AMX BROADCAST OPERATIONS CONSOLE TECHNICAL MANUAL

1.0 GENERAL INFORMATION

This chapter contains an introduction to the AMX Broadcast Operations Console Technical Manual, an overview of the AMX's features, its specifications and warranty information.

1.1 INTRODUCTION

Congratulations on your decision to join the growing ranks of Pacific Research & Engineering (PR&E) broadcasters. PR&E is in the business of supplying the finest audio systems to the world's leading broadcast facilities. Your decision to go with PR&E means that you expect more than simple working hardware. Please be assured that it is our strong desire to provide each of our customers with the kind of products, systems, documentation and support that we would specify if we were in your position.

We invite your comments and suggestions for improvement of this document, and of all our services. By constant attention to our customer's needs, we will continue to earn our reputation for excellence, and to refine our understanding of the requirements of the marketplace.

This manual is designed to provide the information required to understand, install, operate and maintain the AMX Broadcast Operations console. It is assumed that the reader has a working knowledge of audio control consoles, systems and installation practices. The AMX console is a very sophisticated device with an extensive range of features and capabilities. To obtain the maximum benefit of the console's capabilities, it is strongly recommended that the Installation, Operation, and Equipment Description chapters of this manual be read thoroughly prior to installing the console.

Each AMX is specifically configured to the customer's requirements, thoroughly tested, and "burned-in" prior to packing for shipment. Should you encounter any difficulty during installation or initial operation, we recommend that you contact PR&E for assistance.

1.2 DESCRIPTION

The AMX is designed with the capacity to accomplish almost any type of stereo audio control task in a radio broadcast facility. The goal of the design was to break down the past barriers between "air" and "production" applications and develop control consoles which could efficiently handle all contemporary broadcast operations. This design effort resulted in the AMX and ABX series of consoles, which we call "operations" consoles. The AMX series was designed for general broadcast applications including stereo production, while the larger ABX series adds the capability for efficient 4 and 8 channel multi-track tape production.

The AMX is currently being produced in seven mainframe sizes, which will accommodate 10, 14, 18, 22, 26, 30 and 34 input modules. The seven mainframes are virtually identical, with the only difference

being the available space for the meter panel.

In order to realize the full potential of the AMX console, it is important that the user become fully acquainted with the extensive audio and logic control functions available. The console and module block diagrams, located in Chapter 7 of this document, show the audio signal flow and the extensive logic control inputs and outputs which are available to the user. These block diagrams present a concise picture of the modules' operating functions and features as well as the overall console system, and they can be very useful in determining how to best utilize your AMX console.

The AMX console has been designed functionally, mechanically, and electronically to provide the maximum value in performance and features of any currently available broadcast console. Highest quality components and circuit designs are used throughout the console. The gain structure of the console has been designed so that normal operation is easily achieved without any danger of internal clipping (when operating the amplifiers at optimum signal to noise conditions).

The input modules accommodate the range of input levels normally found in broadcast operations, without the use of external pads or amplifiers. A patch point is provided for each input position after the input amplifier and before the fader. This is the optimum point at which to insert external processing devices such as limiters and equalizers. Patch points are also provided for each main output channel (after the mixing amplifier and before the line output amplifiers).

All console inputs and program outputs are balanced, for best noise rejection and simplified system grounding. When properly installed using the information provided in this manual, the AMX console is free of internal pops, clicks, and radio-frequency interference (RFI).

The separately packaged power supply is fully regulated, and is protected with magnetic circuit breakers, as well as electronic safeguards against excessive current and line voltage fluctuations. The power supply provides four separate voltage outputs. Two of these outputs (±22 volts) are used to power the audio circuitry. The third output (+12 volts) is used to power the logic control circuitry, lamps and relays. The fourth output (+48 volts) is for the phantom powering of condenser microphones connected to the Microphone Input Modules.

1.3 SPECIFICATIONS

Following is a list of specifications for the AMX Broadcast Operations Console:

MICROPHONE INPUTS

Source Impedance	150 ohms.
Input Impedance	1000 ohms minimum, balanced.
Input Level Range	Adjustable from -60 dBu to -35 dBu.
Input Headroom	Greater than 30 dB above nominal input.

HIGH LEVEL INPUTS

Source Impedance	600 ohms.
Input Impedance	Greater than 40k ohms, balanced.
Input Level Range:	
Line Input Module	Adjustable from -12 dBu to +8 dBu.
Return Module	Adjustable from -15 dBu to +8 dBu.
Monitor Input Modules	Nominal +4 dBu/+8 dBu.
Input Headroom	Greater than 30 dB above nominal input.

MAIN OUTPUTS

Load Impedance	600 ohms and greater.
Source Impedance	30 ohms, balanced.
Output Level Range	Adjustable from +4 dBu to +8 dBu.
Maximum Output Levels:	
Line Output Amplifiers	+28 dBm, 600 ohm load.
Send Module	+26 dBm, 600 ohm load.

MONITOR OUTPUTS

Main Outputs:	
Load Impedance	600 ohms or greater.
Source Impedance	30 ohms, unbalanced.
Output Level	0 dBu nominal, +20 dBu maximum.
Headphone Outputs:	
Load Impedance	45 ohms or greater.
Source Impedance	Less than 4 ohms.
Output Level	0 dBu nominal, +20 dBu maximum.

PATCH SENDS AND RETURNS

Patch Send Outputs	Nominal -10 dBu; unbalanced.
Patch Return Inputs	Nominal -10 dBu; 40k ohm balanced and bridging.

FREQUENCY RESPONSE

Microphone Input to Program Output	+0 dB, -0.9 dB, 20 Hz to 20 kHz.
Line Input to Program Output	+0 dB, -0.8 dB, 20 Hz to 20 kHz.

NOISE

Microphone Input Amplifier kHz	-127 dBu equivalent input noise, 150 ohm source, 20 bandwidth.
Line Input Amplifier kHz	-88 dBu equivalent input noise, 600 ohm source, 20 bandwidth.
Output Noise with one microphone channel ON, fader at -15 dB, input sensitivity at -50 dBu	76 dB below output, reference +8 dBu, 150 ohm source, 20 kHz bandwidth.
Output Noise with one line channel ON, fader at -15 dB, input sensitivity at +8 dBu	80 dB below output, reference +8 dBu, 600 ohm source, 20 kHz bandwidth.
Output Noise with no input channels ON	82 dB below output, reference +8 dBu, 20 kHz bandwidth.

DISTORTION, T.H.D.

Mic Input to Program Output dBu less	Less than 0.02%, 20 Hz to 20 kHz, -50 dBu input, +8 output into 600 ohm load, 80 kHz meter bandwidth; than 0.01 at 1 kHz, +28 dBu output.
Line Input to Program Output dBu less	Less than 0.008%, 20 Hz to 20 kHz, +8 dBu input, +8 output into 600 ohm load, 80 kHz meter bandwidth; than 0.01 at 1 kHz, +28 dBu output.

DISTORTION, I.M.D.

Mic Input to Program Output 600	Less than 0.008 %, -50 dBu input, +8 dBu output into ohm load; less than 0.01% at +28 dBu output.
Line Input to Program Output 600	Less than 0.005 %, +8 dBu input, +8 dBu output into ohm load; less than 0.01% at +28 dBu output.

CROSSTALK

Interchannel crosstalk	Less than -85 dB at 1 kHz; less than -75 dB at 20 kHz.

POWER REQUIREMENTS

120 VAC, ±8%, 50/60 Hz

AMX-10, fully configured	360 watts.
AMX-14, fully configured	390 watts.
AMX-18, fully configured	420 watts.
AMX-22, fully configured	450 watts.
AMX-26, fully configured	480 watts.
AMX-30, fully configured	500 watts.
AMX-34, fully configured	520 watts.

NOTES:

A) These specifications are for the basic signal paths, per channel, with either or both channels of a stereo pair operating, and with 600 ohm loads connected to the program outputs.

B) 0 dBu corresponds to an amplitude of 0.775 volts RMS regardless of the impedance of the circuit. It is the same voltage value as 0 dBm measured in a 600 ohm circuit. This enables convenient level measurement with meters calibrated for 600 ohm circuits.

C) Noise specifications are for a 14-input console; larger consoles will have slightly reduced signal to noise ratios due to increased summing amplifier gain. Noise specifications are based upon a 20 kHz measurement bandwidth; the use of a meters with 30 kHz bandwidth will result in a noise measurement increase of approximately 1.7 dB.

Pacific Research & Engineering Corporation reserves the right to change specifications without notice or obligation.

1.4 WARRANTY INFORMATION

This product carries a manufacturer's warranty which is subject to the following guidelines and limitations:

A) Except as expressly excluded hereinafter, Pacific Research & Engineering Corporation ("Seller") warrants equipment of its own manufacture against faulty workmanship or the use of defective materials for a period of one (1) year from date of shipment to Buyer. The liability of the Seller under this Warranty is limited to replacing, repairing or issuing credit (at the Seller's discretion) for any equipment, provided that Seller is promptly notified in writing within five (5) days upon discovery of such defects by Buyer, and Seller's examination of such equipment shall disclose to its satisfaction that such defects existed at the time shipment was originally made by seller, and Buyer returns the defective equipment to Seller's place of business in Carlsbad, California, packaging and transportage prepaid, with return packaging and transportage guaranteed.

B) Equipment furnished by Seller but manufactured by another shall be warranted only to the extent provided by the other manufacturer.

C) Thermal filament devices such as lamps and fuses are expressly excluded from this warranty.

D) The warranty period on equipment or parts repaired or replaced under warranty shall expire upon the expiration date of the original warranty.

E) This Warranty is void for equipment which has been subject to abuse, improper installation, improper operation, improper or omitted maintenance, alteration, accident, negligence (in use, storage, transportation or handling), operation not in accordance with Seller's operation and service instructions, or operation outside of the environmental conditions specified by Seller.

F) This Warranty is the only warranty made by Seller, and is in lieu of all other warranties, including merchantability and fitness for a particular purpose, whether expressed or implied, except as to title and to the expressed specifications contained in this manual. Seller's sole liability for any equipment failure or any breach of this Warranty is as set forth in sub-paragraph A) above; and Seller shall not be liable or responsible for any business loss or interruption, or other consequential damages of any nature whatsoever, resulting from any equipment failure or breach of this warranty.

2.0 INSTALLATION

This chapter provides instruction in the proper installation of the AMX Broadcast Operations Console. Included are sections describing general installation guidelines, cable preparation, mainframe configuration, grounding and shielding, power connection, patch point connection, audio and logic connection, remote control connection, and module internal option switches.

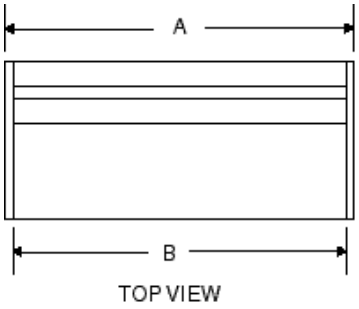
2.1 GENERAL GUIDELINES

The AMX should be carefully unpacked and inspected for any shipping damage. If the inspection reveals any damage, immediately file a claim with the delivering carrier. The packing material should be kept as evidence of mishandling, as well as to allow return of the equipment to the factory, if necessary.

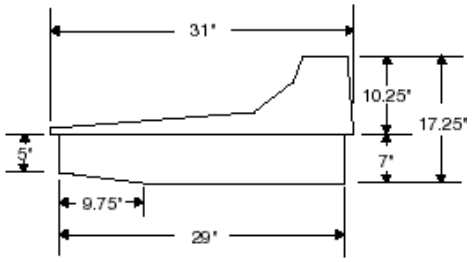
Included with the console are the tool and spare parts kits (reference Sections 6.4 and 6.5), and the appropriate connector kit, which contains all of the Molex connector housings and pins necessary to prepare the audio input/output and logic cables, as described in Section 2.2.

The console mainframe is installed by setting it into a cutout in the work surface of the studio cabinetry (console and cutout dimensions are provided in Figure 2.1). Prior to installing the mainframe, a final check should be made to confirm that the cutout dimensions are correct. Also, be sure that the cabinetry is in its proper position and leveled, as it is unlikely that the cabinetry can be moved, squared or leveled once the weight of the AMX has been added.

NOTE: The cabinetry in which the AMX is to be mounted must be of sufficiently sturdy construction to support the console.



TOP VIEW



SIDE VIEW

DIMENSION TABLE			
CONSOLE	A	B	C
AMX-10	32"	30.5"	30.75"
AMX-14	38"	36.5"	36.75"
AMX-18	44"	42.5"	42.75"
AMX-22	50"	48.5"	48.75"
AMX-26	56"	54.5"	54.75"
AMX-30	62	60.5"	60.75"
AMX-34	68	66.5"	66.75"

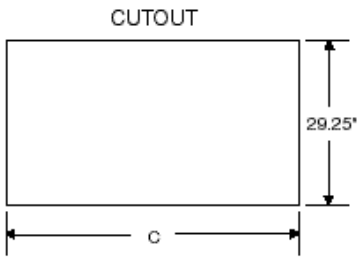


FIGURE 2.1 CONSOLE DIMENSIONS

The console mainframe is supported by the hardwood oak end panels, and is actually suspended between the two end panels, with the front oak piece serving only as trim molding.

