

digital device, Vcc will be employed to power the input/output circuit of the cellular telephone 408 so that input/output circuits of both digital devices will use binary voltage levels referenced to a common supply voltage.

Referring now to FIG. 5, it shows a communication device in accordance with the present invention. The communication device 500 includes a radiotelephone 502 and a modem 504. The modem is in electronic communication with a data device 506 which may be, for example, a personal computer, a personal digital assistant or any other source of digital data.

The radiotelephone 502 includes an antenna 510, a receive circuit 512, a transmit circuit 514, a controller 516, a memory 518, a user interface 520 and a data interface 522. The radiotelephone 502 is powered by a battery 524.

The radiotelephone is configured for radio communication with a remote radio source. Radio signals are received at the antenna 510 and converted to digital data by the receiver 512. Digital data are provided to the controller 516. For transmission of information, the controller 516 provides digital data to the transmitter 514. The transmitter converts digital data to radio signals for transmission from the antenna 510. Thus, the receiver 512 and the transmitter 514 form radio circuitry for radio frequency communication with a remote radio device. The memory 518 stores digital data and programs of instruction for operating the controller 516, which controls operation of the radiotelephone 502. The user interface 520 allows user control and interaction with the radiotelephone 502. For example, the user interface 520 may include a key pad, a display, a microphone and a speaker. The data interface 522 communicates digital data with other digital devices coupled to a port 526.

The modem 504 is a modulator/demodulator which encodes and decodes data for communication between the data device 506 and the radiotelephone 502. The modem includes an interface 530 which has a port 532 coupled to the port 526 of the radiotelephone 502. A cable 534 couples the modem 504 and the radiotelephone 502.

In the illustrated embodiment, the data interface 522 includes a data circuit for communicating digital data with a detachable modem circuit, modem 504. The data circuit of the data interface 522 may be any suitable digital I/O circuit and is responsive to a supply voltage on an interface node of the cable 534 for providing output digital signals to the modem and receiving input digital signals from the modem. The input digital signals and the output digital signals are at voltage levels suitable for communication between the modem and the data interface 522. The data interface 522 further includes a voltage regulator circuit such as the circuit 200 of FIG. 2 or the circuit 300 of FIG. 3. The voltage regulator circuit forms an interface circuit coupled to the interface node of the cable 534 and configured to provide the supply voltage from the radiotelephone 502 to match the output digital signals to logic voltages used by logic circuits of the modem 504.

From the foregoing, it can be seen that the present invention provides a method and apparatus for communicating digital data among digital devices having different operating voltages. A first digital device generates a supply voltage and varies the supply voltage to match a logic voltage used by logic circuits at a second digital device. In one embodiment, the supply voltage is provided at an interface node which is common between the two digital devices. When a second supply voltage at the interface node exceeds the supply voltage, the first digital device interrupts its supply of the supply voltage. In this manner, input/output

circuits of both digital devices communicate using a common supply voltage so that their binary voltage levels match.

While a particular embodiment of the present invention has been shown and described, modifications may be made. For example, in the illustrated embodiment, a cellular telephone communicates with a cellular modem. However, the technique and apparatus illustrated may be modified for use with any digital devices that must communicate digital data. It is therefore intended in the appended claims to cover all such changes and modifications which falls within the true spirit and scope of the invention.

What is claimed is:

1. A radiotelephone comprising:
  - radio circuitry for radio frequency communication with a remote radio device;
  - a controller coupled to the radio circuitry for controlling operation of the radiotelephone;
  - an interface node for electrically connecting said radiotelephone to the supply voltage of a detachable modem circuit;
  - a data circuit for communicating digital data with the detachable modem circuit, the data circuit being responsive to the supply voltage on the interface node for providing output digital signals to the modem circuit and receiving input digital signals from the modem circuit, the input digital signals and the output digital signals at voltage levels suitable for communication with the modem circuit; and
  - an interface circuit coupled to the interface node, the interface circuit configured to provide a supply voltage to match the output digital signals to logic voltages used by logic circuits of the modem circuit.
2. The radiotelephone of claim 1 wherein the interface circuit is configured to provide the supply voltage to the interface node unless the modem circuit supplies a larger voltage to the interface node.
3. The radiotelephone of claim 2 wherein the interface circuit comprises a voltage regulator having an output coupled to the interface node and configured to provide a regulated voltage to the output node as the supply voltage.
4. The radiotelephone of claim 3 wherein the voltage regulator is configured to tolerate an over-voltage condition at the output.
5. The radiotelephone of claim 4 wherein the voltage regulator comprises an output transistor coupled to the output, the output transistor being substantially turned off in response to the over-voltage condition.
6. A communication device comprising:
  - a radiotelephone having a first supply voltage and one or more data circuits;
  - a modem circuit having a second supply voltage and one or more logic circuits;
  - an interface node, a ground node and at least one data communication node electrically connecting said radiotelephone to said modem circuit, said interface node connected to said second supply voltage and said ground node connecting the electrical grounds of said radio telephone and said modem circuit;
  - an interface circuit in said radiotelephone operative to provide said first supply voltage to said interface node if said second supply voltage does not exceed said first supply voltage; and
  - wherein said data circuits are operative to exchange digital data with said logic circuits on said at least one data communication node by switching between ground and a positive voltage level of said interface node.