Chow, John M. Cioffi, and John A.C. Bingham; "Equalizer Training Algorithms for Multimcarrier Modulation Systems", 1999 IEEE, pp. 761-765.

E-Systems Team, "New research Lab Leads to Unique Radio Receiver", May 1995, vol. 5, No. 4.

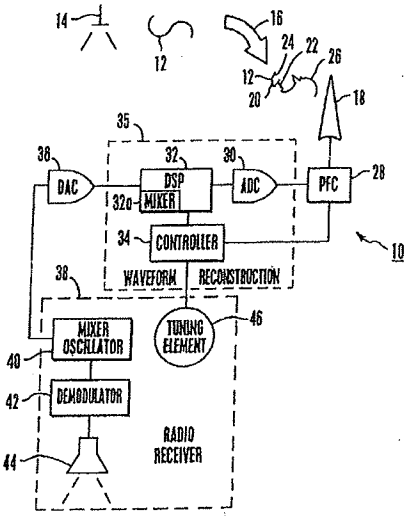
(Continued)

Primary Examiner — Philip Sobutka
(74) *Attorney, Agent, or Firm* — John L. Rogitz

(57) **ABSTRACT**

A waveform reconstruction circuit receives an rf signal from an antenna, digitizes it, and then generates an undistorted reconstructed waveform. The reconstructed waveform can then be conventionally mixed and demodulated to extract useful signal information with enhanced receiver fidelity and sensitivity.

6 Claims, 3 Drawing Sheets



U.S. PATENT DOCUMENTS

5,617,451	A	4/1997	Mimura et al.	
5,640,424	A	6/1997	Banavong et al.	
5,640,428	A	6/1997	Abe et al.	
5,640,670	A	6/1997	Samueli et al.	
5,640,698	A	6/1997	Shen et al.	
5,673,044	A	9/1997	Pellon	
5,742,840	A	4/1998	Hansen et al.	
5,754,591	A	5/1998	Samueli et al.	
5,757,867	A	5/1998	Caulfield et al.	
5,828,955	A	10/1998	Lipowski et al.	
5,850,598	A	12/1998	Behrent	
5,864,754	A *	1/1999	Hotto	455/280
5,892,792	A	4/1999	Walley	
5,917,872	A	6/1999	Ching	
5,949,821	A *	9/1999	Emami et al.	375/235
6,035,004	A	3/2000	Nakata	
6,064,871	A	5/2000	Leung	
6,236,845	B1 *	5/2001	Hotto	455/280
6,577,854	B2 *	6/2003	Hotto	455/280
7,043,219	B2 *	5/2006	Hotto	455/280
7,433,664	B2 *	10/2008	Hotto	455/280

OTHER PUBLICATIONS

Universitat Trier. "MOBICOM 1995: Berkeley, CA, USA, MOBICOM '95, Proceedings of the First Annual International Conference on Mobile Computing and Networking, Nov. 13-15, 1995, Berkeley, CA. ACM, 1995" http://www.informatik.uni-trier.de/~ley/db/conf/mobicom/mobicom1995.html.

David L. Tennenhouse and Vanu G. Bose, "The Spectrum Ware Approach to Wireless Signal Processing", Telemedia Networks and System Group laboratory for Computer Science. MIT, date unknown.

J. Mitola,III, "Software Radios Survey, Critical Evaluation and Future Directions", 1992 IEEE pp. 13-15 to 13-23.

Floyd M. Gardner, "Interpolation in Digital Modems-Part I: Fundamentals", IEEE Transactions on Communications, vol. 41, No. 3, Mar. 1993, pp. 501-507.

Loke Kun Tan and Henry Samueli, "A 200 MHz Quadrature Digital Synthesizer/Mixer in 0.8 um CMOS", IEEE journal of Solid-State Circuits, vol. 30, No. 3, Mar. 1995, pp. 193-200.

Bennett C. Wong and Henry Smaueli, "A 200-MHz All-Digital QAM Modulator and Demodulator in 1.2-um CMOS for Digital Radio Applications", IEEE Journal of Solid-State Circuits, vol. 26, No. 12, Dec. 1991, pp. 1970-1980.

