



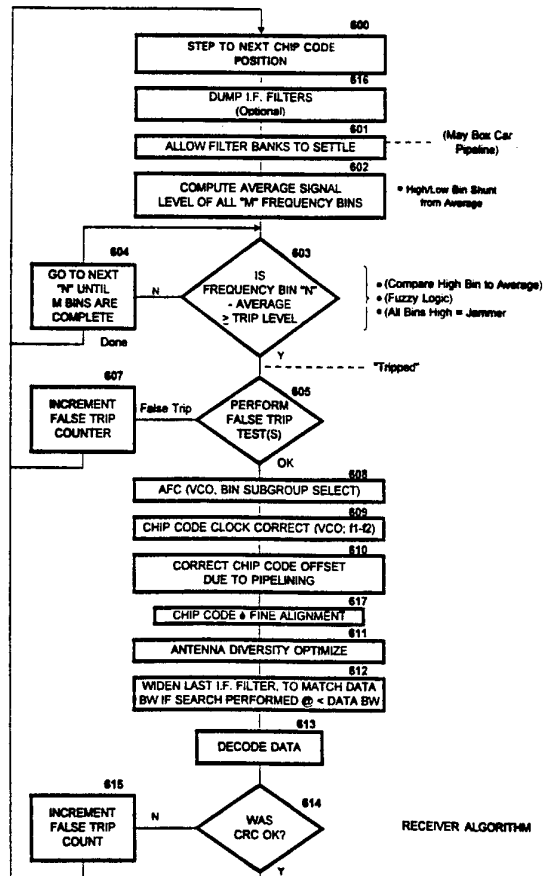
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : H04B 1/707, 1/74, H04J 13/04, H04L 27/06, 7/10</p>	<p>A3</p>	<p>(11) International Publication Number: WO 96/41425 (43) International Publication Date: 19 December 1996 (19.12.96)</p>
<p>(21) International Application Number: PCT/US96/09314 (22) International Filing Date: 6 June 1996 (06.06.96) (30) Priority Data: 08/485,007 7 June 1995 (07.06.95) US (71) Applicant (for all designated States except US): SANCONIX, INC. [US/US]; Suite 202, 101 W. Robert E. Lee Boulevard, New Orleans, LA 70124 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): SANDERFORD, H., Britton, Jr. [US/US]; 7331 General Haig, New Orleans, LA 70124 (US). ROUQUETTE, Robert, E. [US/US]; 633 Meursalt Drive, Kenner, LA 70065 (US). DAVIS, Robert, J. [US/US]; 525 W. William David Parkway, Metairie, LA 70065 (US). (74) Agent: REGARD, Joseph, T.; Joseph T. Regard, Ltd. (plc), Suite 100, 3200 Ridgelake Avenue, Metairie, LA 70002 (US).</p>	<p>(81) Designated States: AU, CA, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 20 February 1997 (20.02.97)</p>	

(54) Title: DIRECT SEQUENCE FREQUENCY AMBIGUITY RESOLVING RECEIVER

(57) Abstract

A parallel frequency acquisition technique is disclosed for increasing receiver sensitivity and increasing process gain while reducing the necessary preamble duration required for spread spectrum acquisition. In addition, techniques are disclosed for reducing the effects of jamming and impulse noise on the performance of the receiver, as well as enhanced antenna diversity approaches (611). Further, techniques are taught which compensate for chip code alignment drift (609, 610, 617), providing an associated transmitter maintains carrier and chip code coherence. These techniques allow for the use of lower-cost frequency-setting crystals in both the receiver and transmitter, as well as the operation of the system over a wider temperature range.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/09314

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(6) :H04B 1/707, 1/74; H04J 13/04; H04L 27/06, 7/10
 US CL :375/206, 349, 320; 370/18
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 U.S. : 375/200, 205, 206, 268, 320, 347, 349, 350, 367; 370/18

