

Message Board Controller

Model MBC-1

– INSTALLATION AND OPERATION –

*This documentation is valid for
Message Board Controller hardware version 2.0 with firmware version 1.04*



Nashville, Tennessee • 615-228-3500

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Section I — Safety Information



WARNING!

The Message Board Controller model MBC-1 should be installed only by qualified technical personnel. An attempt to install this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the MBC-1 or other equipment. Please ensure that proper safety precautions have been made before installing this device.

The MBC-1, as any electronic device, can fail in unexpected ways and without warning. Do not use the MBC-1 in applications where a life-threatening condition could result if it were to fail.

The MBC-1 is designed for indoor use in a dry location. Installation and operation in other locations could be hazardous. Use only the original wall-plug power supply supplied with the unit.

The purchaser and user of the MBC-1 bears the sole responsibility for determining suitability of this equipment for their intended use. Because this equipment can fail in an unpredictable or unexpected way, even in normal use, Sine Systems, Inc. cannot be held responsible for damages, either direct or indirect, resulting from use of this equipment.

Section 2 — System Description

2.1 General Description

The MBC-1 has 15 logic-level inputs and a serial data output. When an MBC-1 input is activated, a message is displayed on the attached message board.

The MBC-1 is housed in a small aluminum chassis. The front panel contains 24 screw-terminals for connections to the external power source, the message-board(s), 15 display-command inputs, and one display-reset input.

The MBC-1 Message-Board Controller is designed to be used in conjunction with a specific display--the Beta-Brite by Adaptive Micro Systems. The combination of the MBC-1 and one or more of these message boards forms an easily interfaced, general purpose information display system suitable for use in broadcast studios or other industrial and commercial applications.

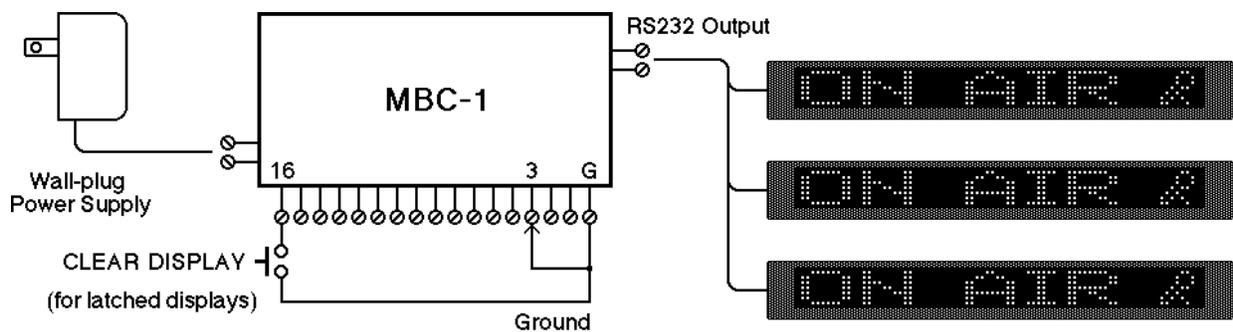


Figure 2.1; MBC-1 conceptual diagram

Message displays are programmed in the Beta-Brite memory. When an input is activated on the MBC-1, it sends a message to the Beta-Brite to display the corresponding message. Each of the inputs on the MBC-1 can be programmed to one of three display modes:

- Latched--a momentary input activates a display that remains active until cleared
- Momentary--a display is active as long as the corresponding input is held low
- Stretched--a display is active as long as the input is held low, plus 6 seconds

The display inputs are prioritized to avoid conflicts when multiple messages are requested. Input 1 has the highest priority and input 15 has the lowest priority. For example, if inputs 7 and 12 are activated at the same time, message number 7 will be displayed. When input 7 is released, message number 12 will be displayed (if input 12 is still activated).

All 15 display inputs, as well as the clear display input, are activated by a pull-down to ground. External sources can be contact closures, open collectors or 5, 12, 15 and 24 volt logic-level sources. The input impedance of the display inputs is 22 K ohms.

The MBC-1 is powered by an external 12 volt DC wall-plug supply (included).

Section 3 — Installation



WARNING!

The MBC-1 should be installed only by qualified technical personnel. An attempt to install this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the Thermal Sentry or other equipment. Please ensure that proper safety precautions have been made before installing this device.

