

Description

The Sine Systems model MA-2 Modem Adapter is for use with the RFC-1/B Remote Facilities Controller. It allows remote access to and logging from the RFC-1/B via modem over a serial data link. Using the RFC-1/B in data mode does not exclude use in voice mode over a telephone. In addition, remote data logging can be achieved fairly quickly using a scriptable communications program like Procomm Plus or Telix.



Figure 1; MA-2 Front Panel

The MA-2 package consists of a small PC board which connects to the rear edge of the RFC-1/B board with a jumper connector. A longer case and new rack panel are included to enclose the assembly.

RFC-1/B software version 4.0 or higher is required to operate the MA-2 Modem Adapter. Issue the command "78" to determine the software version of the RFC-1/B. Model SU-5 software upgrade kit is available from Sine Systems for older systems. The upgrade kit includes a new microprocessor, speech module and documentation.

Installation

Use proper precautions for handling static sensitive devices while performing the installation!

Disconnect all cables from the RFC-1/B and remove it from the rack. Remove the two screws from the rear panel of the RFC-1/B. Remove the bezel and metal end panel. Slide the RFC-1/B PC board out of the case. See figure 2.

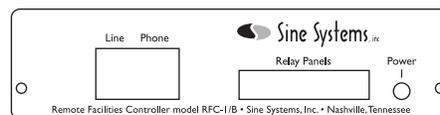


Figure 2; RFC-1/B Rear Panel

The original rack panel and 6 inch long base/cover will not be reused but it is a good idea to save them in case it is 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 MA-2 board down next to the rear edge of the RFC-1/B board so that J1 on the MA-2 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 direction the jumper is installed as long as the jumper is aligned against the notched edges of the expansion sockets. See figure 3.

The MA-2 socket has 20 positions while most RFC-1/B expansion sockets have only 16 positions. When the jumper is installed properly, the socket on the MA-2 will have 4 unused pin positions at the end nearest the telephone line connector. This is normal. *These 4 socket positions must be left empty.*

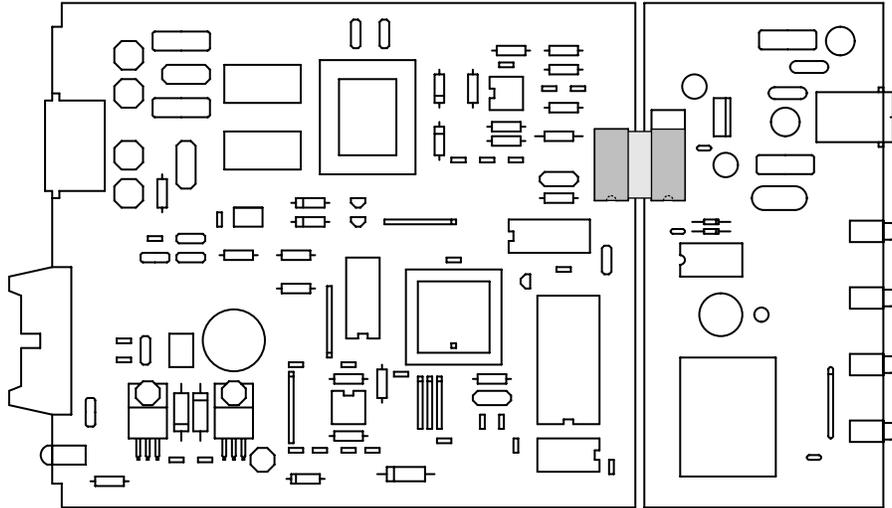


Figure 3; Connecting the MA-2 to the RFC-1/B

Using the new panel and case supplied with the Modem Adapter, slide the assembly of the original RFC-1/B board and the MA-2 board into the case with the RJ-11 connector on the Modem Adapter extending out through the front panel. Place the remaining bezel over the case and drop in the rear RFC-1/B panel. Secure the end panel with two Phillips head screws.

