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# United States Patent [19]

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Taylor et al.

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[54] **WIRELESS RADIO MODEM WITH MINIMAL INTER-DEVICE RF INTERFERENCE**

0599632 6/1994 European Pat. Off. .  
0631398 12/1994 European Pat. Off. .

(List continued on next page.)

[75] Inventors: **Bryan Taylor; Mihal Lazaridis**, both of Waterloo; **Peter Edmonson**, Hamilton; **Perry Jarmuszewski**, Guelph; **Lizhong Zhu**, Waterloo; **Steven Carkner**, Waterloo; **Matthias Wandel**, Waterloo, all of Canada

### OTHER PUBLICATIONS

Electronic Design, vol. 41, No. 16, 5 Aug. 1993 pp. 45-50, Leonard 'PCMCIA-sized radio links portable WLAN terminals' see figure 2.

IEICE Transactions On Communications, vol. E76-B, No. 8, Aug. 1993 pp. 990-995, Takehara 'A SAW-based spread spectrum wireless LAN system' see figures 2, 3, 7.

IEEE Transactions On Vehicular Technology, vol. 43, No. 4, 1 Nov. 1994 pp. 863-869, Mitsutaka Hikita et al 'A wide-band SAW resonator and its application to a VCO for mobile radio transceivers' see abstract.

"Surface Transverse Wave Based FM Modulator/Demodulator", Reprinted from Electronics Letters 15th Mar. 1990 vol. 26 No. 6 pp. 364-365.

"A Surface Transverse Wave-Based MSK System", Ivan D. Avramov, P.J. Edmonson, Member, IEEE, Peter M. Smith, Member, IEEE IEEE Transactions On Ultrasonics, Ferroelectrics, And Frequency Control Vol. 38, No. 3, May 1991. Product Note 11729B-1 Phase Noise Characterization Of Microwave Oscillators Phase Detector Method Hewlett Packard, Aug. 1983.

[73] Assignee: **Research In Motion Limited**, Waterloo, Canada

[21] Appl. No.: **488,695**

[22] Filed: **Jun. 8, 1995**

### Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 337,841, Nov. 14, 1994, Pat. No. 5,619,531.

[51] Int. Cl.<sup>6</sup> ..... **H04L 5/16; H04L 27/10**

[52] U.S. Cl. .... **375/222; 375/274; 455/73**

[58] Field of Search ..... **375/222, 295, 375/298, 308, 261, 219, 316, 340, 274, 336, 305, 329, 279; 379/93.01; 455/73, 88, 86; 332/103, 100; 329/300, 304**

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Attorney, Agent, or Firm—Jones, Day, Reavis & Pogue; Charles B. Meyer

### [56] References Cited

#### U.S. PATENT DOCUMENTS

- 4,087,756 5/1978 Rogers, Jr. .
- 4,418,320 11/1983 Guyton .
- 4,562,404 12/1985 Futakuchi .
- 4,630,314 12/1986 Smith .
- 4,646,326 2/1987 Backof, Jr. et al. .
- 4,665,519 5/1987 Kirchner et al. .

(List continued on next page.)

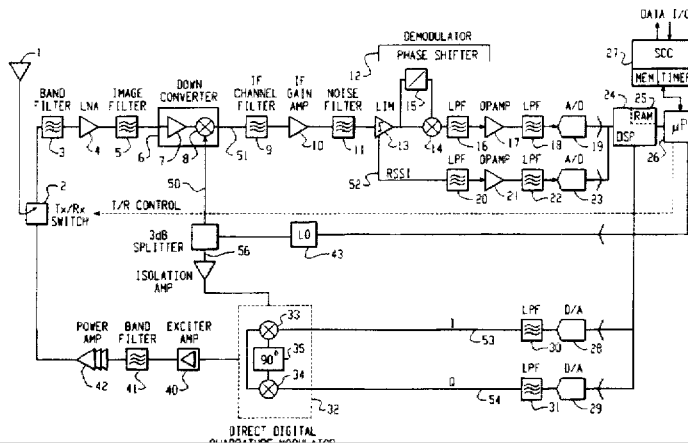
#### FOREIGN PATENT DOCUMENTS

- 0416423 3/1991 European Pat. Off. .
- 0494696 7/1992 European Pat. Off. .
- 0531100 3/1993 European Pat. Off. .
- 0584872 3/1994 European Pat. Off. .