NOTE: Care should be taken to avoid locating the console within six feet of any intense electromagnetic hum fields such as are produced by large power transformers and motors. Likewise, cables to and from the console should be routed to achieve maximum practical distance from AC mains power wiring. Particular attention should be paid to some of the low-cost, supposedly "professional", power amplifiers which have appeared in the marketplace. In many cases the low cost has been partially achieved through the use of small core power transformers operating on the edge of saturation. While these units may operate to their own specifications, the electromagnetic fields they radiate may impair the performance of the console, neighboring turntables, tape recorders and cartridge machines.

Signal, logic and power connections are made to the connector panel located at the rear of the console. This panel is recessed to provide the installer flexibility of wire routing in console installation.

The power supply is usually installed in the console support cabinetry using EIA standard rack rails. Adequate ventilation must be provided for the proper dissipation of heat. The power supply is designed for convection cooling by the two massive rectifier/regulator heat sinks located on opposite sides of the chassis. Large heat sinks were chosen over the use of fans to eliminate the problems of dust circulation, noise, and potential mechanical failure associated with fan cooling.

Install legend strips by sliding them into the tops of the legend panels. Monitor legend strips are 0.6 inch wide by 5.16 inches high (15 mm by 131 mm); Remote Line Selector legend strips are 0.6 inch wide by 4.57 inches high (15 mm by 116 mm); Meter Switcher legend strips are 0.6 inch wide by 2.2 inches high (15 mm by 56 mm). Vertical switch spacing is 0.6 inch (15 mm).

2.2 CABLE PREPARATION

Before beginning the installation, a plan should be drawn up showing how the system will be interconnected (use the module pin-out information contained in Section 2.7 as a guide). All cables and connectors should be tagged with numbers and/or legends, and logged.

Only unspliced (preferably new) cables should be used in connecting the mainframe. Audio connections should be made with 2-conductor stranded insulated foil shielded cable with drain wire. The cable used should be equivalent to Belden types 8451, 9451, or 8761.

Strip the cable insulation jacket and foil shield back about 1-1/2 inches, and sleeve the shield drain wire with heat-shrink tubing, leaving about 3/16 inch of the wire exposed. Then, strip the insulation of each signal wire back about 3/16 inch, and sleeve the shield (at cable ends) with heat-shrink tubing.

NOTE: It is very important to sleeve the shield drain wire and the shield (at cable ends) with heat-shrink tubing. This is the only means of assuring an installation according to recommended grounding procedures.

The Molex pins are designed so that the short tab "ears" are crimped onto the stripped wire to make

the electrical connection, while the long “ears” are crimped over the insulated section of the wire to help support the connection.

In order to crimp, insert the short ears of the Molex crimp pin into notch “B” of the crimping tool (PR&E #70-3), with the ears pointing toward the letter “B”. Insert the wire into the terminal so that the stripped portion is between the short crimp ears, and the insulation is between the long crimp ears. Crimp the short ears.

Now place the long ears of the pin into tool notch “A”, with the ears pointing toward the letter “A”. Crimp the long ears over the insulated section of wire. See Figure 2.2 for an example of a properly crimped Molex pin.

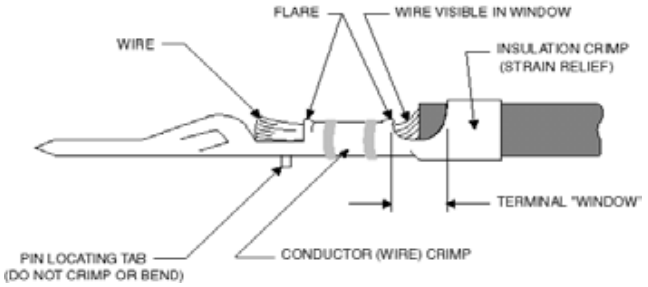


FIGURE 2.2 MOLEX CRIMP PIN

NOTE: When using the ratchet type Molex Crimping Tool #HTR-1719-C (PR&E #70-5), place a pin into slot "B" with the long ears on the “B” of the tool and pointing toward the letter “B”. Place the wire into the tool from the “B”, and then crimp the pin.

Logic control cables should be fabricated in a similar manner using 22 gauge multiple conductor, non-shielded, jacketed cable. The number of conductors required will be determined by application.

Once the pins are crimped, they may be inserted and locked into the nylon connector housing in accordance with the pin-out diagrams contained in Section 2.7. A click can be felt indicating that the locking ears on the pin have set. If a pin is inserted in the wrong connector position, or it is desired to make a circuit change, use the connector pin extractor tool (PR&E #70-4) to release the pin and press it out of the connector housing.

2.3 MAINFRAME CONFIGURATION

Each AMX mainframe is factory configured to the customer’s order by the installation of microphone input, line input and other modules in their specified and/or dedicated locations. This section contains descriptions of the AMX mainframe's control panel, meter panel and connector panel.

2.3.1 Control Panel

Figure 2.3 illustrates the control panel layout of an AMX-14 console. The control panel is divided into two areas (upper and lower), with the primary function modules located in the lower module area, and

the processing and other auxiliary modules located in the upper module area. The positions identified by module names are dedicated to those modules only, and will not accept any other type of plug-in module.

The positions indicated by shading are "optional", and blank panels will be installed in these positions when no modules are present. Any unused "optional" module positions may be used for the installation of customer designed special purpose panels. OPTION cutouts have been provided in the Molex connector panel for the routing of wiring from these positions to the rear of the console (reference Figure 2.5).

NOTE: The "optional" module positions labeled A through E in the lower module area are pre-wired with 24-pin logic cables. These cables are routed to corresponding rear panel OPTION cutouts, as defined in Figure 2.5.

2.3.2 Meter Panel

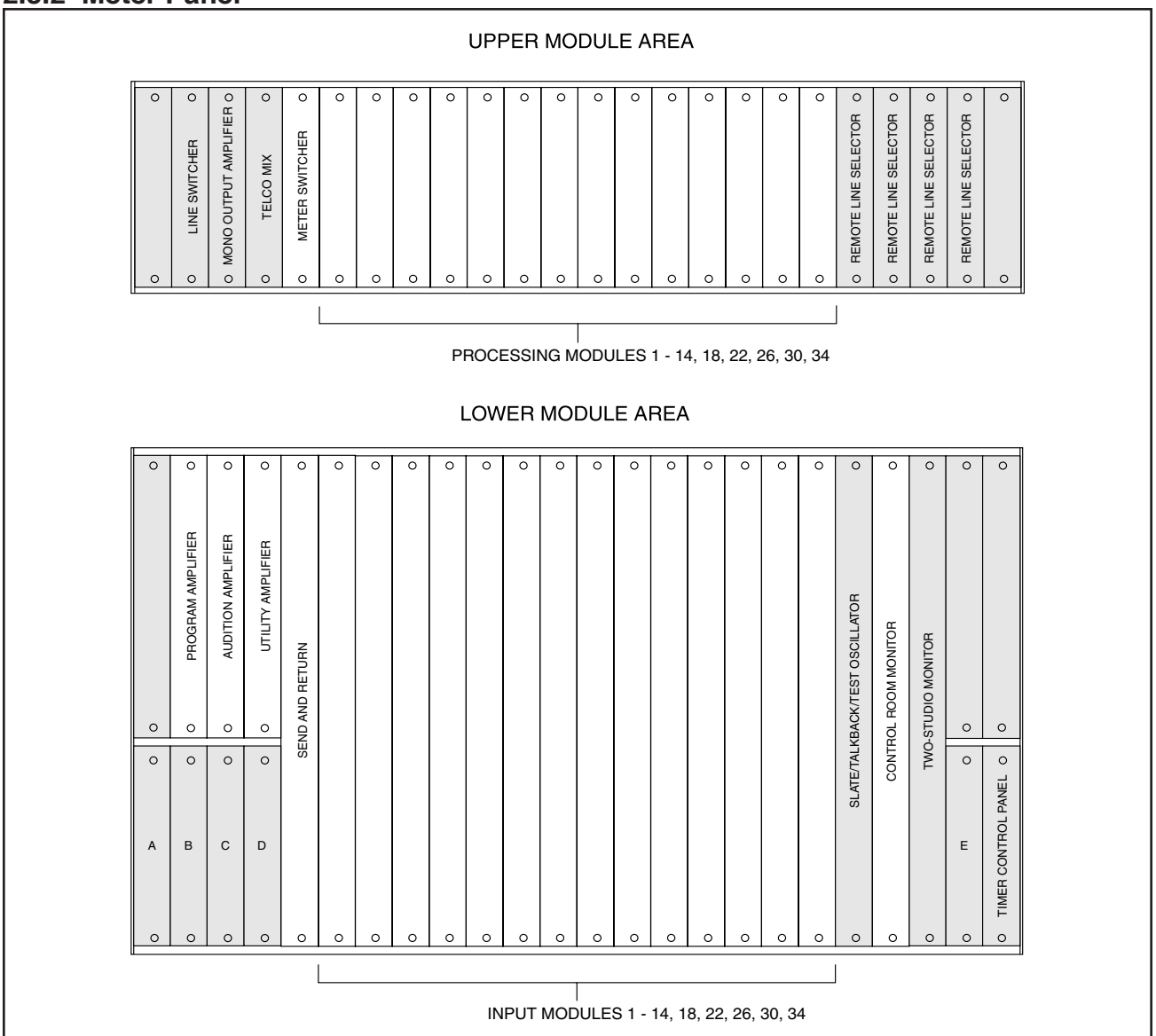


FIGURE 2.3 CONTROL PANEL LAYOUT

Figure 2.4 illustrates the layout of the meter panels for the entire range of AMX consoles. The AUXILIARY meters are utilized for metering the AUDITION and UTILITY outputs of the AMX-10 and AMX-14 mainframe sizes, and for metering the UTILITY output of the AMX-18 and AMX-22 mainframe sizes. This is accomplished by means of the Meter Switcher Module, which also can be used to display the Monaural , Telco Mix or other desired source levels. The AUXILIARY meters are also used to meter CUE and SOLO signals.

The built-in electret condenser microphone is used as the Control Room source for Slate and Talkback operations.

NOTE: Blank filler panels are supplied for any unused clock or timer position.

2.3.3 Connector Panel

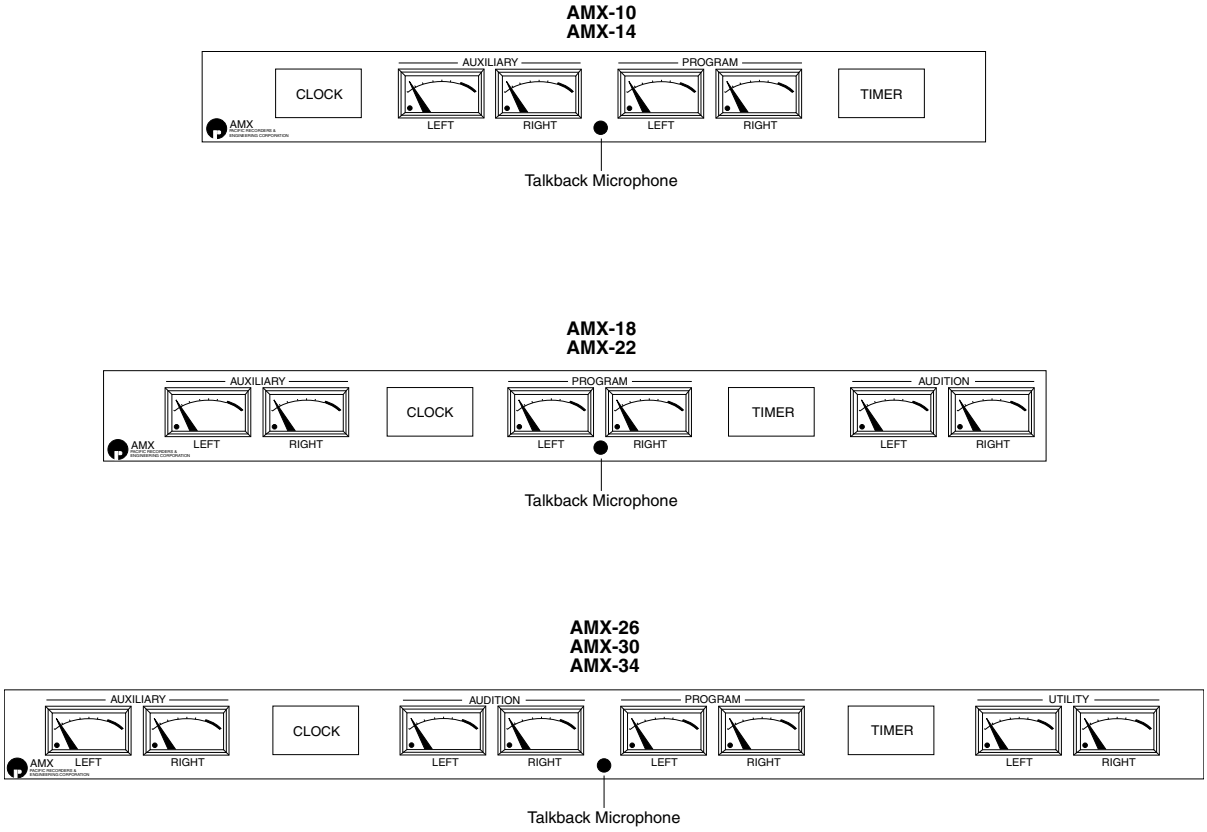


FIGURE 2.4 METER PANEL LAYOUT

Figure 2.5 (on the following page) illustrates the Molex connector panel for an AMX-14 console, and is intended to provide the installer with a map to the location of the various groups of connectors on the panel. As a general rule, the connectors for any given module are located on the panel behind that module's position in the mainframe.

