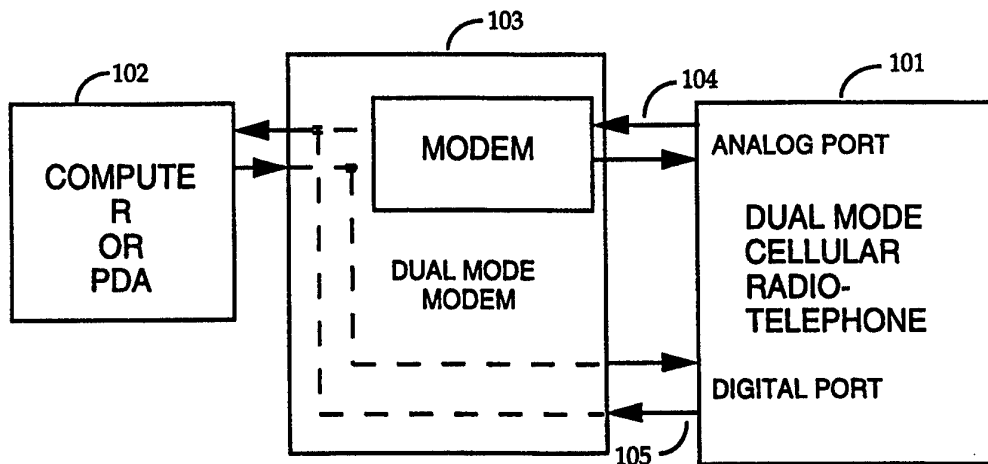




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<p>(21) International Application Number: PCT/US94/12966 (22) International Filing Date: 8 November 1994 (08.11.94) (30) Priority Data: 152,160 15 November 1993 (15.11.93) US (71) Applicant: QUALCOMM INCORPORATED [US/US]; 6455 Lusk Boulevard, San Diego, CA 92121 (US). (72) Inventor: JACOBS, Paul, E.; 1684 Torrance Street, San Diego, CA 92103 (US). (74) Agent: BOLVIN, Kenneth, W.; Qualcomm Incorporated, 6455 Lusk Boulevard, San Diego, CA 92103 (US).</p>	<p>(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ).</p> <p><b>Published</b> <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></p>	

(54) Title: DATA COMMUNICATION USING A DUAL MODE RADIOTELEPHONE



(57) Abstract

The data communication system of the present invention enables an electronic accessory, such as a computer, to communicate data in both an analog type cellular radiotelephone system and a digital type cellular radiotelephone system. The data communication system first determines in which type of system it is operating and the radiotelephone (101) then uses the data signal at either the analog input port (104) or the digital input port (105), depending on the type of system.

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## DATA COMMUNICATION USING A DUAL MODE RADIOTELEPHONE

### FIELD OF THE INVENTION

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The present invention relates to data communications. More particularly, the present invention relates to data communications in a radiotelephone environment.

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### BACKGROUND OF THE INVENTION

At least two types of cellular radiotelephone systems are operating in the United States, an analog type and a digital type. The analog type, also known in the art as the advanced mobile phone system (AMPS), was the sole cellular system until capacity demands required that another system having greater capacity be utilized. The digital type system, presently implemented using either code division multiple access (CDMA) or time division multiple access (TDMA) schemes, was invented to relieve the capacity problems of AMPS.

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Mobile radiotelephones that are designed to operate in one of the digital systems must also have the capability of operating in AMPS. This allows a mobile radiotelephone user to roam from one geographical area with AMPS to another geographical area with one of the digital schemes. Or the user can decide to switch from one type of system to the other while remaining in the same geographical area due to lack of capacity in the other system.

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These cellular systems have greatly increased the mobility of the public. Computers and facsimile machines can now be coupled to mobile telephones, thus allowing data communications, in addition to voice communications, from any location having a cellular system installed.