* cited by examiner

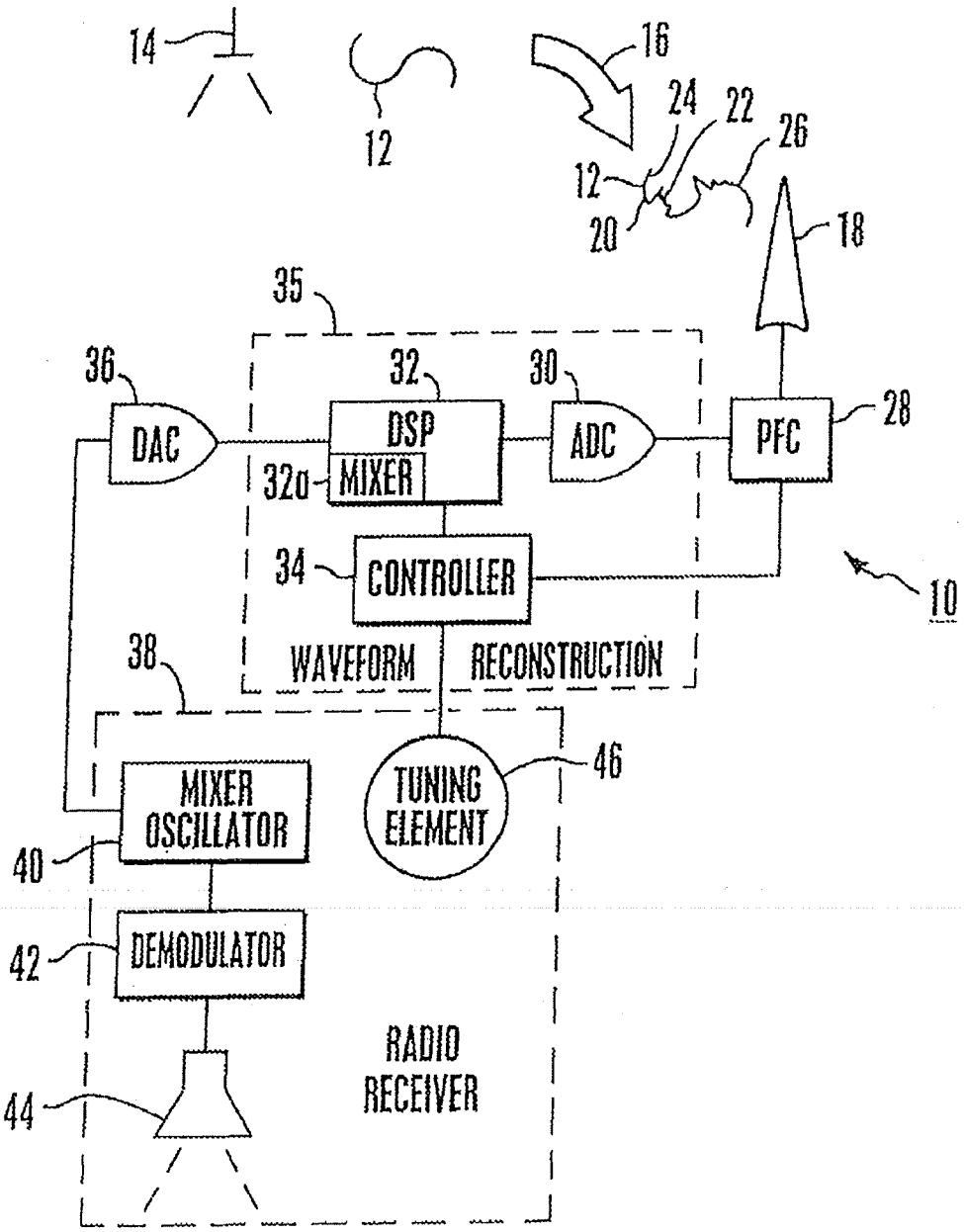
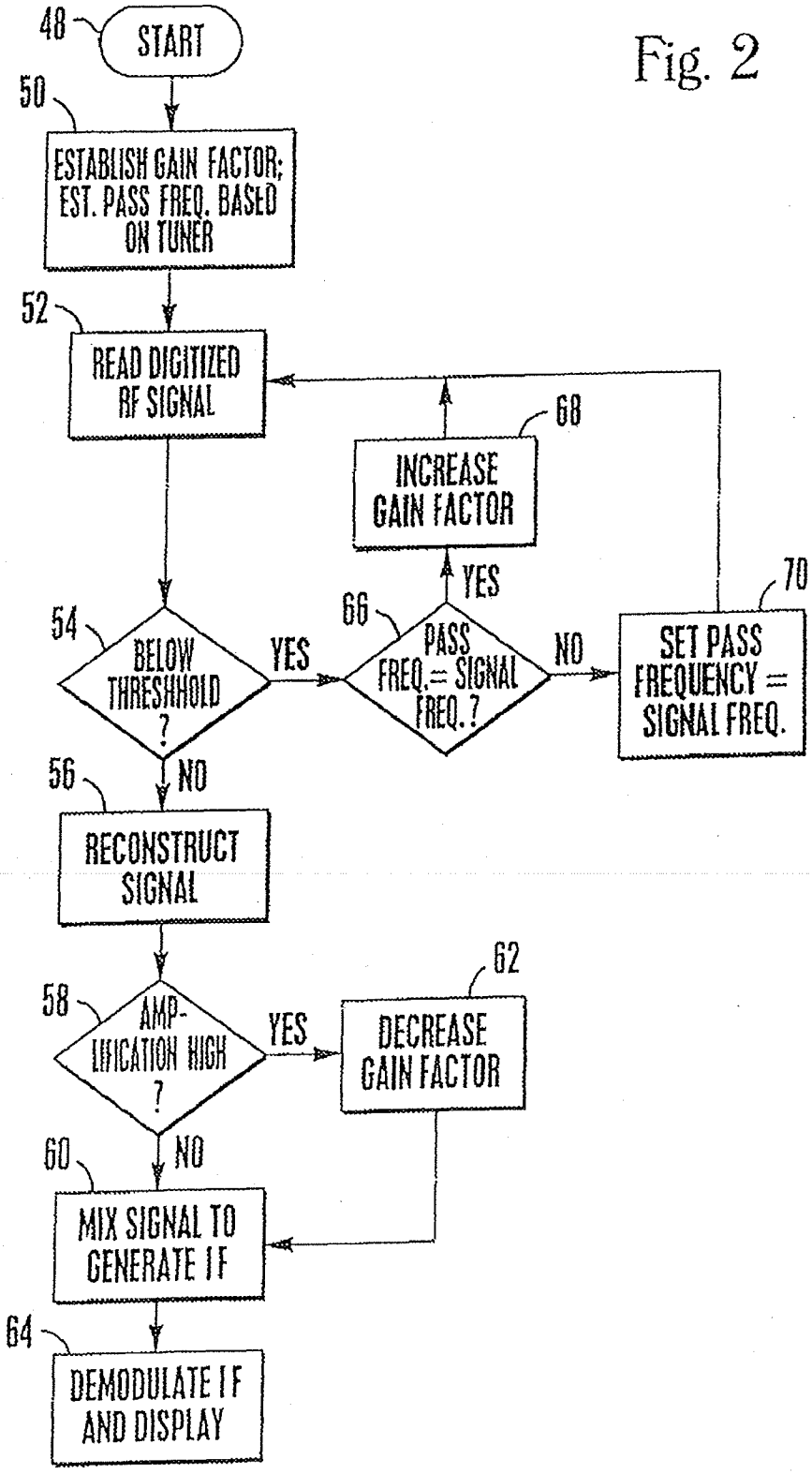

14
12
16
24
22
26
12
20
18
35
36
32
30
28
DAC
DSP
MIXER
ADC
PFC
32a
34
CONTROLLER
10
38
WAVEFORM
RECONSTRUCTION
46
MIXER
OSCILLATOR
TUNING
ELEMENT
40
42
DEMODULATOR
RADIO
RECEIVER
44

Fig. 1

Fig. 2


48
START
50
ESTABLISH GAIN FACTOR; EST. PASS FREQ. BASED ON TUNER
52
READ DIGITIZED RF SIGNAL
68
INCREASE GAIN FACTOR
YES
70
66
54
BELOW THRESHHOLD ?
YES
PASS FREQ. = SIGNAL FREQ. ?
NO
SET PASS FREQUENCY = SIGNAL FREQ.
NO
56
RECONSTRUCT SIGNAL
62
58
AMP-LIFICATION HIGH ?
YES
DECREASE GAIN FACTOR
NO
60
MIX SIGNAL TO GENERATE IF
64
DEMODULATE IF AND DISPLAY

