

# **Audio Control Unit**

*Model ACU-1*

**– INSTALLATION AND OPERATION –**

*This documentation is valid for  
Audio Control Unit hardware version 1.02p with firmware version 10*

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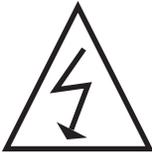
## Section I — Safety Information



### **WARNING!**

***The ACU-1 Audio Control Unit 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 ACU-1 or other equipment. Please ensure that proper safety precautions have been made before installing this device.***

Before connecting AC power to the ACU-1, verify that the internal power supply is configured for the appropriate voltage. Do not remove or defeat the ground prong of the the AC plug. The ACU-1 is designed for indoor use in a dry location. Installation and operation in other locations could be hazardous.



### **High Voltage!**

***Since the ACU-1 operates on 120/240 volts AC, dangerous and potentially lethal voltages will be present if the cover is removed while it is connected to AC power. For this and other reasons, service should be performed only by a qualified technician.***

If the fuse in the ACU-1 is replaced, the new fuse should be of the same type and rating as the original fuse. This is indicated on the rear panel.

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

## Section 2 — System Description

### 2.1 General Description

The Audio Control Unit model ACU-1 is an eight stereo input by one stereo output audio switcher. The system also incorporates silence sensors, parallel logic inputs, multiplex outputs, control relays, a clock/calendar and an optional temperature sensor. The unit can operate on either 120 volts or 240 volts AC. It is set for 120 volts AC operation when shipped from the factory.

The ACU-1 is housed in a standard EIA single space (1U) 19 inch rack mounted chassis. There are eight channel selection switches. System status is given through LED's visible through the front panel. There are indicators for channel selection, audio level and various other elements of system activity and behavior.

Audio input and output connections are made via screw terminal connectors on the rear panel. The screw terminals are detachable for easier system installation and removal. The serial data connection is made via a standard 9 pin D connector. The optional temperature sensor is connected to a 3.5 mm connector. The main power supply also connects through the rear panel.

### 2.2 System Requirements

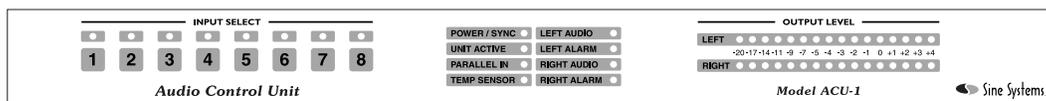
While the ACU-1 can be operated manually to perform simple audio switching functions, the true power of the unit is not utilized unless it is connected to a host computer. The ACU-1 is not designed for any specific operating system or hardware platform.

The host system must have one RS-232 serial port to communicate with the ACU-1. However, multi-drop RS-232 allows the operation of up to ten Audio Control Units from a single serial port.

The ACU-1 requires a single grounded power supply outlet for power.

### 2.3 Front Panel Indicators

The front panel of the ACU-1 Audio Control Unit contains eight channel indicators, eight status indicators for various system functions and two VU meters.



**Channel Indicators** illuminate when an audio input is selected (on). There is one indicator per audio channel for a total of eight.

**POWER/SYNC** indicates that AC power is available and that the power frequency is within 0.01% of 50/60 Hz. This indicator blinks for a half second each minute on the minute.

**UNIT ACTIVE** indicates that the unit has been selected and is sending and receiving data. This is useful when two or more ACU's are used in a single system.

**PARALLEL IN** indicates the presence of data on any or all of the parallel inputs.

**TEMP SENSOR** indicates that the temperature sensor cable is attached and that the sensor is functioning.

**LEFT AUDIO** indicates that audio is present on the left audio channel.

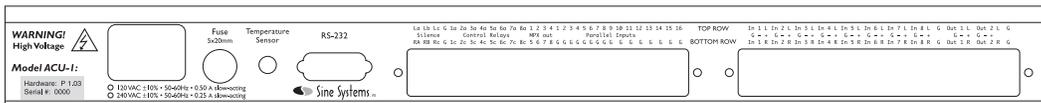
**LEFT ALARM** indicates loss of audio on the left audio channel and signals the alarm condition.

**RIGHT AUDIO** indicates that audio is present on the right audio channel.

**RIGHT ALARM** indicates loss of audio on the right audio channel and signals the alarm condition.

## 2.4 Rear Panel Switches and Connections

The rear panel of the ACU-1 contains all the I/O connections to the device and the power supply protection fuse.