The connector panel is divided into two areas: a lower area and an upper area. The lower area incorporates the connectors for the modules in the lower module area, while the upper area incorporates the connectors for the auxiliary modules located in the upper module area (reference Figure 2.3). All processing module wiring is internal to the mainframe, with the processing module position assigned to its corresponding input module position.

NOTE: The upper connector panel provides cutouts for a 12 and 24-pin Molex connector for each input position in the mainframe. These are labeled "OPTION" and are available for the installation of remote control connectors, special purpose panels, etc. The OPTION connectors labeled A through E on Figure 2.5 are pre-wired with 24-pin logic cables, which are routed to corresponding positions in the lower module area of the mainframe, as defined in Figure 2.3.

Nylon tie anchors are provided along the length of the Molex connector panel for tying down patch cables between the various module positions and the meter and monitor connectors. Factory configured consoles will have the appropriate patch wiring in place.

2.4 GROUNDING AND SHIELDING

Grounding in modern broadcast consoles is more critical than with older devices of more limited band-pass capabilities. Achieving low system ground impedance with a small piece of equipment is relatively easy. However, the problem becomes progressively more difficult as the system becomes larger. In designing the AMX, much thought was given to system grounding requirements and the elimination of DC path ground loops.

The shield pins on each console connector are connected directly to the console mainframe ground, and the only location where the console mainframe ground meets the console's "audio common" point is the power terminal strip on the console mainframe. Therefore, the station's "technical ground" should be connected to either of the two screw terminals labeled "AUDIO COMMON" on the **console** power terminal strip.

NOTE: Do **not** connect the station's "technical ground" to any terminals on the power supply terminal strip.

A preferred method of connecting the line shields in a system is to connect **both** ends of every shield to **all** affiliated equipment. However, this method is only satisfactory if every component shares a common earth ground. This can be accomplished using isolated ground receptacles tied to the station's "technical ground".

If isolated ground receptacles are not available when grounding the AMX, observe the following guidelines:

A) Shields of cables connecting the console to auxiliary equipment should be connected at the console end only, and should not be terminated to the ground of the auxiliary equipment.

B) Ensure that the auxiliary equipment is connected to a "clean" ground by its power cord assembly, or by the addition of a separate ground wire connected between the chassis of the auxiliary equipment and the station's "technical ground".

NOTE: Buzz pickup is generally electrostatic, due to capacitive pickup between an audio line and a power line. When shielded lines are used this should be no problem, unless the audio lines are run in the same wire-way or area as a power line. Radio-frequency interference can also manifest itself as a buzz in the program audio. RF interference is minimized by the extensive RF bypassing and ground-plane techniques used in the AMX, and the shielded lines external to the unit.

2.5 POWER CONNECTION

The power outlet for the AMX power supply should be assigned exclusively to the AMX. Confirm that the outlet supplies 120 VAC, ± 8%, 50/60 Hz, and that the voltage does not sag under a load of up to 5 amperes. The third pin "U-ground" on the power connector must be left intact and connected to a properly installed three way AC outlet. For safety, the "U-ground" wire is connected to the chassis of the power supply and the cores of the power transformers.

WARNING: Do not defeat the safety ground in any way. To do so may provide a potentially danger-

ous condition to the operator.

NOTE: The DC outputs of the power supply are not referenced to the power supply chassis and, therefore, are completely floating from the AC safety ground.

The AC mains cord should be kept away from low level audio wiring to avoid the possibility of inducing hum into that wiring. Also, even though the power transformers were designed for very low radiated magnetic fields, the power supply should not be placed unnecessarily close to tape playback units or other sensitive equipment.

Console connection to the power supply is made with the supplied six foot multi-conductor cable. This cable carries only regulated DC power, and will not radiate hum into adjacent audio wiring. The cable is color-coded, and the corresponding color names are printed adjacent to the terminals on the console and the power supply.

Should it be necessary to install the power supply at a distance further than permitted by the supplied cable, it is recommended that a new cable be made rather than splicing a longer length to the existing cable. Cable lengths up to twenty feet may be fabricated using 14 gauge wire. Cables longer than 20 feet are not recommended.

It is very important to check and double-check the power supply connections prior to turn-on. An error in wiring could result in damage to the power supply and/or console circuitry. Once the power supply is turned on, the meter lamps will illuminate. Use an accurate DC volt meter to verify the operating voltages at the test terminals on the front panel of the power supply.

NOTE: For information on the Redundant Power Supply Coupler Unit (PR&E #99-76), see Chapter 8.

2.6 PATCH POINT CONNECTION

Each AMX input and output module features an audio PATCH connector. These connectors provide the ideal point to connect external processing equipment such as equalizers, limiters, filters, etc. A patch bay system may also be connected to provide a very flexible processing/patching facility.

The output at each patch point is unbalanced, and designed to operate into low-impedance (600 ohm or higher) loads. The patch return is balanced, 40k ohm impedance.

The level at all patch points (microphone, line and output) is -10 dBu nominal. This level was determined to provide optimum headroom within the console, as well as a good compatibility match with currently available processing equipment. See Section 2.7 for module PATCH connector pin assignment.

2.7 AUDIO AND LOGIC CONNECTION

Good wiring practice calls for care in making each connection and in neatness of cable layout. Complete information relative to console input, output and logic terminations is contained in the connection reference drawings included in this section.

A standard connection theme is used throughout all PR&E consoles and mixers - the use of 3, 6 and 12 pin Molex connectors for audio wiring. The standard pin-out sequence is as follows:

Pin #1	Shield of monaural or left channel signal pair.
Pin #2	Low of monaural or left channel signal pair.
Pin #3	High of monaural or left channel signal pair.
Pin #4	Shield of right channel signal pair.
Pin #5	Low of right channel signal pair.
Pin #6	High of right channel signal pair.
Pin #7	Shield of left channel signal pair.
Pin #8	Low of left channel signal pair.
Pin #9	High of left channel signal pair.
Pin #10	Shield of right channel signal pair.
Pin #11	Low of right channel signal pair.
Pin #12	High of right channel signal pair.

This system of pin assignments takes advantage of the three pin per row design of the Molex connectors and, therefore, makes visual inspection of the finished wiring very easy. As viewed from the rear of the console, the shields are always connected to the left pins, the low wires (black) to the center pins and the high wires (red) to the right pins. While this inspection will not indicate if a connector is in the correct position, it will verify proper shield and polarity connection.

Each AMX input module offers a comprehensive set of logic functions, as outlined in Section 2.8. These functions are brought out from each input module position to a pair of 15-pin Molex connectors labeled LOGIC-A and LOGIC-B, and are designed to drive interface relays and/or opto-isolators to control auxiliary equipment.

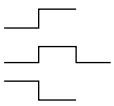
Fabrication of interface systems is straightforward. However, should the installer prefer to use prefabricated units, interface devices and cable assemblies are available from PR&E to control most professional grade tape decks, cartridge machines and turntables. Information on these interfaces is provided in Chapter 8.

NOTE: The control commands and functions are referenced to the console logic power supply and, as such, should never be directly connected to auxiliary equipment control logic supplies and/or grounds.

The AMX uses "common" or "ground" switching for all of its control inputs, thus preventing the possibility of defective remote controls shorting out the logic power supply.

Connection to the control circuitry requires an understanding of the logic nomenclature and symbols. These are outlined below.

Control Outputs:

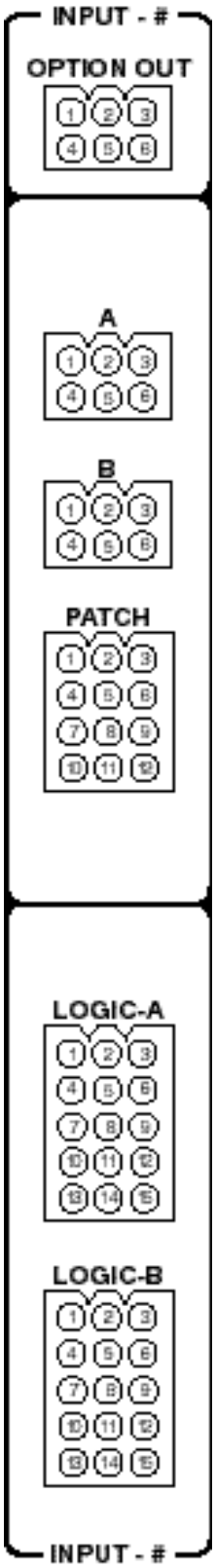
Tally (light)		Provides a +12 VDC continuous source when activated.
Pulse		Provides a +12 VDC pulse source when activated.
Sink		An open collector that provides a connection to Logic Common when activated.

Control Inputs:

Control	ON	A line above the word indicates that the function is activated when a connection to Logic Common is made.

2.8 MODULE REMOTE CONTROL CAPABILITIES

2.7.1 Microphone Input Module Connection



MIC INPUT MODULE AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Direct Output/Left	OPTION OUT	1	2	3
Direct Output/Right	"	4	5	6
Microphone A	A	1	2	3
-No Connection-	"	4	5	6
Microphone B	B	1	2	3
-No Connection-	"	4	5	6
Patch Send	PATCH	1	2	3
-No Connection-	"	4	5	6
Patch Return	"	7	8	9
-No Connection-	"	10	11	12

NOTES:

A) The Patch Send is unbalanced; the Patch Return is balanced.

B) The PATCH connector must be wired so that the Patch Send is connected through to the Patch Return. If no external processing or patch bay equipment is connected, a mating connector with jumpers from pins #2 to #8 and #3 to #9 must be installed.

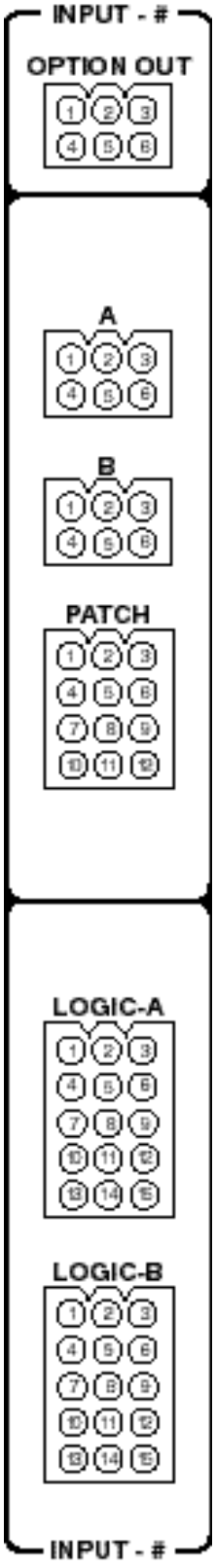
LOGIC PIN ASSIGNMENT	
Function	Pin Number
Logic Common	1
Logic +12 VDC	2
$\overline{\text{ON}}$	3
$\overline{\text{OFF}}$	4
ON TALLY ⌐	5
OFF TALLY ⌐	6
$\overline{\text{COUGH}}$	7
$\overline{\text{TALK}}$ to Control Room	8
$\overline{\text{TALK}}$ to Studio-1	9
$\overline{\text{TALK}}$ to Studio-2	10
$\overline{\text{TALK}}$ to External	11
-No Connection-	12
$\overline{\text{INHIBIT}}$ CUE and SOLO (Privacy Mode)	13
-No Connection-	14
-No Connection-	15

NOTES:

A) A input logic is connected to LOGIC-A; B input logic is connected to LOGIC-B.

B) Consult Section 2.8.1 when connecting Microphone Input Module remote controls.

2.7.2 Stereo Line Input Module Connection



LINE INPUT MODULE AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Direct Output/Left	OPTION OUT	1	2	3
Direct Output/Right	"	4	5	6
Input A/Left	A	1	2	3
Input A/Right	"	4	5	6
Input B/Left	B	1	2	3
Input B/Right	"	4	5	6
Patch Send/Left	PATCH	1	2	3
Patch Send/Right	"	4	5	6
Patch Return/Left	"	7	8	9
Patch Return/Right	"	10	11	12

NOTES:

A) The Patch Sends are unbalanced; the Patch Returns are balanced.