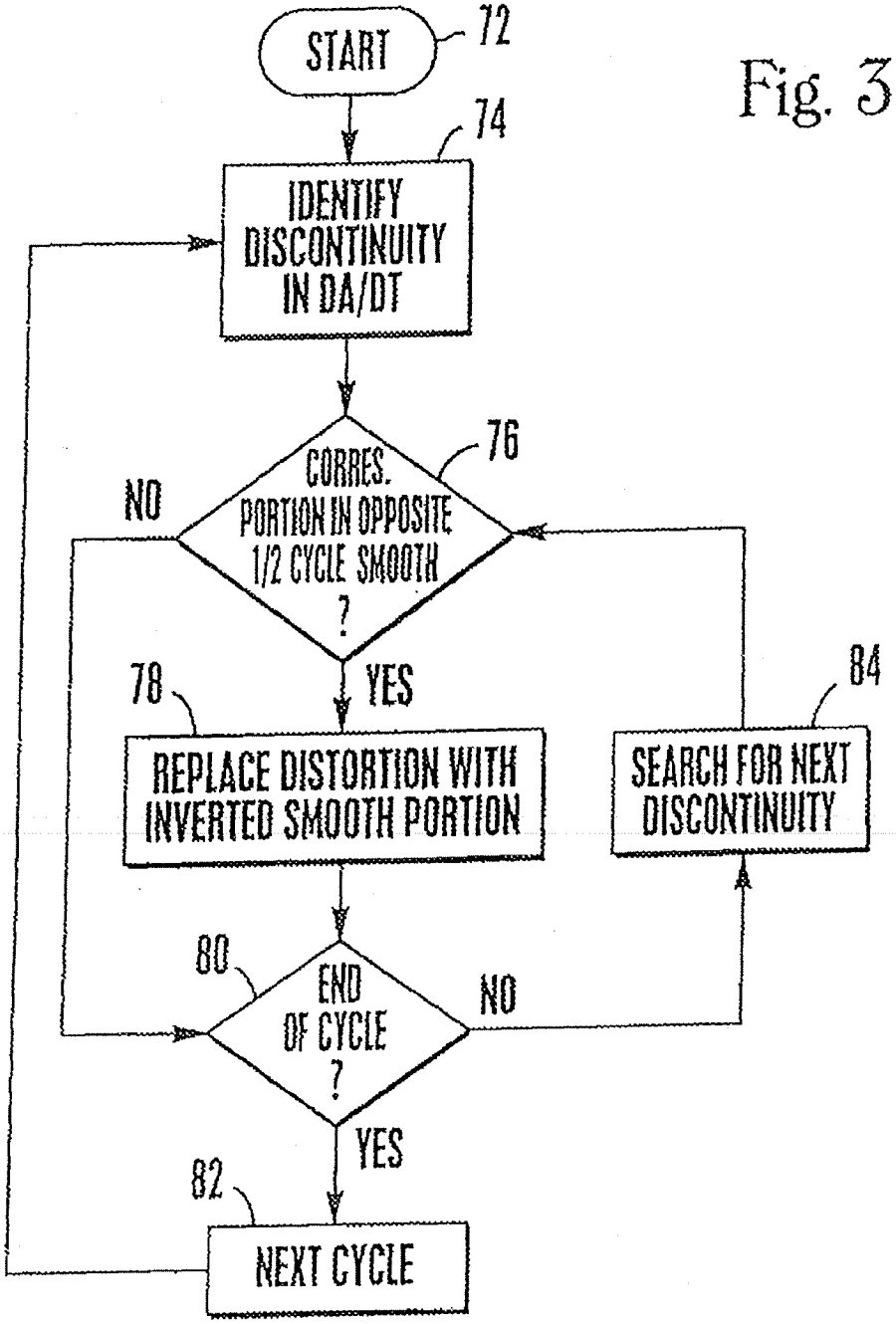

START
72
74
IDENTIFY DISCONTINUITY IN DA/DT
76
CORRES. PORTION IN OPPOSITE 1/2 CYCLE SMOOTH ?
NO
YES
78
REPLACE DISTORTION WITH INVERTED SMOOTH PORTION
84
SEARCH FOR NEXT DISCONTINUITY
80
END OF CYCLE ?
NO
YES
82
NEXT CYCLE

Fig. 3

SYSTEM AND METHOD FOR RADIO SIGNAL RECONSTRUCTION USING SIGNAL PROCESSOR

This application is a continuation of U.S. patent application Ser. No. 11/928,585, filed Dec. 10, 2007, now U.S. Pat. No. 7,831,233, which is a continuation of U.S. patent application Ser. No. 11/068,585, filed Apr. 13, 2005, now U.S. Pat. No. 7,433,664, which is a continuation of U.S. patent application Ser. No. 10/255,438 filed Sep. 26, 2002, now U.S. Pat. No. 7,043,219, which is a continuation of U.S. application Ser. No. 09/771,821 now U.S. Pat. No. 6,577,854, filed Jan. 29, 2001, which in turn is a continuation of U.S. application Ser. No. 09/178,229 now U.S. Pat. No. 6,236,845, filed Oct. 23, 1998, which in turn is a continuation of U.S. application Ser. No. 08/596,551 now U.S. Pat. No. 5,864,754, filed Feb. 5, 1996 all of which are incorporated herein by reference and priority from all of which is hereby claimed.

FIELD OF THE INVENTION

The present invention relates generally to radio signal processing, and more particularly to systems and methods for reducing distortion in rf signals and thus enhancing the fidelity and sensitivity of radio receivers.

BACKGROUND

Conventional radio receivers function by receiving an rf signal and preamplifying it, and then processing the signal using a superheterodyne structure. The superheterodyne structure, in its simplest configuration, includes a mixer oscillator which mixes the received signal down to an intermediate frequency (IF) signal. The IF signal is then sent through a bandpass filter and demodulated by an envelope detector to recover the information (colloquially referred to as "baseband") that is carried by the received rf signal.

Of importance to the present invention is the fact that rf signals are corrupted by environmental factors during transmission. Conventional superheterodyne structures attempt to correct for signal corruption by suppressing corruption-induced noise using filtering techniques. Unfortunately, such conventional filtering, whether using analog or digital techniques, suppresses both noise and useful signal, thereby reducing the fidelity of the receiver. In other words, although filtering improves the ratio between useful signal and noise (referred to as the signal-to-noise ratio, SNR), it typically reduces system fidelity and signal strength.

Further, during demodulation, the envelope detector of a conventional superheterodyne structure effectively demodulates only one-half cycle, for example, the positive half cycle, of the IF signal. Only one half of the signal need be used, since the information attached to the positive half cycle during transmission is identical to the information attached to the negative half cycle during transmission. Accordingly, the negative half of each cycle of the received rf signal is discarded by the envelope detector, and replaced with a mirror image of the positive half.

