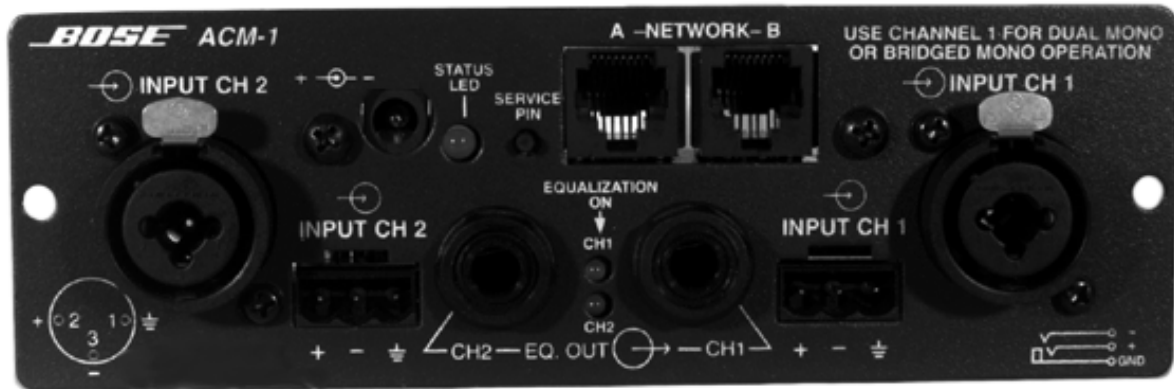


ACM-1 Amplifier Control Module



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CAUTION: The ACM-1 Amplifier Control Module contains no user serviceable parts. To prevent warranty infractions, refer servicing to warranty service centers or factory service.

PROPRIETARY INFORMATION

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF BOSE® CORPORATION WHICH IS BEING FURNISHED ONLY FOR THE PURPOSE OF SERVICING THE IDENTIFIED BOSE PRODUCT BY AN AUTHORIZED BOSE SERVICE CENTER OR OWNER OF THE BOSE PRODUCT, AND SHALL NOT BE REPRODUCED OR USED FOR ANY OTHER PURPOSE.

SAFETY INFORMATION

1. Parts that have special safety characteristics are identified by the  symbol on schematics or by special notes on the parts list. Use only replacement parts that have critical characteristics recommended by the manufacturer.
2. Make leakage current or resistance measurements to determine that exposed parts are acceptably insulated from the supply circuit before returning the unit to the customer. Use the following checks to perform these measurements:

A. Leakage Current Hot Check

- (1) With the unit completely reassembled, plug the AC line cord directly into a 120V AC outlet. Do not use an isolation transformer during this test. Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.1 "Leakage Current for Appliances" and Underwriters Laboratories (UL) 1492 (71).
- (2) With the unit AC switch first in the ON position and then in the OFF position, measure from a known earth ground (metal water pipe, conduit, etc.) to all exposed metal parts of the unit (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis.
- (3) Any current measured must not exceed 0.5 milliamp.
- (4) Reverse the unit power cord plug in the outlet and repeat test.

ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE UNIT TO THE CUSTOMER.

B. Insulation Resistance Test Cold Check

- (1) Unplug the power supply and connect a jumper wire between the two prongs of the plug.
- (2) Turn on the power switch of the unit.
- (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each exposed metallic cabinet part on the unit. When the exposed metallic part has a return path to the chassis, the reading should be between 1 and 5.2 Megohms. When there is no return path to the chassis, the reading must be "infinite". If it is not within the limits specified, there is the possibility of a shock hazard, and the unit must be repaired and rechecked before it is returned to the customer.

ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICE HANDLING

This unit contains ESDS devices. We recommend the following precautions when repairing, replacing, or transporting ESDS devices:

- Perform work at an electrically grounded work station.
- Wear wrist straps that connect to the station or heel straps that connect to conductive floor mats.
- Avoid touching the leads or contacts of ESDS devices or PC boards even if properly grounded. Handle boards by the edges only.
- Transport or store ESDS devices in ESD protective bags, bins, or totes. Do not insert unprotected devices into materials such as plastic, polystyrene foam, clear plastic bags, bubble wrap, or plastic trays.

WARRANTY INFORMATION

- The ACM-1 Amplifier Control Module is covered by a 5-year transferable limited warranty.

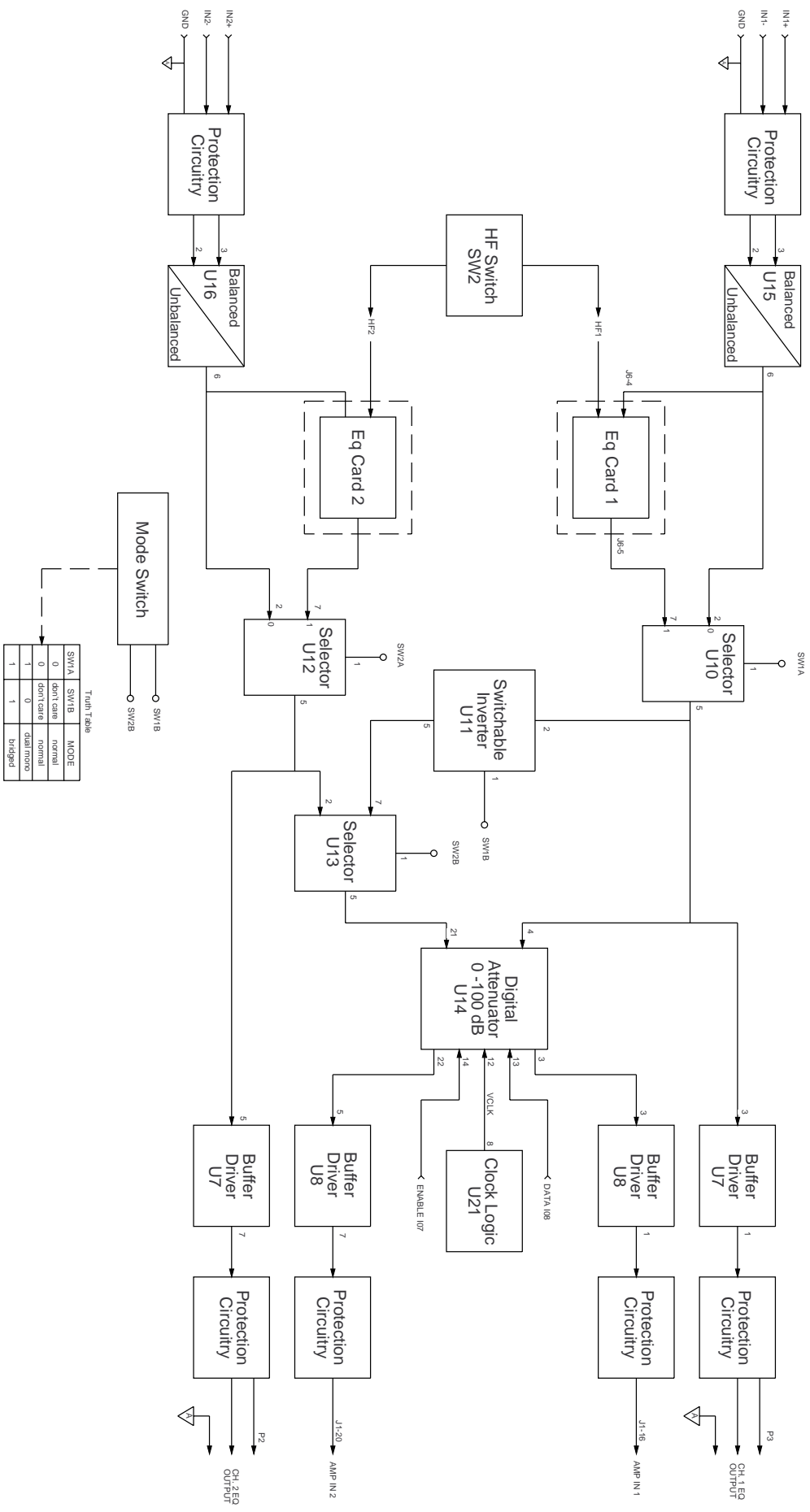
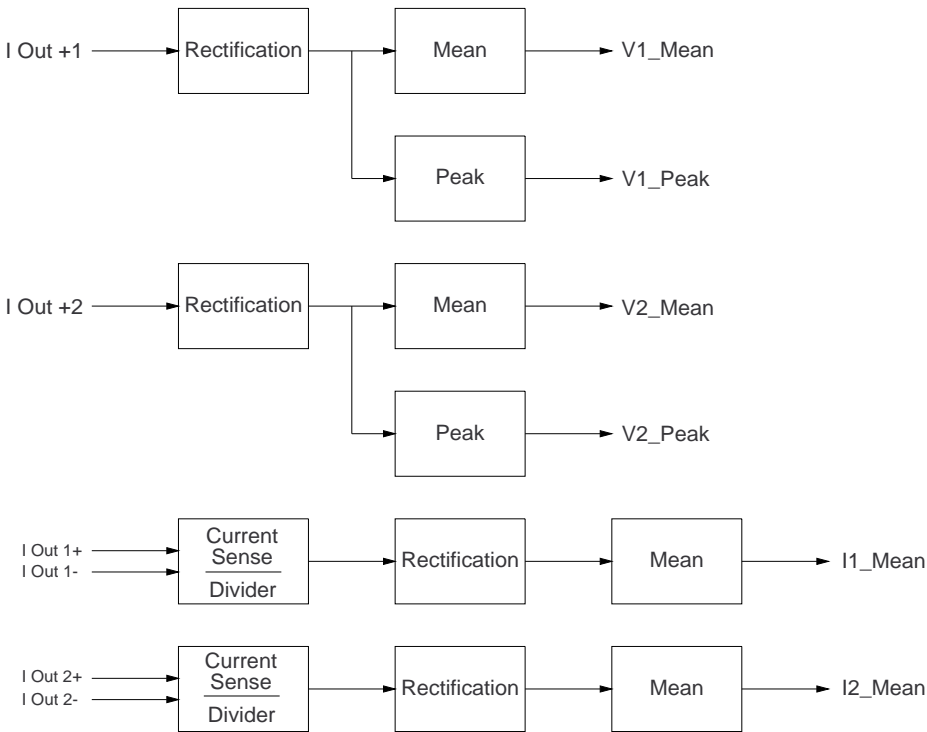


Figure 1. ACM-1 Audio Section Block Diagram

Signals from Amplifier

Therm 1
 Therm 2
 Rail Voltage
 +I Out 1
 -I Out 1
 +I Out 2
 -I Out 2
 Protect 1
 Protect 2