B) The PATCH connector must be wired so that the Patch Sends are connected through to the Patch Returns. If no external processing or patch bay equipment is connected, a mating connector with jumpers from pins #2 to #8, #3 to #9, #5 to #11 and #6 to #12 must be installed.

C) When connecting a monaural line level source to a Stereo Line Input Module, connect the signal to the left input channel, and then insert jumpers between pins #1 and #4, #2 and #5, and #3 and #6.

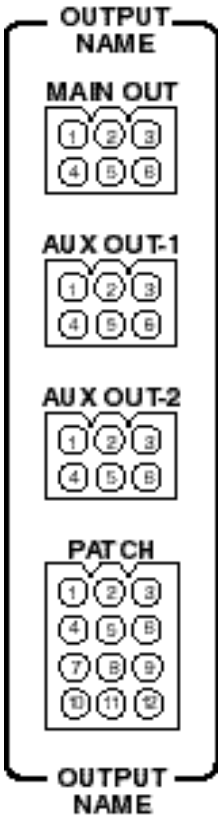
LOGIC PIN ASSIGNMENT	
Function	Pin Number
Logic Common	1
Logic +12 VDC	2
$\overline{\text{ON}}$	3
$\overline{\text{OFF}}$	4
ON TALLY ⌐	5
OFF TALLY ⌐	6
$\overline{\text{READY}}$	7
$\overline{\text{AUDIO RESET TO OFF}}$	8
$\overline{\text{CUE}}$	9
START PULSE ⌐⌐	10
STOP PULSE ⌐⌐	11
CUE TALLY ⌐	12
$\overline{\text{SOLO}}$	13
SOLO TALLY ⌐	14
-No Connection-	15

NOTES:

A) A input logic is connected to LOGIC-A; B input logic is connected to LOGIC-B.

B) Consult Section 2.8.2 when connecting Stereo Line Input Module remote controls.

2.7.3 Stereo Line Output Amplifier Connection

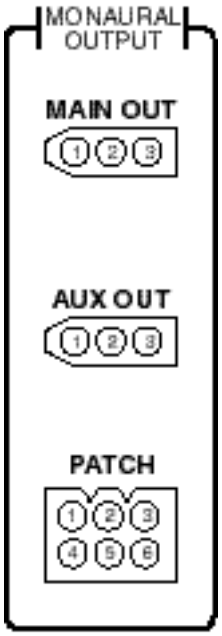


STEREO OUTPUT AMPLIFIER AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Main Output / Left	MAIN OUT	1	2	3
Main Output / Right	"	4	5	6
Auxiliary Output-1 / Left	AUX OUT-1	1	2	3
Auxiliary Output-1 / Right	"	4	5	6
Auxiliary Output-2 / Left	AUX OUT-2	1	2	3
Auxiliary Output-2 / Right	"	4	5	6
Patch Send / Left	PATCH	1	2	3
Patch Send / Right	"	4	5	6
Patch Return / Left	"	7	8	9
Patch Return / Right	"	10	11	12

NOTE:

A) The Main and Auxiliary outputs are balanced.
B) The Patch Sends are unbalanced; the Patch Returns are balanced.
C) The PATCH connector must be wired so that the Patch Sends are connected through to the Patch Returns. If no external processing or patch bay equipment is connected, a mating connector with jumpers from pins #2 to #8, #3 to #9, #5 to #11 and #6 to #12 must be installed.

2.7.4 Monaural Line Output Amplifier Connection

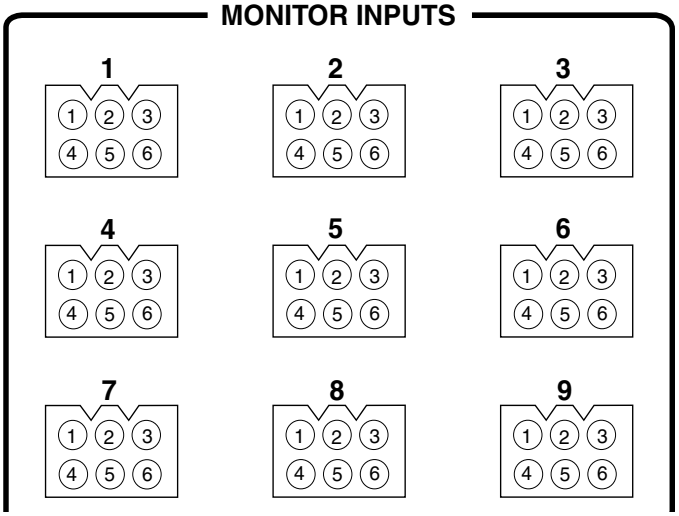


MONO OUTPUT AMPLIFIER AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Main Output	MAIN OUT	1	2	3
Auxiliary Output	AUX OUT	1	2	3
Patch Send	PATCH	1	2	3
Patch Return	"	4	5	6

NOTE:

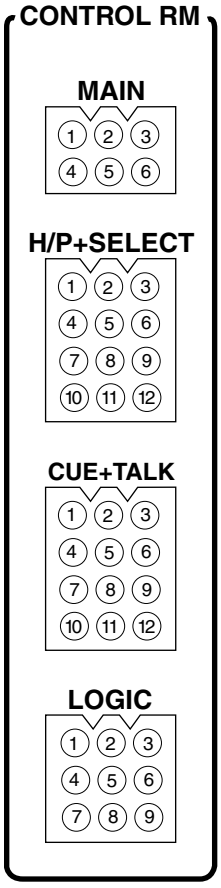
A) The Main and Auxiliary outputs are balanced.
B) The Patch Send is unbalanced; the Patch Return is balanced.
C) The PATCH connector must be wired so that the Patch Send is connected through to the Patch Return. If no external processing or patch bay equipment is connected, a mating connector with jumpers from pins #2 to #5 and #3 to #6 must be installed.

2.7.5 Monitor Module Input Connection



MONITOR INPUT AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Input 1/Left	1	1	2	3
Input 1/Right	"	4	5	6
Input 2/Left	2	1	2	3
Input 2/Right	"	4	5	6
Input 3/Left	3	1	2	3
Input 3/Right	"	4	5	6
Input 4/Left	4	1	2	3
Input 4/Right	"	4	5	6
Input 5/Left	5	1	2	3
Input 5/Right	"	4	5	6
Input 6/Left	6	1	2	3
Input 6/Right	"	4	5	6
Input 7/Left	7	1	2	3
Input 7/Right	"	4	5	6
Input 8/Left	8	1	2	3
Input 8/Right	"	4	5	6
Input 9/Left	9	1	2	3
Input 9/Right	"	4	5	6

2.7.6 Control Room Monitor Module Connection



CONTROL ROOM MONITOR AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Monitor Output/Left	MAIN	1	2	3
Monitor Output/Right	"	4	5	6
Headphone Output/Left	H/P+SELECT	1	2	3
Headphone Output/Right	"	4	5	6
Selector Output/Left	"	7	8	9
Selector Output/Right	"	10	11	12
Cue Output/Left	CUE+TALK	1	2	3
Cue Output/Right	"	4	5	6
Talkback Output, Var. w/mute	"	7	8	9
Talkback Output, Direct	"	10	11	12

NOTES:

A) The Selector Output is the direct output of the Control Room Monitor Module, and consists only of the source selected on the 12-station Monitor Input switch. However, Talkback circuitry may be assigned to this output (reference Section 2.9.3).

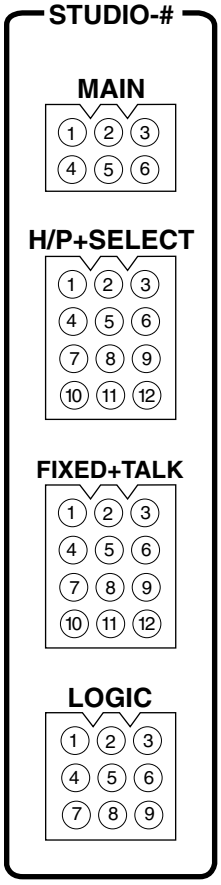
B) The Talkback Outputs consist of any Talk To Control Room signals, and are provided for connection to self-contained headphone and/or monitor systems, if desired.

C) The Variable Talkback Output is only active when the Control Room is muted.

LOGIC PIN ASSIGNMENT	
Function	Pin Number
Logic Common	1
Logic +12 VDC	2
TALKBACK ⌐└	3
MUTE ⌐└	4
DIM ⌐└	5
WARNING TALLY └⌐	6
Logic Common	7
$\overline{\text{DIM}}$ Control Room Monitors	8
$\overline{\text{MUTE}}$ Control Room Monitors	9

NOTE: Consult Section 2.8.3 when connecting Control Room Monitor Module remote controls.

2.7.7 Two-Studio Monitor Module Connection



TWO-STUDIO MONITOR AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Monitor Output/Left	MAIN	1	2	3
Monitor Output/Right	"	4	5	6
H/P Output/Left	H/P+SELECT	1	2	3
H/P Output/Right	"	4	5	6
Selector Output/Left	"	7	8	9
Selector Output/Right	"	10	11	12
Fixed Level Output/Left	FIXED+TALK	1	2	3
Fixed Level Output/Right	"	4	5	6
-No Connection-	"	7	8	9
Talkback Output, Direct	"	10	11	12

NOTES:

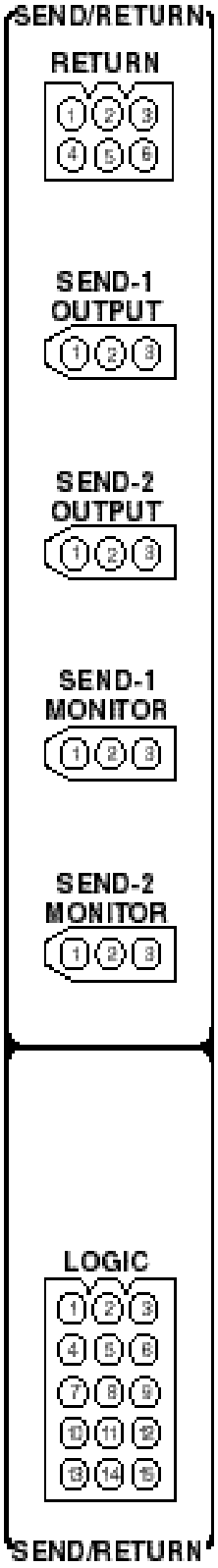
A) The Selector Output is the direct output of the Two-Studio Monitor Module, and consists only of the source selected on the 12-station Monitor Input switch.

B) The Talkback Output consists of the respective Talk To Studio signals, and is provided for connection to self-contained headphone and/or monitor systems, if desired.

TWO-STUDIO MONITOR LOGIC PIN ASSIGNMENT	
Function	Pin Number
Logic Common	1
Logic +12 VDC	2
TALKBACK ⌐_	3
MUTE ⌐_	4
DIM ⌐_	5
WARNING TALLY _⌐	6
Logic Common	7
$\overline{\text{DIM}}$ Studio Monitors	8
$\overline{\text{MUTE}}$ Studio Monitors	9

NOTE: Consult Section 2.8.4 when connecting Two-Studio Monitor Module remote controls.

2.7.8 Send And Return Module Connection



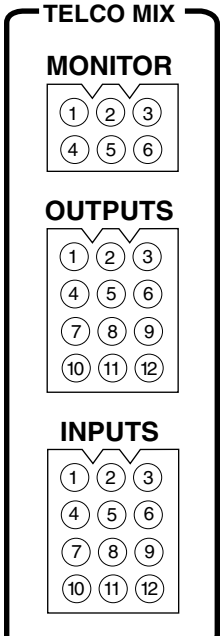
SEND & RETURN AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Return/Left	RETURN	1	2	3
Return/Right	"	4	5	6
Send-1 Output	SEND-1 OUTPUT	1	2	3
Send-2 Output	SEND-2 OUTPUT	1	2	3
Send-1 Monitor Output	SEND-1 MONITOR	1	2	3
Send-2 Monitor Output	SEND-2 MONITOR	1	2	3

NOTE: The Send Monitor Outputs are provided for connection to Control Room and Studio Monitor Inputs, if desired.

SEND & RETURN LOGIC PIN ASSIGNMENT	
Function	Pin Number
Logic Common	1
Logic +12 VDC	2
Send-1 $\overline{ON}/\overline{OFF}$	3
Send-2 $\overline{ON}/\overline{OFF}$	4
Send-1 ON TALLY ⎍	5
Send-2 ON TALLY ⎍	6
Return $\overline{ON}$	7
Return $\overline{OFF}$	8
Return ON TALLY ⎍	9
Return OFF TALLY ⎍	10
-No Connection-	11
-No Connection-	12
-No Connection-	13
-No Connection-	14
-No Connection-	15

NOTE: Consult Section 2.8.5 when connecting Send And Return Module remote controls.