It happens, however, that either one of the positive or negative half of a cycle can be distorted asymmetrically from the other half. Consequently, in instances wherein the negative half of a cycle is relatively uncorrupted, but the positive half cycle is corrupted, the opportunity to use the "best" half of a cycle is lost. Thus, the portion of a corrupted IF signal that is ultimately demodulated and output by the envelope detector statistically can be expected to be the corrupt half 50% of the time.

In light of the above discussion as recognized by the present invention, it would be advantageous to analyze both the positive and negative halves of an rf signal cycle and determine which half is the "best" half, and then extract the useful signal from this "best" half. As further recognized by the present invention, it would be advantageous to accomplish such analysis prior to the non-linear transformation of the rf signal to the IF signal during mixing by the oscillator. Stated differently, it would be advantageous to accomplish such analysis prior to mixing, since the mixing function causes certain data in the signal to be irrecoverable and therefore precludes identification of some distortion and corruption in the "true" signal post-mixing. As still further recognized by the present invention, it would be advantageous to adjust signal gain and tuning "on the fly" to account for transmitter frequency drift and for sometimes constantly changing received signal strength at the antenna.

Accordingly, it is an object of the present invention to provide a system and method for reconstructing a radio signal prior to mixing and demodulating the signal. Another object of the present invention is to provide a system and method for reconstructing a radio signal to improve the extraction of useful portions of the originally transmitted signal that had been corrupted. Yet another object of the present invention is to provide a system and method for reconstructing a radio signal which adjusts signal gain and tuning from the antenna on the fly. Still another object of the present invention is to provide a system and method for reconstructing a radio signal which is easy to use and cost-effective.

SUMMARY OF THE INVENTION

An electromagnetic waveform reconstruction device includes an analog to digital converter (ADC) that is electrically connectable to an antenna for receiving an analog electromagnetic signal therefrom and digitizing the signal. The ADC outputs the digitized electromagnetic signal to a digital signal processor (DSP), which in turn outputs a reconstructed electromagnetic signal in accordance with a predetermined reconstruction paradigm. As more fully discussed herein, the DSP is electrically associable with a mixer circuit for sending the reconstructed electromagnetic signal thereto for mixing and demodulating the signal.

Preferably, the electromagnetic signal is an rf signal, and the device further includes a digital to analog converter (DAC) for converting the reconstructed rf signal to an analog reconstructed rf signal, prior to sending the reconstructed rf signal to the mixer circuit. Alternatively, the DSP digitally mixes the reconstructed rf signal and outputs an intermediate frequency (IF) signal to a demodulator.

As envisioned by the preferred embodiment, the DSP includes reconstruction means for effecting method steps to implement the predetermined reconstruction paradigm. In accordance with the present invention, the method steps include receiving both a positive half and a negative half of the digitized rf signal, and then analyzing the positive and negative halves to identify distorted portions and undistorted portions thereof. At least some of the distorted portions are removed and replaced with respective replacement portions. Thereby, the reconstructed rf signal is produced, with each replacement portion being based on at least some of the undistorted portions.

In one presently preferred embodiment, a controller is electrically connected to the DSP. Also, a preamplifier filter circuit (PFC) is electrically connectable to the antenna and to the ADC for amplifying and filtering the analog rf signal from the antenna prior to sending the analog rf signal to the ADC.

Moreover, the PFC is also electrically connected to the controller. Advantageously, the PFC includes a frequency bandpass filter for attenuating signals having a frequency not equal to a pass frequency, and the controller dynamically establishes the pass frequency.

Furthermore, in the presently preferred embodiment, the PFC includes an amplifier for increasing, by a gain factor, the amplitude of signals having the pass frequency. As intended by the preferred embodiment, the controller establishes the gain factor. To this end, the DSP outputs a gain adjust signal to the controller when the rf signal input to the DSP is characterized by an amplitude outside of a predetermined amplitude range. Stated somewhat differently, the DSP generates the gain adjust signal when its input signal is characterized by distortions due to a weak or clipped signal, and the DSP generates the gain adjust signal by determining information content of the signal. In response to the gain adjust signal, and the controller dynamically establishes the gain factor based on the gain adjust signal. If desired, the device of the present invention can be combined with an electromagnetic signal transmitter.

In another aspect of the present invention, an rf receiver includes an antenna and a signal reconstruction circuit electrically connected to the antenna. Accordingly, the signal reconstruction circuit receives an analog rf signal from the antenna. Per the principles of the present invention, the signal reconstruction circuit generates a substantially undistorted reconstructed waveform. A mixer circuit is electrically associated with the signal reconstruction circuit for generating an intermediate frequency (IF) signal based on the reconstructed waveform, and a demodulator decodes useful information from the IF signal.

In yet another aspect, a computer-implemented method is disclosed for processing a transmitted electromagnetic signal to extract useful information from the signal. The present method includes receiving the electromagnetic signal and reconstructing it in accordance with a predetermined reconstruction paradigm, and then, after reconstruction, mixing and demodulating the electromagnetic signal to extract useful information therefrom.

In still another aspect, a computer program device includes a computer program storage device which is readable by a digital processing system. A program means is provided on the program storage device, and the program means includes instructions that are executable by the digital processing system for performing method steps for reconstructing an rf signal prior to mixing and demodulating the rf signal. The method steps advantageously include receiving both a positive half and a negative half of the rf signal, and analyzing the positive and negative halves to identify distorted portions and undistorted portions thereof. The method steps further include removing at least some of the distorted portions and replacing each with a respective replacement portion to thereby produce a reconstructed rf signal, with each replacement portion being based on at least some of the undistorted portions.

In another aspect of the present invention, a device is disclosed for dynamically preamplifying and filtering an rf signal from an antenna, prior to mixing and demodulating the signal to extract useful information from it. The device includes a controller and a preamplifier filter circuit (PFC) electrically connectable to the antenna and in electrical communication with the controller for amplifying and filtering the rf signal. Per the present invention, the PFC includes a frequency bandpass filter for attenuating signals having a frequency not equal to a pass frequency. Additionally, the PFC includes an amplifier for increasing, by a gain factor, the amplitude of signals having the pass frequency. The controller dynamically establishes/adjusts the pass frequency and gain factor, based on the signal amplitude and distortion.