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One problem with coupling a computer with a radiotelephone is that, in an analog system, the data from the computer must be converted into an analog format to be compatible with the AMPS format. This requires a modem between the radiotelephone and the computer, adding weight and expense to the configuration. Yet when the radiotelephone switches to a digital system, the modem is not required since the digital data from the computer can just be reformatted into the digital standard's format before transmission. In this case, the user must remember to disconnect the computer from the modem and reconnect the computer to

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the radiotelephone. There is a resulting need for a data communications apparatus that does not require the user to reconfigure the connections when changing cellular systems.

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### SUMMARY OF THE INVENTION

The data communications system of the present invention enables data communication in two types of radiotelephone networks. The communication system is comprised of an electronic accessory that  
10 generates a first signal. A modulator/demodulator, coupled to the electronic accessory, produces a modulated signal from the first signal. A radiotelephone, coupled to the modulator/demodulator, uses the first signal when it is operating in the first radiotelephone network and the modulated signal when it is operating in the second radiotelephone  
15 network.

In a preferred embodiment, the electronic accessory is a computer. Also in the preferred embodiment, the two types of radiotelephone networks are analog and digital so that the radiotelephone uses the digital signal from the computer while in the digital radiotelephone environment  
20 and the modulated signal while in the analog radiotelephone environment.

### BRIEF DESCRIPTION OF THE DRAWINGS

25 Figure 1 shows the data communications system of the present invention.

Figure 2 shows a flowchart of the data communications process of the present invention.

30 Figure 3 shows an alternate embodiment of the data communications system of the present invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 illustrates a block diagram of the data communications  
35 system of the present invention. This system is comprised of a dual mode radiotelephone (101) having two data ports, an analog (104) and a digital (105). These dual ports (104 and 105), in the preferred embodiment, are implemented as a single connector with multiple pins. An alternate embodiment uses separate connectors for each input. Another alternate

embodiment multiplexes the output signals onto the same output connector pin.

The analog data port (104) accepts an analog signal that is processed by the radiotelephone (101) in the same manner that a voice  
5 signal is processed by the analog mode of the radiotelephone. The signal is then transmitted by the radiotelephone to the base station. The processing performed by the radiotelephone is well known in the art.

The radiotelephone's digital port (105) accepts a digital signal that is processed by the digital mode circuitry of the radiotelephone (101). This  
10 digital signal is in the format of the electronic accessory (102) and not the proper format for transmission by the radiotelephone (101). The signal, therefore, must be reformatted into the proper frames for transmission in a digital radiotelephone environment. The formatting of digital data into a frame structure by a radiotelephone is also well known in the art.

The analog and digital ports (104 and 105) are coupled to a dual  
15 mode modem (103) that demodulates analog data from the radiotelephone (101) into a digital format for use by the electronic accessory (102) and modulates a digital signal from the electronic accessory (102) into the analog format for the radiotelephone (101) to use. The modem (103) also  
20 passes the digital signal through from the electronic accessory (102) without modifying it. In this manner, the electronic accessory (102) coupled to the dual mode modem (103) has two paths to the radiotelephone (101), a digital path and an analog path.

In the preferred embodiment, the dual mode modem (DMM)  
25 generates a command to the radiotelephone to determine the radiotelephone's mode. The radiotelephone decodes the command and sends a response back to the DMM depending on its mode. The DMM then sets itself to either pass commands to the radiotelephone or run the analog modem depending on the response.

In an alternate embodiment, the electronic accessory determines  
30 the mode of the radiotelephone by sending a command word, requesting the radiotelephone's mode, to the radiotelephone through the digital input. The radiotelephone decodes this word and sends its mode back to the electronic accessory through the digital path. The electronic accessory  
35 now knows the correct mode and instructs the dual mode modem to channel the signal to the proper output port of the modem.

The electronic accessory can instruct the modem by pulling a control line between the accessory and the modem to a logic high or low. In an alternate embodiment, the radiotelephone sends a command over a

digital bus to the modem instructing it on what to do. In another alternate embodiment, the modem intercepts and interprets the reply from the radiotelephone and sets the proper output port on its own. In yet another alternate embodiment, the data from the electronic accessory is output  
5 from both the digital and the analog outputs of the dual mode modem and the radiotelephone decides which input to use depending on the type of radiotelephone system in which it is operating.