The telephone line must be connected to both the RFC-1/B and the MA-2 telephone line connections. If your RFC-1 has a 20 pin socket, instead of the 16 pin socket described above, and you have a jumper that connects *all 20 pins* of the RFC-1 to the MA-2, then the telephone line connection is made internally and you can just connect the telephone line to the rear RFC-1 telephone line input. If you have a 16 pin connector on either part then you must provide this connection by another means. A simple method is to use a "T" connector to split the telephone line to both the rear RFC-1/B line input and the front panel MA-2 telephone line jack. The same connection can be made internally by removing the varistor labeled VR1 from the RFC-1/B board and soldering an appropriate wire jumper from the exposed VR1 pads to the Tip and Ring pads on the MA-2. This should only be done by qualified technical personnel with the supplied cable or with cable that can sustain 1500 Volts to ground.

Operating the RFC-1 through Serial Data Commands

Using the MA-2, the RFC-1/B can be operated via a modem with commands sent from a personal computer. The RFC-1/B should communicate with any terminal program (on any computing platform) capable of sending and receiving ASCII data over an RS-232 serial data stream. In data mode the RFC-1/B responds to the same commands that it does in voice mode from a remote telephone.

The operating information is contained in the RFC-1/B documentation for software versions 4.x and higher.

Remote Logging

Remote logging is possible using the MA-2 to connect to another modem at a distant location that logs data to a printer or to a computer data file. There are two common, cost-effective options for devices at the printer side. Use a computer with a modem and printer that runs a terminal program that echoes data to the printer or to a file. Or, use a serial printer connected directly to a modem that will send all received data to the printer.

In the first scenario the RFC-1/B can call the computer and send data to the computer or the terminal program can run a script that will allow it to call the RFC-1/B and download data automatically. If data is being logged from only one site, it may be easier to program the RFC-1/B to call. But if data is to be collected from multiple sites, having the computer call the remote sites eliminates the possibility of two systems calling the computer at the same time. Using a scriptable terminal program definitely allows more flexibility in the system but it is a little more time-consuming to set up initially.

The second scenario uses a printer and a modem to build a simple but effective uni-directional terminal. In this scenario the printer must be a serial printer (or a parallel printer with a serial to parallel data converter) because it must accept data RS-232 serial data directly from the modem. Many printers that were once used by news wire services have a serial interface. When configured properly and connected directly to a modem, the printer will print any data received by the modem. Enable auto answer on the modem so it will automatically connect when called.

Calling a Remote Computer or Printer from the RFC-1

Information presented in this section assumes that you have functional knowledge of the RFC-1/B and that you are familiar with its programming mode. Programming instructions are in the RFC-1/B documentation. Additional programming information and assistance is available at <http://www.sinesystems.com>.

Setting up the RFC-1/B to call a remote location and send the channel readings involves programming:

- an action sequence that causes the RFC-1/B to place the call and send the data
- a trigger for the action sequence
- the telephone number that will be called
- the communication speed and protocol
- the Autoscan stop channel

The instruction for remote printing is “8-9” and it can be used in an action sequence by itself or placed in an action sequence that performs other tasks. Be aware that if it is placed after an instruction that involves voice telephone calls the user may terminate the alarm before the print sequence is triggered.

Transmitter readings can be logged at specified intervals during the day by programming the appropriate Date/Time Triggers in memory that trigger an action sequence that contains the remote print instruction “8-9”. For instance, to log readings at hourly intervals every day requires programming 24 date/time triggers to the action sequence--one for each hour of the day. Two hour intervals requires programming 12 date/time triggers, etc.

Transmitter readings can be logged when a telemetry alarm event occurs by adding the remote print instruction to the action sequence that is triggered by the alarm. In the factory settings all alarms trigger Action Sequence 1 which tells the system to call all available telephone numbers in voice mode. Change this to trigger the action sequence that contains the remote print instruction to have the alarm print a set of channel readings when the alarm occurs.

When the RFC-1/B encounters the remote print instruction it automatically dials the telephone number stored at location F. This telephone number begins at address 0710 in memory. The call mode for telephone number F (address 0722) should be changed from the factory default 0 to the value 1. The number of attempts (address 0723) is ignored when triggered by the remote print instruction. However, if the number at location F is dialed through the normal calling instructions, the calling mode and number of attempts will be used so it is probably a good idea to set these items appropriately when the telephone number is programmed.

When placing a call in data mode the RFC-1/B uses the baud rate indicated by the data at address 1005. The factory setting is 2400 baud. Settings are available for baud rates from 300 to 9600 baud but the MA-2 hardware is currently limited to 2400 baud. Speed is not usually an issue since the data rate out of the RFC-1/B is limited and the system transmits relatively small amounts of data. The data protocol is fixed at 8 data bits, no parity, 1 stop bit (8,N,1).