The details of the present invention, both as to its structure and operation, can best be understood in reference to the accompanying drawings, in which like reference numerals refer to like parts, and in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic block diagram of the system of the present invention;

FIG. **2** is a flow chart showing the overall method steps of the present invention; and

FIG. **3** is a flow chart showing the steps of a waveform reconstruction method in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring initially to FIG. **1**, a system, generally designated **10**, is shown for reconstructing an rf waveform signal **12** that has been transmitted by an rf transmitter **14**, before the signal **12** is mixed and demodulated. As schematically shown in FIG. **1**, the rf signal **12** is an analog, sinusoidally-shaped signal that is relatively smooth and undistorted when transmitted, but which can become degraded and distorted as it propagates in the direction of the arrow **16** toward an rf antenna **18**. Consequently, upon reaching the antenna **18**, a negative half **20** of the rf signal **12** can have distorted portions **22** and undistorted portions **24**. Likewise, a positive half **26** the rf signal **12** can have distorted portions and undistorted portions as shown. The present invention is directed to removing distortions from rf signals, prior to mixing and demodulating the signals incident to the decoding of useful information therefrom, thereby improving the fidelity and sensitivity of radio receivers.

While the disclosure herein focuses on rf waveform reconstruction, it is to be understood that the principles of the present invention apply equally to other forms of modulated electromagnetic waves that are modulated as appropriate for the data the waves represent. For example, the principles of the present invention can be applied to processing modulated light waves that are transmitted through fiber optic bundles incident to the transfer of computer, video, or voice data.

FIG. **1** shows that the rf signal detected by the antenna **18** is sent to a preamplifying and filtering circuit **28**. In accordance with the present invention, the preamplifying and filtering circuit **28** includes an amplifying circuit which preamplifies, by a gain factor, the signal from the antenna **18**. Furthermore, the preamplifying and filtering circuit **28** includes a frequency bandpass filter for attenuating signals having a frequency not equal to a pass frequency. As described in greater detail below, the pass frequency and gain factor are dynamically established under the principles of the present invention.

Continuing with the description of FIG. **1**, an analog to digital converter (ADC) **30** is electrically connected to the antenna **18** for receiving the analog rf signal therefrom. The ADC **30** is structure well-known in the art that outputs a digitized rf signal in response to the analog rf input from the antenna **18**.

Additionally, a digital signal processor (DSP) **32** is electrically connected to the ADC **30**. Accordingly, the DSP **32** receives the digitized signal from the ADC **30**. Per the present invention, the DSP **32** outputs a reconstructed rf signal in

accordance with a predetermined waveform reconstruction paradigm as more fully disclosed below. The reconstructed waveform has substantially no distorted portions. Instead, distorted portions in the input signal to the DSP **32** are replaced by smooth, undistorted portions.

As shown in FIG. **1**, a digital computer or controller **34** is electrically connected to or integrated with the DSP **32**. In one preferred embodiment, the DSP **32**, controller **34**, and ADC **30** establish a waveform reconstruction circuit **35**. As intended by the present invention, the DSP **32** outputs a gain adjust signal to the controller **34** when the rf signal input to the DSP **32** is characterized by an amplitude outside of a predetermined amplitude range. In other words, when the amplitude of the input signal to the DSP **32** is too high or too low, the DSP **32** sends a gain adjust signal representing this fact to the controller **34**.

In turn, the controller **34** is electrically connected to the preamplifying and filtering circuit **28**, and the controller **34** dynamically establishes the gain factor of the preamplifying and filtering circuit **28**, based on the gain adjust signal. Moreover, the controller **34** can also dynamically establish the pass frequency of the preamplifying and filtering circuit **28**, based on the gain adjust signal, to adjust the signal to optimize reception thereof.

After reconstructing the rf waveform, the DSP **32** sends the reconstructed digitized signal to a digital-to-analog converter (DAC) **36**, which converts the digitized output of the DSP **32** to an analog waveform. The DAC **36** is in turn electrically connected to the mixing circuit of a radio receiver **38**. More specifically, the DAC **36** is electrically connected to an oscillator mixer **40** of the radio receiver **38**, and the mixer **40** outputs an intermediate frequency (IF) signal in accordance with principles well-known in the art, based upon the analog signal from the DAC **36**. The IF output from the mixer **40** is then sent to a demodulator **42**, which decodes the signal to extract useful information therefrom. As but one example of how such useful information is used, an audio speaker **44** can be electrically connected to the demodulator **42** for producing audio signals, based on the output signal of the demodulator **42**.

As the skilled artisan will recognize, the configuration shown in FIG. **1** is conducive to operably associating the waveform reconstruction circuit of the present invention with existing conventional radio receivers. In other words, the waveform reconstruction circuit **35** can be implemented in, e.g., a computer chip, and the chip then electrically engaged with a conventional radio receiver between the receiver and antenna as described, for enhancing the fidelity and sensitivity of the radio receiver. Alternatively, a mixer circuit can be incorporated in the DSP **32** to digitally implement the function of the mixer **40** after reconstruction of the waveform. In such an embodiment, the digitized output of the DSP **32** accordingly represents a reconstructed IF signal to be analogized by a DAC and then decoded by a demodulator.

As can be further appreciated in reference to FIG. **1**, the radio receiver **38** typically includes one or more a tuning control elements, such as, for example, a knob-like tuning element **46**. As is well known in the art, the tuning element **46** is manipulable by a person to establish a channel frequency selection. As shown in FIG. **1**, the tuning element **46** is electrically connected to the controller **34**, such that the controller **34** can establish the pass frequency based on the channel frequency. As stated above however, once the channel frequency has been set by a person, the controller **34** can further dynamically vary the pass frequency from the channel frequency as may be required by the gain adjust signal from the DSP **32**, to compensate for transmitter **14** frequency drift. Stated differently, because the gain adjust signal generated by the DSP **32** is based on the received rf signal, the controller **34** can dynamically establish the pass frequency and/or gain factor, based on the received rf signal.

Now referring to FIGS. **2** and **3**, the operational steps of the present invention can be appreciated. It is to be understood that FIGS. **2** and **3** represent logic flow charts of the present reconstruction means for implementing the predetermined reconstruction paradigm of the present invention. As recognized herein, the advantages of the present invention can be realized by removing at least some of the distorted portions of a received waveform and replacing each distorted portion with a respective replacement portion that is based on at least some of the undistorted portions of the received waveform. Thereby, a reconstructed rf signal is produced.

FIGS. **2** and **3** illustrate the logical structure of the waveform reconstruction of the present invention. This logical structure can be embodied in hardware, firmware, or computer program software. When the waveform reconstruction logic is embodied in software, it will be appreciated that the Figures illustrate the structures of computer program code elements that function according to this invention. Manifestly, the software-implemented invention is practiced in its essential embodiment by a machine component that renders the computer program code elements in a form that instructs a digital processing apparatus (that is, a computer) to perform a sequence of function steps corresponding to those shown in the Figures.

