

## **Description**

The Sine Systems model RS-232 Serial-Data Adapter is 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 for remote printing or logging with the addition of a modem. Several sites can share the same remote printer. The RS-232 interface also allows remote control and telemetry collection using a terminal program on a personal computer (not included). Terminal program selection depends on the functions desired. Basic interaction can be accomplished with a simple program like HyperTerminal while automated facilities logging and control require custom scripting using a communications package like Procomm Plus ([www.symantec.com](http://www.symantec.com)) or Telix ([www.telix.com](http://www.telix.com)). Using the RFC-1/B in data 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. There is no direct metal connection between outboard devices and the RFC-1/B.

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 processor and new system documentation.

The RS-232 Serial Data Adapter is configured as data terminal equipment or DTE device. Device configuration--DTE or DCE--specifies the pinout of the RS-232 connection. A DTE device is meant to connect directly to a DCE device with a straight cable. If two DTE or two DCE devices are connected, a cross-over or null-modem cable is required.

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. The data format is fixed at 8,N,1. The baud rate and data format must match on all connected devices.

## **Installation**

Remove all cables connected to the RFC-1/B. 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 in case it becomes 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.

## Setup

Due to the variety of uses for the RS-232 adapter it is impossible to provide a single set of instructions that will apply to all cases. The items below provide a list of items that may require programming in the RFC-1/B system and suggestions on where to find more information if appropriate.

### Baud Rate

The baud rate is controlled by programming the RFC-1/B. Settings are available for standard baud rates from 75 to 9600 baud. The factory default setting is 2400 baud. This adjustment is located at address 1005 in the advanced programming mode of the RFC-1/B. Consult the RFC-1/B Installation and Operation manual for programming details.

### Communications Mode

The communications mode programming determines how the RFC-1/B will answer incoming calls. The RFC-1/B can answer in voice mode (default) or data mode and it can be set to answer in one mode first and switch to the other mode if the initial connection fails. If the RS-232 will only be used to send data from the RFC-1/B to a remote logging device, there is no need to change the communications mode--*it only effects incoming calls*. The communications mode adjustment is located at address 1002. Consult the Installation and Operation manual for programming details.

### Alarm Calls

The mode of outgoing alarm calls is controlled by extra programming associated with the telephone numbers. The data address that immediately follows digit 12 of each telephone number stores a value that determines the dialing mode. The factory default value of 0 places a voice mode call, a value of 1 will switch this to a data mode call using the modem. Telephone numbers are stored at address 0640-0723. Consult the RFC-1/B Installation and Operation manual for programming details.

### Remote Logging

To log a set of readings to a remote device at a specific time of day, three items must be programmed:

- 1) an action sequence that contains the command 8-9
- 2) a date/time trigger to that action sequence to activate it
- 3) telephone number F must be programmed with the appropriate telephone number and dialing mode

A full list of programming instructions is beyond the scope of this documentation. Consult the RFC-1/B Installation and Operation manual for programming instructions and details. Specific programming instructions can be generated at our web site [www.sinesystems.com](http://www.sinesystems.com). Navigate to the product support area for the RFC-1/B. There is a group of pages that discuss programming various functions. Use the page that discusses programming timed events.

## Device Guidelines

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 some assistance.

### Modems

The RS-232 adapter should connect to 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. Modems are typically DCE devices.

If a modem is connected to the RS-232 adapter, the telephone line must be connected to both the RFC-1/B and the modem. This is so that the RFC-1/B can be switch between voice and data modes. Use a "T" connector to split the telephone line so that it feeds both devices.

Disable "auto-answer" . The command "ATS0=0" should do this. The RFC-1 will tell the modem when to answer.

The RFC-1 uses standard "AT" commands that are compatible with most modems. High speed modems will typically work fine up to 9600 baud (the maximum baud rate of which the RFC-1/B is capable). If you experience connection problems, we recommend setting everything to 2400 baud and disabling as many modem features as possible.

If both voice and serial data modes are used and the RFC-1/B is set to use voice communications first, the calling modem will need to be set to wait at least 40 seconds for a carrier before hanging up. Many modems use a default value of 30 seconds which may not allow enough time for the voice connection attempt and the modem connection to occur. The command "ATS7=060" should work.

Many high speed modems take more time after connection trying to negotiate data compression and error correction protocols. Disable these if at all possible. The RFC-1/B does not use data compression or error correction protocols. Many communication programs allow you to modify the modem setup to disable these features.

### Printers

A serial printer can be connected directly to the RS-232 connector with the appropriate cable and devices settings. The device manual should document how to set the baud rate and data format. The printer should be a DCE device.