3.1 System Includes

The Message Board Controller package contains these items:

- Message Board Controller model MBC-1
- data interface jumper to Beta-Brite (RJ-11)
- 12 volt DC power supply
- crimp connectors
- operation manual

3.2 Installing the Unit

The MBC-1 is small enough to be located just about any place that is convenient to the input devices. All electrical connections to the MBC-1 are made via the 24 screw terminals located on the exterior of the enclosure.

3.2.1 Power Connection

Power for the MBC-1 is provided by a 12-volt DC wall-plug transformer. The lead with the white strip should be connected to the "+12 VDC" terminal and the other lead should connect to the adjacent "GROUND" terminal. Do not power the MBC-1 until all other connections have been made.

3.2.2 Connecting the Display

The MBC-1 contains a high capacity output stage that is capable of driving several Beta-Brite message displays. The number of displays that can be used is determined by the total length of cable used to connect the displays and type of cable. With a short cable run, the MBC-1 can theoretically drive more than 40 displays. With longer runs (50 to 250 feet) this number drops significantly but, in most cases, the MBC-1 should still be able to drive at least 10 displays. Very long cable runs (in excess of 1000 feet) require a short-haul modem. A short-haul modem will allow displays to be located several miles from the MBC-1.

For normal installations, where the display is 250 feet or less from the MBC-1, a foil shielded cable such as Belden 8451, is recommended. Only the red wire and the shield are used--the black wire can be cut off. Connect the red wire to the RS232 OUTPUT terminal on the MBC-1. Connect the shield to the adjacent GROUND terminal.

The BetaBrite has a 6-position/6-conductor modular jack for the data interface. Included with the MBC-1 are a short jumper that is terminated in a modular connector and two crimp splice connectors. These form a simple and reliable connection between the shielded cable run and the modular jack on the BetaBrite.

About 1 inch of the outer jacket should be stripped off the end of the modular cord. Be careful not to cut the insulation on the wires inside. Then, cut off all wires except the red and white making sure the cut off wires do not short to each other. The modular cable should be attached to the shielded cable as shown below.

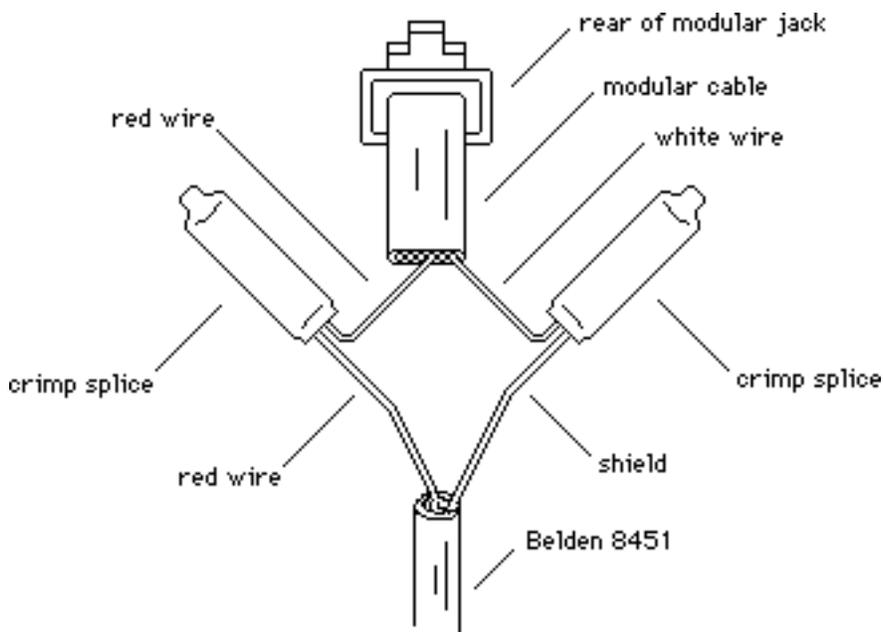


Figure 3.1; Connecting shielded cable run to modular jumper for Beta-Brite

It is not necessary to strip the wires before inserting them into the crimp splice connectors. The inside of the splice contains small metal teeth that will pierce the insulation and make contact with the conductors. Insert both wires as far as they will go into the crimp splice and squeeze it firmly with a pair of pliers.