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, 5,291,517 A (STEIN et al) 01 March 1994, abstract, fig. 4.	1, 2, 7, 9,15, 31, 34, 37 ----- 1, 2, 7-18, 25, 26, 28-31, 34, 38-42, 44, 45, 50-53, 57-59, 61-66, 68, 70

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	* & * document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 25 NOVEMBER 1996	Date of mailing of the international search report 07 JAN 1997
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Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <i>Jeffrey W. Gluck</i> JEFFREY W. GLUCK Telephone No. (703) 308-5462
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US96/09314

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, 5,185,761 A (KAWASAKI) 09 February 1993, abstract, fig. 1, col. 3, lines 8 ff.	1-3, 7, 9, 31, 34, 37, 39 ----- 1-15, 18, 25, 26, 28-31, 34, 35, 38-42, 44, 45, 49, 50-53, 57-59, 61-66, 68, 70
Y	US, 5,168,508 A (IWASAKI et al) 01 December 1992, abstract, figs. 1, 5, 7, 11-15, 19.	1, 2, 7-18, 25, 26, 28-31, 34, 35, 39-42, 44, 45, 50-53, 57-59, 61-66, 68, 70
Y, P	US, 5,450,453 A (FRANK) 12 September 1995, fig. 7.	6, 29, 35, 50, 61, 62, 64
Y, P	US, 5,426,665 A (CLEVERLY et al) 20 June 1995, abstract.	10
Y	US, 4,100,370 A (SUZUKI et al) 11 July 1978, col. 2, line 50 to col. 3, line 23.	11
Y	US, 4,485,477 A (NOSSEN) 27 November 1984, abstract.	14
Y, P	US, 5,436,935 A (BERNHARD et al) 25 July 1995, abstract, fig. 1.	35, 53
Y, E	US, 5,528,624 A (KAKU et al) 18 June 1996, abstract, fig. 1.	14, 35, 53
X --- Y	US 4,932,037 A (SIMPSON et al) 05 June 1990, abstract.	40 ----- 35, 53
Y	US, 5,101,416 A (FENTON et al) 31 March 1992, col. 2, line 45 to col. 3, line 60.	35, 53
Y	US, 5,029,181 A (ENDO et al) 02 July 1991, figs. 1 and 2.	35, 53
Y, E	US, 5,563,537 A (SETA) 08 October 1996, col. 3, lines 22-33, claims 3-5.	44, 45
Y	US, 4,468,793 A (JOHNSON et al) 28 August 1984, abstract, col. 9, lines 4-44, col. 20, lines 43-63, claims 12 and 15.	57-59
Y	US, 5,418,778 A (CUMMISKEY et al) 23 May 1995, col. 20, lines 62-4, col. 22, lines 27-51, claim 14.	58

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, 5,291,081 A (TAKEUCHI et al) 01 March 1994, abstract, col. 1, line 64 to col. 2, line 7.	58
Y	US, 4,847,860 A (ROBERT) 11 July 1989, abstract, fig. 1.	65
Y	US, 5,309,484 A (MCLANE et al) 03 May 1994, col. 7, lines 60-8.	18
Y	US, 4,977,577 A (ARTHUR et al) 11 December 1990, abstract, fig. 4.	25, 26, 40-42
Y	US, 5,095,493 A (ARTHUR et al) 10 March 1992, abstract, fig. 4.	25, 26, 40-42
Y	US, 4,152,651 A (LAMPERT et al) 01 May 1979, col. 2, lines 12 ff.	51, 63, 64
Y	US, 4,538,281 A (RAJAN) 27 August 1985, abstract, figures.	32, 33, 42, 71
Y	US, 5,245,629 A (HALL) 14 September 1993, abstract, fig. 6.	32, 33, 42, 71
Y	US, 5,263,050 A (SUTTERLIN et al) 16 November 1993, abstract.	32, 33, 42, 71
Y, P	US, 5,440,597 A (CHUNG et al) 08 August 1995, abstract, fig. 3.	32, 33, 42, 71
Y	US, 4,225,976 A (OSBORNE et al) 30 September 1980, abstract.	32, 33, 71
X	US, 5,398,258 A (SU et al) 14 March 1995, abstract, fig. 5.	48
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Y		49
X	US, 4,479,215 A (BAKER) 23 October 1984, abstract.	48
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Y		49
Y	US, 5,420,850 A (UMEDA et al) 30 May 1995, col. 8, lines 18-38.	70
Y	US, 4,599,732 A (LEFEVER) 08 July 1986, cols. 9-10.	70

