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Nelson et al.

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(54) **MODEM WITH FIRMWARE UPGRADE FEATURE**

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Related U.S. Application Data

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(51) **Int. Cl.**[7] **H04B 1/38**; H04M 11/00

(52) **U.S. Cl.** **375/222**; 379/93.05

(58) **Field of Search** 375/222, 219; 395/200, 200.01, 200.02, 200.09, 200.18, 200.64, 200.51, 750.05; 379/93.01, 93.05, 100.01

(56) **References Cited**

U.S. PATENT DOCUMENTS

RE30,187 E		1/1980	Hong et al.
4,203,006 A		5/1980	Mascia
4,592,069 A		5/1986	Redding
4,725,977 A	*	2/1988	Izumi et al. 364/900
4,782,462 A	*	11/1988	Kaplinsky et al. 364/900
4,830,757 A	*	5/1989	Lynch et al. 210/742
4,893,271 A		1/1990	Davis et al.
5,001,729 A	*	3/1991	Tjahjadi et al. 375/106
5,132,716 A	*	7/1992	Samuels et al. 354/322
5,155,847 A		10/1992	Kirouac et al.
5,175,845 A		12/1992	Little
5,239,652 A		8/1993	Seibert et al.

5,268,928 A		12/1993	Herh et al.
5,293,376 A		3/1994	White
5,301,122 A		4/1994	Halpern
5,305,196 A		4/1994	Deaton et al.
5,337,044 A	*	8/1994	Folger et al. 340/825.14

(List continued on next page.)

OTHER PUBLICATIONS

AT&T Microelectronics, "High Speed Data Pump Chip Sets," published in Dec. 1991.
Zilog Intelligent Peripheral Controllers, "Z84CO1 Z80® CPU with Clock Generator/Controller," 43–73, published in 1991.
Zilog Intelligent Peripheral Controllers, "Z84C90 CMOS Z80® KIO Serial/Parallel/Counter/Timer," 205–224, published in 1995.

(List continued on next page.)

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(57) **ABSTRACT**

Updated operating code and parameters can be reprogrammed into a modem system with no disassembly of the modem hardware. The modem system includes a memory chip in which operating code and parameters are stored. Two control programs control the reprogramming of updated operating code. One of the control programs is designed for manufacturing and testing purposes. The other control program allows remote reprogramming of updated operating code or parameters from a remote location such as a customer site. A user can thus remotely upgrade system firmware with updates, bug fixes, enhancements or other new releases of system operating code by downloading the update over a phone line to a host PC and reprogramming the memory chip of the modem over the serial port from the host PC. The user can also remotely upgrade the modem system firmware by directly programming the memory chip of the modem without the assistance of the host PC. The modem system is portable, obtaining power from a standard 9 volt battery. Therefore, various power saving features are also incorporated into the modem system

8 Claims, 28 Drawing Sheets
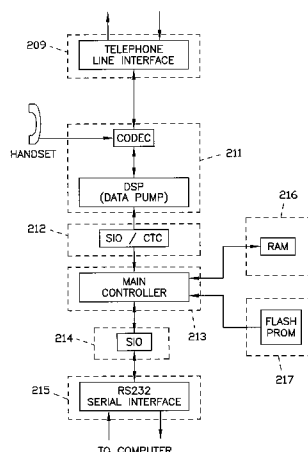
U.S. PATENT DOCUMENTS

5,367,670 A	*	11/1994	Ward et al.	....	395/575
5,390,350 A	*	2/1995	Chung et al.	....	395/150
5,408,522 A	*	4/1995	Ikehata et al.	....	379/98
5,428,790 A	*	6/1995	Harper et al.	....	395/750
5,434,849 A	*	7/1995	Vicard et al.	....	370/32.1
5,450,425 A	*	9/1995	Gunn et al.	....	371/67

OTHER PUBLICATIONS

AT&T Microelectronics, WE® DSP16C Digital Signal Processor/CODEC Preliminary Data Sheet, 32 pages, published in May, 1991.

AT&T Microelectronics, "T7540 Digital Telephone CODEC Data Sheet and Addendum," 1–4, published in Jul., 1991.

AT&T Microelectronics, T7540 Digital Telephone CODEC Preliminary Data Sheet, 1–64, published in Jan., 1991.