If multiple message displays are used, they may be daisy-chained by crimping an extra wire into the crimp splice for the next display in the chain.



WARNING!

The colors in the wiring diagram above only apply to the jumper supplied with the MBC-1. If a different jumper is used, the cord may be flipped in the connector or the wire may have different colors. In either case, the correct wires will not be the white and red. The 8451 shield should connect to the far right conductor and the 8451 red should connect to the third-from-the-right conductor of the modular connector as viewed from the rear of the modular connector with the locking tab on the top as shown in the wiring diagram above.

3.2.3 Connecting Input Devices

The MBC-1 has a total of 16 inputs. Fifteen are used for display commands and the sixteenth is used as a “clear display” input for the latched displays. All sixteen inputs are activated by a pull-down to ground. The following diagram shows the internal configuration of each input:

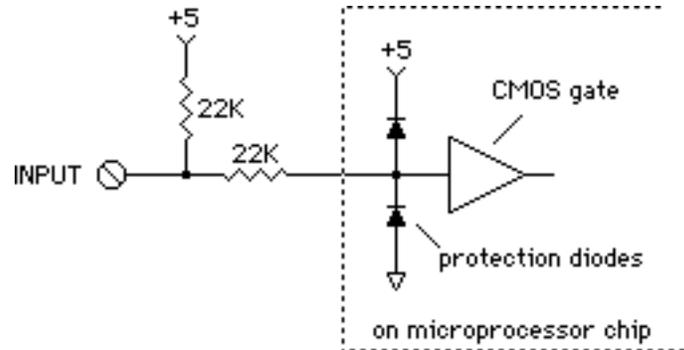


Figure 3.2; Electrical configuration of MBC-1 logic-level input

Each input is pulled-up to +5 volts with a 22 K resistor. The CMOS gate is protected by a pair of clamp diodes and the 22 K series-resistor limits the current during clamping. This allows the inputs can be connected to any voltage up to 50 volts DC and gives them transient protection up to ± 350 volts.

The inputs can be activated with a simple contact-closure to ground, an open-collector, +5, +12 and +15 volt logic-levels, or it can ride “piggy-back” with an external control circuit. When connecting to control circuitry with logic-levels greater than +5 volts (+12 for example) be sure the MBC-1’s internal 22K resistor connected to +5 volts does not prevent the external circuitry from working properly. Also, be sure the ground potential of the MBC-1 is at the same potential of the external equipment’s ground. The following is an example of how the MBC-1 can be connected:

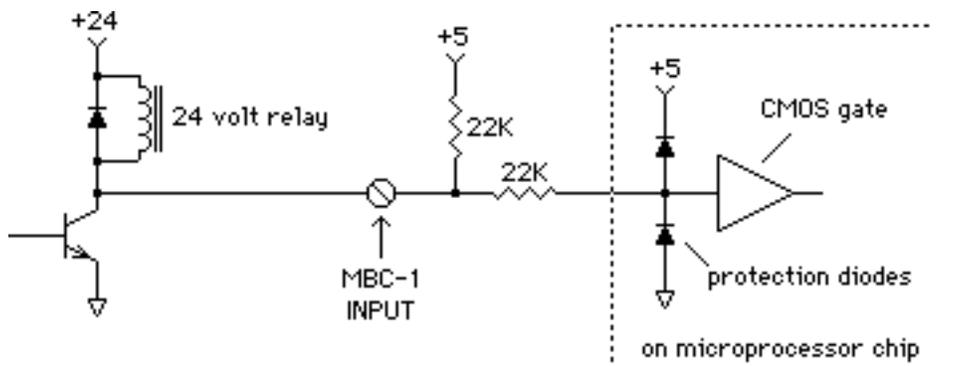


Figure 3.3; MBC-1 input tied to a shared 24 volt control signal

The external device, in this case a relay, is of sufficiently low impedance that 22 K resistor connected to +5 volts has negligible effect.

Input number 16, the clear-display input, is typically connected to a normally-open pushbutton (not included) at a location convenient to the operator. This, and all other inputs are debounced with microprocessor software. The inputs must remain stable for 30 milliseconds before they are considered valid by the microprocessor.