**Power Supply** is a standard three prong AC supply inlet as found on PC's and most other modern commercial electronic devices.

**Fuse** is a twist-release type connector. A 5 x 20 mm fuse is installed inside this connector. The fuse value is indicated on the rear panel.

**Temperature Sensor** is a 3.5 mm connector for the optional temperature sensor.

**RS-232 Data** is a 9 pin female 'D' type connector. This is a standard serial data connector commonly associated with PC's.

**Silence L/R a/b/c** are screw terminal connections for the silence sensor alarm relay contacts. L/R represents the left or right channel and a/b/c represents the relay normally open, normally closed and common relay contacts.

**Control Relays 1-8 a/b** are screw terminal connections for the control relay contacts. Numbers 1-8 identify the relay and a/b represents the normally open relay contacts. Normally closed contacts are not available but can be simulated by system programming commands.

**MPX Out 1-8** are screw terminal connections for the multiplex open-collector outputs. These outputs follow the audio input selector when only a single channel is selected.

**Parallel Inputs 1-16** are screw terminal connections for the 16 logic-level parallel inputs. These inputs have internal +5 VDC pull-up resistors.

**Audio Inputs 1-8 L/R +/-G** are screw terminal connections for the eight balanced audio inputs. L/R denotes left or right channel and +/-G identifies + or - audio and ground.

**Audio Outputs 1-2 L/R +/-G** are screw terminal connections for the two balanced audio outputs. L/R denotes left or right channel and +/-G identifies + or - audio and ground. The two audio outputs are identical.

## **2.5 Electrical Functions and Description**

The Audio Control Unit is relatively sophisticated for an audio switching device. Audio switching tasks are handled intelligently and effectively without infringing on program source material. And a variety of I/O options give the ACU-1 the ability to signal or control outboard equipment so that it is easily integrated in a complete audio system.

### **2.5.1 Audio Inputs**

Each of the eight stereo inputs is factory configured for balanced operation at nominal 'line' level (-4 dBm to +10 dBm). By changing a socketed resistor network any or all inputs can easily be converted to 'consumer level' unbalanced inputs (-15 dBm).

### **2.5.2 Audio Outputs**

The ACU-1 has two sets of audio outputs that contain identical program material. Output levels are adjustable by internal trim pots between 0 dBm and +8 dBm. The factory is +4 dBm at 0 VU. The audio outputs are isolated and short circuit protected.

### **2.5.3 Audio Switching**

The heart of the ACU-1 is an 8 x 1 stereo switcher. The two isolated audio outputs are driven by the audio output of this switcher. The switcher is a summing switcher--any or all of the inputs can be switched on at the same time.

### **2.5.4 Automatic Level Control**

The switcher contains an automatic level control (ALC) that acts to maintain the output level at approximately 0 VU. The ALC will adjust the gain down rapidly if the audio level is too high or raise it up slowly if the audio output level is too low. The operation is conservative and quite transparent regardless of the program material. The goal of the ALC is to gently 'ride the levels' much like a human operator. It should have no effect on other audio processing that may be in use.

### **2.5.5 Virtual Level Presets**

Rather than use potentiometers for level presets on each input, the ACU-1 uses a technique we call virtual level presets. By storing the gain of each channel at critical points in time and restoring that gain from memory at appropriate times, audio dips and bursts are virtually eliminated during switching. The ACU-1 handles virtual level presets automatically and without outside intervention.

### **2.5.6 Silence Sensor**

The ACU-1 contains individual silence sensors for both the left and right output channels. The audio detection threshold and alarm delay times are set through data commands. Silence alarm status can be polled by data commands. Presence and loss of audio are indicated by LED's on the front panel of the ACU-1. Relay contacts are also available on the rear panel for a pair of SPDT relays that open or close on detection of silence on one or both audio channels.

### **2.5.7 Multiplex Output**

The ACU-1 has eight open collector outputs that follow channel selection called multiplex outputs (MPX). The open collector can be used to select a channel on an external device when an audio channel is selected on the ACU-1.

### **2.5.8 Control Relays**

There are eight general purpose control relays in the ACU-1 that can be used to control outboard equipment. The relays are operated by data commands and the relay action can be momentary or maintained (latched).