"Dynamic Setting of Modem Parameters," IBM Technical Disclosure Bulletin, Vo. 26, No. 1, Jun. 1983, pp. 261–262.

"Technique for Power Management in Signal Processors," IBM Technical Disclosure Bulletin, vol. 35, No. 5, Oct., 1992, pp. 425–427.

"Resume Operation for Internal Modems," IBM Technical Disclosure Bulletin, vol. 5, No. 48, Sep. 1992, pp. 398–399.

K. Tolly, "The New Branch–Office Routers", *Data Communications*, pp. 58–70, Aug. 1994.
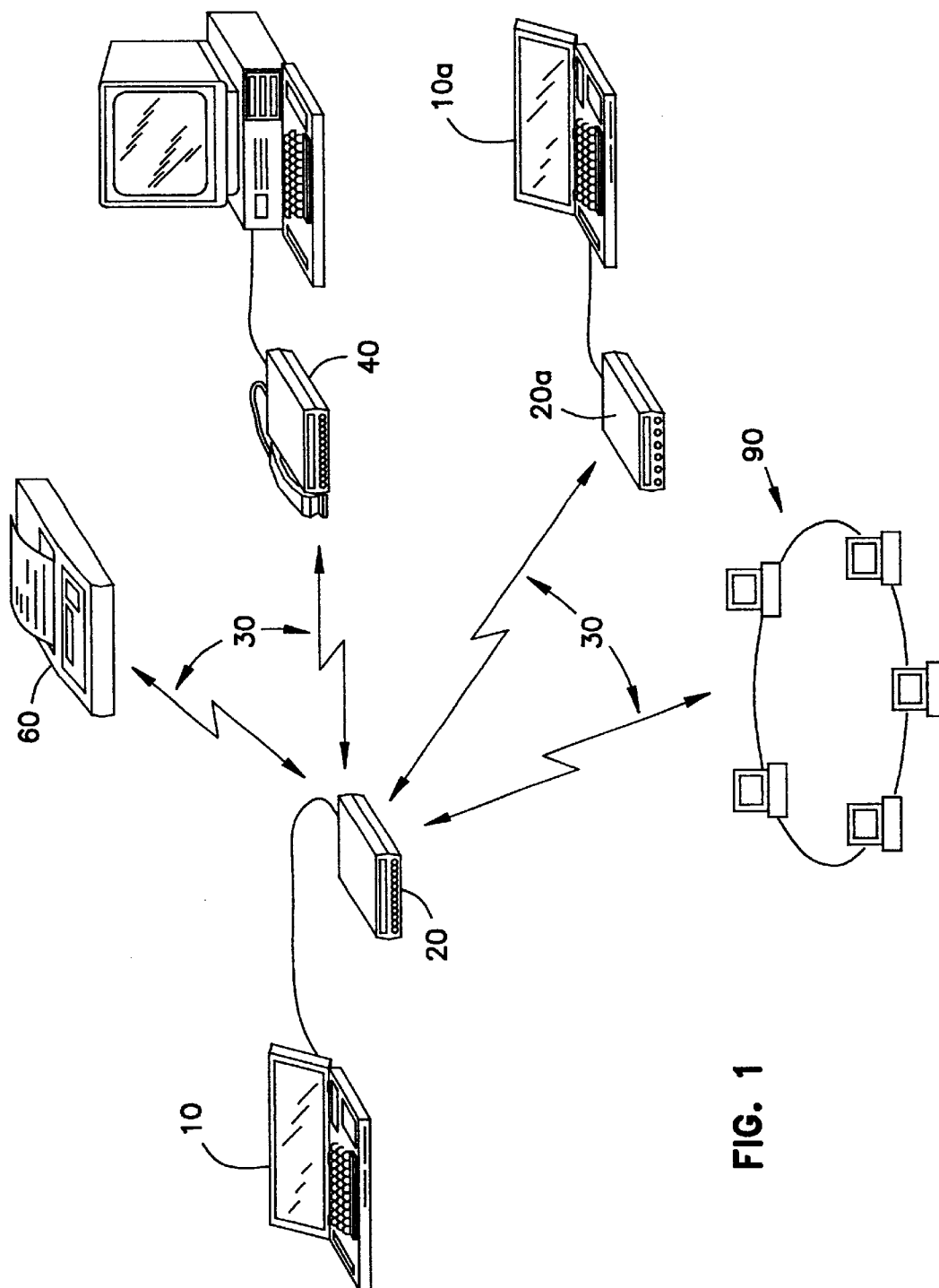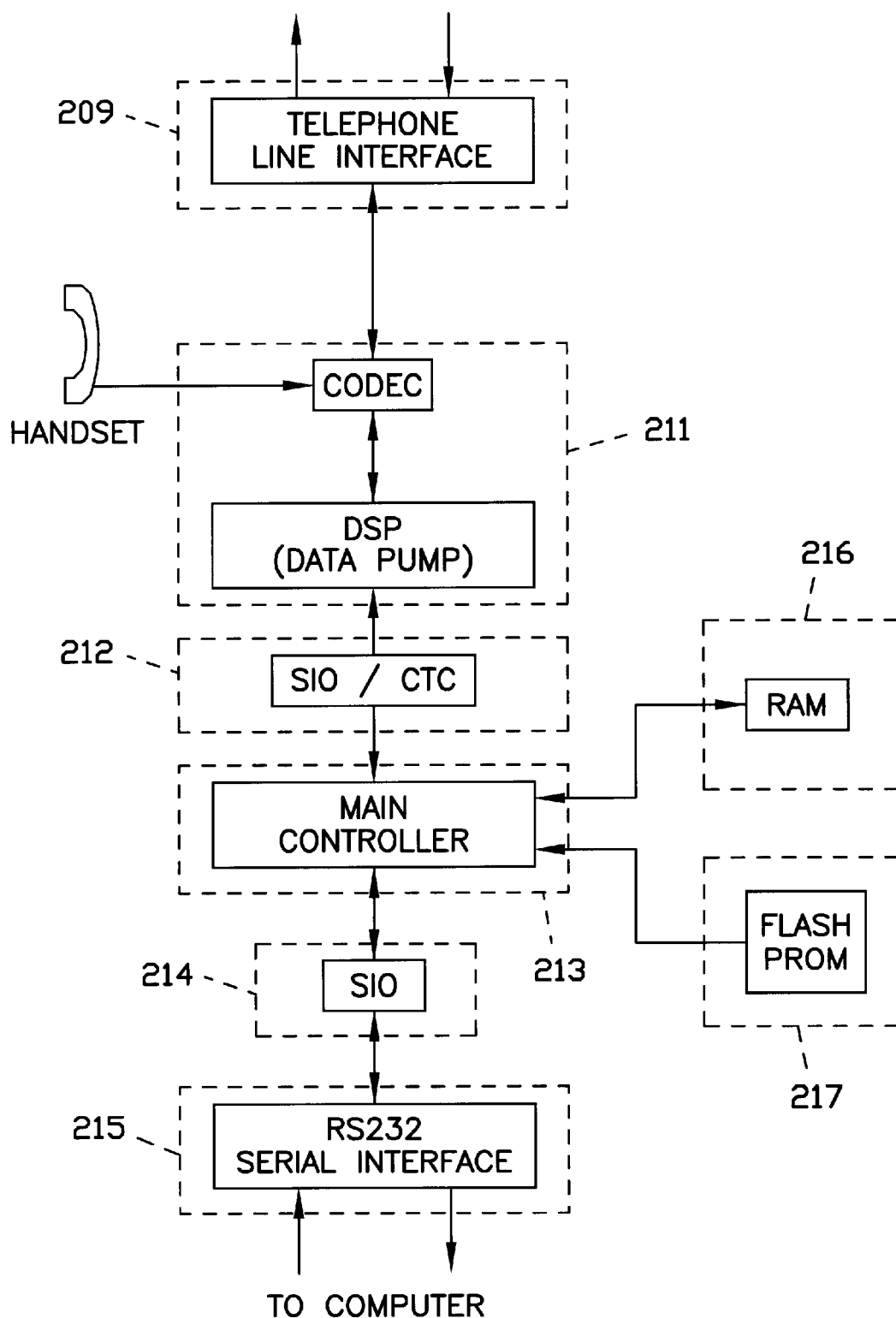
* cited by examiner

FIG. 1

209 — TELEPHONE LINE INTERFACE

HANDSET

CODEC

211

DSP (DATA PUMP)