Signals to Amplifier

Amp In 1
 Amp In 2
 Power-up
 LED

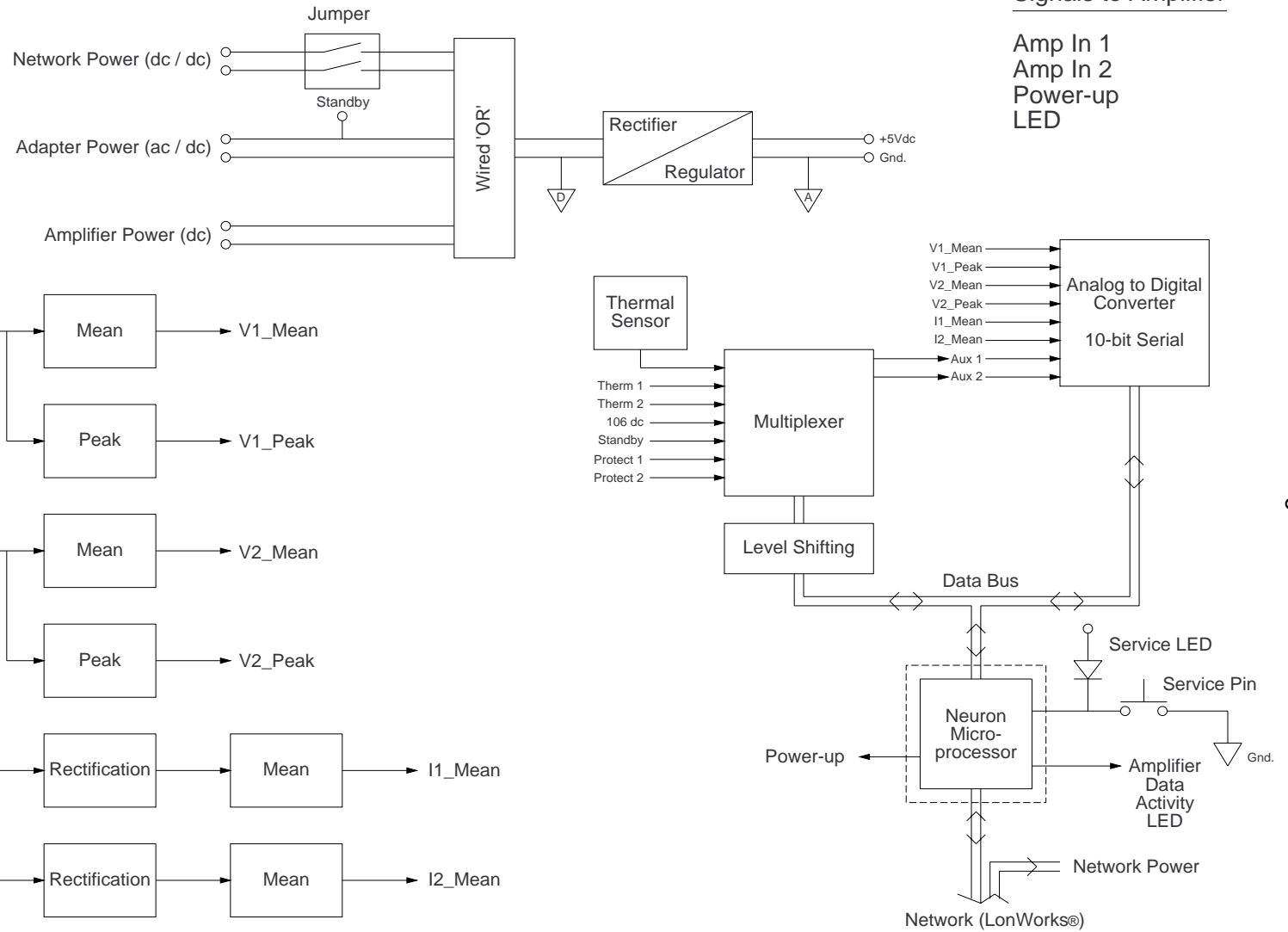


Figure 2. ACM-1 Monitoring Section Block Diagram

THEORY OF OPERATION

General Description:

The Bose[®] ACM-1 Amplifier Control Module is an optional replacement for the standard Input Module that is delivered with the Bose 1600 and 1800 Series VI Power Amplifiers. This module, which installs into the back of the amplifier in place of the standard input module, adds a network interface to the power amplifier; allowing the user to control and monitor the amplifier(s) remotely and simultaneously. This can be done only when the amplifier is in standby or 'sequence' mode, which is set on the front of the amplifier. The network topology used by the ACM-1 Amplifier Control Module is the LonWorks[®] network standard which is a registered trademark of Echelon[®] Corporation. The device controlling the amplifier(s) may be a personal computer or any other 'smart' device that incorporates a LonWorks Neuron[®] module.

The Bose ACM-1 uses a LonWorks Neuron module to translate network polls into addressing, reading and writing commands used to control the amplifier. This device contains a network transceiver and a micro-controller interacting with on-board flash-memory. On the main PCB of the ACM-1, an Analog to Digital Converter (ADC) translates amplifier operating conditions such as output level, temperature and clipping level inside the amplifier to digital information to be passed to and from the Neuron module and ultimately, the network. This information can be monitored with a computer either locally, tied directly to the control network of the installation, or remotely, provided that the remote computer has a network connection such as a modem (Internet), Ethernet, or LAN, and the required software. The amplifier itself is controlled by setting a digital/analog signal attenuator to manipulate volume level, as well as to switch the amplifier from stand-by mode to operate mode and vice versa.

The ACM-1 is normally fed stand-by power by an external 12 Vrms AC power adapter when the amplifier is off or in stand-by (sequence) mode. This allows the amplifier to be turned on remotely by providing a constant power source to the Neuron module and the Analog to Digital Converter. The amplifier cannot supply power to the Neuron module when the amplifier is switched off, which is why the AC adapter is required. Without this keep-alive voltage, the amplifier would not be able to be powered up remotely. Once the amplifier is operating, the keep-alive voltage could fail and still have the amplifier operate. Once the amplifier is shut off again, however, the keep-alive voltage must again be present to allow remote turn-on of the amplifier. The recommended AC power adapter is the Bose PS71. See Table 2 on page 12 for part numbers for the various models.

The keep-alive voltage input circuitry of the ACM-1 is designed to also allow the use of a DC external stand-by power source. The nominal power requirements for a DC source are +12 Vdc at 100 mA. Furthermore, it is also possible to power the ACM-1 via the network cable. This must be a DC source. Although this mode of powering has its limitations due to wire length and thickness, this option might be very useful in smaller or highly segmented applications. To use network power, jumpers at JB1 on the daughterboard must be set. Place jumpers across pins 1 & 2 and across pins 5 & 6 at JB1. Refer to sheet 2 of the schematic diagram at coordinates [D5]. The daughterboard is the small board mounted to the faceplate with the RJ45 connectors on it. Refer to the daughterboard layout diagrams on page 23. The ACM-1 is shipped with the jumpers uninstalled in order to avoid RFI noise coupling onto the network wire, which may degrade amplifier performance when this mode is not used.

Refer to the ACM-1 Schematic Diagram, Sheet 2 of 2, for the following information.

Note: The designators inside the brackets "[]" are the schematic grid coordinates which are provided in order to make it easier to locate components on the schematic sheet indicated in the description.

THEORY OF OPERATION

Power Supply Section:

The required keep-alive voltage for the ACM-1 enters the unit at J11 [C7] as V_IN. This input voltage is rectified, if necessary, by D32 and C44 [C7]. The DC voltage is regulated by the +5V regulator U18 [C7]. This keep-alive power is required by the components that allow the amplifier to be powered up remotely, the Neuron[®] module [not shown on schematic], and the Analog to Digital Converter U9 [Sheet 1, B3]. D31 and D30 [C7] together form a wired 'OR' gate. This means that if the amplifier is powered-up, the ACM-1 receives power from it, which is +15 Vdc regulated down to +5 Vdc by U18. If not, the ACM-1 is powered from the standby power source, which could be an AC adapter, a DC adapter, or a DC voltage supplied through the network cable. STANDBY [B4] is the network power source which is passed through R97 [B4] to make STBYOK, which is passed on to the ADC Multiplexer U17 [Sheet 1, C1/2], and is used to detect if there is adapter power available, even when the amplifier is turned on. Note that digital ground is used for the power supply reference in order to keep the analog ground after the +5V regulator as clean as possible.

The ACM-1 consists of a power supply section, an analog section, which is the audio signal path to the power amplifier, and a digital section which controls and monitors the amplifier.

Note: The schematics and theory of operation of the neuron module will not be covered in detail in this section.

Refer to the ACM-1 Schematic Diagram, Sheet 1 of 2, for the following information.

Audio signal path:

The input stage is a balanced input receiver composed of U15 and U16 [C/D7]. The input is taken from either the combi input connectors [D2/3] or the euro screw terminal inputs at J4 and 5 [Sheet 2, B7]. The shield ground is decoupled from the analog ground by capacitors C14 and C15. All inputs have spark gaps to avoid possible damage due to static electricity. All input legs have RFI low-pass filters [C/D 7/8] and diode clamps to protect the op-amps against overload. The input impedance in each leg is approximately 25k Ohms and is laser trimmed for good common-mode rejection.

After the input signal is converted from balanced to unbalanced, the signal enters switchable op-amps U10 and U12 [C/D6]. These op-amps are used to route the signal through the optional loudspeaker equalizer cards that can be installed on the ACM-1 motherboard. The presence of the EQ cards is detected automatically. If the EQ card is plugged into its socket, the EQ1USED or EQ2USED at J6-6 or J7-6 [Sheet 2, B7] signal is grounded causing U10 and/or U12 to route the audio signal through the EQ-cards, by pulling the SW1A and SW2A signals at U10 or U12 low. Also, the appropriate section of the green dual LED D50 [Sheet 2, A4] will be turned on to indicate the card is installed. Further, the high-pass filter available on the EQ cards can be activated by setting switch SW2 [Sheet 2, D7] to the correct position. This causes signal HF1 and HF2, which are routed to the EQ cards via J6 and J7 [Sheet 2, B7] to be grounded.

After the signal is equalized, the audio signal is passed on to a second set of switchable op-amps, U11 and U13 [C/D6]. The function of this op-amp pair is to set the mode of operation of the amplifier: normal (stereo) mode, bridged mode or dual-mono mode. If SW2B is high, the amplifier is in normal mode regardless of the state of the SW1B signal. SW2B basically routes the signal of channel 1 into channel 2 if it is pulled low. By doing this, the amplifier is configured in bridged mode or dual mono mode, depending on SW1B, which inverts the signal going into channel 2, or not. When SW1B is high, the signal is not inverted and the amplifier is in dual mono mode; if it is pulled low, the amplifier is in bridged mode. The configuration of the mode of the amplifier is done by setting the SW1 to the correct position [Sheet 2, D7].

THEORY OF OPERATION

The equalized signal is also routed to U7 [C/D6] which forms output line drivers. The output of the EQ card is then available to link to the next amplifier, minimizing the need for additional EQ cards. This signal is available at the female EQ output jacks P2 and P3 [C/D4] on the frontplate of the ACM-1 module. These outputs are also equipped with RFI low-pass T-filters, diode clamps and spark-gaps. The output impedance at audio frequencies is approximately 400 Ohms, making it possible to drive long cable lengths without oscillation.

After the audio signals are equalized and composed in such a way as to set the correct mode of the amplifier, they are routed into a software controlled attenuator U14 [D5]. With this attenuator, the level of the audio signal can be attenuated in steps of 1 dB from 0 dB all the way down to -100 dB. The lowest attenuation level is a full mute. The attenuation level is set by the serial data stream IO9 (DATA) from the Neuron[®]. The attenuator is addressed with IO7 (ENABLE) with the timing signal supplied by IO8 (CLOCK), which is generated by the Neuron. The 3.16 k Ohms resistors R40, 41, and 42, protect U14 from damage when the ACM-1 is in standby mode. In this mode, the attenuator is off, but the Neuron is still powered. The quad-NAND U21 [Sheet 2, C4/5] generates VCLK from the ENABLE and CLOCK signal. This logic is used by the TC9412F attenuator. After the level is set with the attenuator, signal buffer U8 [C/D4] routes the signal out through J1 pins 16 and 20 [Sheet 2, B7] to the power stages of the amplifier.

Monitoring and control, digital section:

Refer to the ACM-1 Schematic Diagram, Sheet 1 of 2, for the following information.

The monitoring and control of the amplifier is performed by the plug-in LonWorks[®] Neuron module (not shown on schematic) which plugs into the ACM-1 motherboard at J9 and J10 [Sheet 2, A/B7]. This module incorporates a network transceiver which is connected to the system's control network by means of RJ-45 connectors J12 and J13 [Sheet 2, D4], which are located on the daughterboard.