### **2.5.9 Clock/Calendar**

The ACU-1 contains a real time clock that is synchronized to the 50/60 Hz AC power line. This results in highly accurate time keeping with near-zero long term drift. If external power is lost, time will be maintained by a backup battery for approximately 12 hours. The NiCad battery recharges when external power becomes available again.

The ACU-1 also has a calendar that allows it to automatically adjust the clock between Standard and Daylight Savings Time. On the first Sunday of April and the last Sunday of October the clock will be adjusted appropriately. This feature is optional and can be disabled in regions that do not observe Daylight Savings Time.

### **2.5.10 Temperature Sensor**

An external temperature sensor is available for the ACU-1. The sensor comes with a weatherproof capsule and 100 feet of shielded cable. The length of the cable can be increased up to 1000 feet (~300 meters) using extension cables. The external temperature sensor is calibrated and polled by data commands.

### **2.5.11 Multidrop RS-232**

Two or more ACU-1's can be operated by the host system on a single RS-232 serial port using multi-drop 'addressable' RS-232. Each ACU-1 must be assigned a unique address in firmware. Each ACU-1 will only respond to commands directed to the appropriate address. A front panel indicator shows when a unit is 'selected' by the host computer.

### **2.5.12 Power Supply**

The power supply of the ACU-1 is adjustable for either 120 or 240 volts AC via internal jumpers. The factory setting is for 120 volts AC.

## Section 3 — Installation



### **WARNING!**

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Before connecting AC power to the ACU-1, verify that the internal power supply is configured for the appropriate voltage. Do not remove or defeat the ground prong of the the AC plug. The ACU-1 is designed for indoor use in a dry location. Installation and operation in other locations could be hazardous.

### **3.1 System Includes**

The ACU-1 Audio Control Unit package contains these items:

- Audio Control Unit model ACU-1
- rack mounting hardware
- screw terminal connector boards (attached)
- rechargeable battery (installed)
- power cable and fuse for use in the US
- operation manual

The ACU-1 does not include software or a host computer. This device is meant to be incorporated into an audio system consisting of external audio sources and a host system that is provided by the user or a third party value added reseller.

### **3.2 Installing the Unit**

The ACU-1 is housed in a standard EIA single space (1U) 19 inch rack mounted case. The system generates little heat and can be installed in most any convenient rack space. It may be desirable to mount the unit where front panel switches and indicators are convenient but this is not absolutely necessary.

Most of the wiring to the ACU-1 occurs on two 64 position, depluggable screw terminal connectors that are attached to the back of the unit. These connectors can be removed by releasing the two screws that fasten the connector boards to the ACU-1.

### 3.2.1 Power Supply Adjustment

The ACU-1 can operate on either 120 volts or 240 volts AC. It is set for 120 volt AC operation when shipped from the factory. Inside the unit are a set of jumpers that determine the input supply voltage. If the unit is to be powered by 240 volts AC, change the jumpers as shown in Figure 3.1.

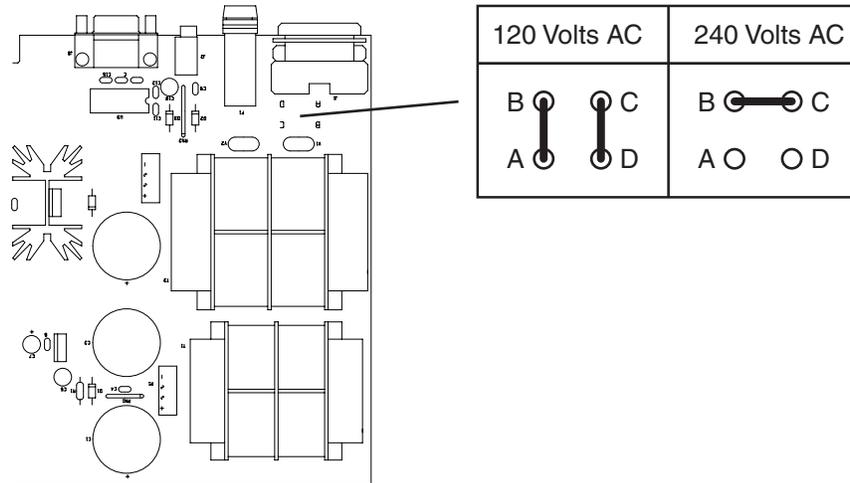


Figure 3.1; Power supply jumper select

### 3.2.2 Power Supply Fuse

The main supply is fuse protected. The fuse that is installed at the factory is suitable for U.S. installations. It is not necessary to remove the cover to replace the fuse should this become necessary. The fuse rating is given on the rear panel of the ACU-1.



