Description

The Sine Systems model RS-232 Serial-Data Adapter is designed for use with the RFC-1/B Remote Facilities Controller. It consists of a small PC board which connects to the rear edge of the RFC-1 board with a jumper connector. A longer case and new rack panel are included to enclose the assembly and mount the RS-232 connector.

The RS-232 adapter can be used for local printing or, with the addition of two modems, remote printing. Several sites can share the same remote printer. The RS-232 adapter can also be used with a modem to allow remote control and telemetry using either a terminal or personal computer. Facilities control software can be custom written fairly quickly using a communications package like Procomm Plus or Telix. Using the RFC-1/B in the serial mode does not prevent the use of the voice/DTMF mode.

To isolate the RFC-1 from the RS-232 data connection, a special RS-232 driver is used which optically isolates the data stream in each direction and has an isolated DC-to-DC converter to convert +5 volts in the RFC-1 to the ±12 volts needed at the RS-232 side. There is no ohmic connection between any pin on the RS-232 connector and the RFC-1/B. Varistors are included to protect the serial converter if the voltage between the RS-232 connector and the RFC-1 exceeds 400 volts.

RFC-1/B software version 4.00 or later is required to operate the RS-232 Adapter. A software upgrade kit is available from Sine Systems as model SU-5. The upgrade kit will include a new microprocessor, instructions for installing the new microprocessor, a new speech chip, and a new Programming Instruction book.

The RS-232 Serial Data Adapter is configured as data terminal equipment or DTE device. This means that the serial data output from the RFC-1 appears on pin 2 of the RS-232 connector and the serial data input to the RFC-1 should go to pin 3. The connector on the RS-232 adapter is a male 25 pin D connector. The RFC-1 data format is factory set to 2400, 8, N, 1 (2400 baud, 8 data bits, no parity bits, one stop bit). The baud rate can be set to any standard value from 75 baud to 9600 baud via software programming in the RFC-1/B.

Devices

There are many different types of modems, printers, computers, and data terminals so the interface requirements of different equipment may be different. The following guidelines should be of help.

- The RS-232 adapter should work with most modems using a straight through cable with a DB-25 male on one end and a DB-25 female on the other end. A null modem cable is not normally necessary to connect the RS-232 adapter to a modem.

- The RS-232 adapter should work with most data terminals using either a "null modem" cable with D connectors of the appropriate gender, or a "straight through" cable AND a null modem adapter. Set the RFC-1 baud rate to match the data terminal.

- The telephone line must be connected to both the RFC-1/B and the modem. To accomplish this without extra "T" connectors, the telephone line can be connected to the "Line" jack on the modem and the RFC-1 "Line" jack can be connected to the "Phone" jack on the modem. The local telephone would then be connected to the RFC-1 "Telephone" jack.

- The RFC-1 uses the common "AT" commands and is compatible with any most every "AT command set" modem. High speed modems will typically work fine up to 9600 baud (the maximum baud rate of which the RFC-1/B is capable). Although, if you experience connection problems, we recommend setting everything to 2400 baud and disabling as many modem features as possible. The RFC-1/B does not use data compression or error corrections. If the modem sends data to the RFC-1 which it does not understand, the RFC-1/B attempts to re-initialize the modem by sending the command "ATZ".

- If a dual communications mode is used (both voice and serial data modes are used) and the RFC-1/B is set to try voice communications first, the calling modem may need to be set to wait at least 40 seconds for a carrier before hanging up. The normal default value of 30 seconds may not be enough time to allow for telephone ringing and the voice response attempt. Additionally, many of the newer high speed modems take more time after connection trying to negotiate error correction protocol. Lengthen the time allowed for connection and disable error correction by typing "ATS7=040" into the calling modem. Many communication programs allow you to modify the modem setup string to include this information.

- A serial printer can be connected directly to the RS-232 connector with the appropriate cable. However, most low cost printers currently available are "parallel" printers. Parallel printers can be used but the data must first be converted from RS-232 serial data to parallel data. Some printer manufacturers offer this as an option on some models. Call your dealer or the printer manufacturer to find out if such an accessory is available for your printer. Many third party devices are also available that perform this task. Your local computer superstore should have one. They usually cost between $50 and $100. A simple gender changer adapter is not the same as a serial to parallel converter and will not work.

Parallel printers are remarkably standard devices. Users have had very little trouble with the vast majority of parallel printers. In fact, most problems can be traced to mistakes in wiring or equipment setup. A relatively new class of printers called Windows printers are now available. These printers have a parallel interface but they are not true parallel printers. Windows printers rely on Microsoft's Windows operating system to operate so they will not work with the RFC-1/B on any of its data interface ports.