### [57] ABSTRACT

A wireless radio modem that may be incorporated into a host system or connected through a PCMCIA or similar port to a host system includes radio frequency modulation/demodulation circuitry employing electronic device elements that operate in a frequency range that minimizes the RF interference between the radio modem and the host system. Radio modem power conservation is maximized by 1) simplifying signal modulation processing by use of a two-point waveform transition table, thereby reducing processing requirements; and 2) incorporating a "sleep mode" feature in which all non-timer circuitry is powered-down when not in use.

12 Claims, 8 Drawing Sheets



U.S. PATENT DOCUMENTS

4,682,344 7/1987 Somer .  
4,843,613 6/1989 Crowle ..... 375/295  
4,893,347 1/1990 Eastmond et al. .  
4,962,510 10/1990 McDavid et al. .... 375/308  
5,020,093 5/1991 Pireh .  
5,230,094 7/1993 Kitching et al. .  
5,231,647 7/1993 Deguchi .  
5,313,211 5/1994 Tokuda .

5,317,707 5/1994 Wallace .  
5,347,304 9/1994 Moura et al. .  
5,548,253 8/1996 Durrant ..... 375/296

FOREIGN PATENT DOCUMENTS

62-292005 12/1987 Japan .  
930577 5/1982 U.S.S.R. .  
2114392 8/1983 United Kingdom .  
2261345 5/1993 United Kingdom .