These software instructions may reside on a program storage device including a data storage medium, such as may be included in the DSP **32**. The machine component in such an embodiment is a combination of program code elements in computer readable form that are embodied in a computer-usable data medium on the DSP **32**. Alternatively, such media can also be found in semiconductor devices, on magnetic tape, on optical and magnetic disks, on a DASD array, on magnetic tape, on a conventional hard disk drive, on electronic read-only memory or on electronic ransom access memory, or other appropriate data storage device. In an illustrative embodiment of the invention, the computer-executable instructions may be lines of compiled C++ language code.

Referring particularly to FIG. **2**, the waveform reconstruction logic of the DSP **32** begins at start oval **48**, wherein positive and negative half cycles of a digitized waveform having distorted and undistorted portions are received from the ADC **30**. At block **50**, the gain factor and pass frequency of the preamplifying and filtering circuit **28** are established. Initially, the gain factor is established at a default value, and the pass frequency is established to be equal to the channel frequency established by the timing element **46** (FIG. **1**).

Next, at block **52**, the digitized rf signal input to the DSP **32** is read. The present logic proceeds to decision diamond **54** to determine whether the amplitude of the input signal is below a predetermined threshold. If not, the logic moves to block **56** to reconstruct the signal as discussed in greater detail below.

From block **56**, the logic proceeds to decision diamond **58**, wherein it is determined whether the amplification of the reconstructed signal exceeds a predetermined value. If not, the logic proceeds to block **60**, wherein the reconstructed signal is mixed (after being analogized, if appropriate) to generate an IF signal.

On the other hand, if, at decision diamond **58**, it is determined that the amplification of the reconstructed signal indeed exceeds a predetermined value, the logic proceeds to block **62**, wherein the DSP **32** outputs a gain adjust signal to the controller **34** to cause the controller **34** to decrease the gain factor of the preamplifying and filtering circuit **28**. From

blocks **60** or **62**, the logic moves to block **64**, wherein the IF signal is demodulated, and the useful information that is thereby extracted is displayed audibly, visually, or indeed stored or otherwise input to a device requiring the information.

Recall that at decision diamond **54** it is determined whether the amplitude of the input signal is below a predetermined threshold. In other words, as recognized by the present invention, the signal input to the DSP **32** should be characterized by an amplitude that is sufficient to permit decoding of useful information from the signal.

If the amplitude is below the threshold, the logic of the present invention proceeds to decision diamond **66**, wherein it is determined whether the pass frequency is equal to the frequency of the received rf signal. If it is, the logic moves to block **68**, wherein the gain adjust signal from the DSP **32** is generated to cause the controller **34** increase the gain factor of the preamplifying and filtering circuit **28**.

In contrast, if, at decision diamond **66**, it is determined that the pass frequency is not equal to the frequency of the received rf signal (i.e., that the pass frequency is not optimized for receiving the desired rf signal), the logic moves to block **70**. As shown in Figure, at block **70**, the controller **34** dynamically varies the pass frequency to set the pass frequency equal to the frequency of the received rf signal. From blocks **68** and **70**, the logic returns to block **52**.

Now referring to FIG. **3**, the details of one embodiment of the waveform reconstruction paradigm of the present invention are shown. The paradigm begins at start oval **72**, and moves to block **74**, wherein discontinuities in the slope (referred to as "dA/dt") of the input waveform to the DSP **32** are identified. As recognized by the present invention, such discontinuities should not exist in a perfect waveform, and consequently indicate distorted portions of the waveform. On the other hand, a smooth slope (i.e., dA/dt is a smooth sinusoidal function) indicates an undistorted waveform portion.

From block **74**, the logic proceeds to decision diamond **76**, wherein it is determined whether the corresponding waveform portion in the opposite half-cycle that corresponds to the distorted portion is smooth (i.e., whether dA/dt of the corresponding waveform portion is a smooth sinusoidal function). By "corresponding waveform portion" is meant the portion of the waveform that occupies the segment along the time axis in the opposite half-cycle from the distorted portion which corresponds to the segment along the time axis occupied by the distorted portion in its own half-cycle.

If the test at decision diamond **76** is positive, the logic moves to block **78**, wherein the distorted portion is replaced with the inverse of the corresponding waveform portion. Next, the logic moves to decision diamond **82**, wherein it is determined whether the complete waveform cycle (i.e., one positive half-cycle and its negative half-cycle) has been analyzed. If it has been, the process proceeds to block **82**, to analyze the next cycle, returning to block **74**. Otherwise, the process proceeds to block **84** to search for the next discontinuity in the current cycle, thence to loop back to decision diamond **76**. Also, if the test at decision diamond **76** is negative, the process skips to decision diamond **80**.

It is to be understood that the waveform reconstruction paradigm of the present invention may use analysis methods other than the one shown in FIG. **3**. For example, a fast Fourier transform (FFT) may be used to reconstruct a smooth waveform from a distorted waveform by replacing the distorted input waveform with a series of smooth regular waveforms from a waveform library, with each replacement waveform having a unique frequency and an amplitude based upon its relative contribution to the reconstructed waveform. Accordingly, using FFT analysis, distorted portions of waveforms are replaced by smooth portions, with the smooth portions being based in accordance with FFT principles on the undistorted portions of the input waveform.

As yet another alternative, distorted portions of the input waveform can be replaced by smooth portions that are based on the undistorted portions of the input waveform using so-called "wavelet analysis". In wavelet analysis, small undistorted waveform segments are stored in a library and are fitted to the undistorted portions of the input waveform as needed to replace distorted waveform portions. Examples of such analysis are disclosed by, e.g., Donoho in "Nonlinear Wavelet Methods for Recovery of Signals, Densities, and Spectra from Indirect and Noisy Data", *Proceedings of Symposia in Applied Mathematics*, Vol. 00. 1993 (American Mathematical Society); Basseville et al., "Modeling and Estimation of Multiresolution Stochastic Processes", *IEEE Transactions on Informational Theory*, vol. 38. no. 2, 1992 (IEEE); and Coffman et al., "Wavelet Analysis and Signal Processing", pps. 153-178, Jones and Barlett, Boston, Mass. 1992 all of which publications are incorporated herein by reference.

While the particular SYSTEM AND METHOD FOR RADIO SIGNAL RECONSTRUCTION USING SIGNAL PROCESSOR as herein shown and described in detail is fully capable of attaining the above-described objects of the invention, it is to be understood that it is the presently preferred embodiment of the present invention and is thus representative of the subject matter which is broadly contemplated by the present invention, that the scope of the present invention fully encompasses other embodiments which may become obvious to those skilled in the art, and that the scope of the present invention is accordingly to be limited by nothing other than the appended claims.