#### **WARNING!**

***Do not make any attempt to bypass the fuse. If fuse replacement becomes necessary, use one of the specified type and rating. Failure to follow these instructions could result in a hazardous condition to the installer or other personnel, and/or damage to the ACU-1 or other equipment. Please ensure that proper safety precautions have been made before installing this device.***

### 3.2.3 Screw Terminal Connector Boards

The majority of connections to the ACU-1 are made through two screw terminal blocks on the rear panel. These blocks of connectors are detachable for easier installation. Simply remove the two screws at each end of the connector board and pull the connector board straight away from the ACU-1.

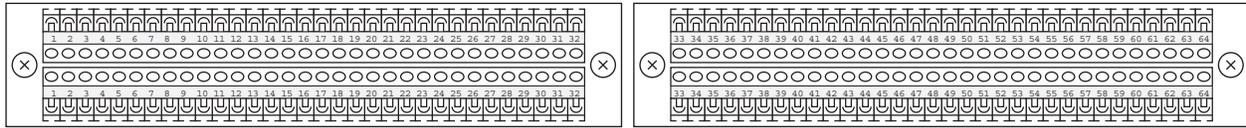


Figure 3.2; Connector boards

The large DIN type connector that attaches the screw terminal connector board to the ACU-1 is keyed to fit in only one direction. Please observe proper connector board orientation when wiring a connector board that is not attached to the ACU-1.

### 3.2.4 Audio I/O Connections

Audio input connections are made through the right block of screw terminal connectors on the rear panel of the ACU-1. The eight audio inputs are connected on terminal positions 33-56 counting from the left of the left connector block. The audio inputs are balanced. Left channel audio is connected on the top row of terminals. Right channel audio is connected on the bottom row of terminals. Input number, audio channel and polarity are all indicated on the rear panel.

Audio output connections are also made through the right block of screw terminal connectors. There are two sets of audio outputs at terminal positions 58-63. The audio on both sets of output terminals is the same. The audio outputs are balanced. Left channel audio is connected on the top row of terminals. Right channel audio is connected on the bottom row of terminals. Audio channel and polarity are indicated on the rear panel.

### 3.2.5 Silence Sensor Output Connections

In addition to the front panel LED indicator, the silence detector of the ACU-1 has a pair of relays that change state depending on the status of the left and right silence detectors. The relay contacts appear on the left block of screw terminal connectors at positions 1-3. The left channel relay contacts are on the top row and the right channel relay contacts are on the bottom row. The relay contacts are labeled a/b/c on the rear panel of the ACU-1. These labels correspond to the relay contacts according to the table below.

<i>Label</i>	<i>Relay Contact</i>
La	Normally open contact--left channel
Lb	Normally closed contact--left channel
Lc	Common contact--left channel
Ra	Normally open contact--right channel
Rb	Normally closed contact--right channel
Rc	Common contact--right channel

### **3.2.6 Control Relay Connections**

The control relay contacts appear on the left block of screw terminal connectors at positions 5-12. Only the normally open relay contacts are available but it is a simple task to simulate a normally closed contact through software commands to the ACU-1. There is no voltage on the control relay contacts. The control relay contacts are labeled on the rear panel.

### **3.2.7 Multiplex Output Connections**

The multiplex output connections appear on the left block of screw terminal connectors at positions 13-16. This set of outputs is a set of eight open collectors that follow the audio channel selection. These outputs can be used to select or enable an external device when its audio channel is selected either by software or by front panel selection buttons. The multiplex output is only active when a single audio channel is selected. Outputs 1-4 are on the top row and 5-8 are on the bottom row. The multiplex outputs are labeled on the rear panel.

### **3.2.8 Parallel Input Connections**

The parallel logic inputs appear on the left block of screw terminal connectors at positions 17-32. These 16 inputs are a set of ground referenced, +5 VDC logic level inputs with internal pull-up resistors. The parallel inputs are provided for general purpose on/off status sensing. Parallel inputs 1-16 are labeled on the top row of terminals and the bottom row is ground for all 16 inputs. These inputs are labeled on the rear panel.

### **3.2.9 RS-232 Data Connection**

A 9 female pin 'D' type connector is provided on the rear panel for data communications with the ACU-1. A straight-through cable from the host computer to the ACU-1 should work nicely. In other words, a null-modem cable should not be necessary and is not desirable for most installations.