3.2.4 Telephone Ring Detection/Ground Isolation

For telephone ring detection or other applications where ground isolation is required, the model OC-2 Optocoupler is available. The OC-2 can isolate two display inputs with a sensitive, bipolar optoisolator. The inputs to the OC-2 may be AC or DC coupled. The following is a schematic diagram of the OC-2:

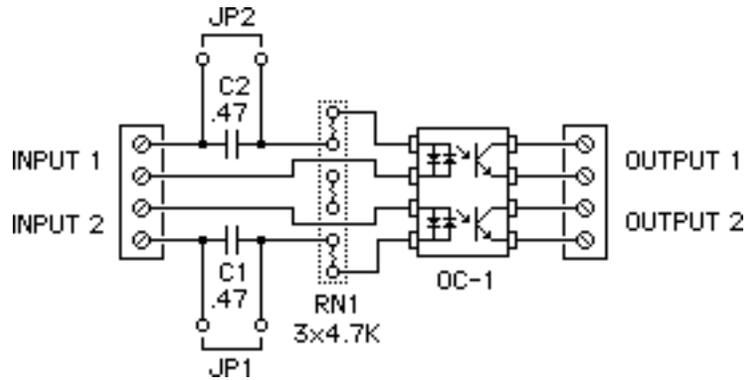


Figure 3.3; Optional OC-2 optocoupler

3.3 Programming the Display

All display information (text, pictures, colors, fonts, etc.) is stored in the display device. The Beta-Brite message display comes with no messages programmed except for a demonstration sequence which initiates at power up. A hand-held infrared programmer is included with the Beta-Brite that will allow you to compose and store a variety of display messages. Messages will remain stored in the Beta-Brite up to 30 days without power.

Messages are stored with an associated identifier (TEXT A, TEXT B, etc.) so they can be recalled later. When inputs 1 through 15 are activated on the MBC-1, the Beta-Brite files named "TEXT A" through "TEXT O" are displayed, correspondingly. Custom designed displays should be named accordingly so the proper message is displayed.

The MBC-1 can load a list of commonly used displays into the Beta-Brite for you. To do this, connect the Beta-Brite display to the MBC-1 following the directions above for normal operation. Then, hold input 16 to ground while powering up the MBC-1. The auto-load will take a few seconds and the Beta-Brite will beep when the load complete. During the auto-load, the Beta-Brite may show random displays--this is normal. The following table shows what is loaded and the corresponding (factory) settings of the MBC-1:

<u>Input</u>	<u>Priority</u>	<u>File Name</u>	<u>Display Mode</u>	<u>Message Loaded</u>
1	1	TEXT A	Latched	FIRE
2	2	TEXT B	Latched	TRANSMITTER OFF
3	3	TEXT C	Momentary	ON AIR
4	4	TEXT D	Latched	Audio Failure
5	5	TEXT E	Latched	Security Alert
6	6	TEXT F	Latched	EBS Alert
7	7	TEXT G	Latched	Weather Bulletin
8	8	TEXT H	Latched	News Bulletin
9	9	TEXT I	Stretched	Music Ending
10	10	TEXT J	Stretched	Hotline
11	11	TEXT K	Latched	Front Door
12	12	TEXT L	Latched	Back Door
13	13	TEXT M	Momentary	APPLAUSE
14	14	TEXT N	Momentary	Quiet Please
15	15	TEXT O	Momentary	TAPING
		TEXT P	[idle display]	[blank]

Figure 3.4; Factory MBC-1 settings and auto-load messages

If most of the messages in the auto-load list are acceptable and only a few need to be customized, it is generally easier to start with an auto-load and then overwrite the messages that need to be changed.

3.4 Programming the MBC-1

The MBC-1 can be programmed to accommodate different input sources. For instance, a ringing telephone line is distinctly different from a mic relay. Each of the inputs on the MBC-1 can be programmed to one of three display modes:

- Latched--a momentary input activates a display that remains active until cleared
- Momentary--a display is active as long as the corresponding input is held low
- Stretched--a display is active as long as the input is held low, plus 6 seconds

The latched mode is useful for important things like EBS and weather bulletins. A momentary input will cause the display to come on and stay on until an operator acknowledges it by clearing the display.

The momentary mode is best for things like the ON AIR display. The display comes on when the mike is turned on and it goes off when the mike is turned off.