An alternate embodiment of the system of the present invention is illustrated in Figure 3. This embodiment uses a typical modem (301) to  
10 couple the digital output of the electronic accessory (102) with the analog input (104) of the radiotelephone (101). The electronic accessory's output is coupled directly to the digital input (105) of the radiotelephone (101) without going through the modem (103). This embodiment does not require a special dual mode modem. In this embodiment, the electronic  
15 accessory (102) outputs the digital signal to both the digital and analog inputs of the radiotelephone (101). The radiotelephone (101) then determines which input to use depending on the type of radiotelephone system in which it is operating.

In the preferred embodiment, the electronic accessory (102) is a  
20 computer. An alternate embodiment uses a personal digital assistant as the electronic accessory. Yet another alternate embodiment uses a facsimile/data modem to couple the computer to the radiotelephone. In this embodiment, the electronic accessory can output to the modem either digital data or a digitized facsimile. If facsimile data is output and the  
25 radiotelephone is in a digital radiotelephone system, the radiotelephone will use the digital input port. If the radiotelephone is in an analog cellular system, it will use the signal produced by the modem at the analog input port.

The process of the present invention is illustrated in Figure 2. This  
30 process begins with the radiotelephone determining the type of cellular system in which it is operating (201). This is part of the registration procedure for the radiotelephone and is well known in the art. If the radiotelephone is operating in a digital system (202), either a CDMA system or a TDMA system, it uses the data from its digital input (203). If it  
35 is operating in an analog system, it uses the data from the analog input (204).

In summary, the data communications system of the present invention enables a user of an electronic accessory, such as a computer, to go from a digital cellular radiotelephone system to an analog cellular

telephone system without changing the connections between radiotelephone and the accessory. The system of the present invention determines the type of cellular system in which the radiotelephone is operating so that the signal at the proper radiotelephone input is used.

## CLAIMS

1. A data communications system for communicating data in a  
2 digital radiotelephone network or an analog radiotelephone network, the  
data communications system comprising:  
4 an electronic accessory that generates a digital data signal;  
a modulator/demodulator, coupled to the electronic accessory, for  
6 generating a modulated data signal from the digital data signal; and  
a radiotelephone, coupled to the modulator/demodulator, using the  
8 digital data signal when operating in the digital radiotelephone network  
and using the modulated signal when operating in the analog  
10 radiotelephone network.
2. The data communications system of claim 1 wherein the digital  
2 cellular radiotelephone network is a code division multiple access  
compatible network and the analog cellular radiotelephone network is an  
4 advanced mobile phone system compatible network.
3. The data communications system of claim 1 wherein the electronic  
2 accessory is a computer.
4. A method for communicating data with an electronic accessory  
2 coupled to a radiotelephone through a modem, the radiotelephone having  
a digital mode for use in a digital type radiotelephone system and an  
4 analog mode for use in an analog type radiotelephone system, the  
electronic accessory generating a digital signal and the modem  
6 generating an analog signal from the digital signal, the radiotelephone  
coupled to the modem by a first input for accepting digital signal and a  
8 second input for accepting the analog signal, the method comprising the  
steps of:  
10 determining whether the radiotelephone is operating in the digital  
or the analog type radiotelephone system;  
12 the radiotelephone using the digital signal if the radiotelephone is  
operating in the digital type radiotelephone system; and  
14 the radiotelephone using the analog signal if the radiotelephone is  
operating in the analog type radiotelephone system.



5. A method for communicating data by a radiotelephone coupled to a computer through a modem, the radiotelephone having a digital operating mode for use in a digital cellular radiotelephone system and an analog operating mode for use in an analog cellular radiotelephone system, the radiotelephone coupled to the modem by a digital input for accepting a digital signal and an analog input for accepting a modulated signal, the method comprising the steps of:

- 8 the modem interrogating the radiotelephone to determine the mode of the radiotelephone;
- 10 the radiotelephone indicating its mode to the modem;
- the modem transmitting the digital signal to the radiotelephone in response to the radiotelephone operating in the digital operating mode;
- 12 and
- 14 the modem transmitting the modulated signal to the radiotelephone in response to the radiotelephone operating in the analog operating mode.