Multi-drop RS-232 allows multiple ACU-1 to be connected to the same host computer on the same RS-232 serial port. A custom cable will be necessary for these installations. The multi-connector cable should simply connect each pin of each 'D' connector in parallel.

### **3.2.10 Temperature Sensor Connection**

The temperature sensor connects through a 3.5mm connector on the rear panel of the ACU-1. The jack is labeled. When the sensor is connected and operating properly, the front panel indicator will illuminate.

### 3.3 Installation Options

This section contains information that does not necessarily pertain to every ACU-1 installation, but is pertinent in many cases.

#### 3.3.1 Audio Input Termination

The ACU-1 main board has locations where terminating resistors can be added if necessary. A pair of 620 ohm 1/4 watt resistors per channel is sufficient. Each channel has two termination points—one for the left input and one for the right input. Figure 3.3 shows the locations of the termination points.

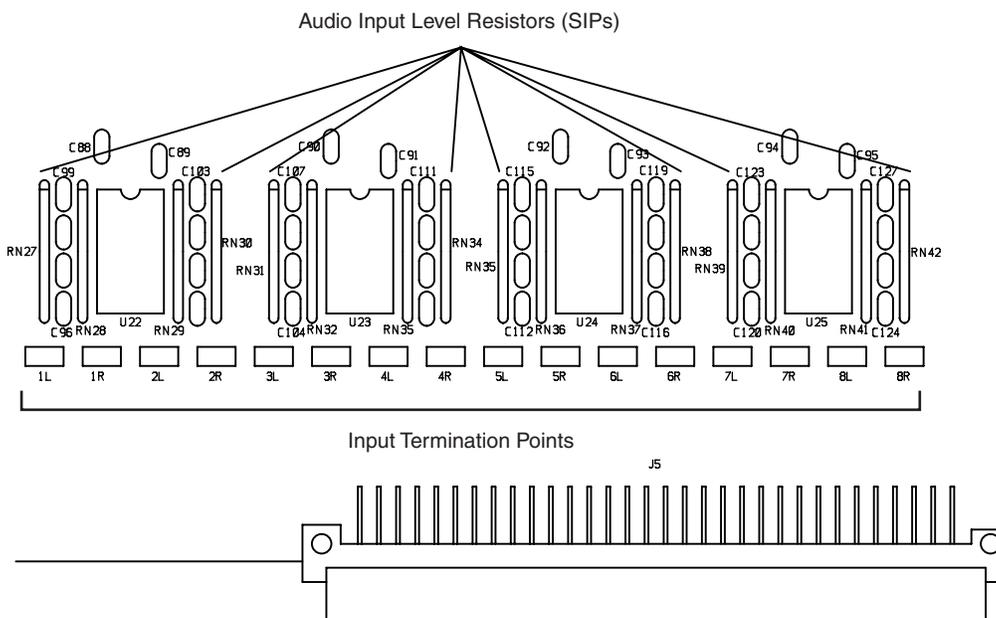


Figure 3.3; Input Level Resistors and Termination Points

#### 3.3.2 Adjusting Input Audio Level

The input audio level for each channel is factory set at +4dBm by the use of a 33K SIP resistor. The input resistor (SIP) is in a socket and can be changed easily to adjust the input level. Replacing the 33K SIP with a 3.3K SIP resistor will change the input level to -16dBm. This is an appropriate level for consumer level audio sources. The location of the SIP sockets is shown in figure 3.3.

##### Location    Input Channel

RN27	Audio Input 1
RN30	Audio Input 2
RN31	Audio Input 3
RN34	Audio Input 4
RN35	Audio Input 5
RN38	Audio Input 6
RN39	Audio Input 7
RN42	Audio Input 8

### 3.3.3 Connecting Multiple Units

The audio switching capabilities of the ACU-1 can be expanded by connecting multiple units in parallel—up to 10 units can be connected in a single system. Our multidrop RS-232 allows all of the units to be connected to a single serial port on the host computer.

Normally, only a single device can be connected to an RS-232 serial port so serial 'Y' adapter cables are not common but they are available. It is easy to make a cable that will work in this application. Simply connect each pin of each 'D' connector in parallel. The RS-232 driver in the ACU-1 is switched to a high impedance state when the unit is not active. This allows a direct parallel RS-232 connection without damage to the unit. Software will only be able to activate one ACU-1 at a time.