The stretched mode is similar to the momentary. The display comes on when the input is activated and it stays on for 6 seconds after the input is released. This is useful to indicate a telephone line ringing or the tertiary cue from a cart machine. A brief input, at least once every 6 seconds, will cause the display to stay on continuously.

The factory settings are shown in the Figure 3.4 above.

3.4.1 Host Cable

The display modes can be reprogrammed by connecting the MBC-1 to the serial port of a PC with a terminal program. You will need an interface cable and the message displays must be disconnected for the duration of this process. Figure 3.5 shows how to make a cable for both 9 and 25-pin D connectors.

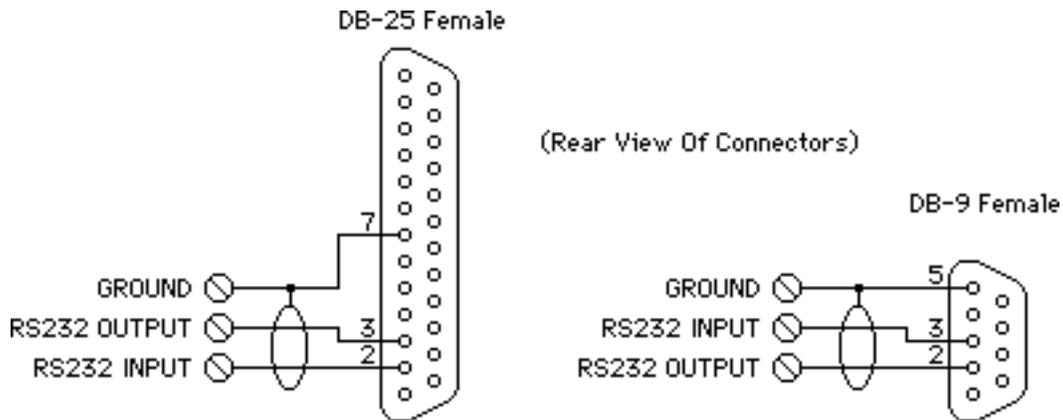


Figure 3.5; Interface cable diagrams to reprogram MBC-1 display modes

Make the cable that is appropriate for the serial port on your computer and connect the MBC-1 to the computer.

3.4.2 Software Settings

The terminal software should be set for 9600 baud, 8 data bits, 1 stop bit and no parity (8N1). Once the cable is connected, press the "Enter" or "Return" key a time or two and you should see a screen similar to the following:

```
Model MBC-1
Version 1.00
Sine Systems, Inc.
```

```
Display Mode Programming
```

```
Input  1: Latched
Input  2: Latched
Input  3: Momentary
Input  4: Latched
Input  5: Latched
Input  6: Latched
Input  7: Latched
Input  8: Latched
Input  9: Stretched
Input 10: Stretched
Input 11: Latched
Input 12: Latched
Input 13: Momentary
Input 14: Momentary
Input 15: Momentary
```

```
Press [M] to modify, [Q] to quit
```

Suppose you want to change input 9 from "stretched" to "momentary." First press "M". The terminal screen will then display:

```
Enter Input Number to modify then press [Enter]:
```

Press "9" followed by the "Enter" key. The MBC-1 will respond:

```
Input  9: Stretched
Mode:   1) Momentary
        2) Stretched
        3) Latched
```

```
Enter Mode selection:
```

Then push "1" and the screen will then display an updated version of the complete table:

```
Display Mode Programming
```

```
Input  1: Latched
...
Input  9: Momentary
...
Press [M] to modify, [Q] to quit
```

At this point press "M" to modify another input or press "Q" to save the changes and quit. *When all changes are made, be sure to press "Q".* Then, disconnect the terminal cable and reconnect the message display(s).

The display modes programmed in the MBC-1 are stored in nonvolatile memory. The programming will be retained even after extended periods without power.

3.4.3 Compatibility Issues

Some users of the previous model, the MBC-1, have experienced a compatibility problem while trying to connect to the MBC-1 using the HyperTerminal program. The issue usually occurs when the HyperTerminal communications settings are set incorrectly. Specifically, the 3-wire serial cable described in the documentation requires that "flow control" is set to either "none" or "software", preferably none. The 3-wire serial cable does not provide the signals needed for hardware flow control.