The Neuron module switches the amplifier to operate mode by pulling low the IO6 signal on transistor Q1 [Sheet 2, A4]. This transistor causes current to flow into the opto coupler, located inside the amplifier which fires the TRIAC in the amplifier's power supply. Refer to the 1600VI/1800VI service manual, Bose[®] part number 199747, for more information on the amplifiers.

Each Neuron module is assigned its own unique identification number when it is manufactured. It can only be activated and controlled by this unique address. If the address number for a Neuron module is lost, the unit can identify itself on the network by toggling its service pin. This pin is connected to the momentary switch on the front-panel of the ACM-1 module. When this switch is depressed, the SERV pin is grounded and the yellow LED lights up. The LED is also used to indicate network activity in the ACM-1. In this mode the LED is lit constantly. The LED blinks with a 50% duty-cycle when the neuron module is not yet configured on the network.

The amplifier is equipped with an LED on the front of the amplifier, located in the center of the front panel, used to indicate network activity. It is triggered by Q4 [Sheet 2, A4], which is turned on and off via the IO5 pin from the Neuron's micro-processor.

The Neuron gets its status information via the Analog to Digital Converter U9 [B3]. This is a serial 10-bit ADC with 8 inputs. It communicates with the Neuron on the same DATA line. The serial timing is delivered via the IO8 CLOCK signal and the IO1 signal which basically functions as a control signal (the control clock for successive approximation circuitry inside the chip) for the ADC. IO0 toggles the chip select pin and the output enable pin. When they are both low, the falling edge of the IO8 shifts out the conversion data out of the output pin connected to IO10. IO9 shift serial data into the converter. For detailed timing information, consult the National Semiconductor datasheet on the ADC1038.

THEORY OF OPERATION

The ADC inputs are all equipped with diode clamps to protect its inputs from damage due to a 15V input signal. This failure could occur if one of the components connected to the ADC fails and shorts one of the 15V rails to the inputs. The resistors on the inputs of the ADC protect the input stages of the converter against excessive currents due to fault signals.

Six of the inputs directly sample six status signals. The other two are connected to a dual 4 channel multiplexer U17 [C1] which makes it possible to sample eight more different status signals. V1_PEAK, V2_PEAK, V1_MEAN, V2_MEAN, I1_MEAN and I2_MEAN are the mean and peak voltage and current levels directly measured at the output of the power amplifier. With these signals, output signal levels can be displayed and the load impedances can be calculated and used in the User Interface(s) connected via the network.

The peak and mean output voltage levels are generated with U1, U2 and U3. U1 [C7] divides down the +IOUT1 80 Vpk signal from the amplifier's output. After this, the signal undergoes double sided rectification. From the rectified signal, the mean voltage is created by a RC filter section, N14 [C6] and C24 [C6] and buffered with an op-amp. The V1_MEAN output is taken from U1 pin 14 [C6]. In another op-amp stage, U3 [C5], the peak signal is derived with a peak-hold circuit. The peak level is stored in C28 [B5]. V1_PEAK is taken off of U3 at Pin 7 [C5]. +IOUT2 is processed in the same way using U2 and U3.

The mean current level is generated with U4 and U5 [A5-7]. Because the output current is measured across the 20 milliOhm resistor that is installed inside the amplifier, the signal needs to be divided down before it is routed into the balanced input stage formed by U4 and U5. The division is done by the 5 kOhms resistor arrays N16-19 [A/B7]. After converting the signal into an unbalanced signal, the signal is double sided rectified. RC filters R5/C26 [A5] and R6/C27 [A5] filter the signal and produce the scaled mean of the output current for both amplifiers. U4 and U5 buffer this signal before it is routed into the ADC [B3].

The dual multiplexer U17 together with U6 [C1] produce two extra buffered signals which are routed into the remaining two inputs of the ADC. With the multiplexer, the Neuron[®] can select which parameter should be sampled. These parameters are connected to the 8 inputs of the multiplexer and can be selected with IO2A and IO3A. These 2 signals are level shifted to +15V and inverted with transistors Q2 and Q3 [Sheet 2, A5]. Two inputs are selected at the same time and fed to the ADC. XTEMP is the temperature on the ACM-1 motherboard and is generated with temperature sensor U20 [C2]. 316ADD1 and 316ADD2 are generated by the amplifier and indicate that the relays at the outputs of the amplifier are open due to a short circuit condition or due to DC offset caused by amplifier failure. These signals are also supplied to the User Interface(s) to indicate that impedance measurement is then invalid due to the opened relays.

The 106VDC (1800VI), 90VDC (1600VI) signal indicates the presence of the power amplifier rail voltage. It is a divided down version of the rail voltage, and is used by the User Interface(s) to detect proper operation of the amplifier.

THERM1 and THERM2 are voltages generated by the temperature sensors on the power amplifier stage's heatsinks. With these scaled voltages the temperature of these stages can be measured and displayed on the User Interface.

STDBYOK is the voltage derived from the standby power from the mains adapter or the network. It is used to indicate if the amplifier can be turned back on after it is powered down.

DISASSEMBLY/ASSEMBLY PROCEDURES

Note: In order to test the ACM-1 Amplifier Control Module, you must first remove the standard input module that is supplied by the factory from the rear of the amplifier.

1. Input Module Removal

1.1 Use a phillips-head screwdriver to remove the two screws from the input module connector panel. The input module is located on the rear of the amplifier. See Figure 3.

1.2 Pull the input module partially out of the chassis.

1.3 Disconnect the amplifier ribbon cable from the input module J1 connector.



Figure 3. Input Module Screw Removal

Note: Before installing the ACM-1 module into the amplifier, you must set the switches on the ACM-1 to the default settings.

Default switch settings:

On the ACM-1 Module, place the Input Mode Switch SW1 to the NORMAL (center) position. Place the HF/Full Range Switch SW2 to the FULL (right) position. See Figure 4.

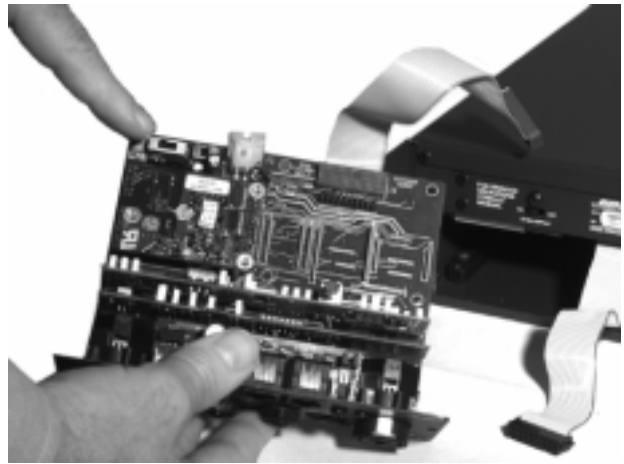


Figure 4. ACM-1 Default Switch Settings

Note: DO NOT install any EQ cards into the ACM-1 module that may have been installed in the standard input module. Installing these cards will change the response of the ACM-1 and make the tests invalid.

2. ACM-1 Module Installation

2.1 Connect the ribbon cable from the J8 connector of the ACM-1 to the J2 connector located on the I/O board of the amplifier. This connector is fairly difficult to insert. Pin 1 (red stripe) of the ribbon cable is to the right. See Figure 5.



Figure 5. Amplifier Ribbon Cable Connector Location (ACM-1 J8 to amplifier J2)

DISASSEMBLY/ASSEMBLY PROCEDURES

2.2 Connect the amplifier's ribbon cable to the ACM-1 module J1 connector. Pin 1 (red stripe) of the ribbon cable is to the right. See Figure 6.

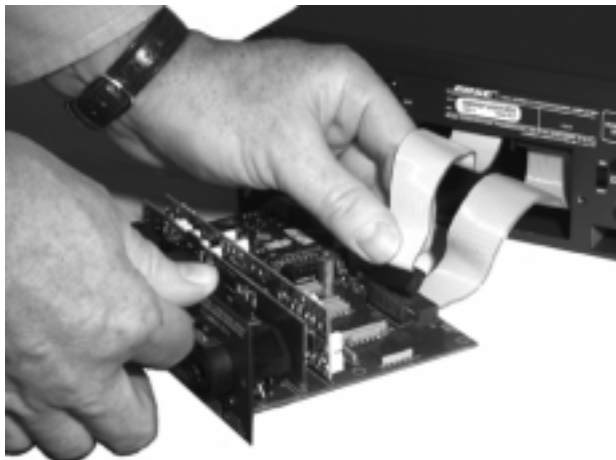


Figure 6. ACM-1 J1 Ribbon Cable Connection

2.3 Slide the ACM-1 module into the chassis slot until the module's J2 connector is completely seated into the amplifier two-pin harness connector. The module should be flush with the chassis back panel.

2.4 Secure the ACM-1 module to the amplifier chassis with two screws using a phillips-head screwdriver.

Note: The ACM-1 Module will not operate properly unless at least one screw is used to secure it to the amplifier. The faceplate of the ACM-1 is used to provide a ground connection to the amplifier.

3. ACM-1 Module Removal

3.1 Use a phillips-head screwdriver to remove the two screws from the ACM-1 module connector panel.

3.2 Pull the input module partially out of the chassis.

3.3 Disconnect the amplifier's ribbon cable from the input module's J1 connector.

3.4 Disconnect the ACM-1's ribbon cable from the amplifier's J2 connector.

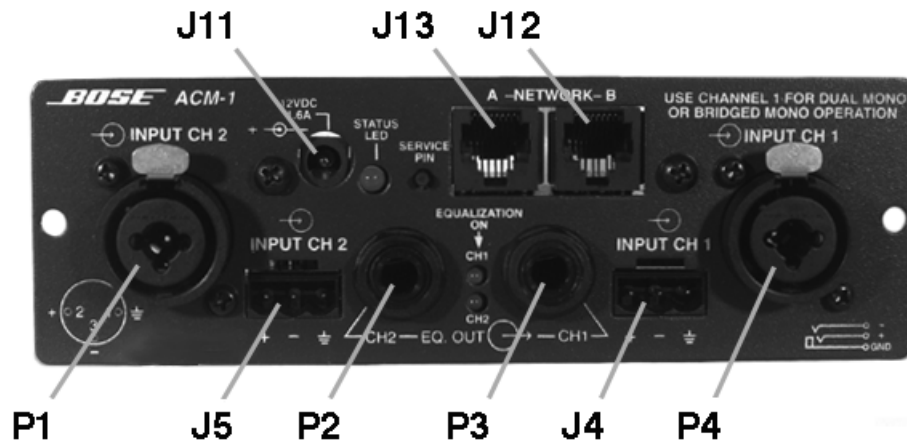
4. Input Module Replacement

4.1 Connect the amplifier's ribbon cable to the input module connector at J1. Pin 1 (red stripe) of the ribbon cable is to the right.

4.2 Slide the input module into the chassis slot until the input module J2 connector is completely seated into the amplifier's two-pin harness connector. The input module should be flush with the chassis back panel.

4.3 Secure the input module to the amplifier chassis with the two screws using a phillips-head screwdriver.

TEST PROCEDURES



Function	PCB Location	Type of Connection
Source Input Ch. 1	P4	Balanced TRS; tie LO to ring, tie HI to tip, tie ground to sleeve.
Source Input Ch. 2	P1	Balanced TRS; tie LO to ring, tie HI to tip, tie ground to sleeve.
Source Input Ch. 1 (Euro)	J4	Three position connector; tie LO to -, tie HI to +, tie ground to GND.
Source Input Ch. 2 (Euro)	J5	Three position connector; tie LO to -, tie HI to +, tie ground to GND.
External Power Supply (PS71)	J11	Co-axial; connect LO (gnd) to sleeve, connect HI (12VAC) to tip.
LonWorks® Network Connector (for monitoring and control)	J12 or J13	RJ45; use standard CAT-5 network cable with crimped RJ45 connectors.
EQ Output Ch. 1	P3	Balanced TRS; tie LO to ring, tie HI to tip, tie ground to sleeve.
EQ Output Ch. 2	P2	Balanced TRS; tie LO to ring, tie HI to tip, tie ground to sleeve.