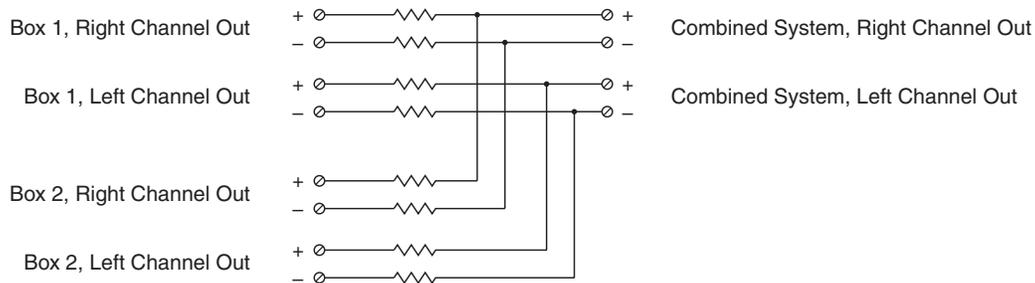


Figure 3.4; Combining Audio Outputs of Multiple ACU-1's

The audio outputs of the ACU-1 should not be connected in parallel due to their low output impedance. Figure 3.4 shows a simple combiner pad that will sum the two audio outputs. The combiner will have a loss of 6 to 9 dB depending on the load impedance at the combined system output audio terminals.

### 3.3.4 Temperature Sensor Calibration

The ACU-1 can read the temperature in degrees Fahrenheit or Celsius. To calibrate the ACU-1 temperature sensor, a thermometer of known accuracy should be placed as close as possible to the temperature sensor. Give the thermometer about ten minutes to stabilize in temperature. Then set the ACU-1 to read the same temperature as the thermometer. See the programming section for the appropriate commands for setting the temperature.

An alternate method to calibrate the temperature sensor is to fill a styrofoam cup with crushed ice and water. Insert the sensor into the cup and allow a couple of minutes for the temperature to stabilize. Shield the sensor and cup from direct sunlight. Set the ACU-1 to read a temperature of 32 degrees F (or 0 degrees C). See the programming section for the appropriate commands for setting the temperature.

The temperature calibration and scale are stored in non-volatile memory and will not be lost during a power failure, even if the back-up battery is not charged.

### 3.3.5 Temperature Sensor Placement

To get readings that give good correlation to those reported by the nearest NOAA weather station, it is important to measure the temperature the same way they do. Just hanging the sensor out a window will almost surely produce temperatures that fluctuate wildly. The key measuring the temperature accurately is to mount the sensor in a standard enclosure. It provides very accurate air-temperature readings.

An alternative to buying a standard enclosure is to make one using inexpensive materials. The primary raw material is two 12 inch wide louvered wood shutters—louvered doors might also work. Cut the shutters so you end up with four equal lengths of shutter about 13 to 16 inches long. A little improvising may be required depending on the style of shutter or door. Some can be cut along a solid horizontal reinforcement piece and others will require the end louvers to be stabilized with glue or a piece of wood. In either case, you will build a box with the four pieces of shutter using them for the four walls. The floor and roof of the box are made of 3/8 inch exterior grade plywood.

Attach three of the four sides together with glue and nails or screws. The pieces of shutter should be oriented so the louvers will drain outside of the enclosure. Attach this assembly to the floor. The roof should overhang about 3 inches on all sides. Attach the roof with a couple of 1/4 inch spacers near the front so that it slopes slightly to the rear. This will prevent water from standing on top. The remaining wall should be attached with two hook-and-eye sets so it can be removed.

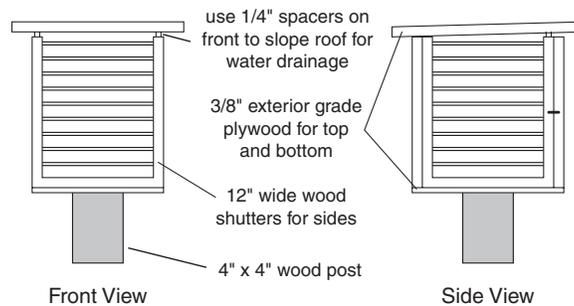


Figure 3.5; Standard Enclosure

Mount the enclosure on a 4 inch square wooden post. The floor of the enclosure should be 4 feet above the ground. Drill a small hole in the floor near the edge of the post for the sensor cable to come through. A 1/4 inch hole drilled in one of the walls about an inch above the floor makes an easy way to insert a calibration thermometer without removing the louvered panel (see section 3.3.2). The enclosure should be given at least two coats of white exterior paint inside and out.