216

212 — SIO / CTC

RAM

MAIN CONTROLLER

213

214 — SIO

FLASH PROM

217

215 — RS232 SERIAL INTERFACE

TO COMPUTER

FIG. 2

FIG. 3

DOCKET ALARM
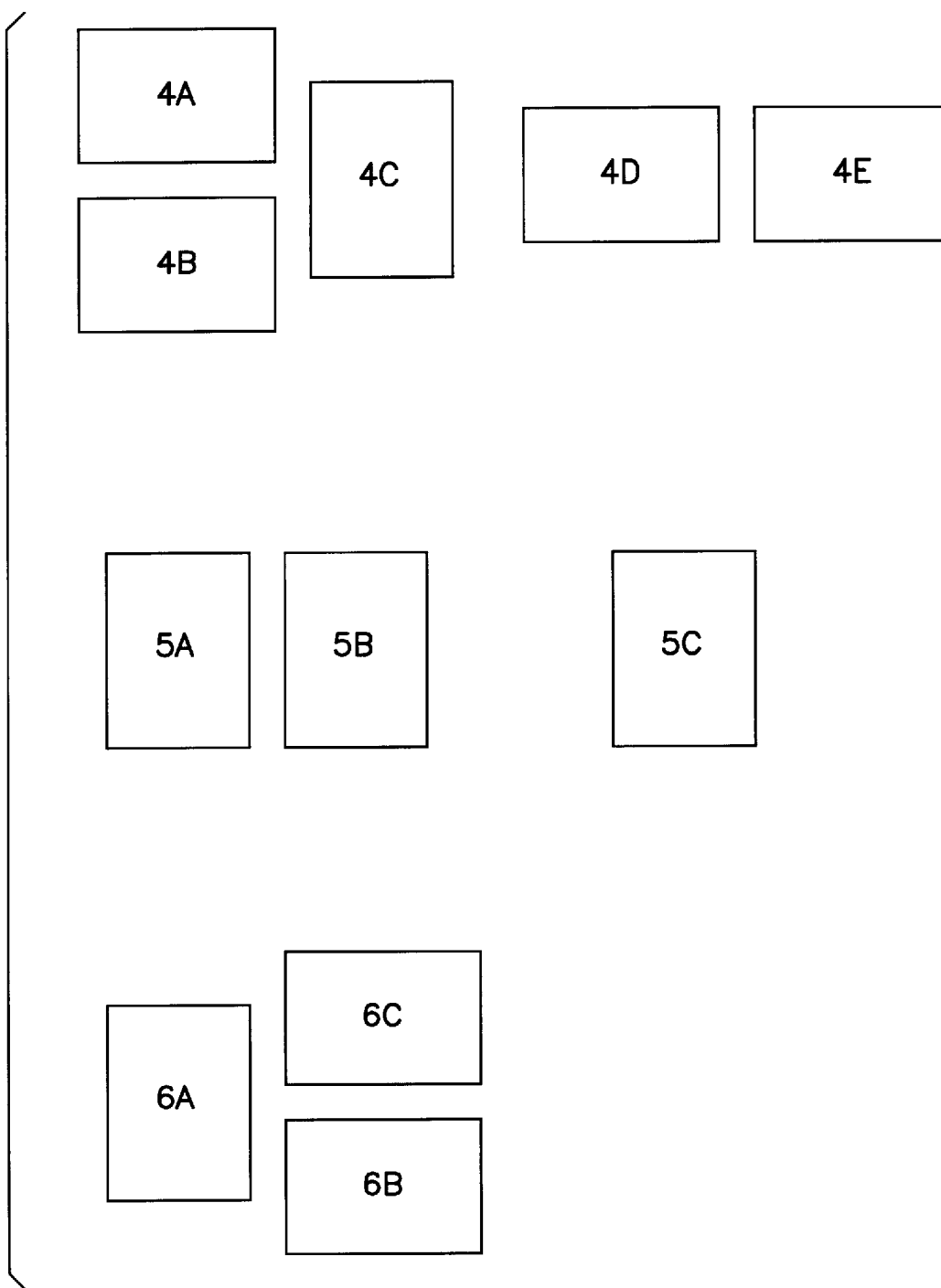
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