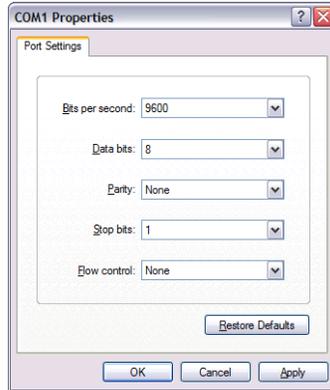


Figure 3.6; Hyper Terminal communications settings

The COM ports on some computers compensate for this and will work no matter what setting is used for flow control. Others will not work at all. When the latter occurs, the only known solution is to use software other than HyperTerminal.

There are several freeware terminal emulation software programs available. A search of your favorite download site should turn up at least a few options. Tera Term Pro is a no-frills software terminal that supports direct serial connections. It is easy to install and the default settings work fine to connect with the MBC-1 and the MBC-1.5.

If you use Tera Term Pro, the only program adjustment necessary is to select the "Serial" option and choose the COM Port that is appropriate for your computer on the "New connection" window that opens after Tera Term loads.

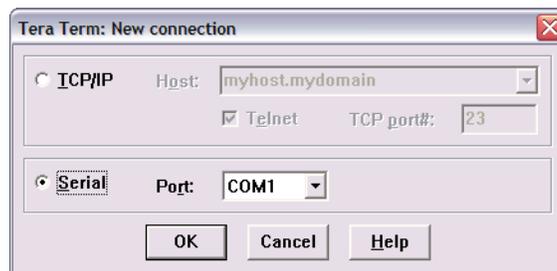


Figure 3.7; Tera Term Pro Setup Screen

Section 4 — Circuit Description and Repair

4.1 Repair Safety Warnings



WARNING!

The Thermal Sentry should be installed or repaired only by qualified technical personnel. An attempt to repair this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the Thermal Sentry or other equipment. Please ensure that proper safety precautions have been made before installing or repairing this device.

4.2 Circuit Description

The heart of the MBC-1 is a Motorola MC68HC711 microprocessor. This device contains a processor, program ROM, nonvolatile EEPROM, a timer, a serial interface and a number of parallel input pins. XT1 is an 8.00 MHz crystal. One-fourth of this frequency should appear at the pin marked “E” on the schematic. Pin 2 of U1 should be approximately equal to the +5 volt supply voltage until the supply voltage drops to approximately 4.5 volts. Below this voltage, pin 2 clamps to ground and prevents the microprocessor from trying to operate on a supply voltage that might produce erratic operation.

U3 is a logic-level-to-RS232 interface. It is a 2-in/2-out device with both output channels connected in parallel for greater drive capacity.

The external 12 volt DC power supply regulated to +5 volts by U1.

4.3 Factory Service Policy

Sine Systems, Inc. does not provide warranty or service on display devices. Service and/or warranty issues with display devices should be directed toward the appropriate vendors and/or manufacturers.

These policies are effective August 1999 and are subject to change without prior notice.

4.3.1 Factory Warranty

Sine Systems, Inc. guarantees our products to be free from manufacturing defect for a period of one year from the original date of purchase from Sine Systems, Inc. This warranty covers the parts and labor necessary to repair the product to factory specifications. This warranty does not cover damage by lightning, normal wear, misuse, neglect, improper installation, failure to follow instructions, accidents, alterations, unauthorized repair, damage during transit, fire, flood, tornado, hurricane or acts of God and/or nature.

4.3.2 Factory Return Policy

The factory return policy only applies to equipment purchased directly from Sine Systems, Inc. Equipment purchased through a third party (dealer) is subject to the return policy of the dealer and arrangements for return or exchange must be handled through the dealer.

Sine Systems policy on returns and exchanges with the factory is broken down according to the following schedule:

30 days "no questions asked"

During the first thirty days from the date that equipment ships from our factory we will accept it back for a full refund less shipping charges provided that the equipment is still in new, resellable condition with no cosmetic damage. This does not constitute an evaluation program. It is for legitimate purchases only.

less than 60 days, may be returned less 15% restocking fee

Between 31 and 60 days from the time we ship the equipment, we will accept unmodified equipment back for a refund less shipping charges and 15% of the invoice cost. This is to cover the cost of restocking the items which must then be sold at a discount as reconditioned instead of new.

no return after 60 days

We will recondition the equipment for you according to our repair rates but we will not accept it for refund or exchange after 60 days from the initial purchase.