2.7.9 Telco Mix Module Connection



TELCO MIX AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Monitor Output, Variable	MONITOR	1	2	3
Monitor Output, Fixed	"	4	5	6
Output 1	OUTPUTS	1	2	3
Output 2	"	4	5	6
Output 3	"	7	8	9
Output 4	"	10	11	12
Input 1	INPUTS	1	2	3
Input 2	"	4	5	6
Input 3	"	7	8	9
Input 4	"	10	11	12

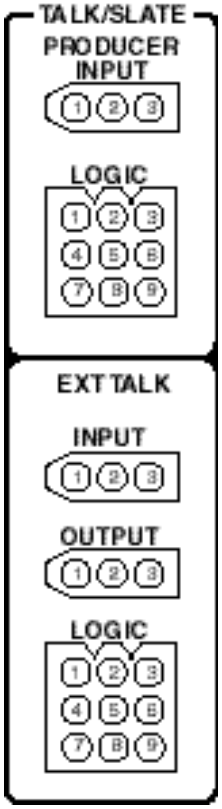
NOTES:

A) The Fixed and Variable Monitor Outputs consist only of those callers assigned to the Telco Mix System.

B) Telco Outputs 1 through 4 are routed to the telco hybrid(s).

C) The Telco Mix Module receives its inputs from the Direct Output/Left signals of those Stereo Line Input Modules assigned as Telco inputs.

2.7.10 Slate/Talkback/Test Oscillator Module Connection



TALK/SLATE AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Producer's Mic Input	PRODUCER INPUT	1	2	3
External Mic/Line Input	EXTERNAL INPUT	1	2	3
Talk to External Output	EXTERNAL OUTPUT	1	2	3

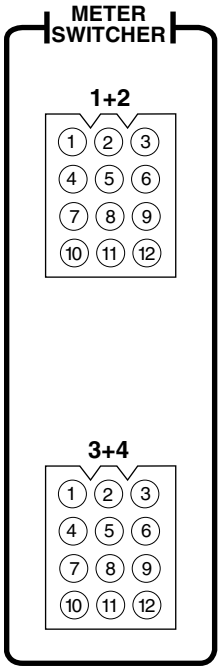
NOTE: The External Input is switchable between microphone and line input levels (reference Section 2.9.7).

PRODUCER TALKBACK LOGIC PIN ASSIGNMENT	
Function	Pin Number
Logic Common	1
Logic +12 VDC	2
$\overline{\text{TALK}}$ to Studio-1	3
$\overline{\text{TALK}}$ to Studio-2	4
$\overline{\text{TALK}}$ to External	5
-No Connection-	6
-No Connection-	7
$\overline{\text{SLATE}}$	8
-No Connection-	9

EXTERNAL TALKBACK LOGIC PIN ASSIGNMENT	
Function	Pin Number
Logic Common	1
Logic +12 VDC	2
$\overline{\text{TALK}}$ to Studio-1	3
$\overline{\text{TALK}}$ to Studio-2	4
$\overline{\text{TALK}}$ to Control Room	5
-No Connection-	6
-No Connection-	7
TALK ⌐└	8
-No Connection-	9

NOTE: Consult Section 2.8.6 when connecting Slate/Talkback/Test Oscillator Module remote controls.

2.7.11 Meter Switcher Module Connection



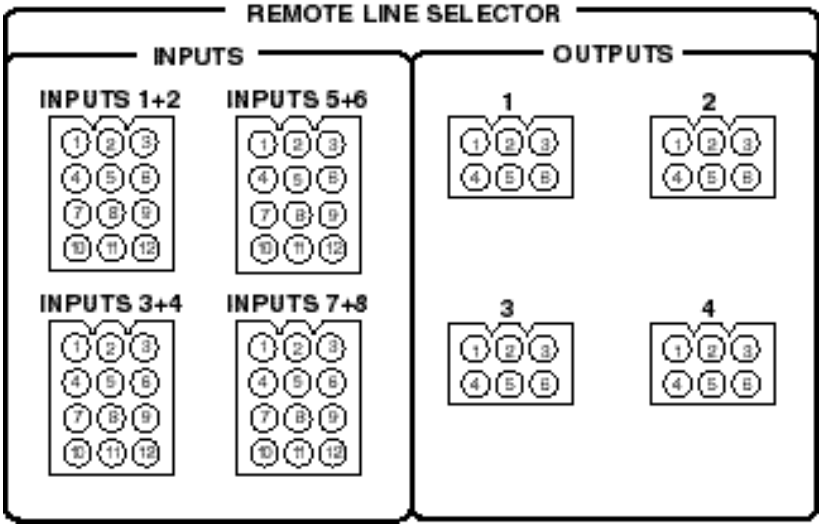
METER SWITCHER AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Input 1/Left	INPUT-1	1	2	3
Input 1/Right	"	4	5	6
Input 2/Left	INPUT-2	1	2	3
Input 2/Right	"	4	5	6
Input 3/Left	INPUT-3	1	2	3
Input 3/Right	"	4	5	6
Input 4/Left	INPUT-4	1	2	3
Input 4/Right	"	4	5	6
Input 5/Left	INPUT-5	1	2	3
Input 5/Right	"	4	5	6

NOTES:

A) On AMX-18 and 22 mainframes, Input 4 will be pre-wired for UTILITY metering.

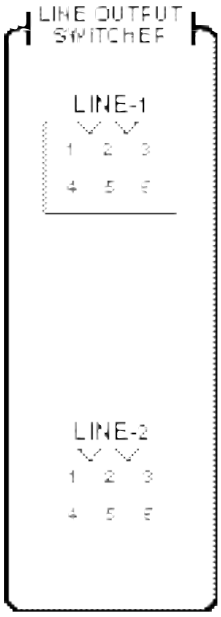
B) On AMX-10 and 14 mainframes, Input 3 will be pre-wired for AUDITION metering and Input 4 will be pre-wired for UTILITY metering.

2.7.12 Remote Line Selector Module Connection



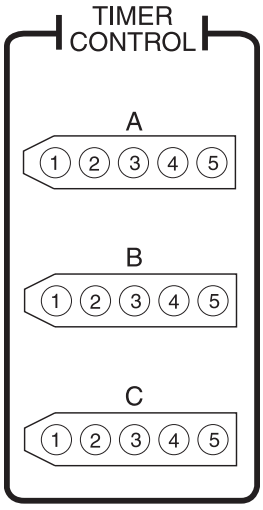
REMOTE LINE SELECTOR AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Input 1 / Left	1+2	1	2	3
Input 1 / Right	"	4	5	6
Input 2 / Left	"	7	8	9
Input 2 / Right	"	10	11	12
Input 3 / Left	3+4	1	2	3
Input 3 / Right	"	4	5	6
Input 4 / Left	"	7	8	9
Input 4 / Right	"	10	11	12
Input 5 / Left	5+6	1	2	3
Input 5 / Right	"	4	5	6
Input 6 / Left	"	7	8	9
Input 6 / Right	"	10	11	12
Input 7 / Left	7+8	1	2	3
Input 7 / Right	"	4	5	6
Input 8 / Left	"	7	8	9
Input 8 / Right	"	10	11	12
Output 1 / Left	1	1	2	3
Output 1 / Right	"	4	5	6
Output 2 / Left	2	1	2	3
Output 2 / Right	"	4	5	6
Output 3 / Left	3	1	2	3
Output 3 / Right	"	4	5	6
Output 4 / Left	4	1	2	3
Output 4 / Right	"	4	5	6

2.7.13 Line Output Switcher Module Connection



LINE OUTPUT SWITCHER AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Line 1 Output/Left	LINE-1	1	2	3
Line 1 Output/Right	"	4	5	6
Line 2 Output/Left	LINE-2	1	2	3
Line 2 Output/Right	"	4	5	6

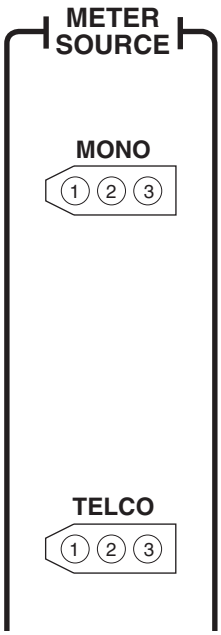
2.7.14 Timer Control Connection



LOGIC PIN ASSIGNMENT	
Function	**Pin Number**
HOLD ⌐	1
Logic Common	2
RESET ⌐	3
START ⌐	4
STOP ⌐	5

NOTE: These connectors are provided for the control of external "slave" timers.

2.7.15 Meter Source Connection



METER SOURCE AUDIO PIN ASSIGNMENT				
		Pin Number		
Signal	Connector	Shield	Low	High
Monaural Meter Source	MONO	1	2	3
Telco Meter Source	TELCO	1	2	3

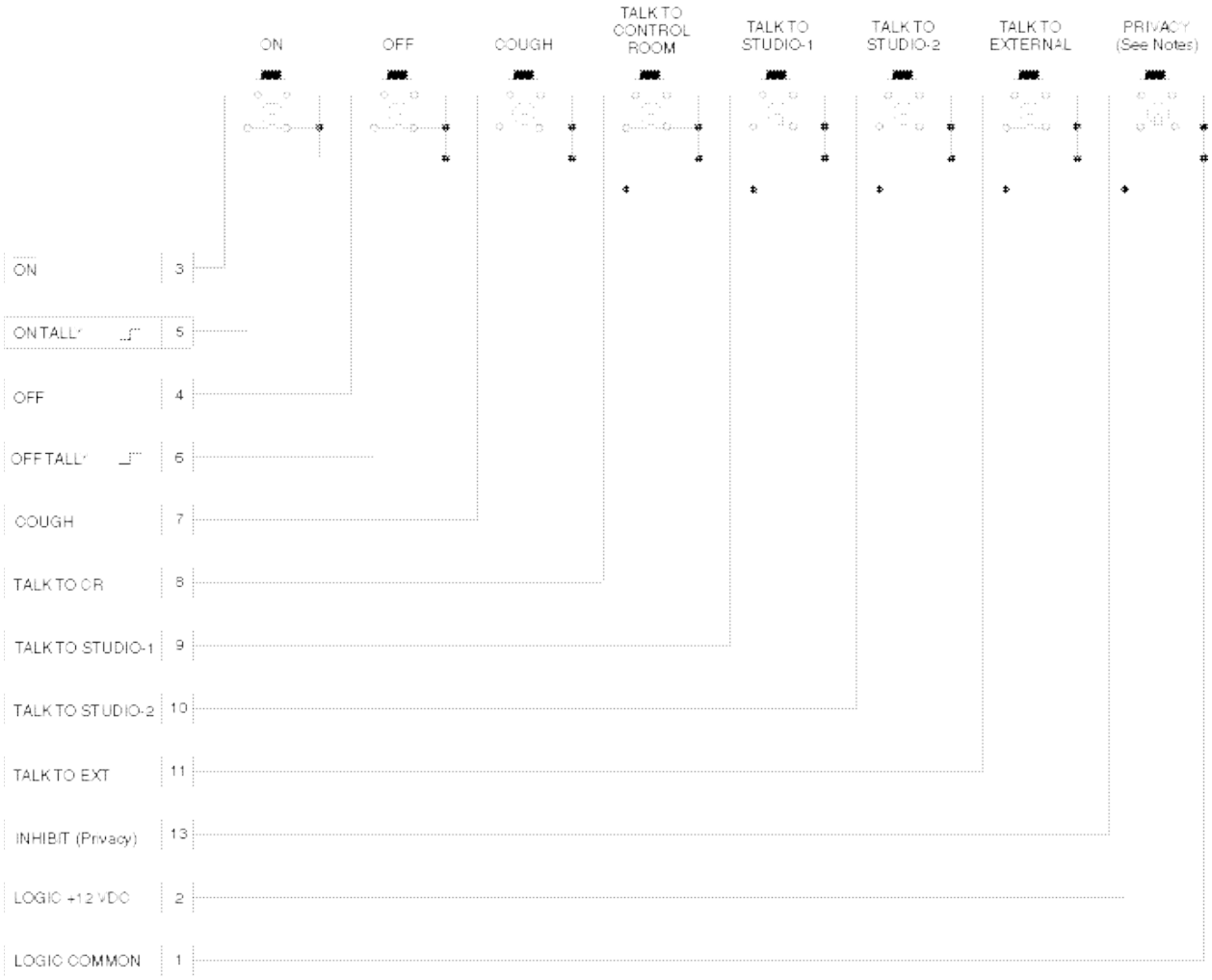
NOTE: Mono and Telco Meter Source signals are provided for connection to a Meter Switcher Module input, if desired.

This section outlines AMX module remote control capabilities. Included are descriptions of Microphone Input, Stereo Line Input, Control Room Monitor, Two-Studio Monitor, Send And Return, and Slate/ Talkback/Test Oscillator Module remote control capabilities.

2.8.1 Microphone Input Module Remote Control

The schematic below illustrates the full remote control capability of the Microphone Input Module's A and B inputs. Since it is not desirable for a microphone to “talk” to its own location, or to locations which may not exist in a particular installation, delete any inappropriate talk buttons. The INHIBIT command disables module CUE and SOLO functions for as long as the PRIVACY button is engaged. This facility ensures that private "off-mic" conversations cannot be overheard in the Control Room.