Table 1. ACM-1 Input, Output, and Power Connections

Test Setup Parameters

- In order to be able to perform these tests, you will need the following:
 - A Microsoft® Windows® compatible computer with at least 40Mbytes of hard disk space, 32Mbytes of RAM and a CD ROM drive.
 - Bose® Entero™ software (CD ROM)
 - Windows 95 or Windows NT 4.0.
 - Network Interface Card, such as the Echelon PCNSI for desktops or the PCC-10 for laptops.
 - The Echelon LNS (LonWorks® Network Services) software must be installed on the computer you are using for testing. This enables management of the

LonWorks database and direct communication with nodes on the network.

- Bose 1600VI or 1800VI power amplifier.
- Bose PS71 external power supply as listed in Table 2 below.

Power Supply	Bose Part Number
UL 120 VAC	178371
230V Euro	178375
230V UK/Singapore	178374
240V Australia	178373
100V Japan	178372

Table 2. PS71 Power Supply List

TEST PROCEDURES

Test Setup Parameters (continued)

2. Default switch settings: On the ACM-1 Module, place the Input Mode Switch SW1 to the NORMAL (center) position.

Place the HF/Full Range Switch SW2 to the FULL (right) position. See Figure 7.

On the amplifier rear panel, place the Level Defeat Switch to the ENABLED (on) position. This disables the volume controls on the amplifier front panel.

Place the Clipping Eliminator Switch to the DISABLED (off) position, and the Power Switch to the STANDBY position. See Figure 8.

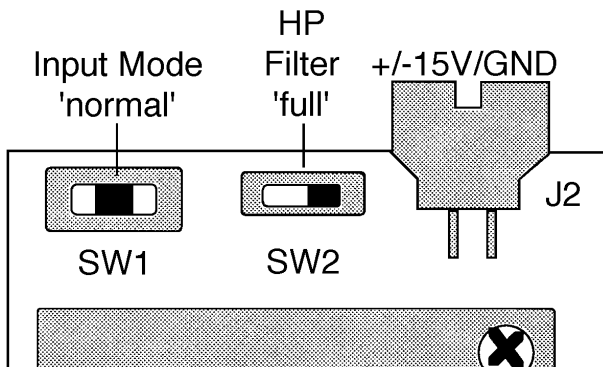


Figure 7. ACM-1 Switch Settings

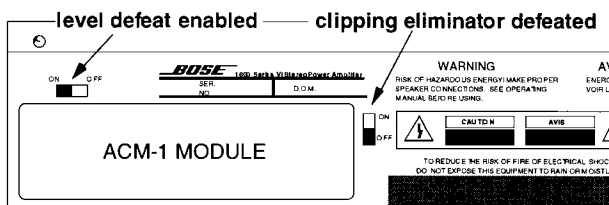


Figure 8. Amplifier Rear Panel Switch Settings

Note: If the Power Switch on the front panel of the amplifier is not in the STANDBY position, you will not be able to control the amplifier using the network.

Note: If there are any EQ PCBs installed in the ACM-1 at J6 or J7, be sure to remove them before testing.

3. Install the ACM-1 Module into the rear of the amplifier using Disassembly/ Assembly procedures 1 & 2.

4. Connect the PS71 external power supply to an AC Mains connection and to the Standby Power connector at J11 on the ACM-1 Module. This will provide power to allow the module to be controlled by the network before the amplifier is powered up.

5. Connect the CAT-5 network cable between the network interface card located in the computer and the ACM-1 module.

6. Four signal paths are used during testing. They are as follows:

- Source Input Ch.1 to EQ output Ch.1.
- Source Input Ch.2 to EQ output Ch.2.
- Source Input Ch.1 to amp output Ch.1.
- Source Input Ch.2 to amp output Ch.2.

7. For each signal path there are two basic input/output terminations to be used.

- Noise Test Termination - Noise is measured in a bandwidth of 20 Hz to 22 kHz with no weighting function. The source inputs (+ and -) are not to be driven with signal, but terminated with 50 Ohms. Power amplifier outputs are measured across an 8 Ohm, 500 Watt load connected across the outputs. The EQ outputs of the ACM-1 are measured across a 10 kOhm load terminating the unbalanced outputs (each leg to ground).
- Gain, Response and Distortion Test Termination - The inputs are to be driven from a 50 Ohm source. EQ outputs are measured across a 10 kOhm load terminating the unbalanced outputs. Power amplifier outputs are measured across an 8 Ohm, 500 Watt load connected across the outputs.

TEST PROCEDURES

Adding a Bose® 1600VI or 1800VI amplifier to a network using the Entero™ software.

1. Install the ACM-1 Amplifier Control Module into the amplifier using Disassembly/Assembly procedures 1 & 2.
2. Connect the network cable to J12 or J14 of the ACM-1.
3. Plug the PS71 standby power supply into J11 of the ACM-1. Connect the power cord of the PS71 to the AC mains.
4. Make all required audio input and output connections.
5. Open the Entero software on the computer screen.
6. Click on the Device Finder tab. You should see all of the previously configured devices (if any) on the left-hand side of the screen.
7. Pull down the Tools menu, scroll down to Add Device, and click the mouse. A dialog box will open with folders listing different types of devices.
8. Double-click on the Amplifiers folder.
9. There will be four files listed to choose from. They are: Bose 1600 Bridge.dev; Bose 1600 Stereo.dev; Bose 1800 Bridge.dev; and Bose 1800 Stereo.dev. Click on the Bose 1600 Stereo.dev or the Bose 1800 Stereo.dev file, according to which amplifier you are using for testing. Click on Open. The device will appear grayed-out on the left-hand side of the screen.
10. Pull down the Tools menu, scroll down to Attach, and click the mouse. You will be prompted to press the service pin switch on the panel of the ACM-1. Press the service pin switch. The device will be added to the database and will no longer be grayed-out.

Electrical Tests

Note: Refer to Figure 9 for the following tests.

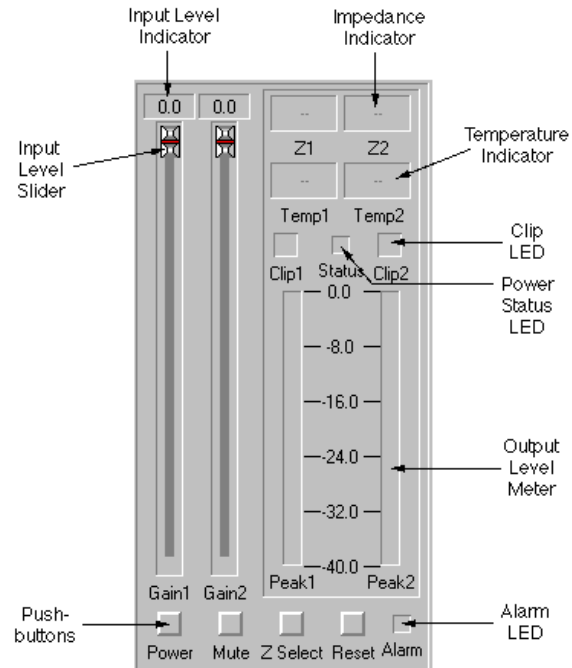


Figure 9. ACM-1 Graphical User Interface Control Panel

1. Network Power Up Test

1.1 Open the Entero software by double-clicking on the icon. When the program opens enter the password, if required, and click OK. Click on the Device Finder tab. The amplifier to be used for the test should be listed in the column on the left. If the amplifier is not listed, refer to the Appendix in the back of this manual for information on how to add and configure it.

1.2 Click on the icon for the amplifier, the controls for the amplifier should appear in the box on the right.

1.3 In the box to the right, you will see several controls for the amplifier. At the bottom left, you will see the Power button. Click on the Power button using the mouse. The amplifier should power up.

TEST PROCEDURES

1.4 Verify that the amplifier powers up, and that on the computer screen, the green status light located in the controls section next to the gain sliders lights green to indicate proper operation of the amplifier.

2. EQ Audio Output Gain Test

2.1 Open the Entero™ software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to -100.0 dB.

2.2 Apply a 1 Vrms, 1 kHz signal to the Channel 1 input of the ACM-1.

2.3 Measure the output level at the Channel 1 ACM-1 EQ output at P3. It should be $0 \text{ dBV} \pm 1 \text{ dB}$.

2.4 Repeat this procedure for Channel 2.

3. EQ Audio Output THD Test

3.1 Open the Entero software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to -100.0 dB.

3.2 Apply a 1 Vrms, 1 kHz signal to the Channel 1 input of the ACM-1.

3.3 Measure the THD level at the Channel 1 ACM-1 EQ output at P3. It should be $0.05\% \pm 0.1\%$.

3.4 Repeat this procedure for Channel 2.

4. EQ Audio Output Noise Test

4.1 Open the Entero software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to -100.0 dB.

4.2 Terminate the ACM-1 Channel 1 audio input at P4 (or J4) with 50 Ohms. Measure the ACM-1 Channel 1 output at P3 across 10k Ohms, terminating each unbalanced output leg to ground.

4.3 Measure the noise level at P3 within a bandwidth of 20 Hz - 22 kHz with no weighting function. It should be $-95 \text{ dBV} \leq -90 \text{ dBV}$.

4.4 Repeat this procedure for Channel 2.

5. Amplifier Output Gain Test

5.1 Open the Entero software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to 0.0 dB.

5.2 Apply a 775 mVrms, 1 kHz signal to the ACM-1 Channel 1 input at P4 (or J4).

5.3 Reference a dB meter to the output.

5.4 Measure the output level at the amplifier channel 1 output. For the 1600VI amplifier, it should be $+27.6 \text{ dB} \pm 1.0 \text{ dB}$ for low sensitivity units and $+33.3 \text{ dB} \pm 1.0 \text{ dB}$ for high sensitivity units. For the 1800VI amplifier, it should be $+30.3 \text{ dB} \pm 1.0 \text{ dB}$ for low sensitivity units and $36.0 \text{ dB} \pm 1.0 \text{ dB}$ for high sensitivity units.

5.5 Repeat this procedure for Channel 2.

TEST PROCEDURES

6. Amplifier Output Relative Gain Tests

6.1 Open the Entero™ software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to 0.0 dB.

6.2 Apply a 100 mV, 1 kHz signal to the ACM-1 Channel 1 input at P4 (or J4).

6.3 Reference a dB meter to the amplifier channel 1 output. This is the reference level.

6.4 Perform the tests in Table 3 below.

Test Name	Freq.	Output
Gain 20 Hz	20 Hz	0 dBr \pm 1.0 dBr
Reference	1 kHz	0 dBr \pm 1.0 dBr
Gain 100 Hz	100 Hz	0 dBr \pm 1.0 dBr
Gain 500 Hz	500 Hz	0 dBr \pm 1.0 dBr
Gain 5 kHz	5 kHz	0 dBr \pm 1.0 dBr
Gain 20 kHz	20 kHz	0 dBr \pm 1.0 dBr

Table 3. Amplifier Output Performance Tests

6.5 Repeat this procedure for Channel 2.

7. Amplifier Output THD Test

7.1 Open the Entero software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to 0.0 dB.

7.2 Apply a 500 mV, 1 kHz signal to the ACM-1 Channel 1 input at P4 (or J4).

7.3 Measure the THD level at the amplifier channel 1 output. It should be $0.05\% \leq 0.2\%$.

7.5 Repeat this procedure for Channel 2.

8. Amplifier Output Noise Test

8.1 Open the Entero software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to 0.0 dB.

8.2 Terminate the ACM-1 Channel 1 audio input at P4 (or J4) with 50 Ohms. Measure the ACM-1 Channel 1 output at P3 across 10k Ohms, terminating each unbalanced output leg to ground.