6. The method of claim 8 and further including the steps of:

- 2 the radiotelephone transmitting a received signal to the modem;
- if the radiotelephone is operating in the analog operating mode, the
- 4 modem demodulating the received signal;
- if the radiotelephone is operating in the analog operating mode, the
- 6 modem transmitting the demodulated, received signal to the computer;
- and
- 8 if the radiotelephone is operating in the digital operating mode, the modem transmitting the received signal to the computer.

7. A method for communicating data by a radiotelephone coupled to a computer, the radiotelephone having a digital operating mode for use in a digital cellular radiotelephone system and an analog operating mode for use in an analog cellular radiotelephone system, the method comprising the steps of:

- 6 the computer interrogating the radiotelephone to determine the mode of the radiotelephone; and
- 8 the radiotelephone indicating its mode to the computer.

8. A data communications system for communicating data in a digital radiotelephone network or an analog radiotelephone network, the data communications system comprising:

- 4 a computer that generates a digital data signal;

a radiotelephone, having a digital mode and an analog mode, for  
6 transmitting and receiving data in the digital and analog radiotelephone  
networks; and  
8 a modulator/demodulator coupling the computer to the radiotelephone,  
the modulator/demodulator transmitting a mode command to the  
10 radiotelephone to determine whether the radiotelephone is operating in  
the digital mode or the analog mode, the modulator/demodulator  
12 generating a modulated signal from the digital signal if the  
radiotelephone is in the analog mode and conducting the digital data  
14 signal to the radiotelephone if the radiotelephone is in the digital mode.