The Autoscan stop channel is programmed at addresses 1010-1011. The RFC-1/B prints all channels from 00 to the channel programmed at these locations. The factory setting is 0-7 for channels 00-07 inclusive.

Calling the RFC-1 from a Remote Computer

Information presented in this section assumes that you have functional knowledge of the RFC-1/B and that you are familiar with its programming mode. Programming instructions are in the RFC-1/B documentation. Additional programming information and assistance is available at <http://www.sinesystems.com>.

With the MA-2 the RFC-1/B can be called from a remote computer in data mode and polled for channel readings. Operation in data mode is not limited to taking channel readings since the RFC-1/B will respond to any commands just as if it were on a voice call from a remote telephone.

Setting up the RFC-1/B to be contacted from a remote computer involves programming:

- the communications mode
- the baud rate

The communications mode determines if the RFC-1/B answers an incoming call in voice mode or data mode. To make the system more flexible, the system can attempt to answer a call in one mode and transfer to the other if the first mode fails. This option is controlled by programming at address 1002. See the RFC-1/B manual for more information.

If the RFC-1/B is set to connect in voice mode before data mode, the calling modem may need to be set to wait *at least 40 seconds* for a carrier signal before timing out. Many modems default to 30 seconds which may not allow enough time for call connection the voice mode attempt. Additionally, many of the newer high speed modems take more time after connection trying to negotiate error correction and data compression. The command "ATS7=060" makes the modem wait 60 seconds before timing out. Many communication programs allow you to modify the modem setup string to include this information.

When receiving a call in data mode the RFC-1/B uses the baud rate indicated by the data at address 1005. The factory setting is 2400 baud. Settings are available for baud rates from 300 to 9600 baud but the MA-2 hardware is currently limited to 2400 baud. Speed is not usually an issue since the data rate out of the RFC-1/B is limited and the system transmits relatively small amounts of data. The data protocol is fixed at 8 data bits, no parity, 1 stop bit (8,N,1).

Sending Readings to a Remote Computer or Printer

In this example we will program Action Sequence 2 to print a set of readings to a remote computer using the MA-2 and we will program Date/Time Trigger 1 to activate the action sequence every hour at 10 minutes past the hour to automatically log the transmitter readings. The remote print instruction automatically selects telephone number F. For this example the telephone number 1-615-555-1212 will be programmed at telephone number location F.

- Step 1 Enter the Advanced Programming Mode: 80
2 Enter the Advanced Programming Security Code: 4150
- 3 Enter the starting address (from the Address Table) for Action Sequence 2: 0740
4 From Section 6 of the RFC-1 manual, the command for local printing is: V1=8, V2=9
5 Enter V1 for the local print command: 8
6 Press the # key to enter this value and increment to the next address in memory
7 Enter V2 for the local print command: 9
8 Press the # key to write this value and increment to the next address in memory

The action sequence is programmed. Jump to a new address to program the date/time trigger.

- 9 Enter the Advanced Programming Mode command to jump to a new address: 80
10 Enter the starting address (from the Address Table) for Date/Time Trigger 1: 0632
- 11 Enter the number of the action sequence that should be triggered: 2 (remote print, programmed above)
12 Press the # key to enter this value and increment to the next address in memory
- 13 Enter up to two digits for the month in which this trigger should function: 15 (every month)
14 Press the # key to write this value and increment to the next address in memory
- 15 Enter the first digit for the date in which this trigger should function: 15 (every day)
16 Press the # key to write this value and increment to the next address in memory
- 17 Enter the second digit for the date in which this trigger should function: 15 (every day)
18 Press the # key to write this value and increment to the next address in memory
- 19 Enter the first digit for the hour at which this trigger should function: 15 (every hour)
20 Press the # key to write this value and increment to the next address in memory
21 Enter the second digit for the hour at which this trigger should function: 15 (every hour)
22 Press the # key to write this value and increment to the next address in memory
- 23 Enter the first digit for the minute at which this trigger should function: 1
24 Press the # key to write this value and increment to the next address in memory
25 Enter the second digit for the minute at which this trigger should function: 0
26 Press the # key to write this value and increment to the next address in memory

The date/time trigger is programmed. The text in RFC-1 manual describes the use of the value 15 for a "global match"--an entry that will match any condition in a time trigger. This example continues on the next page.