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. Third party devices are also available that perform this task. Your local computer superstore or favorite online vendor 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. Most problems can be traced to wiring issues, setup errors or RF interference. Keep in mind that most printers are not shielded and were never intended to operate in a relatively harsh broadcast environment.

A relatively new class of printers called *Windows printers* are now available. These printers may have a parallel interface but they lack a proper processing engine. 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 sends a continuous stream of data with carriage returns and line feeds and lets the printer break the pages up as efficiently as possible. Typically this works fine. A few older printers refuse to dump the final data from the buffer because a page feed has not been received and the page is not complete. There is usually an option in the printer setup that will make it print the final data from buffer.

### **Personal Computers or Terminals**

The RS-232 adapter should connect to most data terminals using a null-modem cable. Data terminals are typically DTE devices.

The RFC-1 is a dialup device--it was never intended to act as a continuously operating interface to a transmitter. There is no software package to allow this type of interaction. The RFC-1 can be tricked into operating continuously over a data link either by modem or direct serial connection. Notes are available on our web site ([www.sinesystems.com](http://www.sinesystems.com)) to assist in writing a custom application. Telephone tech support is not equipped to provide assistance in this area.

### **Serial to Parallel Data Converter**

As the name suggests, serial to parallel data converters take an incoming RS-232 serial data stream and convert it to a parallel data signal that is compatible with most parallel printers. The RS-232 input of the converter needs to be set to match the data stream sent by the RFC-1/B through the RS-232 port. The converter should be set to receive serial data at 2400,8,N,1 and it should be set as a DCE device. If characters are dropped try slowing the baud rate to 300 on both devices.

### **Remote Serial Printer with Modem**

This method is a little obscure but simple in concept. If you have a serial printer and a modem then it is not absolutely necessary to have a computer in between them to have a simple logging device.

The transmitter site consists of the RFC-1/B with the RS-232 adapter connected to a modem. The logging site consists of a modem connected to a printer (a cross-over cable may be required depending on the devices). The modem at the logging site is set with "auto-answer" enabled.

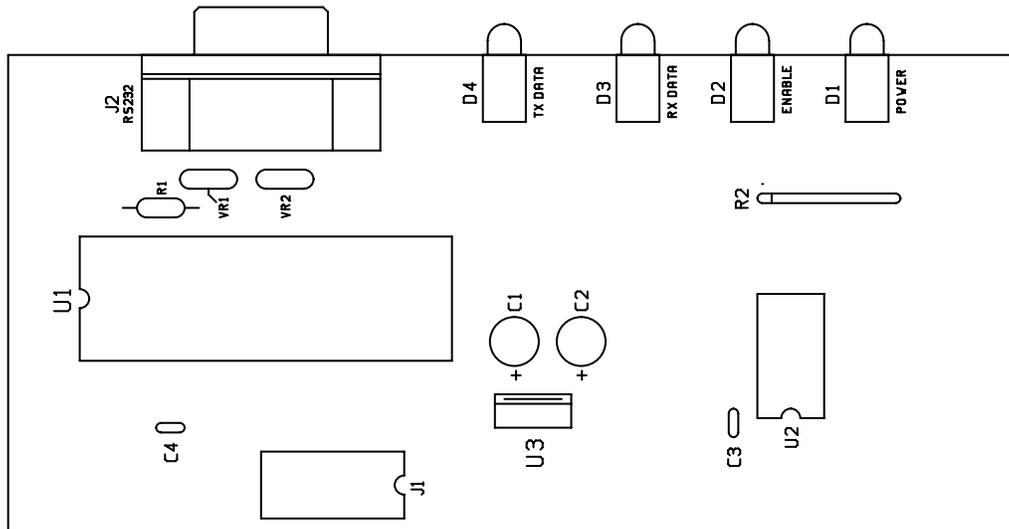
When the RFC-1/B makes a call through the modem to the logging site, the modem at the logging site answers and the modem connects. All data that is received by the logging modem will be relayed directly to the attached printer.

### **Operating the RFC-1/B through Serial Data Link**

The RFC-1/B can be operated with commands over a data link. If the RFC-1/B communications mode is set to answer in data mode (see above), a connection can be established by modem. Once the connection is made, the RFC-1/B will respond to the same commands as it does in voice mode--just send the commands as ASCII characters directly from the keyboard.

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 ([www.sinesystems.com](http://www.sinesystems.com)).