8.3 Measure the noise level at the amplifier channel 1 output within a bandwidth of 20 Hz - 22 kHz with no weighting function. It should be $-60 \text{ dBV} \leq -55 \text{ dBV}$.

8.4 Repeat this procedure for Channel 2.

9. Voltage Controlled Amplifier Tests

9.1 On the Entero Graphical User Interface Control Panel, set the sliders to -40.0 dB. You can do this by sliding the sliders or by clicking on the box above the slider. A dialog box will open that will allow you to type in the level you want.

9.2 Apply a 775 mVrms, 1 kHz signal to the Channel 1 input of the ACM-1 module.

9.3 Measure the output at the Channel 1 output of the amplifier. For the 1600VI amplifier it should be $-14.25 \text{ dBV} \pm 1.0 \text{ dB}$. For the 1800VI amplifier it should be $-6.4 \text{ dBV} \pm 1.0 \text{ dB}$.

9.4 Repeat this procedure for Channel 2.

TEST PROCEDURES

10. Monitoring Functions Test

10.1 Open the Entero™ software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to 0.0 dB.

10.2 Apply a 200 mVrms, 1 kHz signal to the ACM-1 channel 1 and 2 inputs at P4 and P1. Verify that the GUI Display for Z1 and Z2 reads $8 \text{ Ohms} \pm 1 \text{ Ohm}$.

10.3 While the 200 mVrms, 1 kHz signal is applied, check the GUI display at for Temp1 and Temp2. They should read between 20° C and 60° C , or 68° F and 140° F , depending on how long the amplifier has been operating and what the ambient temperature of the test environment is.

11. Bridged Mono Test

11.1 Place the Amplifier Mode Switch SW1 on the ACM-1 to the BRIDGED position (full left).

11.2 Open the Entero software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to 0.0 dB.

11.3 Apply a 100 mVrms, 1 kHz signal to the ACM-1 Channel 2 input only.

11.4 Measure the output level at the Channel 1 output of the amplifier. For the 1600VI amplifier it should be $7.35 \text{ dBV} \pm 1.0 \text{ dB}$. For the 1800VI amplifier it should be $15.6 \text{ dBV} \pm 1.0 \text{ dB}$.

12. Dual Mono Test

12.1 Place the Amplifier Mode Switch SW1 on the ACM-1 to the DUAL MONO position (full right).

12.2 Open the Entero software on the computer, and select the device finder tab. Click on the icon for the amplifier in the left-hand column. On the right-hand side of the screen, click on the Power button using the mouse. The amplifier should power up. Set the gain slider for the channel under test to 0.0 dB.

12.3 Apply a 100 mVrms, 1 kHz signal to the ACM-1 Channel 2 input only.

12.4 Measure the output level at the Channel 1 output of the amplifier. For the 1600VI amplifier it should be $7.35 \text{ dBV} \pm 1.0 \text{ dB}$. For the 1800VI amplifier it should be $15.6 \text{ dBV} \pm 1.0 \text{ dB}$.

TEST PROCEDURES

Test Cable Construction

If you need to troubleshoot an ACM-1 outside of the amplifier chassis, you will need to make a test cable.


You can do this by unsoldering the 4-pin Molex connector at J2 from the rear of the ACM-1 board and soldering a twisted-pair of wires on to pins 1 and 2. These are the terminals that are the closest to the connector and correspond to the bottom pins of the connector itself. It's recommended to use two different color wires to avoid errors. Refer to the component layout diagram for location.

Solder the other ends of the wires to the corresponding pads on the board. The +15Vdc terminal at J2 pin 2 is tied to D40 and C92. The -15Vdc terminal at J2 pin 1 is tied to D41 and C93. Be sure to solder the wires to the correct terminals or you will destroy the PCB.

This cable will allow you to plug the into the Molex connector in the card slot of the 1600/1800VI amplifier and operate the ACM-1 outside of the amplifier chassis.

Note: Be sure to connect a ground wire from the front panel of the ACM-1 to the chassis of the amplifier. The ACM-1 will not operate without this ground wire.

PART LIST NOTES

1. This part is not normally available from Customer Service. Approval from the Field Service Manager is required before ordering.
2. The individual parts located on the PCBs are listed in the Electrical Part List.
3.  This part is critical for safety purposes. Failure to use a substitute replacement with the same safety characteristics as the recommended replacement part might create shock, fire, and/or other hazards.

MAIN AND PACKAGING PART LIST

ACM-1 Amplifier Control Module (see Figure 10)

Item Number	Description	Part Number	Qty.
1	SCREW, MACH, 6-32X.25, PAN, XREC	107343-04	4
2	MODULE, NEURON, TPFT-10F, ECHELON P/N: 55020-10	193966-01	1
3	CHIP, FLASH, EXTENSOR	193965-01	1
4	PCB ASSY, DAUGHTERBOARD	196387	1
5	PANEL, FRONT	188663	1
6	SCREW, MACH, M3X0.5X5.0, PAN, XREC	183435-05	4
7	PCB ASSY, MOTHERBOARD	196343	1
8	SPACER, HEX, STEEL, 6-32X.5	196392-08	2
9	MANUAL, OWNER'S GUIDE	193962	1
10	CARTON, RSC	VENDOR SUPPLIED	1

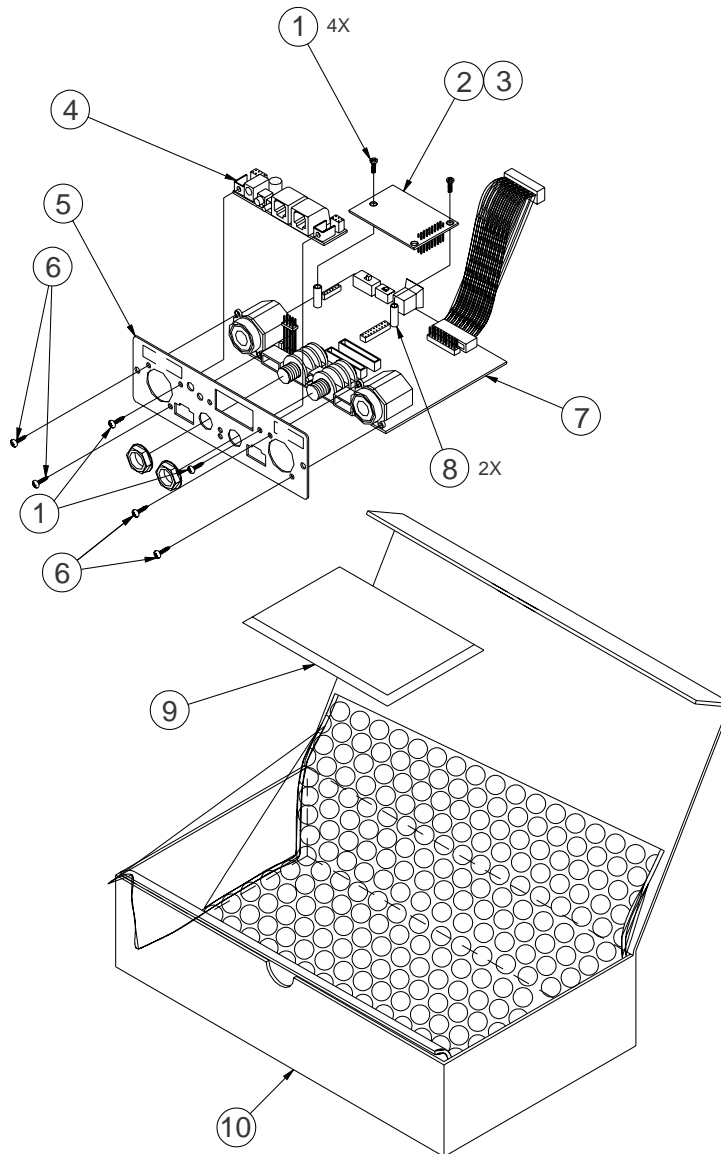


Figure 10. ACM-1 Amplifier Control Module Exploded View

ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	100K, 0805, 1/10W, 1%	133625-1003	
R2	100K, 0805, 1/10W, 1%	133625-1003	
R3	100K, 0805, 1/10W, 1%	133625-1003	
R4	100K, 0805, 1/10W, 1%	133625-1003	
R5	100K, 0805, 1/10W, 1%	133625-1003	
R6	100K, 0805, 1/10W, 1%	133625-1003	
R43	100K, 0805, 1/10W, 1%	133625-1003	
R44	100K, 0805, 1/10W, 1%	133625-1003	
R40	3.16K, 0805, 1/10W, 1%	133625-3161	
R41	3.16K, 0805, 1/10W, 1%	133625-3161	
R42	3.16K, 0805, 1/10W, 1%	133625-3161	
R45	JUMPER CHIP, 0805	133627	
R47	JUMPER CHIP, 0805	133627	
R60	392K, 0805, 1/10W, 1%	133625-3923	
R61	392K, 0805, 1/10W, 1%	133625-3923	
R62	392K, 0805, 1/10W, 1%	133625-3923	
R63	392K, 0805, 1/10W, 1%	133625-3923	
R70	12.1Ω, 0805, 1/10W, 1%	133625-12R1	
R76	330K, 0805, 1/10W, 5%	133626-3345	
R77	330K, 0805, 1/10W, 5%	133626-3345	
R78	330K, 0805, 1/10W, 5%	133626-3345	
R79	330K, 0805, 1/10W, 5%	133626-3345	
R80	1.0K, 0805, MF, 1%	181896-1001	
R81	1.0K, 0805, MF, 1%	181896-1001	
R82	1.0K, 0805, MF, 1%	181896-1001	
R83	1.0K, 0805, MF, 1%	181896-1001	
R98	1.0K, 0805, MF, 1%	181896-1001	
R90	4.99K, 0805, 1/10W, 1%	133625-4991	
R91	4.99K, 0805, 1/10W, 1%	133625-4991	
R92	100K, 0805, 1/10W, 1%	133625-1003	
R93	100K, 0805, 1/10W, 1%	133625-1003	
R94	4.22K, 0805, 1/10W, 1%	173767-4221	
R95	4.22K, 0805, 1/10W, 1%	173767-4221	
R97	5.10K, 0805, 1/10W, 1%	133626-5125	
R96	332Ω, 0805, 1/10W, 1%	173767-332R	
R99	330K, 0805, 1/10W, 5%	133626-3345	
R101	330K, 0805, 1/10W, 5%	133626-3345	
R100	33.2K, 0805, 1/10W, 1%	173767-3322	
R102	33.2K, 0805, 1/10W, 1%	173767-3322	
N1	10K, RES NET, 1/10W, 2%, X4	196347-1002	
N2	10K, RES NET, 1/10W, 2%, X4	196347-1002	
N3	10K, RES NET, 1/10W, 2%, X4	196347-1002	
N4	10K, RES NET, 1/10W, 2%, X4	196347-1002	
N5	2.7K, RES NET, 1/10W, 2%, X4	196347-2701	
N24	2.7K, RES NET, 1/10W, 2%, X4	196347-2701	
N6	10K, RES NET, 1/10W, 2%, X3	196346-1002	
N9	10K, RES NET, 1/10W, 2%, X3	196346-1002	
N7	20K, RES NET, 1/10W, 2%, X5	196345-2002	
N8	20K, RES NET, 1/10W, 2%, X5	196345-2002	
N10	200Ω, RES NET, 1/10W, 2%, X4	196347-2000	
N11	200Ω, RES NET, 1/10W, 2%, X4	196347-2000	
N12	47K, RES NET, 1/10W, 2%, X4	196347-4702	

ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
N13	47K, RES NET, 1/10W, 2%, X4	196347-4702	
N14	100K, RES NET, 1/10W, 2%, X4	196347-1003	
N15	100K, RES NET, 1/10W, 2%, X4	196347-1003	
N16	5.00K, RES NET, 1/10W, 0.1%, X8	181482-5001	
N17	5.00K, RES NET, 1/10W, 0.1%, X8	181482-5001	
N18	5.00K, RES NET, 1/10W, 0.1%, X8	181482-5001	
N19	5.00K, RES NET, 1/10W, 0.1%, X8	181482-5001	
N20	470Ω, RES NET, 1/10W, 2%, X4	196347-4700	
N21	470Ω, RES NET, 1/10W, 2%, X4	196347-4700	
N22	470Ω, RES NET, 1/10W, 2%, X4	196347-4700	
N23	470Ω, RES NET, 1/10W, 2%, X4	196347-4700	

Capacitors

Reference Designator	Description	Part Number	Note
C2	1000pF, 0805, COG, 50V, 5%	133622-102	
C3	16pF, 0805, COG, 50V, 5%	133622-160	
C4	16pF, 0805, COG, 50V, 5%	133622-160	
C5	330pF, 0805, COG, 50V, 5%	133622-331	
C6	330pF, 0805, COG, 50V, 5%	133622-331	
C7	330pF, 0805, COG, 50V, 5%	133622-331	
C8	330pF, 0805, COG, 50V, 5%	133622-331	
C10	5600pf, 1206, COG, 50V, 5%	177214-562	
C11	5600pf, 1206, COG, 50V, 5%	177214-562	
C14	.01uF, 0805, X7R, 50V, 10%	133623-103	
C15	.01uF, 0805, X7R, 50V, 10%	133623-103	
C16	.01uF, 0805, X7R, 50V, 10%	133623-103	
C22	1uF, 1206, Y5V, 16V, 80%	173383-105	
C23	1uF, 1206, Y5V, 16V, 80%	173383-105	
C24	1uF, 1206, Y5V, 16V, 80%	173383-105	
C25	1uF, 1206, Y5V, 16V, 80%	173383-105	
C26	1uF, 1206, Y5V, 16V, 80%	173383-105	
C27	1uF, 1206, Y5V, 16V, 80%	173383-105	
C28	1uF, 1206, Y5V, 16V, 80%	173383-105	
C29	1uF, 1206, Y5V, 16V, 80%	173383-105	
C30	47 pF, 0805, COG, 50V, 5%	133622-470	
C31	47 pF, 0805, COG, 50V, 5%	133622-470	
C32	2.2 uF, EL, 85, 50V, 20%	149947-2R2H	
C33	2.2 uF, EL, 85, 50V, 20%	149947-2R2H	
C34	2.2 uF, EL, 85, 50V, 20%	149947-2R2H	
C35	2.2 uF, EL, 85, 50V, 20%	149947-2R2H	
C36	2.2 uF, EL, 85, 50V, 20%	149947-2R2H	
C37	2.2 uF, EL, 85, 50V, 20%	149947-2R2H	
C42	1.0 uF, EL, 85, 50V, 20%	149948-1R0H	
C43	.10uF, 0805, Y5V, 25V, 80%	133624	
C45	.10uF, 0805, Y5V, 25V, 80%	133624	
C47	.10uF, 0805, Y5V, 25V, 80%	133624	
C49	.10uF, 0805, Y5V, 25V, 80%	133624	
C50	.10uF, 0805, Y5V, 25V, 80%	133624	
C51	.10uF, 0805, Y5V, 25V, 80%	133624	
C52	.10uF, 0805, Y5V, 25V, 80%	133624	

ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C54	.10uF, 0805, Y5V, 25V, 80%	133624	
C55	.10uF, 0805, Y5V, 25V, 80%	133624	
C56	.10uF, 0805, Y5V, 25V, 80%	133624	
C57	.10uF, 0805, Y5V, 25V, 80%	133624	
C58	.10uF, 0805, Y5V, 25V, 80%	133624	
C59	.10uF, 0805, Y5V, 25V, 80%	133624	
C60	.10uF, 0805, Y5V, 25V, 80%	133624	
C61	.10uF, 0805, Y5V, 25V, 80%	133624	
C62	.10uF, 0805, Y5V, 25V, 80%	133624	
C63	.10uF, 0805, Y5V, 25V, 80%	133624	
C65	.10uF, 0805, Y5V, 25V, 80%	133624	
C66	.10uF, 0805, Y5V, 25V, 80%	133624	
C67	.10uF, 0805, Y5V, 25V, 80%	133624	
C71	.10uF, 0805, Y5V, 25V, 80%	133624	
C44	330 uF, EL, 85, 25V, 20%	149948-331E	
C92	100 uF, EL, 105, 50V, 20%	144000-101H	
C93	100 uF, EL, 105, 50V, 20%	144000-101H	

Diodes

Reference Designator	Description	Part Number	Note
D1	DUAL, SOT-23, BAV 99R-R	147239	
D2	DUAL, SOT-23, BAV 99R-R	147239	
D3	DUAL, SOT-23, BAV 99R-R	147239	
D4	DUAL, SOT-23, BAV 99R-R	147239	
D5	DUAL, SOT-23, BAV 99R-R	147239	
D6	DUAL, SOT-23, BAV 99R-R	147239	
D7	DUAL, SOT-23, BAV 99R-R	147239	
D8	DUAL, SOT-23, BAV 99R-R	147239	
D9	DUAL, SOT-23, BAV 99R-R	147239	
D10	DUAL, SOT-23, BAV 99R-R	147239	
D11	DUAL, SOT-23, BAV 99R-R	147239	
D12	DUAL, SOT-23, BAV 99R-R	147239	
D13	DUAL, SOT-23, BAV 99R-R	147239	
D14	DUAL, SOT-23, BAV 99R-R	147239	
D15	DUAL, SOT-23, BAV 99R-R	147239	
D16	DUAL, SOT-23, BAV 99R-R	147239	
D17	DUAL, SOT-23, BAV 99R-R	147239	
D18	DUAL, SOT-23, BAV 99R-R	147239	
D19	DUAL, SOT-23, BAV 99R-R	147239	
D20	DUAL, SOT-23, BAV 99R-R	147239	
D30	AXIAL, 500V, 35A, 1N4004	146515-4	
D31	AXIAL, 500V, 35A, 1N4004	146515-4	
D32	AXIAL, 500V, 35A, 1N4004	146515-4	
D40	ZENER, 18V, 1W, 5%, 1N4746	116995-4746A	
D41	ZENER, 18V, 1W, 5%, 1N4746	116995-4746A	
D42	ZENER, .5W, 12V	174265-5242	
D43	ZENER, .5W, 12V	174265-5242	
D50	DIODE, LED, DUAL GREEN	196355	
D51	DIODE, LED, LUMEX, SINGLE	196356	

ELECTRICAL PART LIST

Transistors

Reference Designator	Description	Part Number	Note
Q1	BPLR, P, 40V, 200mA, SOT23	148596	
Q2	BPLR, N, 40V, 200mA, SOT23	146819	
Q3	BPLR, N, 40V, 200mA, SOT23	146819	
Q4	BPLR, N, 40V, 200mA, SOT23	146819	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	OP-AMP, QUAD, SOIC-14, NJM2059	187472	
U2	OP-AMP, QUAD, SOIC-14, NJM2059	187472	
U3	OP-AMP, QUAD, SOIC-14, NJM2059	187472	
U4	OP-AMP, QUAD, SOIC-14, NJM2059	187472	
U5	OP-AMP, QUAD, SOIC-14, NJM2059	187472	
U6	OP-AMP, DUAL, SOIC-8, NJM4559	187473	
U7	OP-AMP, DUAL, SOIC-8, NJM4559	187473	
U8	OP-AMP, DUAL, SOIC-8, NJM4559	187473	
U9	ADC, 10 BIT / 8 IN, ADC1038, SO20	196360	
U10	OP-AMP SWITCH, SOIC-8, NJM2120	187474	
U11	OP-AMP SWITCH, SOIC-8, NJM2120	187474	
U12	OP-AMP SWITCH, SOIC-8, NJM2120	187474	
U13	OP-AMP SWITCH, SOIC-8, NJM2120	187474	
U14	VOL CTL, ST, TC9412AF	196350	
U15	OP-AMP, SSM2141S, SOIC-8	196348	
U16	OP-AMP, SSM2141S, SOIC-8	196348	
U17	MUX, 2X4IN/1OUT, CD4052BCM, SO16	196351	
U18	REG, ISOPKG, +5V, L7805CP, TO220	196361	
U20	TEMP SENSOR, LM50C1M3, SOT23	196352	
U21	NAND, DUAL 2 IN NAND, SMD, MM74HC00M	186065	

ELECTRICAL PART LIST

Miscellaneous

Reference Designator	Description	Part Number	Note
J1	CONN, 10X2 ROWS, .1 GRID, MALE	196364	
J2	CONN, MOLEX, PCB MT, 4 PIN	196365	
J3A	CONN, HEADER, W/ SPACER, 8 PIN	196359	
J3B	CONN, HEADER, BTM INSERT, 4x2 PIN GRID	196358	
J4	CONN, RTANG, 3 POS, BLK	177291-03	
J5	CONN, RTANG, 3 POS, BLK	177291-03	
J6	CONN, TOP ENTRY, 12 POS	170250	
J7	CONN, TOP ENTRY, 12 POS	170250	
J8	CABLE, RIBBON, 20 PIN	196366	
J9	CONN, SOCKET, PCB MNT	196367	
J10	CONN, SOCKET, PCB MNT	196368	
J11	CONN, DC PWR JACK, 1 POS, FEMALE	147540	
J12	CONN, RJ45, PCB MNT, AMP 520251-4 OR EQUIV.	196357	
J13	CONN, RJ45, PCB MNT, AMP 520251-4 OR EQUIV.	196357	
JB1	CONN, JUMPER BLOCK, 3x2 ROW, .1 GRID	196369	
P1	CONN. DUAL, XLR/ 1/4 PLUG	196363	
P4	CONN. DUAL, XLR/ 1/4 PLUG	196363	
P2	CONN, TRS, 1/4, PCB MT	196349	
P3	CONN, TRS, 1/4, PCB MT	196349	
S1	SCREW TERM, PCB HORIZ, 6-32	187504	
S2	SCREW TERM, PCB HORIZ, 6-32	187504	
SW1	2P3T, E SW EG2301	196353	
SW2	2P2T, E SW EG2209A	196354	
SW3	SPST, PB, PCB MNT, HRZ GRID	196362	
-	JUMPER, SHORTING, GOLD, SULLINS P/N SSC02SYAN	-	