Sending Readings to a Remote Computer or Printer (*continued*)

The remote print command will dial at telephone number location F. By default the RFC makes all calls in voice mode but the remote print function requires a data mode call. Each telephone number has a call mode associated with it. It is stored in the address immediately following the last telephone number digit.

Jump to a new starting address to program the telephone number and call mode.

- 27 Enter the Advanced Programming Mode command to jump to a new address: 80
- 28 Enter the starting address (from the Address Table) for Telephone Number F: 0710

- 29 Enter the first digit of the telephone number: 1
- 30 Press the # key to enter this value and increment to the next address in memory

- 31 Enter the second digit of the telephone number: 6
- 32 Press the # key to write this value and increment to the next address in memory
- 33 Enter the third digit of the telephone number: 1
- 34 Press the # key to write this value and increment to the next address in memory
- 35 Enter the fourth digit of the telephone number: 5
- 36 Press the # key to write this value and increment to the next address in memory

- 37 Enter the fifth digit of the telephone number: 5
- 38 Press the # key to write this value and increment to the next address in memory
- 39 Enter the sixth digit of the telephone number: 5
- 40 Press the # key to write this value and increment to the next address in memory
- 41 Enter the seventh digit of the telephone number: 5
- 42 Press the # key to write this value and increment to the next address in memory

- 43 Enter the eighth digit of the telephone number: 1
- 44 Press the # key to write this value and increment to the next address in memory
- 45 Enter the ninth digit of the telephone number: 2
- 46 Press the # key to write this value and increment to the next address in memory
- 47 Enter the tenth digit of the telephone number: 1
- 48 Press the # key to write this value and increment to the next address in memory
- 49 Enter the eleventh digit of the telephone number: 2
- 50 Press the # key to write this value and increment to the next address in memory

- 51 Clear the unused twelfth digit of the telephone number: 10
- 52 Press the # key to write this value and increment to the next address in memory

- 53 Program this telephone number as a data mode call (instead of a voice mode call): 1
- 54 Press the # key to write this value and increment to the next address in memory

The telephone number is programmed and the call mode is set to data.

Sending Readings to a Remote Computer or Printer (*continued*)

Readings will be printed from channel 00 to the autoscan stop channel. The autoscan stop channel is programmed at addresses 1010-1011. The default setting is channel 07. If the installation has two relay panels then there are sixteen channels total, 00-15. This example continues by reprogramming the stop channel for channel 15.

- 55 Enter the Advanced Programming Mode command to jump to a new address: 80
- 56 Enter the starting address (from the Address Table) for Autoscan stop channel: 1010

- 57 Enter the first digit of the stop channel: 1
- 58 Press the # key to enter this value and increment to the next address in memory
- 59 Enter the second digit of the stop channel: 5
- 60 Press the # key to write this value and increment to the next address in memory

- 61 Press the * key to exit the programming mode--*this step is very important!*

The stop channel has been programmed to 15. When action sequence 2 executes at 10 minutes after the hour with the remote print instruction 8-9, telephone number F will be dialed in data mode to a remote computer and channel readings will print starting at channel 00 and ending at channel 15. This completes the programming example.

The clock must be set before the time trigger can function. Setting the clock/calendar is easy. Issue the commands 70 and 71 in the operating mode, *not in programming mode*, and the RFC-1 will prompt for the time and date.

Modem Connection Issues

Compared to a PC, the RFC-1/B is an unsophisticated device. It cannot negotiate error correction and data compression. The key to successful connections is to disable as many of these features in the calling modem as possible. Lock the calling modem in at the desired baud rate and disable these high speed connection features (the commands vary among modem chipsets). More often than not they will cause the connection to the RFC-1/B fail.

FCC Information

The Modem Adapter complies with Part 68 of the FCC rules. On the front of the Modem Adapter face plate is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.

The Modem Adapter is designed for use with standard modular (RJ11C) telephone jacks.

The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total RENs contact the telephone company to determine the maximum REN for the calling area.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the Modem Adapter. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications to maintain uninterrupted service.