## Component Layout



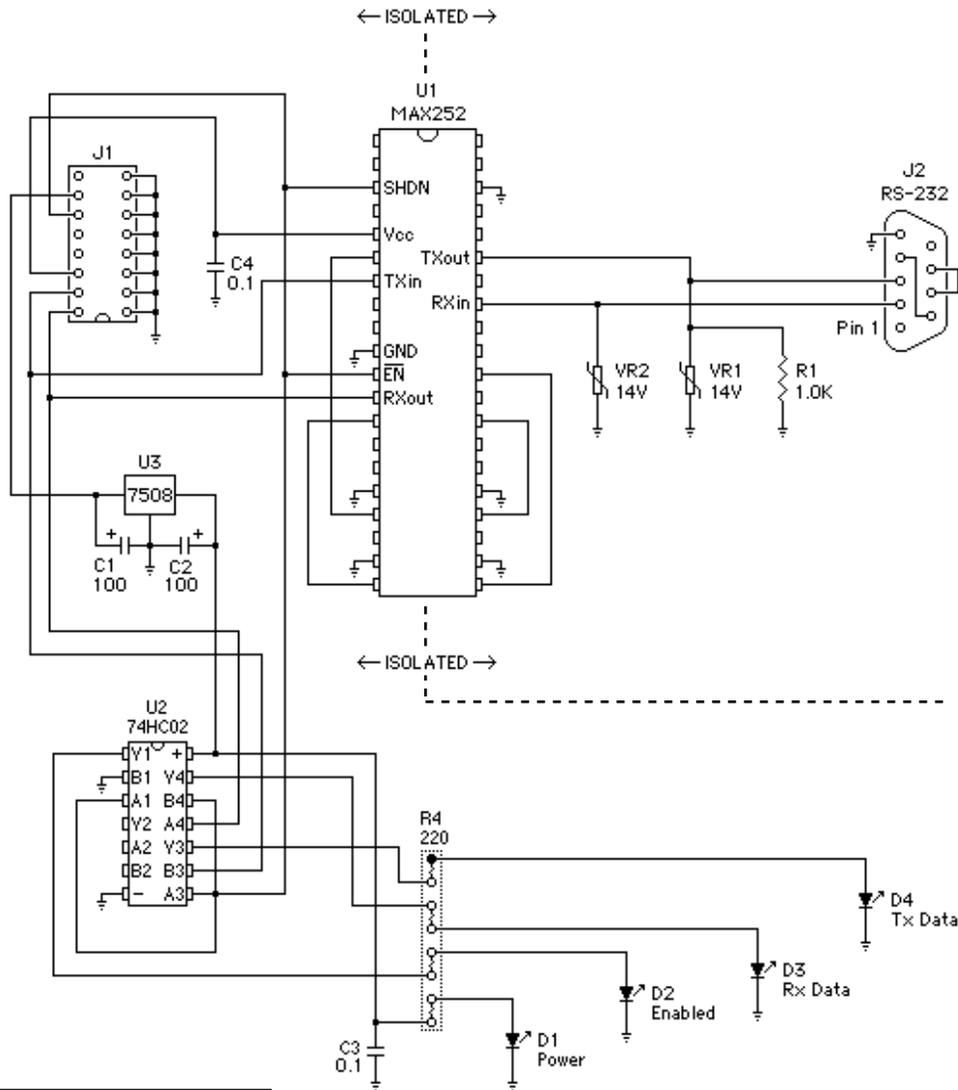
## Parts List

<u>Qty</u>	<u>Value</u>
2	capacitor, aluminum, radial, low profile, 100 $\mu$ F, 16v
2	capacitor, monolythic ceramic, 0.1 $\mu$ F
1	connector, D, male, 9, PCB, 90°
2	connector, DIP, male, 16, IDC
1	integrated circuit, logic, quad 2-input NOR, 74HC02,
1	integrated circuit, RS-232, MAX252BCHL, optically isolated
1	integrated circuit, voltage regulator, low drop, LM2937ET-5.0, +5V DC/0.5 A
2	LED, 5mm, green
2	LED, 5mm, red
1	resistor, carbon film, 1/4W, 1.0K, 5%
1	resistor, SIP, 4 x 220, isolated
1	socket, DIP, 14
1	socket, DIP, 16
1	socket, DIP, 40
2	varistor, metal oxide, 14 VDC, 11 VAC

## Pinout

<u>Pin</u>	<u>Description</u>
2	received data
3	transmitted data
5	signal ground

**Schematic Diagram**



Pin	RS232 Function
1	DCD—data carrier detect
2	RX—receive data
3	TX—transmit data
4	DTR—data terminal ready
5	SG—signal ground
6	DSR—data set ready
7	RTS—ready to send
8	CTS—clear to send
9	RI—ring indicate

**Model RS-232 Revision 4**  
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Unless otherwise noted, all resistor values are in ohms and all capacitor values are in microfarads.