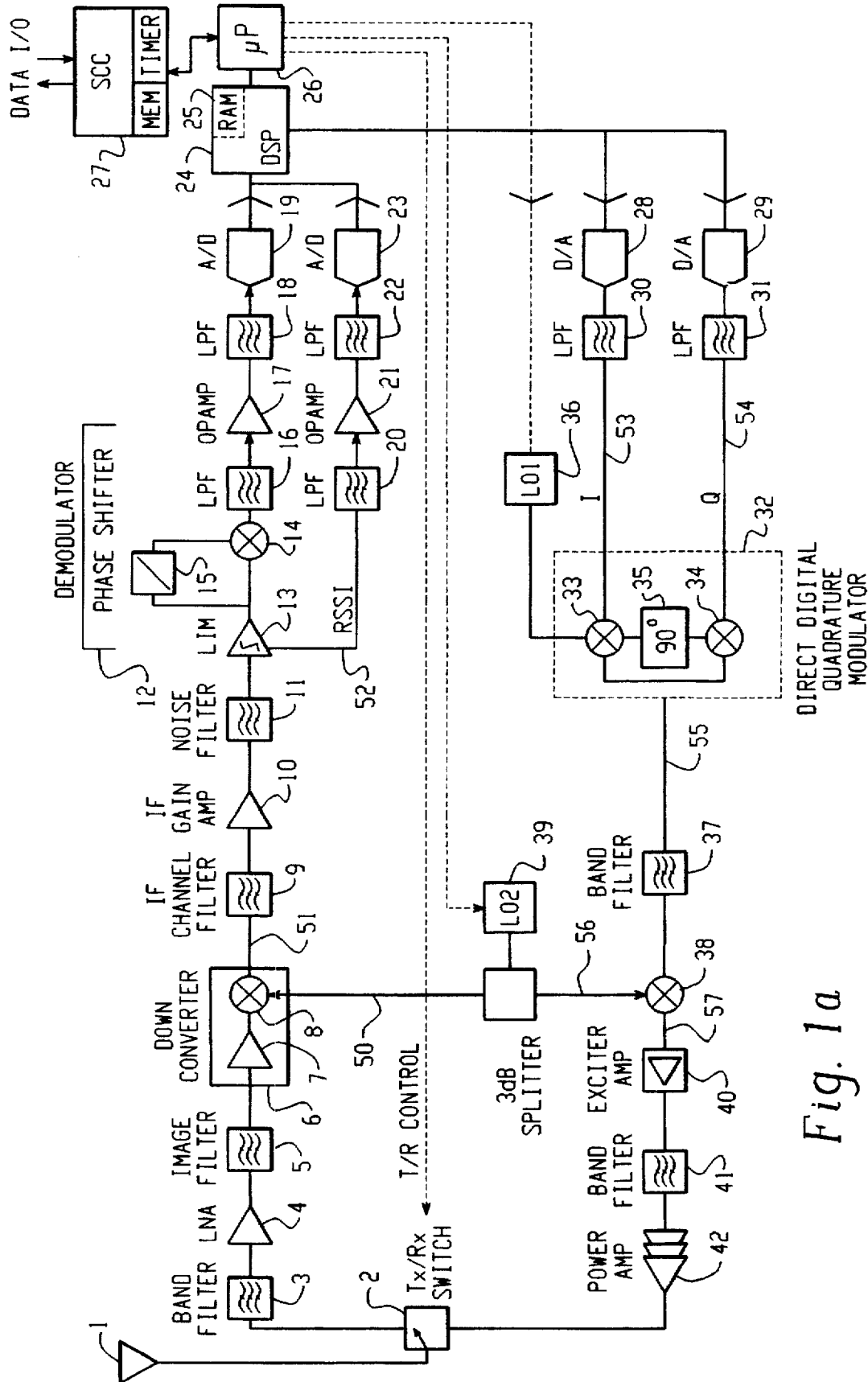


Fig. 1a

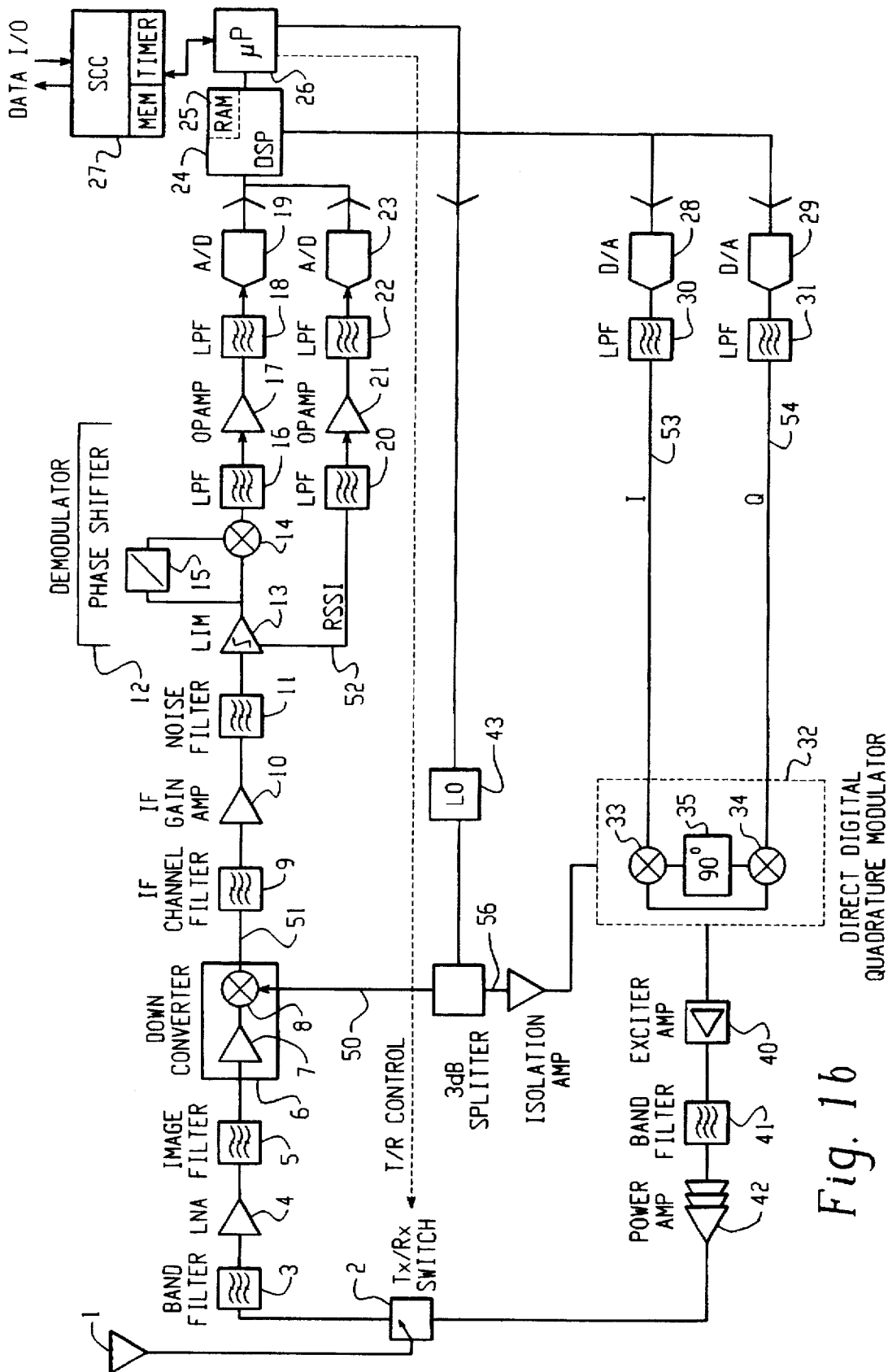


Fig. 1b