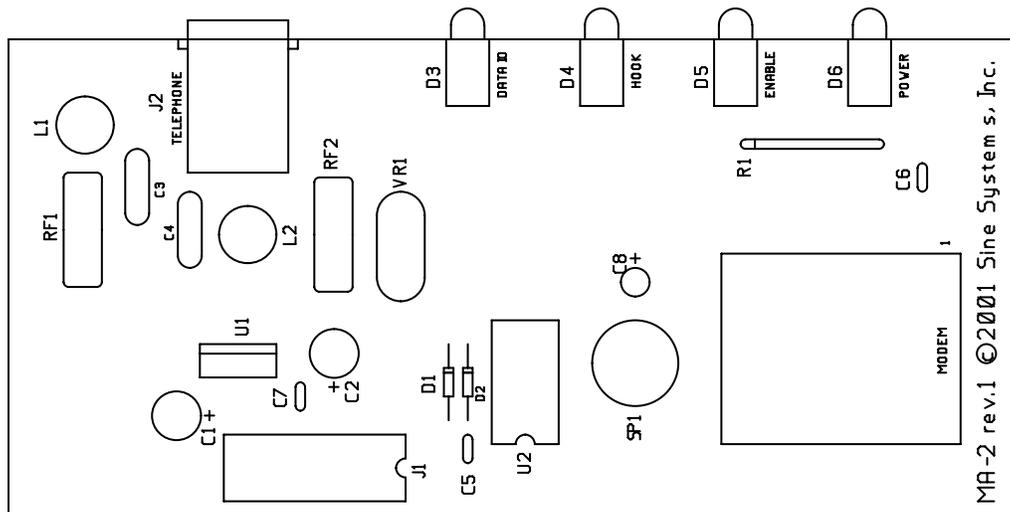
If trouble is experienced with the Modem Adapter, please contact Sine Systems, Inc. (at the telephone number on the cover of the RFC-1/B instruction book), for repair and/or warranty information. If trouble with the Modem Adapter is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved. The telephone company will notify you in advance of service disconnection. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The Modem Adapter cannot be used on public coin service lines provided by the telephone company. Connection to Party Line Service is subject to state tariffs. Contact your state public utility commission, public service commission, or corporation commission for information.

The Modem Adapter is registered with the Federal Communications Commission and is certified to meet specific safety requirements. It is extremely important that the Modem Adapter not be modified in any way. Modification of this equipment will void the FCC certification, void the warranty, and perhaps pose a hazard to the user of this equipment or to maintenance personnel of your local telephone company.

Service of the Modem Adapter should be performed only by qualified technical personnel who are familiar with the implications of FCC Part 68 registration. Extreme caution should be used if the Modem Adapter case is opened without first being disconnected from the telephone line. High voltages may be present on telephone lines, and although the Modem Adapter is powered by 12 volts AC from a "wall plug" transformer, failure of this transformer could cause dangerous and potentially lethal voltages to become present. Only the supplied transformer should be used.