4.3.3 Factory Service Policy

Sine Systems is proud to offer same day repair service on all of our products. When we receive damaged equipment, we will repair it and ship it back the same day it arrives. Because we offer immediate service, we do not send loaner equipment. If we cannot immediately repair equipment and return it, we may ship a loaner unit at our discretion.

While we do not require prior authorization on repairs, we suggest that you verify our shipping address before returning equipment for repair. Sine Systems is not responsible for items lost in transport or delivered to the wrong address. Emergency service may be made available on weekends or holidays, at our discretion, if arrangements are made with us in advance.

4.3.4 Warranty Service

There is no charge for repair service on items covered under warranty. You are responsible for shipping charges to return damaged equipment to us for repair. Damage due to negligence, lightning or other acts of nature are not covered under warranty.

4.3.5 Service Rates

For service not covered under warranty we have a flat rate repair fee. Flat rate repairs cover only components that fail electrically. Mechanical damage will be assessed on a per repair basis. Repair charges typically fall into one of these categories. Shipping fees are not covered in the repair rate.

Minor programming adjustments or no damage, \$50 plus shipping

Sometimes a system works exactly like it is supposed to when we get it or it can be fixed through a simple adjustment in firmware. We will do our best to identify intermittent hardware problems and correct them. The fee covers the time it takes our technician to thoroughly inspect and test the equipment.

Minor repairs are up to \$150 plus shipping

Five or fewer defective components are replaced in a minor to moderate repair. This accounts for most of our repairs. These repairs may cost less depending on the components replaced and the amount of time required to complete the repair.

Moderate repairs are \$250 plus shipping

Six to ten defective components are replaced in a major repair. Again, we may charge less depending on the components replaced and the amount of time required to complete repairs.

Major repairs cost more than \$250 plus shipping

This occurs rarely but it can happen. If the equipment has blown traces and scorch marks from burned components, it's a safe bet that it will take several components and quite a bit of bench time to repair. We assess this type of repair on a per incident basis.

Damaged beyond recognition, assessed on a per case basis

Hopefully you have insurance. In cases where the board is so badly damaged that it is not worth repairing we may, at our discretion, offer to replace the destroyed circuit board. The options and costs vary widely in these cases so we will call with options.

All repairs must be billed to a credit card or shipped COD. Specify which you prefer with your request for service. At your request, we will call with the total amount of the repair (including applicable shipping charges) so that suitable payment can be arranged before a COD shipment. If you need a COD total, do not forget to include a telephone number where you can be contacted.

4.3.6 Instructions for Factory Service

Please include a note with any specific information available about the equipment failure as an aid to our technicians. Pack equipment carefully to avoid further damage in shipping. We are not responsible for damage during transport.

When returning a system with multiple components, we strongly suggest that you return the entire system. We will repair the parts that are returned but lightning is rarely selective enough to damage only a single part of a system.

Be sure to include a street address for return shipping by UPS. The repair will be delayed if you neglect to give us enough information to return your equipment--this actually happens! If you prefer a carrier other than UPS or wish us to bill to your shipping account, we can usually accommodate these requests. Many carriers do not accept COD shipments so credit card billing may be required for carriers other than UPS. If you do not specify otherwise, return shipments will be made by the UPS equivalent of the received shipping method.

We suggest that you verify our shipping address before sending equipment for repair. Same day service does not apply if you ship to an incorrect address and/or the carrier delivers the equipment too late in the day for repairs to be completed. Sine Systems is not responsible for equipment that is not delivered to our factory. It will be your responsibility to contact the carrier to retrieve your improperly delivered equipment.

Section 5 — Specifications

5.1 Electrical Specifications

Ports

Inputs 1-16 (5.0mm screw terminal connectors)
RS-232 data I/O (5.0mm screw terminal connectors)
Power Input (5.0mm screw terminal connectors)

Inputs are activated by a pull-down to ground. Minimum pull-down time is 30 milliseconds. External sources can be contact closures, open-collectors or 5, 12, 15 and 24 volt logic-level sources. The input impedance is 22k ohms.