2.8.2 Stereo Line Input Module Remote Control

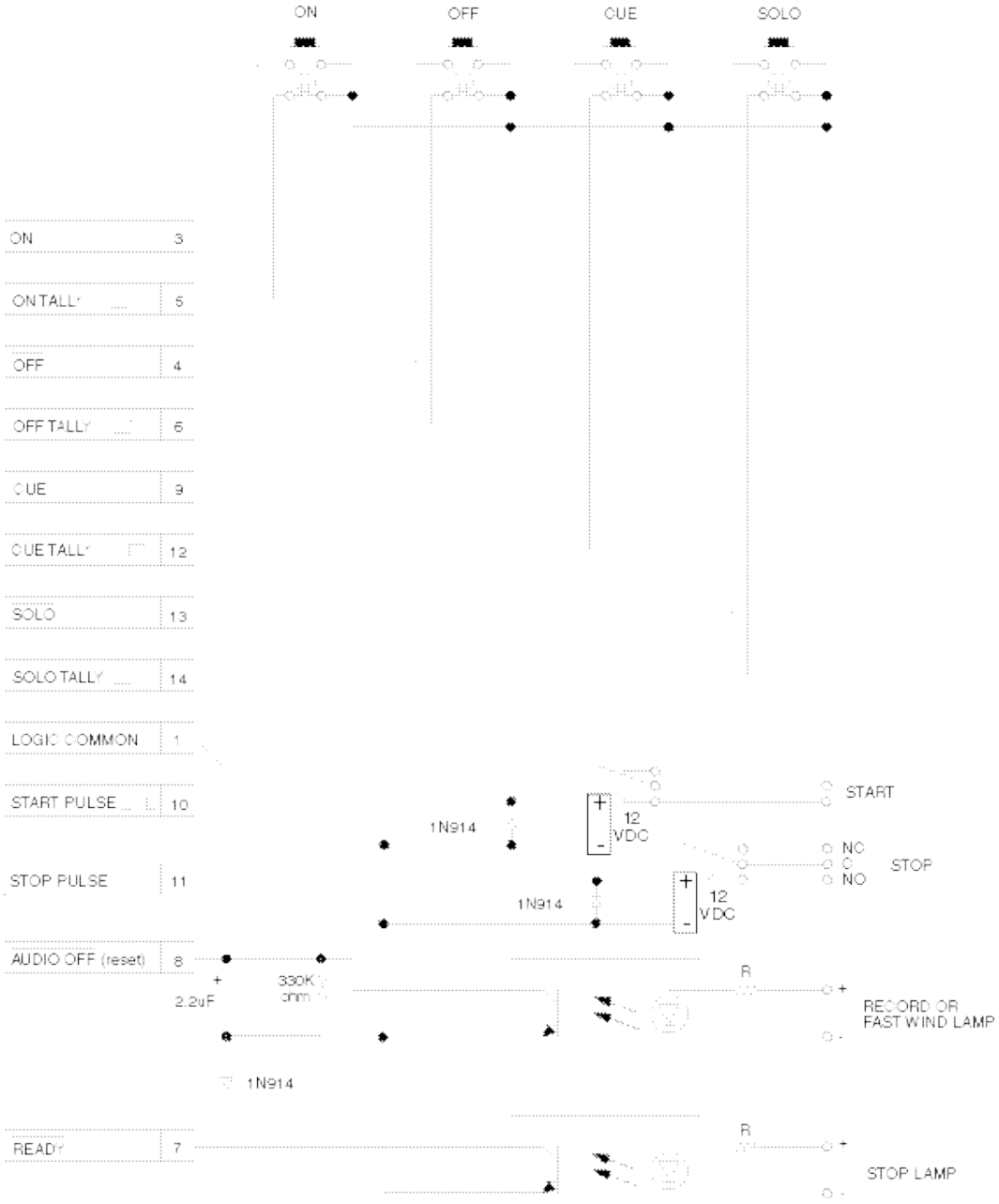


NOTES:

A) All button switches except PRIVACY are momentary-action (the PRIVACY button switch is maintained-action).
B) Lamps are 12-14 volt, 80 mA.
C) When COUGH, TALK TO and PRIVACY tallies are connected as shown above, switch lamps will be illuminated at all times.

The schematic below illustrates the full remote control and machine interface capability of the Stereo Line Input Module's A and B inputs. Typical applications include providing cartridge input ON and OFF buttons at co-host or news turret positions, and ON, OFF, CUE and SOLO buttons adjacent to turntables and tape recorders.

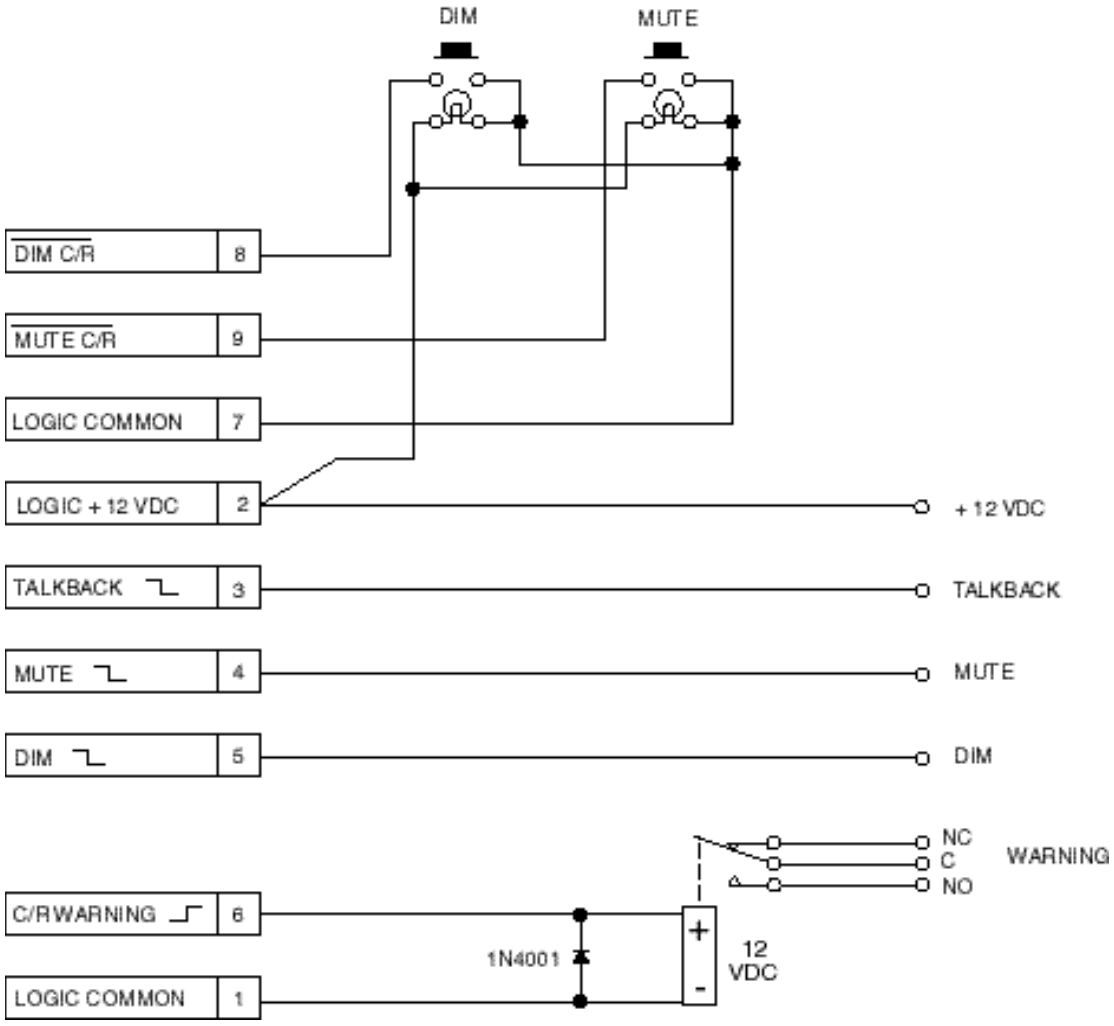
2.8.3 Control Room Monitor Module Remote Control



NOTES:
A) Button switches are momentary-action.
B) Lamps are 12-14 volt, 80 mA.
C) Relays are 12 volt DC, 100 mA maximum.
D) Opto-isolators are Motorola MCT-2 or equivalent.

The schematic below illustrates the full remote control capability of the Control Room Monitor Module.

While it is unlikely that a "typical" installation will utilize all of these facilities, it is important to un-



NOTES:
A) Button switches are momentary-action.
B) Lamps are 12-14 volt, 80 mA.
C) Relay is 12 volt DC, 100 mA maximum.
D) When DIM and MUTE tallies are connected as shown above, switch lamps will be illuminated at all times.

derstand what is available, along with the potential applications.

The DIM control input may be used to remote control the dim function of the Control Room Monitor Module. Typical applications include equipping the control room door with a "door open" switch, or a telephone set with an "off-hook" switch to automatically dim the Control Room speakers whenever the door opens or the telephone is picked up.

The MUTE control input may be used to remote control the mute function of the Control Room Monitor Module. Typical applications include operations where two on-air consoles are used in the same room,

such as a second console for news and sports programming.

The TALKBACK control output is a current-sinking open collector, which is active (low) whenever the Control Room is receiving Talkback from another location. This command is intended for connection to active, self-contained, headphone and monitor systems, and is used to switch the Talk to Control Room signals into the headphone and monitor circuits. Such headphone and/or monitor systems are usually provided to co-host and news positions in a Control Room.

The MUTE control output is a current-sinking open collector, which is active (low) whenever a Control Room microphone is ON. This command is provided for interface to intercoms, telephones and/or other external equipment which may need to be muted whenever a Control Room microphone is "live".

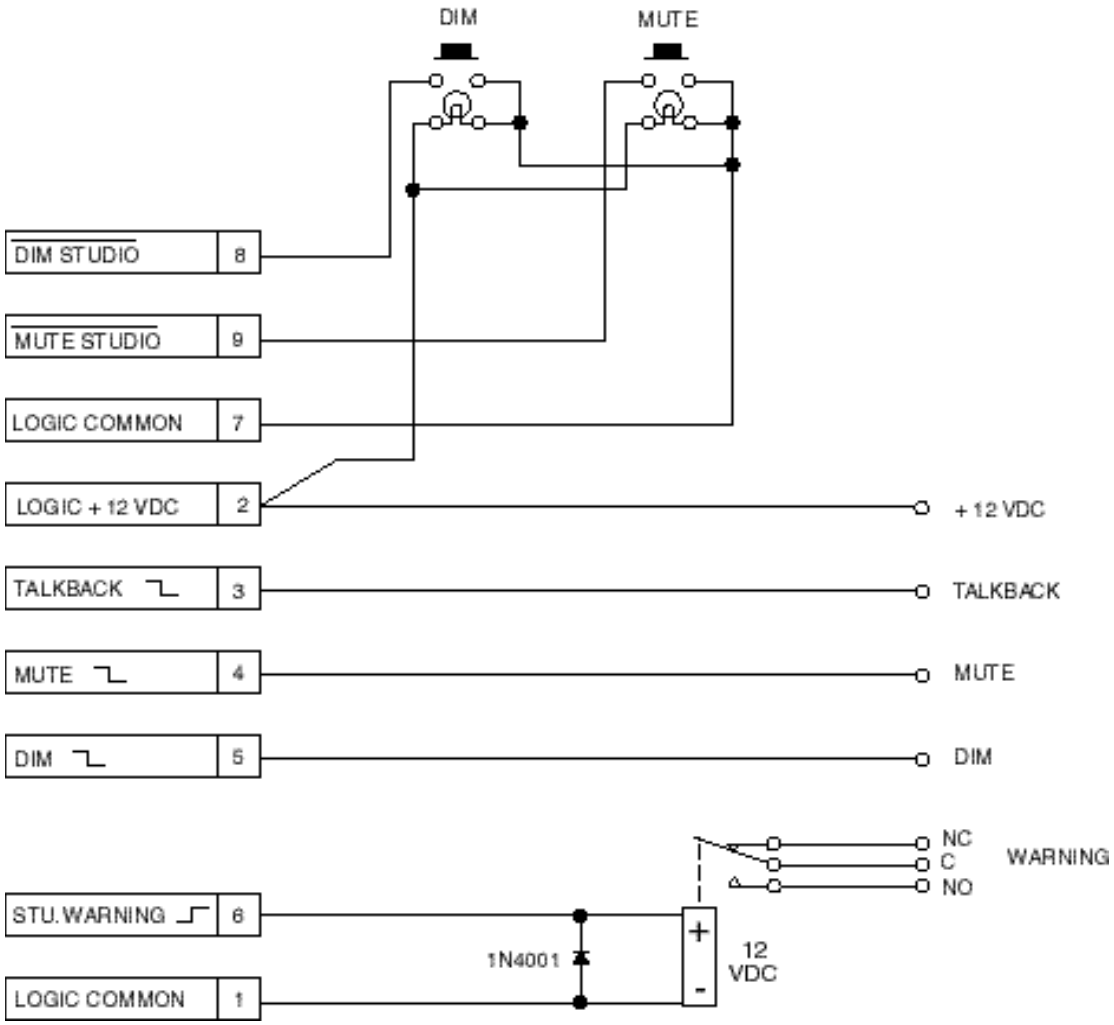
The DIM control output is a current-sinking open collector, which is active (low) whenever Talkback is occurring from the Control Room to another location. This command is provided for similar applications as the MUTE command.