The RFC-1/B thinks that all printers are continuous feed dot matrix parallel printers so it does not know that it should send page feeds to a printer. It sends a continuous stream of data with carriage returns and line feeds, and lets the printer break the pages up as efficiently as possible. Usually this is not a problem. Some printers, however, refuse to dump the final data from the buffer because a page feed has not been received and the page is not complete. In these cases, there is usually an option is the printer setup that will make it print the final data from buffer.

Installation

To install the RS-232 Serial Data Adapter, first remove all cables connected to the RFC-1/B. Then remove the two Phillips head screws from the rear panel of the RFC-1/B. Remove the bezel and metal end panel. Slide the RFC-1 PC board out of the case.

The original rack panel and 6 inch long base/cover will not be reused. It is probably a good idea to save these, however, in case it is ever necessary to return the RFC-1/B to its original configuration.
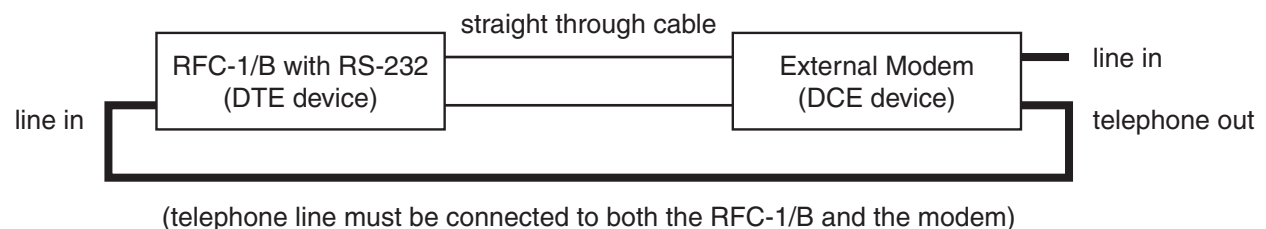
Set the RFC-1/B board on a flat surface with the component side up. Set the RS-232 board down next to the rear edge of the RFC-1 board so that J1 on the RS-232 board is next to J4 on the RFC-1/B board. Install the jumper connector between the two boards to form one PC board assembly, now 8.5 inches long. It does not matter which way the jumper is installed as long as all the pins are in place.

Using the new panel and case supplied with the RS-232 Adapter, slide the assembly of the original RFC-1/B board and the RS-232 Adapter board into the case with the connector on the RS-232 Adapter sticking out through the front panel. Place the remaining bezel over the case and drop in the rear RFC-1 panel. Secure the end panel with two Phillips head screws.

Finally, install the two jack screws on the RS-232 connector. The jack screws are optional but they do hold the D connector firmly against the rack panel and help make the entire assembly a little more stable. Thread locking compound can keep the jack screws from loosening unintentionally when the connected device is disconnected.

Modem Installation

To attach a modem to the RFC-1/B you need a modem that recognizes the standard AT compatible command set and a straight-through data cable. Connect the devices as shown in the following diagram. If the modem does not have a loop through jack for an external telephone, use a "T" connector to split the telephone line to both the RFC-1/B and the modem. It is absolutely necessary that the telephone line be connected to both devices.

straight through cable

| RFC-1/B with RS-232 (DTE device) | | External Modem (DCE device) |

line in   line in   telephone out

(telephone line must be connected to both the RFC-1/B and the modem)

The factory settings for most modems are acceptable for the RFC-1/B, just make sure that Auto-answer is disabled. It is quite impossible for Sine Systems to exhaustively test every modem on the market for compatibility. However, we have found that most AT command set modems have similar factory configurations and will work with the RFC-1/B.

Serial Printer Installation (local printing)

A serial printer can be attached directly to the data output of the RS-232 Serial Data Adapter. In most cases a straight through cable is all that is necessary. Set the printer to accept data at 300,8,N,1 and set the RFC-1/B to send data at 300 baud.

Parallel Printer Installation (local printing)

Parallel printers can be used with the Serial Data Adapter if an appropriate outboard data converter is used to feed parallel data to the printer. The serial to parallel data converter should be set to receive serial data at 300,8,N,1 and it should be set as a DCE device.

When the RS-232 Adapter is used with a printer, we suggest 300 baud because it allows the printer to keep up with the data stream. A higher data rate may be used if the printer has a buffer.

The following is a typical list of steps required to install a parallel printer with a generic serial to parallel converter to an RFC-1/B with the RS-232 adapter already installed. This setup is for local printing only.

1) Verify that the DIP switches on the serial to parallel converter are set for 300 bps, 8 data bits, no parity, and software (or no) handshaking. Also, make sure that the DCE/DTE switch is in the DCE position.