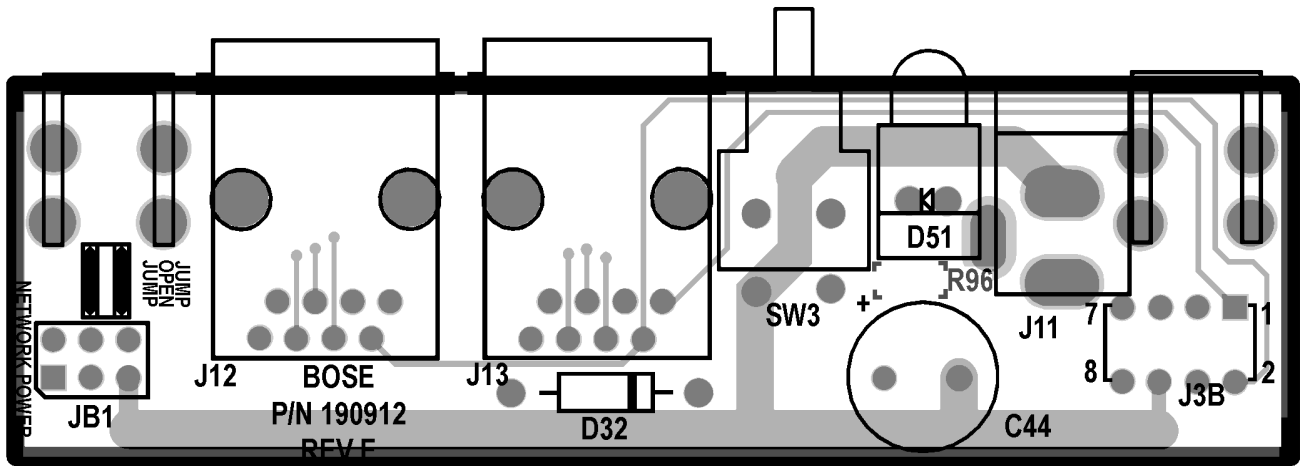


Figure 11. Daughterboard Topside Etch Layout Diagram

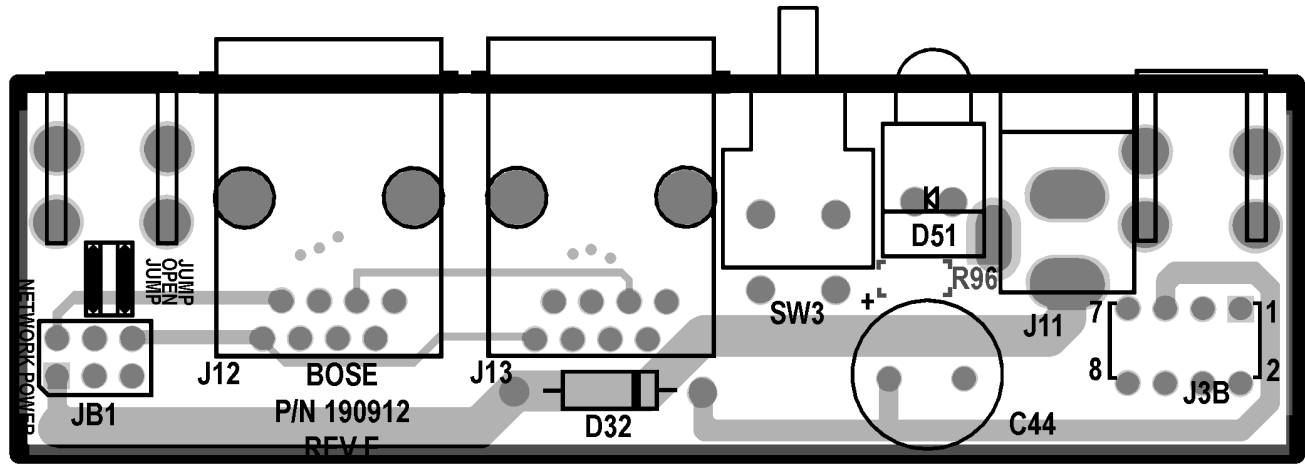


Figure 12. Daughterboard Internal Etch Layout Diagram

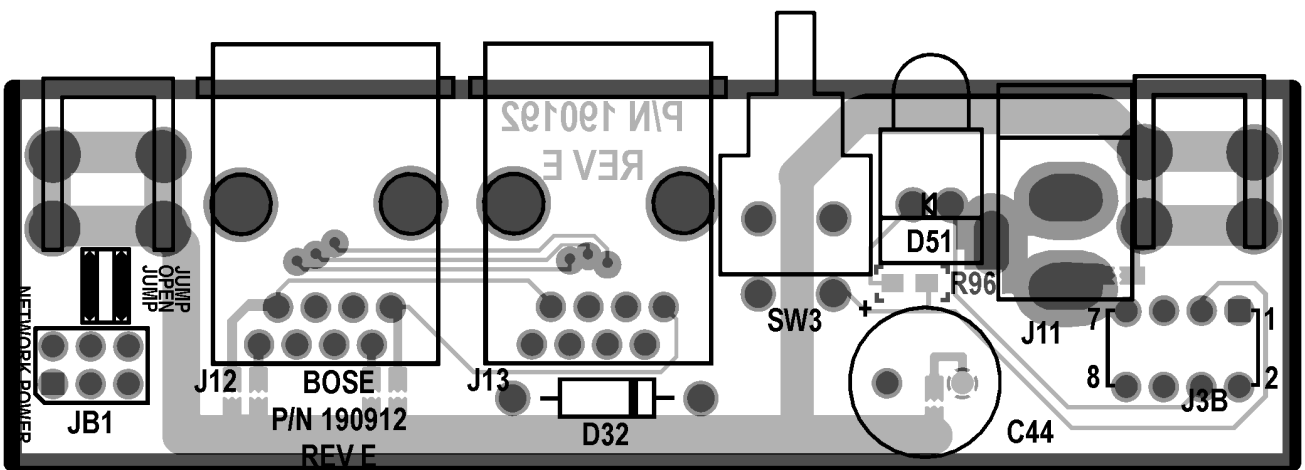
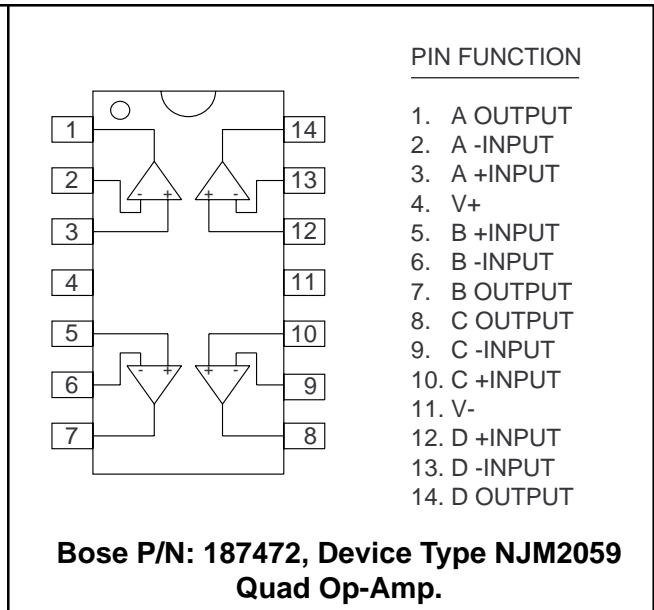
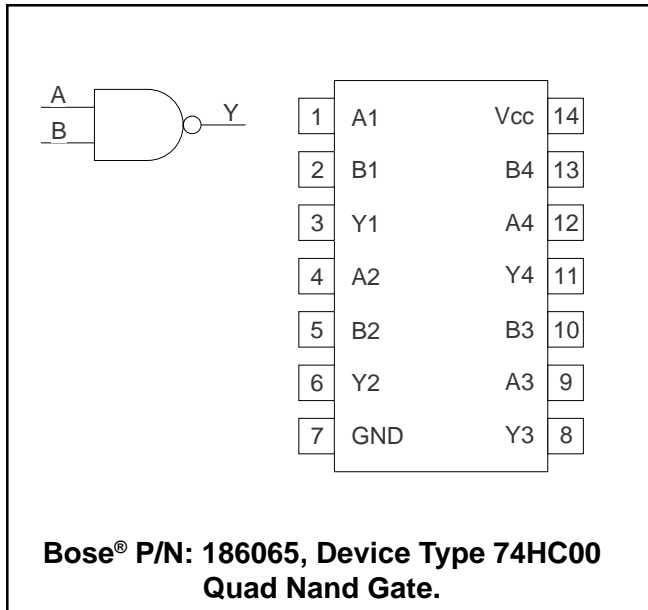


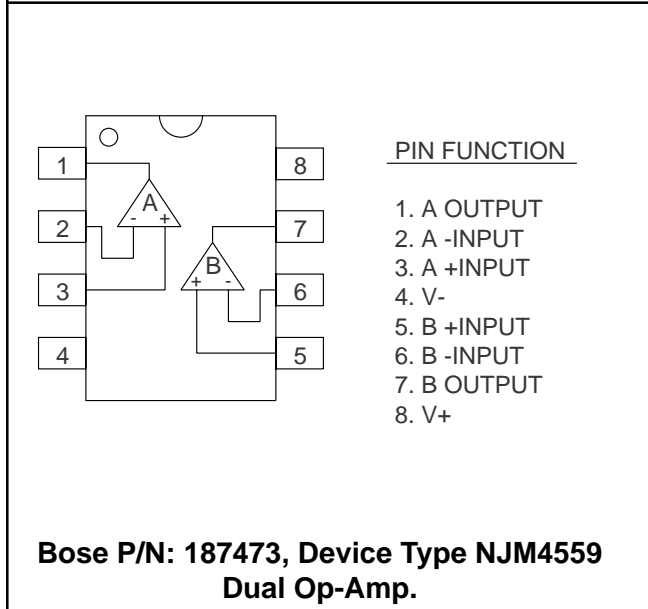
Figure 13. Daughterboard Bottom Etch Layout Diagram

INTEGRATED CIRCUIT PINOUT DIAGRAMS



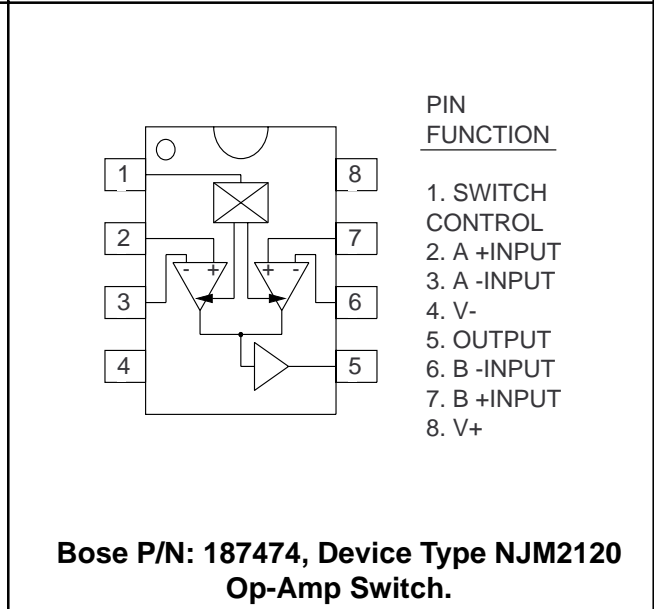
PIN FUNCTION

1. A OUTPUT
2. A -INPUT
3. A +INPUT
4. V+
5. B +INPUT
6. B -INPUT
7. B OUTPUT
8. C OUTPUT
9. C -INPUT
10. C +INPUT
11. V-
12. D +INPUT
13. D -INPUT
14. D OUTPUT