The C/R WARNING tally is a 12 volt DC, 150 mA maximum, source output for connection to a magnetic or solid-state relay unit for driving the Control Room entry warning light(s).

2.8.4 Two-Studio Monitor Module Remote Control

The Two-Studio Monitor Module is equipped with many of the same audio and logic features provided in the Control Room Monitor Module. The schematic below illustrates the full remote control capability of each of the two Studio logic connectors.

While it is unlikely that a "typical" installation will use all of these features, it is important to understand



NOTES:
A) Button switches are momentary-action.
B) Lamps are 12-14 volt, 80 mA.
C) Relay is 12 volt DC, 100 mA maximum.
D) When DIM and MUTE tallies are connected as shown above, switch lamps will be illuminated at all times.

what is available, along with the potential applications.

The DIM control input may be used to remotely control the dim function of the Studio Monitor Module. Typical applications include equipping the Studio door with a "door open" switch, or a telephone set with an "off-hook" switch to automatically dim the Studio speakers whenever the door opens or the telephone is picked up.

The MUTE control input may be used to remotely control the mute function of the Studio Monitor Module. A typical application would be to provide a host with a Monitor Mute button in those instal-

lations where a monitor volume control is not provided in the Studio itself.

The TALKBACK control output is a current-sinking open collector, which is active (low) whenever the Studio is receiving Talkback from another location. This command is intended for connection to active, self-contained, headphone and monitor systems, and is used to switch the Talk to Studio signals into the headphone and monitor circuits. Such headphone and/or monitor systems are usually provided to the host and co-host positions.

The MUTE control output is a current-sinking open collector, which is active (low) whenever a Studio microphone is ON. This command is provided for interface to intercoms, telephones and/or other external equipment which may need to be muted whenever a Studio microphone is "live".

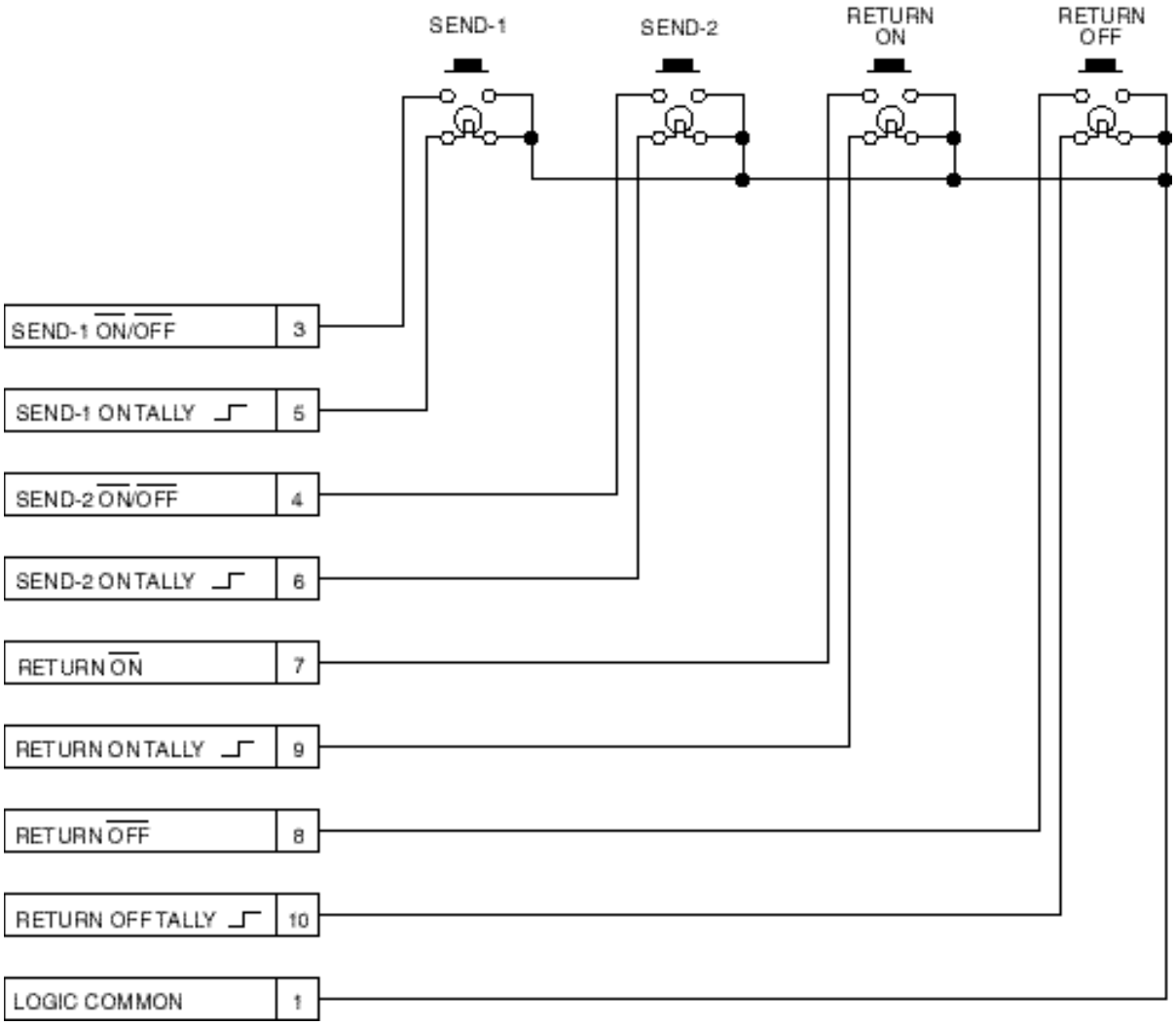
The DIM control output is a current-sinking open collector, which is active (low) whenever Talkback is occurring from the Studio to another location. This command is provided for similar applications as the MUTE Command.

The STUDIO WARNING tally is a 12 volt DC, 150 mA maximum, source output for connection to a magnetic or solid-state relay unit for driving the Studio entry warning light(s).

2.8.5 Send And Return Module Remote Control

The Send And Return Module contains three independent sets of circuitry: two Send circuits and one stereo Return input channel. The schematic below illustrates the full remote control capability of this module, which consists of controlling and tallying the ON/OFF status of both Send circuits and the Return circuitry.

2.8.6 Slate/Talkback/Test Oscillator Remote Control



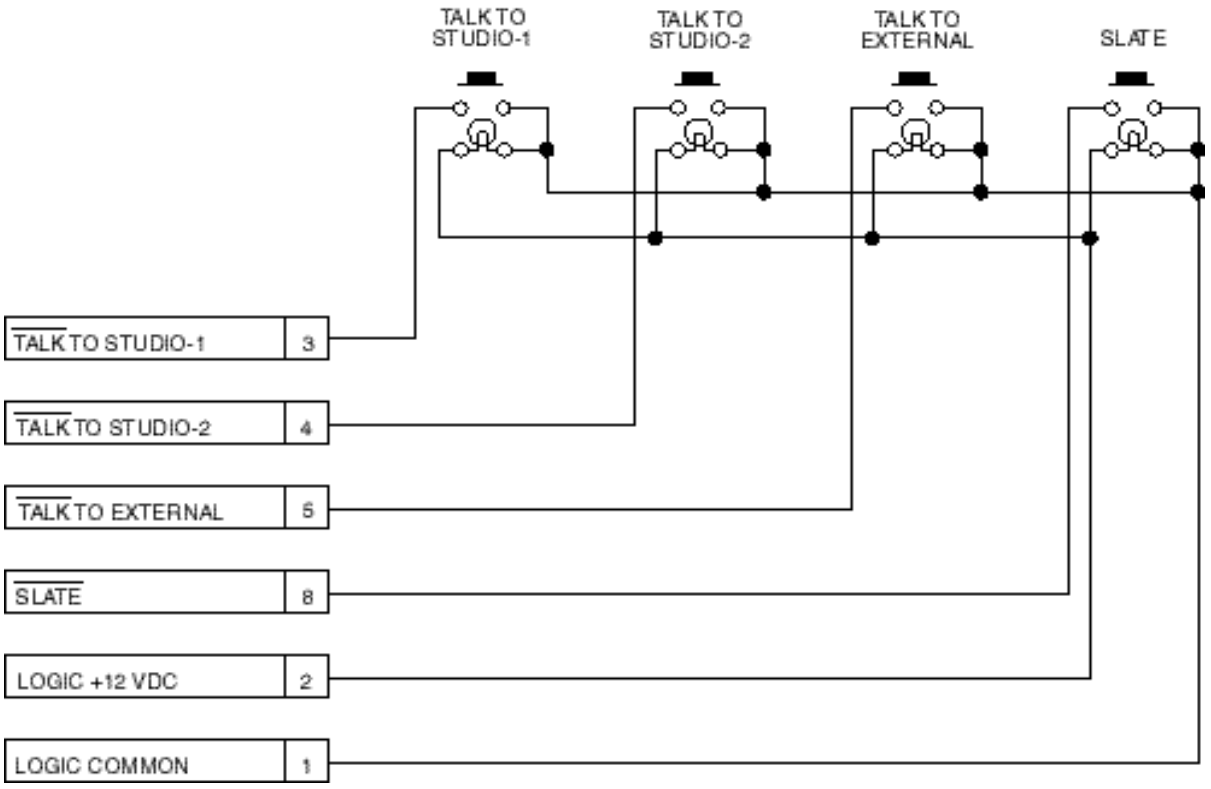
NOTES:
A) Button switches are momentary-action.
B) Lamps are 12-14 volt, 80 mA.
C) SEND-1 and SEND-2 remote ON/OFF control inputs can be momentary- or maintained-action, as determined by module internal option switches (reference Section 2.9.5).

The Slate/Talkback/Test Oscillator module has remote control circuitry available for both “Producer” and “External” locations.

PRODUCER INPUT

The “Producer” is usually located somewhere in the Control Room. TALK control inputs route the Producer's Microphone Input signal to the selected location. The schematic below illustrates the full remote control capability of this input.

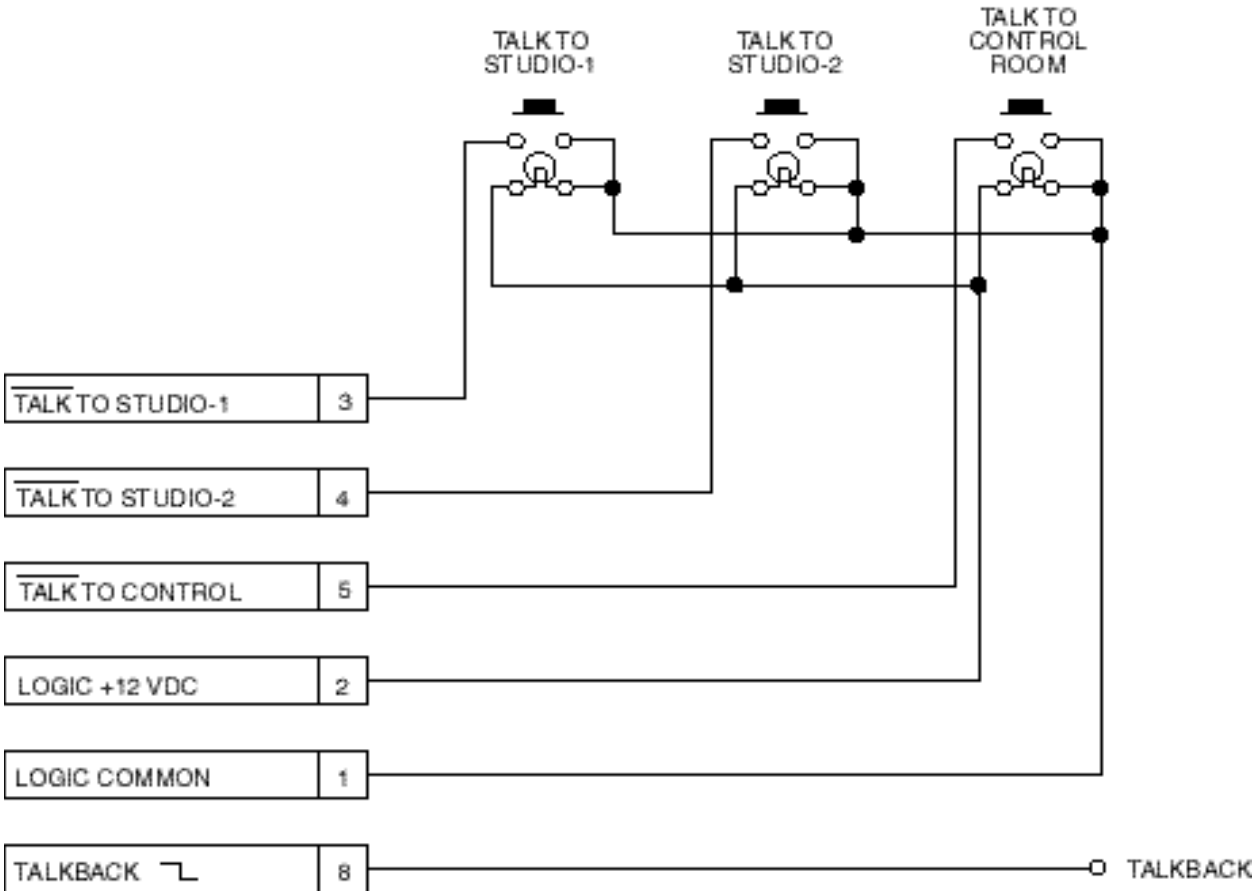
EXTERNAL INPUT



NOTES:
A) Button switches are momentary-action.
B) Lamps are 12-14 volt, 80 mA.
C) When tallies are connected as shown above, switch lamps will be illuminated at all times.