What is claimed is:

1. A receiver, comprising:

an analog to digital converter (ADC) receiving as input an rf signal that has not been downconverted in the analog domain to IF by the receiver, the ADC outputting a digitized signal representing the rf signal; and

a digital processor electrically connected to the ADC, the digital processor being programmed with software to decode and extract baseband information from the digitized signal.

2. The receiver of claim **1**, wherein the module replaces at least one distorted portion of the signal with a replacement portion that is based on at least some undistorted portions of the signal.

3. A receiver, comprising:

a reconstruction circuit receiving an analog rf signal and generating a reconstructed waveform having substantially no distortions therein, wherein the reconstruction circuit includes:

an analog to digital converter (ADC) for receiving the analog rf signal that has not been downconverted in the analog domain and outputting a digitized rf signal in response; and

a module electrically connected to the ADC for receiving the digitized if signal and in response outputting the reconstructed waveform in accordance with a predetermined reconstruction paradigm.

4. The receiver of claim **3**, wherein the paradigm includes replacing at least one distorted portion of the signal with a replacement portion that is based on at least some undistorted portions of the signal.

5. A receiver, comprising:

a signal repair circuit receiving an analog waveform carried in an optical transmission line and generating a repaired waveform, wherein the signal repair circuit includes:

an analog to digital converter (ADC) for receiving the signal prior to any extraction of basedband information therefrom and outputting a digitized signal in response; and

a module electrically connected to the ADC for receiving the digitized signal and in response outputting the repaired waveform in accordance with a predetermined repair paradigm.

6. The receiver of claim 5, wherein the paradigm includes replacing at least one distorted portion of the signal with a replacement portion that is based on at least some undistorted portions of the signal.

* * * * *

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

I (a) PLAINTIFFS (Check box if you are representing yourself ☐)
AMERICAN RADIO LLC

DEFENDANTS
BROADCOM CORPORATION

(b) Attorneys (Firm Name, Address and Telephone Number. If you are representing yourself, provide same.)
Terry T. Tsai (SBN 277495) / Thomas G. Pasternak (moving for pro hac vice admission) / John Caracappa (moving for pro hac vice admission)
Steptoe & Johnson LLP, 2121 Ave of the Stars #2800, Los Angeles, CA 90067

Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an X in one box only.)

☐ 1 U.S. Government Plaintiff ☑ 3 Federal Question (U.S. Government Not a Party)
☐ 2 U.S. Government Defendant ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES - For Diversity Cases Only (Place an X in one box for plaintiff and one for defendant.)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated or Principal Place of Business in this State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated and Principal Place of Business in Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. ORIGIN (Place an X in one box only.)

☑ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify): ☐ 6 Multi-District Litigation ☐ 7 Appeal to District Judge from Magistrate Judge

V. REQUESTED IN COMPLAINT: **JURY DEMAND:** ☑ Yes ☐ No (Check 'Yes' only if demanded in complaint.)

CLASS ACTION under F.R.C.P. 23: ☐ Yes ☑ No ☑ **MONEY DEMANDED IN COMPLAINT: $** TBD

VI. CAUSE OF ACTION (Cite the U.S. Civil Statute under which you are filing and write a brief statement of cause. Do not cite jurisdictional statutes unless diversity.)
Title 35, Infringement

VII. NATURE OF SUIT (Place an X in one box only.)

OTHER STATUTES	CONTRACT	TORTS PERSONAL INJURY	TORTS PERSONAL PROPERTY	PRISONER PETITIONS	LABOR
☐ 400 State Reapportionment	☐ 110 Insurance	☐ 310 Airplane	☐ 370 Other Fraud	☐ 510 Motions to Vacate Sentence Habeas Corpus	☐ 710 Fair Labor Standards Act
☐ 410 Antitrust	☐ 120 Marine	☐ 315 Airplane Product Liability	☐ 371 Truth in Lending	☐ 530 General	☐ 720 Labor/Mgmt. Relations
☐ 430 Banks and Banking	☐ 130 Miller Act	☐ 320 Assault, Libel & Slander	☐ 380 Other Personal Property Damage	☐ 535 Death Penalty	☐ 730 Labor/Mgmt. Reporting & Disclosure Act
☐ 450 Commerce/ICC Rates/etc.	☐ 140 Negotiable Instrument	☐ 330 Fed. Employers' Liability	☐ 385 Property Damage Product Liability	☐ 540 Mandamus/ Other	☐ 740 Railway Labor Act
☐ 460 Deportation	☐ 150 Recovery of Overpayment & Enforcement of Judgment	☐ 340 Marine	BANKRUPTCY	☐ 550 Civil Rights	☐ 790 Other Labor Litigation
☐ 470 Racketeer Influenced and Corrupt Organizations	☐ 151 Medicare Act	☐ 345 Marine Product Liability	☐ 422 Appeal 28 USC 158	☐ 555 Prison Condition	☐ 791 Empl. Ret. Inc. Security Act
☐ 480 Consumer Credit	☐ 152 Recovery of Defaulted Student Loan (Excl. Veterans)	☐ 350 Motor Vehicle	☐ 423 Withdrawal 28 USC 157	FORFEITURE / PENALTY	PROPERTY RIGHTS
☐ 490 Cable/Sat TV	☐ 153 Recovery of Overpayment of Veteran's Benefits	☐ 355 Motor Vehicle Product Liability	CIVIL RIGHTS	☐ 610 Agriculture	☐ 820 Copyrights
☐ 810 Selective Service	☐ 160 Stockholders' Suits	☐ 360 Other Personal Injury	☐ 441 Voting	☐ 620 Other Food & Drug	☑ 830 Patent
☐ 850 Securities/Commodities/ Exchange	☐ 190 Other Contract	☐ 362 Personal Injury-Med Malpractice	☐ 442 Employment	☐ 625 Drug Related Seizure of Property 21 USC 881	☐ 840 Trademark
☐ 875 Customer Challenge 12 USC 3410	☐ 195 Contract Product Liability	☐ 365 Personal Injury-Product Liability	☐ 443 Housing/Acco-mmodations	☐ 630 Liquor Laws	SOCIAL SECURITY
☐ 890 Other Statutory Actions	☐ 196 Franchise	☐ 368 Asbestos Personal Injury Product Liability	☐ 444 Welfare	☐ 640 R.R. & Truck	☐ 861 HIA (1395ff)
☐ 891 Agricultural Act	REAL PROPERTY	IMMIGRATION	☐ 445 American with Disabilities - Employment	☐ 650 Airline Regs	☐ 862 Black Lung (923)
☐ 892 Economic Stabilization Act	☐ 210 Land Condemnation	☐ 462 Naturalization Application	☐ 446 American with Disabilities - Other	☐ 660 Occupational Safety /Health	☐ 863 DIWC/DIWW (405(g))
☐ 893 Environmental Matters	☐ 220 Foreclosure	☐ 463 Habeas Corpus-Alien Detainee	☐ 440 Other Civil Rights	☐ 690 Other	☐ 864 SSID Title XVI
☐ 894 Energy Allocation Act	☐ 230 Rent Lease & Ejectment	☐ 465 Other Immigration Actions			☐ 865 RSI (405(g))
☐ 895 Freedom of Info. Act	☐ 240 Torts to Land				FEDERAL TAX SUITS
☐ 900 Appeal of Fee Determi-nation Under Equal Access to Justice	☐ 245 Tort Product Liability				☐ 870 Taxes (U.S. Plaintiff or Defendant)
☐ 950 Constitutionality of State Statutes	☐ 290 All Other Real Property				☐ 871 IRS-Third Party 26 USC 7609