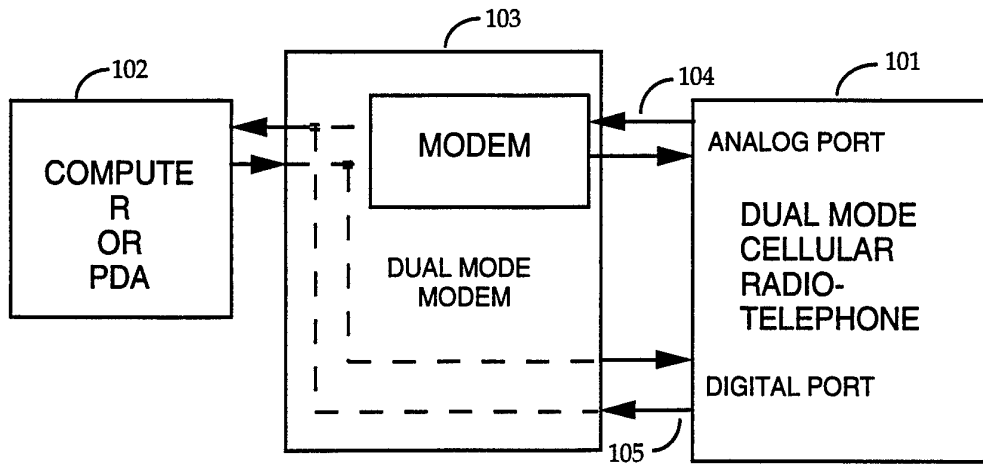


FIG. 1

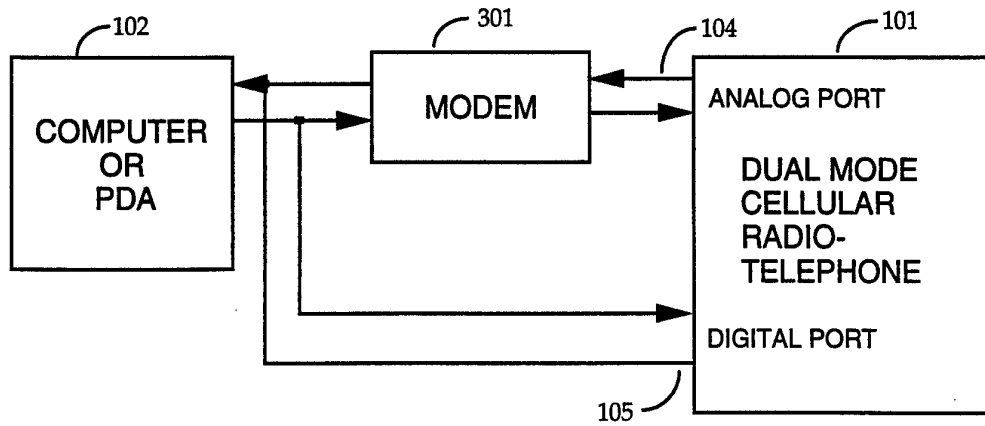


FIG. 3

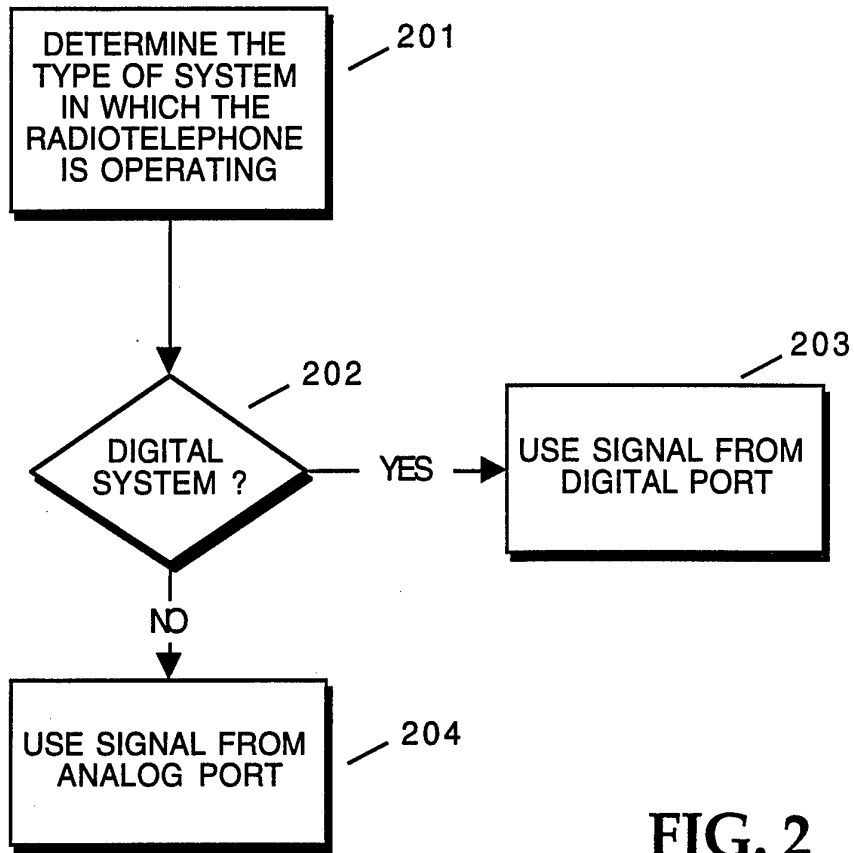


FIG. 2

## INTERNATIONAL SEARCH REPORT

Internatic Application No  
PCT/US 94/12966

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 H04Q7/32

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)  
IPC 6 H04Q H04M H04B

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 practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,5 249 218 (SAINTON) 28 September 1993 see column 3, line 9 - line 25 see column 3, line 61 - column 4, line 16 see column 4, line 45 - line 55 see column 5, line 10 - line 20 see column 5, line 39 - line 56 see column 6, line 23 - line 50 see column 11, line 14 - line 34 ---	1,3-8
Y	EP,A,0 502 546 (MITSUBISHI) 9 September 1992 see column 3, line 5 - line 47 see column 6, line 20 - line 25 ---	1,3-8
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

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## INTERNATIONAL SEARCH REPORT

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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.
A	<p>ELECTRONICS AND COMMUNICATION ENGINEERING JOURNAL, vol.5, no.3, June 1993, LONDON GB pages 147 - 156, XP377790 R. STEELE ET AL 'Third generation PCN and the intelligent multimode mobile portable' see page 155, paragraph 13 - page 156, middle column, line 51 -----</p>	1,2

## INTERNATIONAL SEARCH REPORT

Information on patent family members

Internatic Application No

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