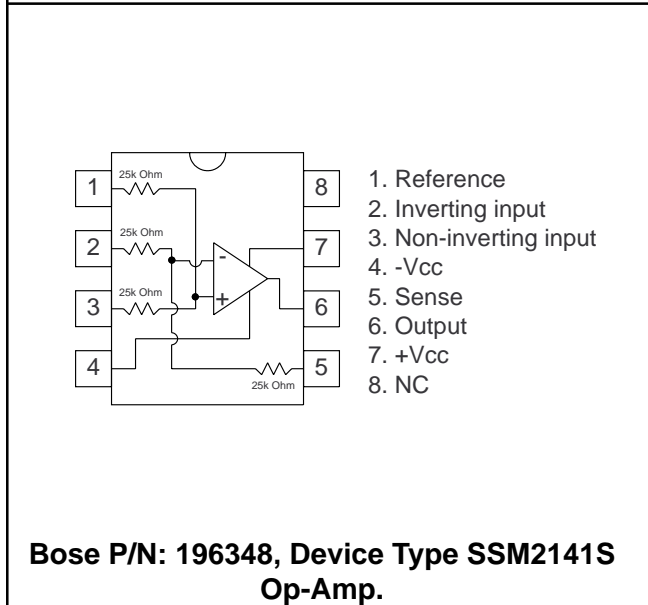
PIN FUNCTION

1. A OUTPUT
2. A -INPUT
3. A +INPUT
4. V-
5. B +INPUT
6. B -INPUT
7. B OUTPUT
8. V+

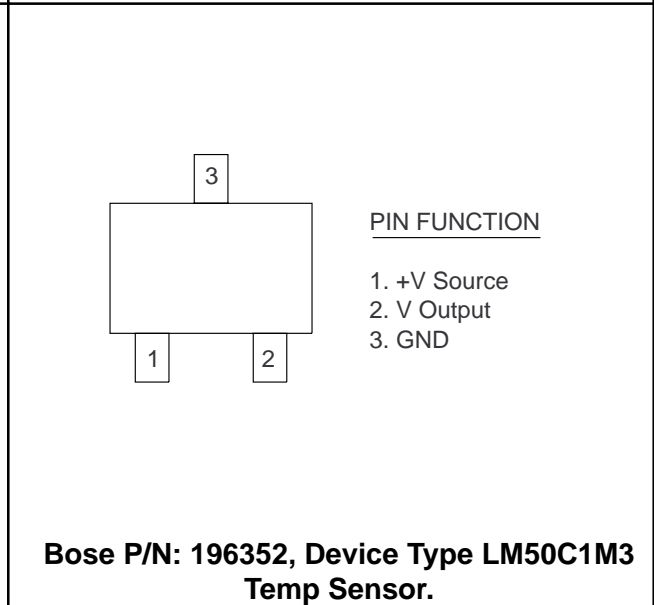


PIN FUNCTION

1. SWITCH CONTROL
2. A +INPUT
3. A -INPUT
4. V-
5. OUTPUT
6. B -INPUT
7. B +INPUT
8. V+



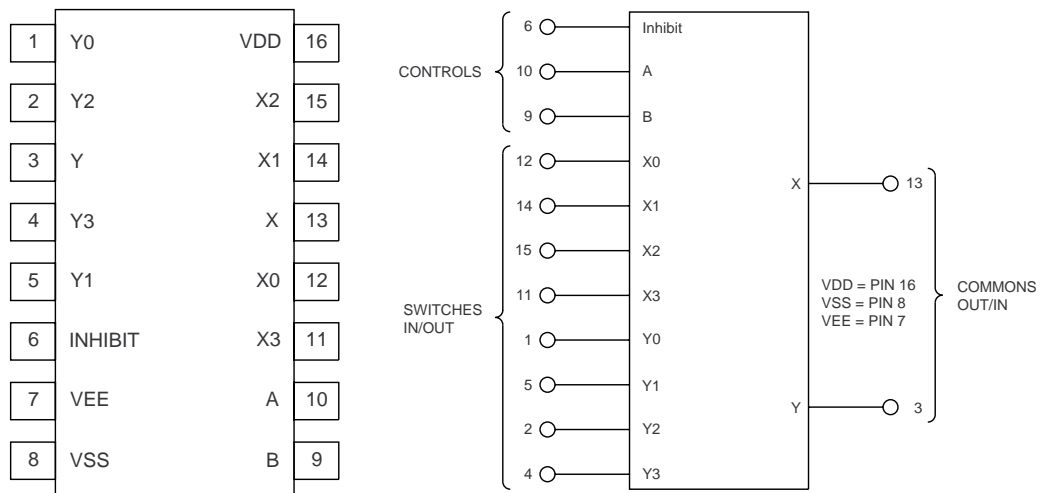
1. Reference
2. Inverting input
3. Non-inverting input
4. -Vcc
5. Sense
6. Output
7. +Vcc
8. NC



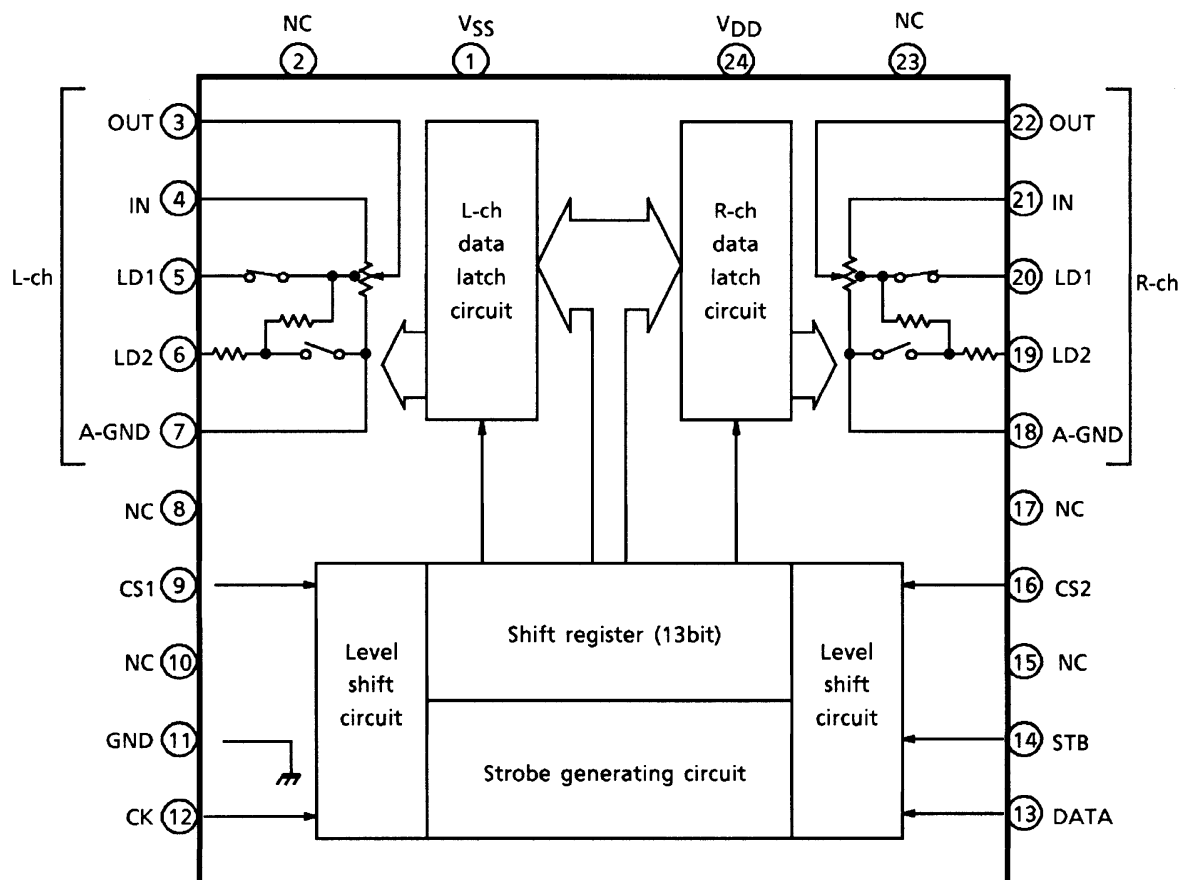
PIN FUNCTION

1. +V Source
2. V Output
3. GND

INTEGRATED CIRCUIT PINOUT DIAGRAMS

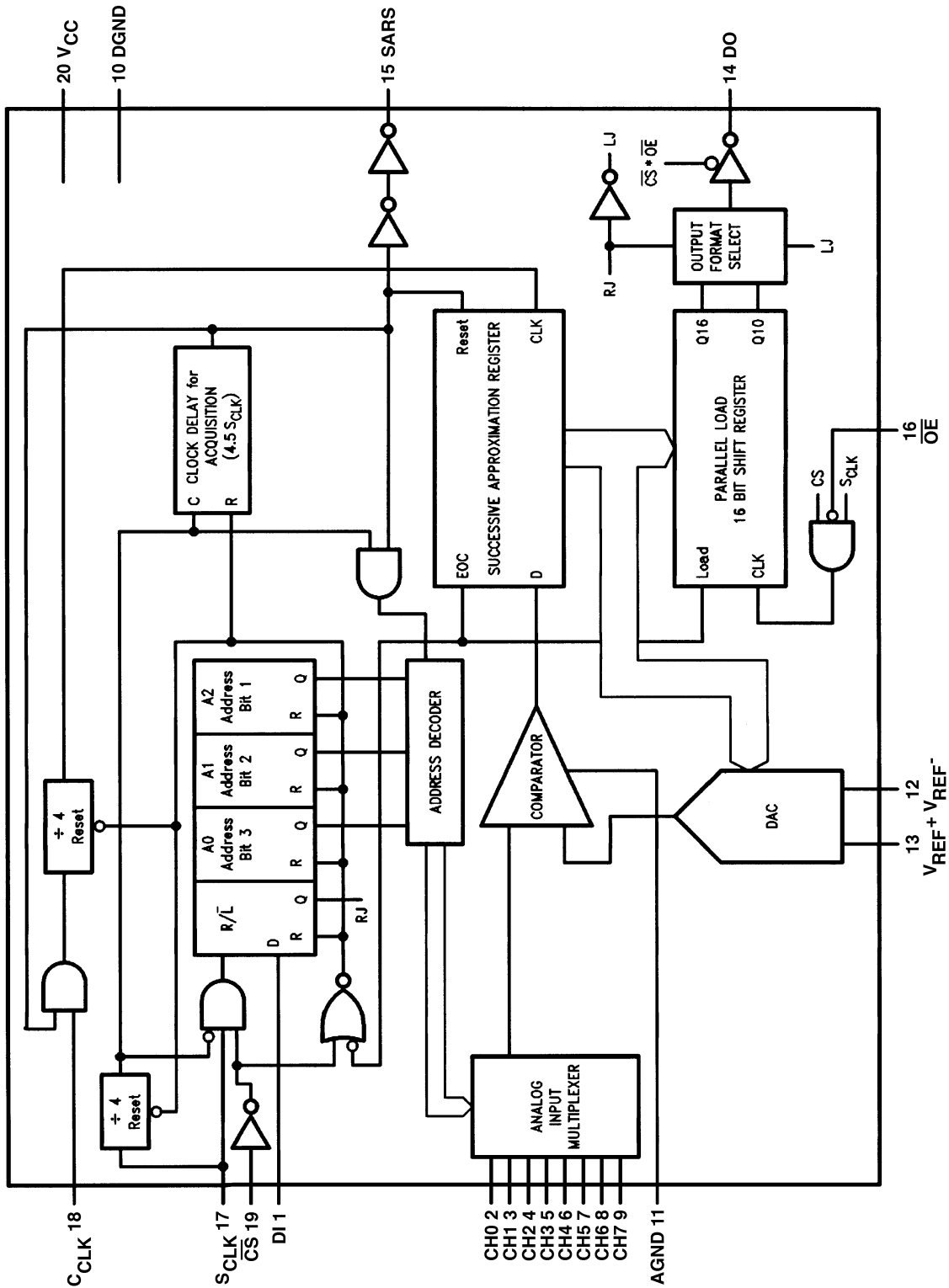


Bose® P/N: 196351, Device Type CD4052 2x4 in/ 1 Out Multiplexer



Bose P/N: 196350, Device Type TC9412AF Volume Control

INTEGRATED CIRCUIT PINOUT DIAGRAMS



Bose® P/N: 196360, Device Type ADC1038 10-Bit Analog to Digital Converter with Analog Multiplexer and Track/Hold Function.

SPECIFICATIONS AND FEATURES SUBJECT TO CHANGE WITHOUT NOTICE

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