FOR OFFICE USE ONLY: Case Number: SACV12-1123

AFTER COMPLETING THE FRONT SIDE OF FORM CV-71, COMPLETE THE INFORMATION REQUESTED BELOW.

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

VIII(a). IDENTICAL CASES: Has this action been previously filed in this court and dismissed, remanded or closed? ☑ No ☐ Yes
If yes, list case number(s): _____

VIII(b). RELATED CASES: Have any cases been previously filed in this court that are related to the present case? ☑ No ☐ Yes
If yes, list case number(s): _____

Civil cases are deemed related if a previously filed case and the present case:
(Check all boxes that apply) ☐ A. Arise from the same or closely related transactions, happenings, or events; or
☑ B. Call for determination of the same or substantially related or similar questions of law and fact; or
☐ C. For other reasons would entail substantial duplication of labor if heard by different judges; or
☑ D. Involve the same patent, trademark or copyright, and one of the factors identified above in a, b or c also is present.

IX. VENUE: (When completing the following information, use an additional sheet if necessary.)

(a) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named plaintiff resides.
☐ Check here if the government, its agencies or employees is a named plaintiff. If this box is checked, go to item (b).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
San Diego County	

(b) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named defendant resides.
☐ Check here if the government, its agencies or employees is a named defendant. If this box is checked, go to item (c).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Orange County	BROADCOM CORPORATION, a California corporation

(c) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** claim arose.
Note: In land condemnation cases, use the location of the tract of land involved.

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Los Angeles County	

*** Los Angeles, Orange, San Bernardino, Riverside, Ventura, Santa Barbara, or San Luis Obispo Counties**
Note: In land condemnation cases, use the location of the tract of land involved

X. SIGNATURE OF ATTORNEY (OR PRO PER): Terry T. Tsai **Date** July 9, 2012

Notice to Counsel/Parties: The CV-71 (JS-44) Civil Cover Sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law. This form, approved by the Judicial Conference of the United States in September 1974, is required pursuant to Local Rule 3-1 is not filed but is used by the Clerk of the Court for the purpose of statistics, venue and initiating the civil docket sheet. (For more detailed instructions, see separate instructions sheet.)

Key to Statistical codes relating to Social Security Cases:

Nature of Suit Code	Abbreviation	Substantive Statement of Cause of Action
861	HIA	All claims for health insurance benefits (Medicare) under Title 18, Part A, of the Social Security Act, as amended. Also, include claims by hospitals, skilled nursing facilities, etc., for certification as providers of services under the program. (42 U.S.C. 1935FF(b))
862	BL	All claims for "Black Lung" benefits under Title 4, Part B, of the Federal Coal Mine Health and Safety Act of 1969. (30 U.S.C. 923)
863	DIWC	All claims filed by insured workers for disability insurance benefits under Title 2 of the Social Security Act, as amended; plus all claims filed for child's insurance benefits based on disability. (42 U.S.C. 405(g))
863	DIWW	All claims filed for widows or widowers insurance benefits based on disability under Title 2 of the Social Security Act, as amended. (42 U.S.C. 405(g))
864	SSID	All claims for supplemental security income payments based upon disability filed under Title 16 of the Social Security Act, as amended.
865	RSI	All claims for retirement (old age) and survivors benefits under Title 2 of the Social Security Act, as amended. (42 U.S.C. (g))

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

NOTICE OF ASSIGNMENT TO UNITED STATES MAGISTRATE JUDGE FOR DISCOVERY

This case has been assigned to District Judge David O. Carter and the assigned discovery Magistrate Judge is Robert N. Block.

The case number on all documents filed with the Court should read as follows:

SACV12- 1123 DOC (RNBx)

Pursuant to General Order 05-07 of the United States District Court for the Central District of California, the Magistrate Judge has been designated to hear discovery related motions.

All discovery related motions should be noticed on the calendar of the Magistrate Judge

---

NOTICE TO COUNSEL

A copy of this notice must be served with the summons and complaint on all defendants (if a removal action is filed, a copy of this notice must be served on all plaintiffs).

Subsequent documents must be filed at the following location:

[ ] **Western Division**
312 N. Spring St., Rm. G-8
Los Angeles, CA 90012

[X] **Southern Division**
411 West Fourth St., Rm. 1-053
Santa Ana, CA 92701-4516

[ ] **Eastern Division**
3470 Twelfth St., Rm. 134
Riverside, CA 92501

Failure to file at the proper location will result in your documents being returned to you.

Name & Address:
Terry T. Tsai (SBN 277495)
Thomas G. Pasternak (Applied for Pro Hac Vice)
John Caracappa (Applied for Pro Hac Vice)
STEPTOE & JOHNSON LLP
2121 Ave of the Stars, #2800, Los Angeles, CA90067

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

AMERICAN RADIO LLC,

PLAINTIFF(S)

v.

BROADCOM CORPORATION,

DEFENDANT(S).

CASE NUMBER

SACV12-1123-DOC (RNBx)

SUMMONS

TO: DEFENDANT(S):

A lawsuit has been filed against you.

Within 21 days after service of this summons on you (not counting the day you received it), you must serve on the plaintiff an answer to the attached ☑ complaint ☐ _____ amended complaint ☐ counterclaim ☐ cross-claim or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff's attorney, Terry T. Tsai, whose address is 2121 Avenue of the Stars, Suite 2800, Los Angeles, CA 90067. If you fail to do so, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

Clerk, U.S. District Court

Dated: JUL 10 2012

By: _____
Deputy Clerk

(Seal of the Court)

[Use 60 days if the defendant is the United States or a United States agency, or is an officer or employee of the United States. Allowed 60 days by Rule 12(a)(3)].