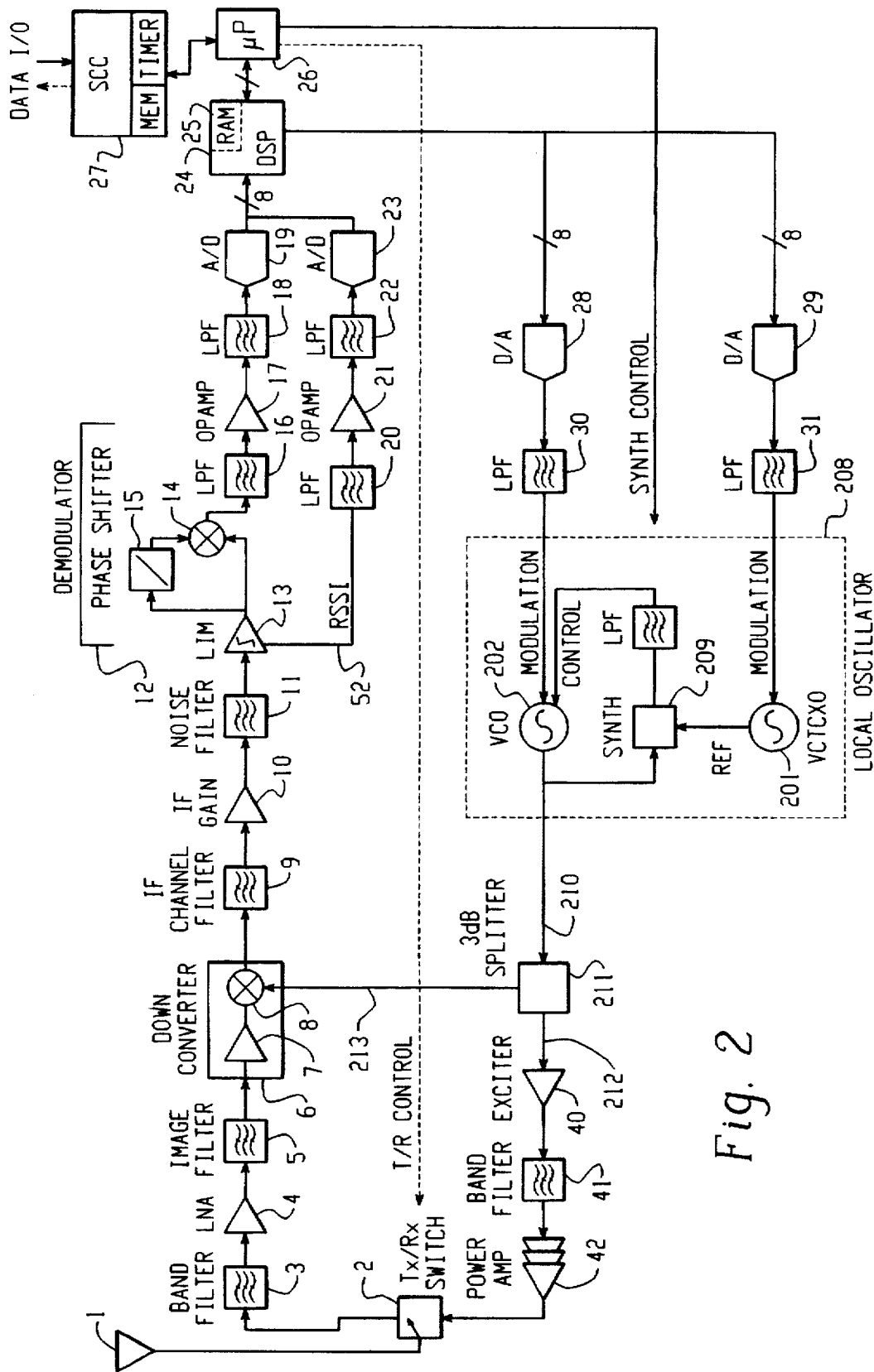


Fig. 2

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