Data Format

Operate Mode: 4800 baud, 7 data bits, even parity, 2 stop bits
Programming Mode: 9600 baud, 8 data bits, no parity, 1 stop bit

Power

Input: 100-240 Volts AC, 50-60 Hz, 5 watts
Output: 12 Volts DC, 100 mA max

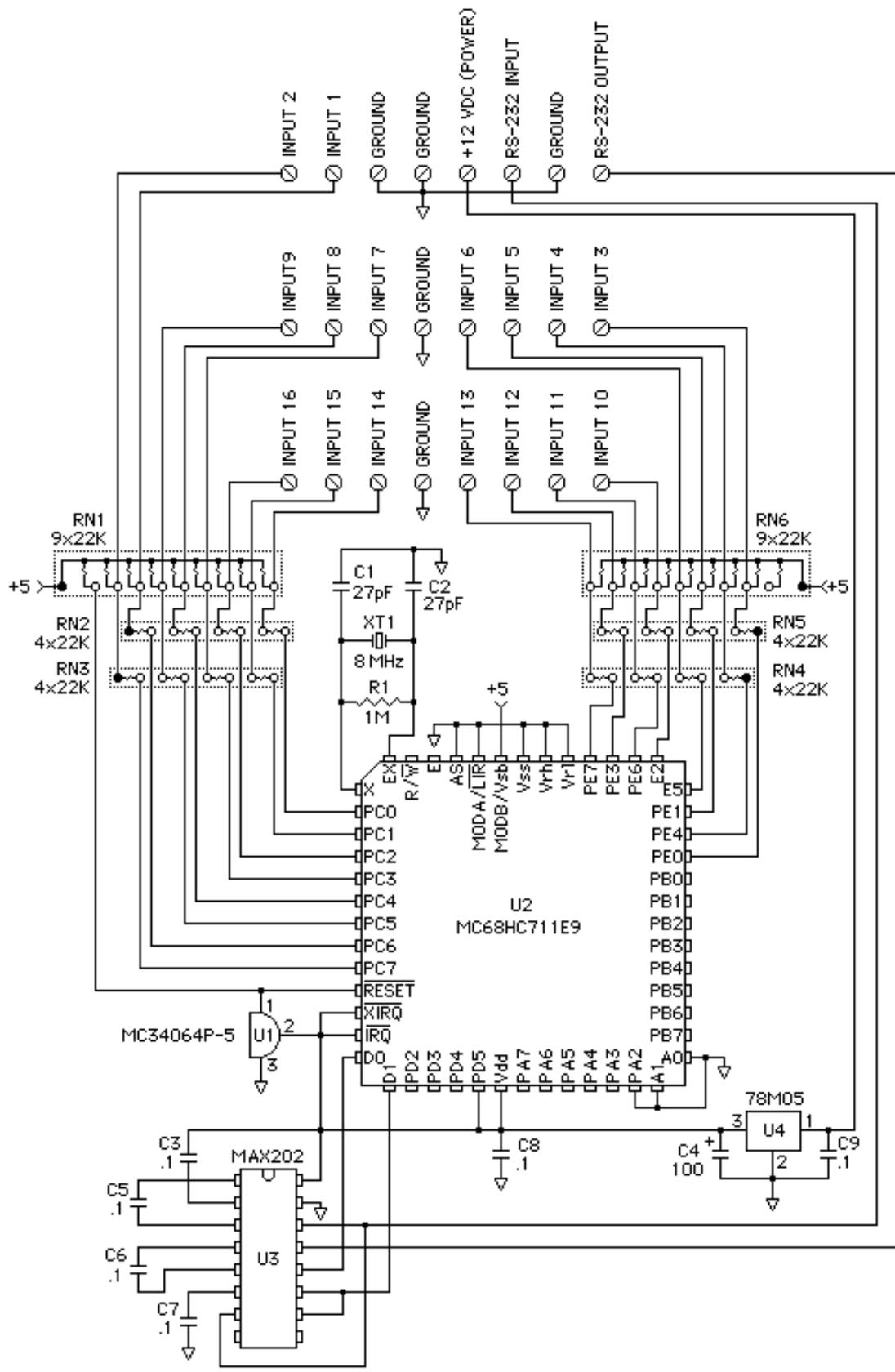
5.2 Mechanical Specifications

Dimensions

6.5" (w) x 1.5" (d) x 2.75" (h)

Weight

1 lb.



5.4 Component Layout