Place the enclosure at least 20 feet from the nearest building, preferably on grass covered soil. It should be as far away as possible from concrete and pavement. Do not place the enclosure near air-conditioner compressors or under trees.

Run the cable for the sensor up the post and through the hole in the floor. Lay the sensor in the center of the floor of the enclosure. Be careful not to cut or puncture the outer insulating jacket of the cable. The inner conductors must be protected from the weather. If an extension cable is used, wrap electrical tape around the connectors to seal out moisture.

When visiting the enclosure during the summer months you might want to take a can of wasp and hornet killer with you. They just love to build nests in these things.

## Section 4 — Troubleshooting and Repair

### 4.1 Common Problems and Possible Solutions

*Problem:* The ACU-1 does not power up.

*Solutions:* Check that the fuse and internal jumpers are set for the appropriate voltage. Make sure that the fuse is intact. Check power cord for shorts or worn spots.

*Problem:* The ACU-1 powers up but there is no response to commands from the host computer.

*Solutions:* When the ACU-1 is communicating with the host system, the 'Unit Active' LED will illuminate when it receives the attention signal portion of the command: AT Ø1 (assuming that the box address is set to the factory default of 1.) If the LED does not illuminate then the ACU-1 and the host computer are not communicating. There are several possible reasons for this: a defective data cable, incorrectly set box address, mismatched baud rates. The ACU-1 is factory set to 57.6K baud and box address 1. A straight-through data cable will work for most computers.

If the ACU-1 communicates properly then stops, try sending a carriage return without any data to clear the command buffer and send the command again. If all else fails and communications cannot be reestablished, the ACU-1 can be reset to the factory default settings through the front panel. To do this, press and hold Input Select buttons 1 and 8 simultaneously for two seconds. Performing this procedure has the same effect on the system as the BXDF command.

*Problem:* The output audio level is low.

*Solutions:* Make certain that your software has instructed the ACU-1 to select the proper input channel(s) and raise the level appropriately. Verify that none of the audio output terminal are grounded. Check the audio level to the ACU-1 audio input(s). The ACU-1 is factory configured for an input level of 0 dBm to +10 dBm. The audio input level can be adjusted. See Section 3 for more information on hardware adjustments.

## 4.2 Safety Warnings



### **WARNING!**

*The ACU-1 Audio Control Unit 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 ACU-1 or other equipment. Please ensure that proper safety precautions have been made before installing or repairing this device.*



### **High Voltage!**

*Since the ACU-1 operates on 120/240 volts AC, dangerous and potentially lethal voltages will be present if the cover is removed while it is connected to AC power. For this and other reasons, service should be performed only by a qualified technician.*

## 4.3 Factory Service Policy

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

*If you purchased this equipment as part of a system from a third party, you must contact your vendor for support. The third party vendor is responsible for support issues.*

### 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 (i.e. Ground shipment, 2nd Day, Overnight).

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

Balanced Audio In/Out (3.5mm screw terminal connectors)  
Control & Logic I/O (3.5mm screw terminal connectors)  
RS-232 Data (9 pin female 'D' type)  
Temperature Sensor (3.5mm phone)  
AC Power (consumer type grounded)

#### Switches

Input Source Select (selectable interlocked/toggle pushbutton)

#### Indicators

Input Select (green)  
Power/Sync (green)  
Unit Active (green)  
Parallel In (green)  
Temperature Sensor (green)  
Left/Right Audio (green)  
Left/Right Alarm (red)  
Output Level (green/yellow/red)

#### Data

RS-232 multi-drop (addressable)  
2400 to 115.2K baud

#### AC Power

100-240 Volts AC, 50-60 Hz

#### Fuse

120 VAC, 0.50 A slow-acting (120 Volt installations)  
240 VAC, 0.25 A slow-acting (240 Volt installations)

#### Interference

Complies with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules

### 5.2 Mechanical Specifications

#### Dimensions

16.75" (w) x 8.5" (d) x 1.75" (h)  
mounts in standard 19" EIA rack

#### Weight

6 lbs.