2) Plug one end of a 25 pin D cable to the RS-232 adapter on the RFC-1/B.

3) Plug the other end of the cable into the serial input side of the serial to parallel data convertter.

4) Attach the serial to parallel converter directly to the Centronics type parallel input of the printer or use a short printer cable to attach the parallel output of the data converter to the printer.

5) Apply power to the RFC-1/B and the printer and the converter if it uses an external supply.

6) Set the RFC-1/B baud rate to 300. This is done by programming a value of 5 at address 1005 in the RFC-1/B memory. Consult the instructions that came with your RFC-1/B for programming information.

7) Program the RFC-1/B to send readings to the printer at scheduled intervals by programming an action sequence and setting up the proper date and time triggers for that action sequence. Consult the instructions that came with your RFC-1/B for programming information.

Printer Installation (remote printing)

Remote printing is possible by inserting a pair of modems between the data output or the RFC-1/B and the printer. See the sections above for connecting a modem to the RFC-1/B. Connected a serial printer directly to the output of the receiving modem. A parallel printer can be used with a serial to parallel data converter as described above. In this case the adapter goes between the receiving modem and the parallel printer.

Program the RFC-1/B to perform remote printing as an action sequence. Set the receiving modem to auto answer. After the modems establish a communications link, any data that the RFC-1/B send will be printed on the remote printer. Consult the instructions that came with your RFC-1/B for programming information.

Operating the RFC-1/B through Serial Data Commands

The RFC-1/B can be operated via modem with commands sent from a personal computer. Operating in serial mode uses the same commands with the same keystrokes as in voice mode. The operating information is contained in the RFC-1/B Programming Instruction Book for software versions 4.00 and later.

At this time, Sine Systems does not offer a software package to control the RFC-1/B via personal computer. However, since the RFC-1/B responds to simple ASCII commands, it is a fairly simple matter to write a script that will access the RFC-1/B for communications packages that support scripting. More information on this can be found at our web site (http://www.sinesystems.com) on our Fax-on-Demand system (615-227-2393).

In some cases, users would like to have the RFC-1/B operational full time in the serial mode with a direct cable connection to the RS-232 port. While this is not necessarily impossible, it falls outside of the dial-up nature of the RFC-1/B and is difficult enough to implement that we do not recommend it. There is no provision for a full time RS-232 connection to the RFC-1/B.

Component Layout
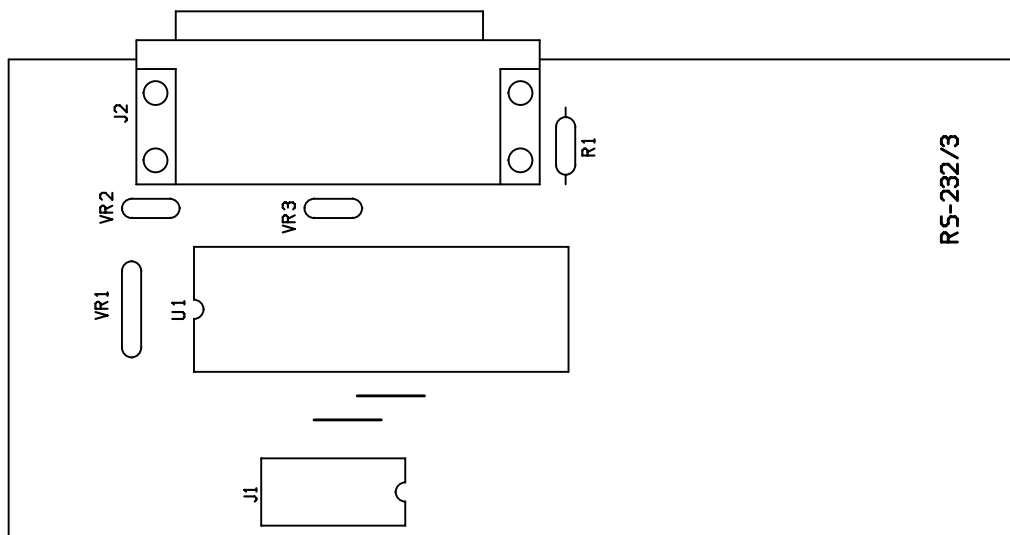
Parts List

J1	16 pin DIP connector
J2	25 pin D connector
R1	1.0K resistor (1/4 watt carbon film)
U1	Maxim MAX252BCHL (integrated circuit)
VR1	Panasonic ERZ-C10DK361U varistor
VR2, VR3	Panasonic ERZ-C07DK180 varistor
jack screw	3/16 inch hex male/female
connector	16 conductor flat cable with two 16 pin male DIP connectors