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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: 72 and 52/54 (but not 52/28 or 52/53)
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

None of the parent claims of Claim 72 contain antecedent basis for "the present parameter", rendering the meaning of this claim so unclear as to be unsearchable, nor does Claim 54 provide antecedent basis for the use of any "trip level".

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US96/09314

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

APS

search terms: pn, code, sequence, chip, phase offset, synchronization, correction, frequency offset, filter bank, parallel filters, direct sequence, envelope shaping or enhancement, table of filter coefficients, pipelining, storage, buffer, memory, change or difference, signal strength, power or energy, frequency uncertainty, center, central or middle frequency or bin or filter, rolloff, threshold or trip level, interpolation, jamming, antennas, duty cycle or switch or alternate, temperature measurement, amplitude shift keying or on off keying, disable or turn off or switch off, orthogonal, inverting or inversion, sampling or digitizing clock or reference.

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, Claims 1-15, 16-19, 21, 25-30, 31/(1, 16, 18, 25, 28), 34/(1, 16, 18), 35/(1, 16, 18), 36/(1, 16, 18), 37-39, 43/(1, 16, 18, 28), 44/(1, 16, 18, 28), 45/(1, 16, 18, 28), 47/(1, 16, 18, 21, 25, 28), 50, 51, 52/(28, 52, 53), 53, 57/(1, 16, 18, 21, 25, 28), 58/57/(1, 16, 18, 21, 25, 28), 59/57/(1, 16, 18, 21, 25, 28), 60/(1, 16, 18, 21, 22, 25, 28), 61-64, 65/(1, 16, 21, 28), 66/65/(1, 16, 21, 28), 67/65/(1, 16, 21, 28), 68/(1, 16, 21, 28), 69/(1, 16, 18, 21, 22, 25, 28), 70 and 72/34/(1, 16, 18), drawn to a direct-sequence spread-spectrum system with frequency and time uncertainty reduction.

Group II, Claims 20, 22-24, 31/20, 34/22, 35/22, 36/22, 43/22, 44/22, 45/22, 47/(20, 22), 57/(20, 22), 58/57/(20, 22), 59/57/(20, 22), 60/(20, 22), 65/22, 66/65/22, 67/65/22, 68/22, 69/(20, 22), 72/34/22, drawn to a direct-sequence spread-spectrum system with frequency and time uncertainty reduction, in which hybrid coefficient tables are used, which are derived from the product of a particular chip code sequence and a particular low-pass or band-pass filter characteristic.

Group III, Claims 32, 33 and 71, drawn to a trip level algorithm based on a normalization control loop.

Group IV, Claims 40-42, 52/54, 54, 55 and 56, drawn to an algorithm for the elimination of unwanted code phase dwells.

Group V, Claim 46, drawn to a non-spread-spectrum amplitude-shift keying reception method.

Group VI, Claims 48 and 49, drawn to a method for increasing the capacity of a code-division multiple-access system.

The inventions listed as Groups I-VI do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: As specified above, the Group I claims do not contain any of the special technical features found in the claims of Groups II-VI; in fact, none of the claims of Groups II-VI contain the special technical features of those claims of any other group. Group II has the special technical feature of hybrid coefficient tables derived from a particular chip code sequence and a particular low-pass or band-pass filter characteristic. Group III has the special technical feature of a trip level algorithm based on a normalization control loop. Group IV has the special technical feature of elimination of unwanted code phase dwells. Group V has the special technical feature of being drawn to a general, not-necessarily-spread-spectrum, amplitude-shift keying system. Group VI has the special technical feature of a method for increasing the capacity of a code-division multiple-access system.