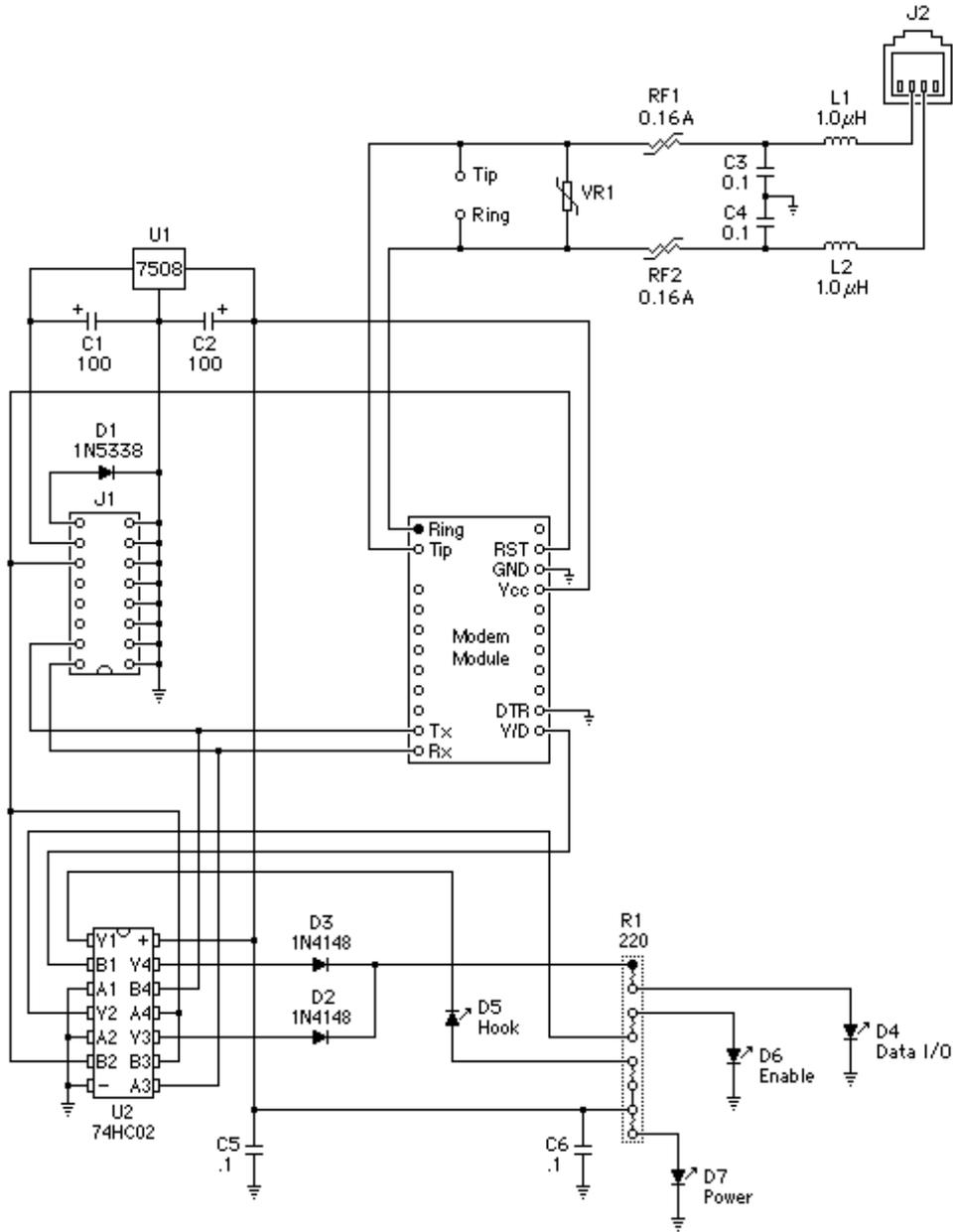
Component Layout



Parts List

<u>Qty</u>	<u>Part Description and Value</u>
1	board, PC, MA-2, Rev. 1
1	capacitor, aluminum, radial, 10 μ F, 16v/short
2	capacitor, aluminum, radial, 100 μ F, 16v/short
2	capacitor, ceramic disc, 0.001 μ F/1000 pF, 1KV
3	capacitor, monolythic ceramic, 0.1 μ F, .1" spacing
2	connector, DIP, male, 16, IDC
1	connector, modular, single, 4/6, PCB, 90°
2	diode, general purpose, 100 V/0.5 A, 1N4148
1	enclosure, assembly, dark gray, T1 MicroPak, 8.5"
1	enclosure part, rack panel, aluminum, painted for MA-2
2	fuse, polyswitch, resettable, 0.16 amp, 600 V
2	hardware, screw, pan head, thread rolling, 4-40 x 5/8", clear
2	inductor, 1.0 mH, 5 ohms/150 mA, radial
1	integrated circuit, logic, quad 2-input NOR, 74HC02,
1	integrated circuit, modem module, 2400 baud, CH1786LC
1	integrated circuit, voltage regulator, low drop, LM2937ET-5.0, +5V DC/0.5 A
2	LED, 5mm, long, green, 90°
2	LED, 5mm, long, red, 90°
1	miscellaneous, transducer, electro-magnetic, 42 ohm coil, 80dB @ 1.5V
1	resistor, SIP, 4 x 220, isolated
1	socket, DIP, 14,
1	socket, DIP, 20,
1	varistor, metal oxide, 320 VDC, 250 VAC

Schematic Diagram



Model MA-1 Revision 4
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Unless otherwise noted, all resistor values are in ohms and all capacitor values are in microfarads.