The “External” circuitry is intended for a variety of possible applications, including a telephone call screener booth, announce booth, newsroom, or even connection to a two-way transmitter/receiver for communicating with the rush-hour traffic reporter. The schematic below illustrates the full remote control capability of this input.

The TALKBACK control output is a current-sinking open collector, which is active (low) whenever the external location is receiving Talkback from another location. Typical applications include keying



NOTES:
A) Button switches are momentary-action.
B) Lamps are 12-14 volt, 80 mA.
C) When tallies are connected as shown above, switch lamps will be illuminated at all times.

a two–way transmitter or dimming an external monitor.

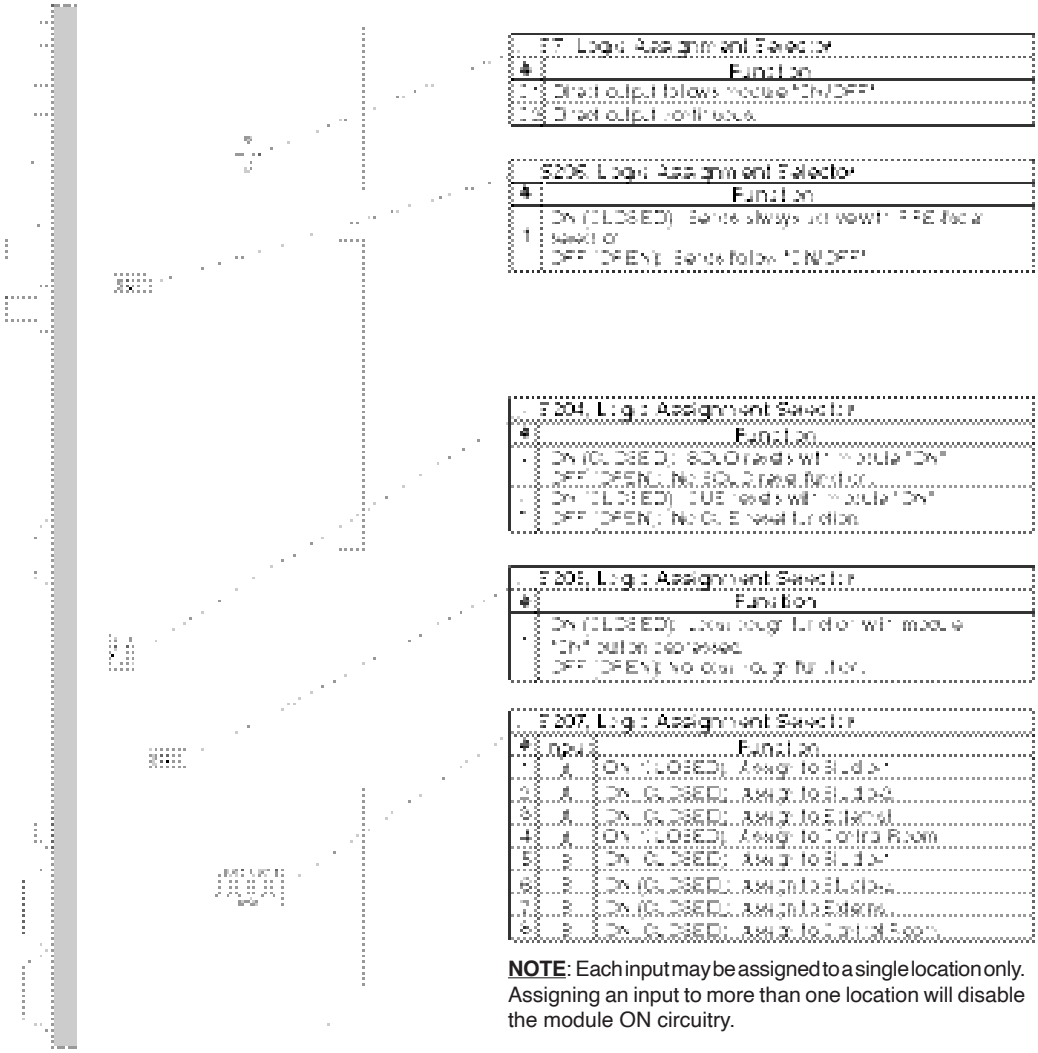
2.9 MODULE INTERNAL OPTION SWITCHES

Some AMX console modules are equipped with internal option switches, which can be set to enable or disable selected module functions. This section provides the locations of these switches on the module printed circuit assemblies, and their functions. Included are descriptions of the Microphone Input, Stereo Line Input, Control Room Monitor, Two-Studio Monitor, Send And Return, Telco Mix, Slate/Talkback/Test Oscillator, Meter Switcher, and Monaural and Stereo Equalizer Module option switches.

2.9.1 Microphone Input Module Option Switches

The illustration below provides the locations of the Microphone Input Module internal option switches, and defines their functions.

Switch S7 determines whether the module Direct Output is continuous, or if it follows the ON/OFF status of the module.



NOTE: Each input may be assigned to a single location only. Assigning an input to more than one location will disable the module ON circuitry.

The Send circuits normally follow the ON/OFF status of the module, but there are some applications, such as on and off-air telephone contest recording, for the PRE-fader Send signal to be "on" and available at all times. Closing option switch S206 will engage the Send relay whenever the front panel

PRE-fader button is depressed, regardless of the ON/OFF status of the module.

Switch S204 is a two-station switch, with S204-1 determining whether SOLO will reset and S204-2 determining whether CUE will reset when the module is turned ON.

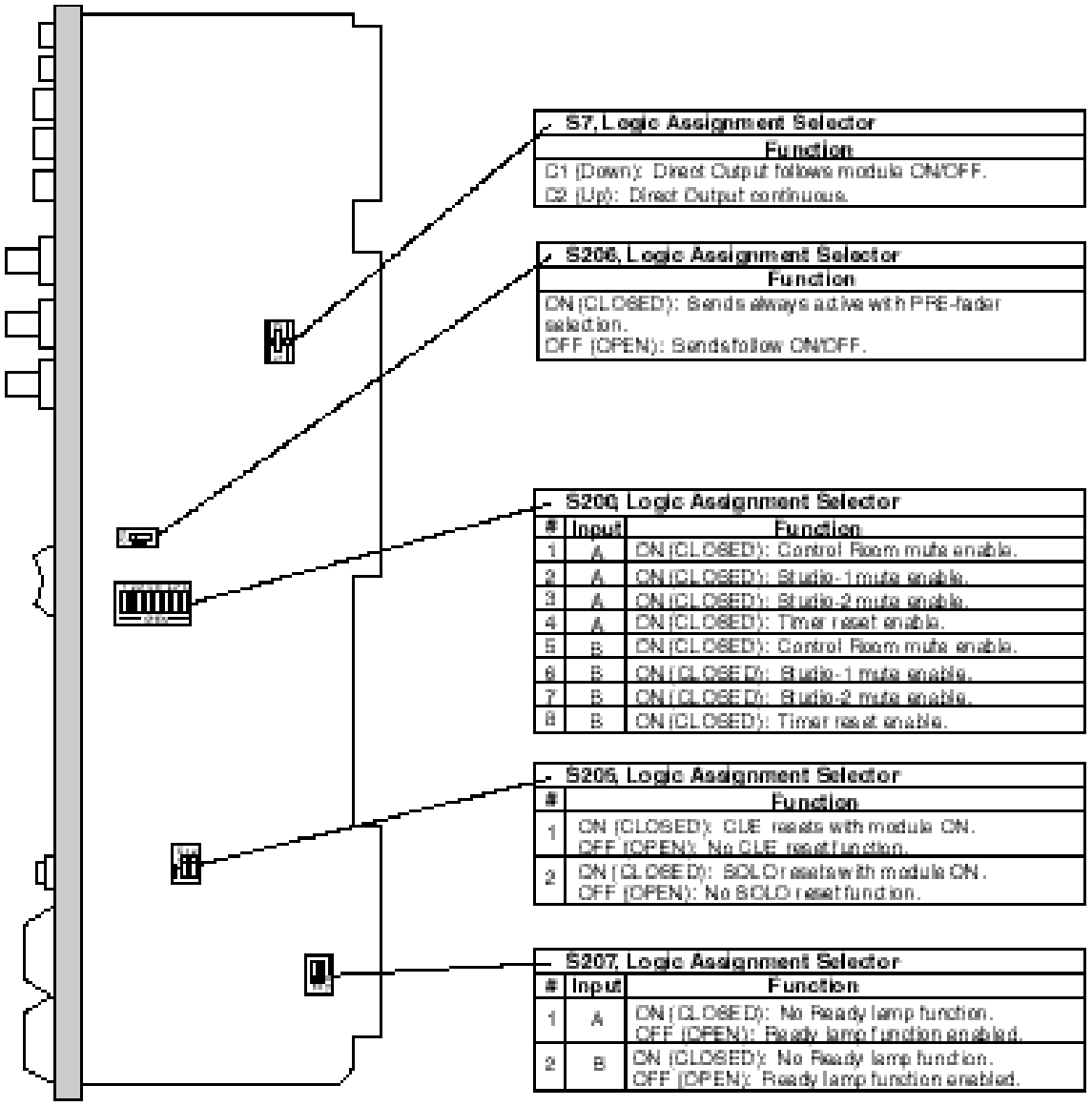
Switch S205 enables the local cough function, allowing the module ON button to function as a cough button when depressed while the module is ON.

Switch 207 is an eight-station switch that assigns the microphone to its own location (i.e., Control Room, Studio-1, etc.), enables the monitor mute function for that location, and enables Talkback from that location to all other locations.

2.9.2 Stereo Line Input Module Option Switches

The illustration below provides the locations of the Stereo Line Input Module internal option switches, and defines their functions.

Switch S7 determines whether the module Direct Output is continuous, or if it follows the ON/OFF



S7, Logic Assignment Selector

Function
C1 (Down): Direct Output follows module ON/OFF.
C2 (Up): Direct Output continuous.

S206, Logic Assignment Selector

Function
ON (CLOSED): Sends always active with PRE-fader selection.
OFF (OPEN): Sends follow ON/OFF.

S200, Logic Assignment Selector

#	Input	Function
1	A	ON (CLOSED): Control Room mute enable.
2	A	ON (CLOSED): Studio-1 mute enable.
3	A	ON (CLOSED): Studio-2 mute enable.
4	A	ON (CLOSED): Timer reset enable.
5	B	ON (CLOSED): Control Room mute enable.
6	B	ON (CLOSED): Studio-1 mute enable.
7	B	ON (CLOSED): Studio-2 mute enable.
8	B	ON (CLOSED): Timer reset enable.

S206, Logic Assignment Selector

#	Function
1	ON (CLOSED): CUE resets with module ON. OFF (OPEN): No CUE reset function.
2	ON (CLOSED): SOLO resets with module ON. OFF (OPEN): No SOLO reset function.

S207, Logic Assignment Selector

#	Input	Function
1	A	ON (CLOSED): No Ready lamp function. OFF (OPEN): Ready lamp function enabled.
2	B	ON (CLOSED): No Ready lamp function. OFF (OPEN): Ready lamp function enabled.

status of the module.

The Send circuits normally follow the ON/OFF status of the module, but there are some applications, such as on and off-air telephone contest recording, for the PRE-fader Send signal to be "on" and available at all times. Closing option switch S206 will engage the Send relay whenever the front panel PRE-fader button is depressed, regardless of the ON/OFF status of the module.

Switch S200 is an eight-station switch which enables the Control Room, Studio-1 and Studio-2 mute functions (these are available in the event that a preamplified microphone is connected to the module). This switch also enables the timer reset function for each input, causing the console timer to reset

whenever the module is turned ON.

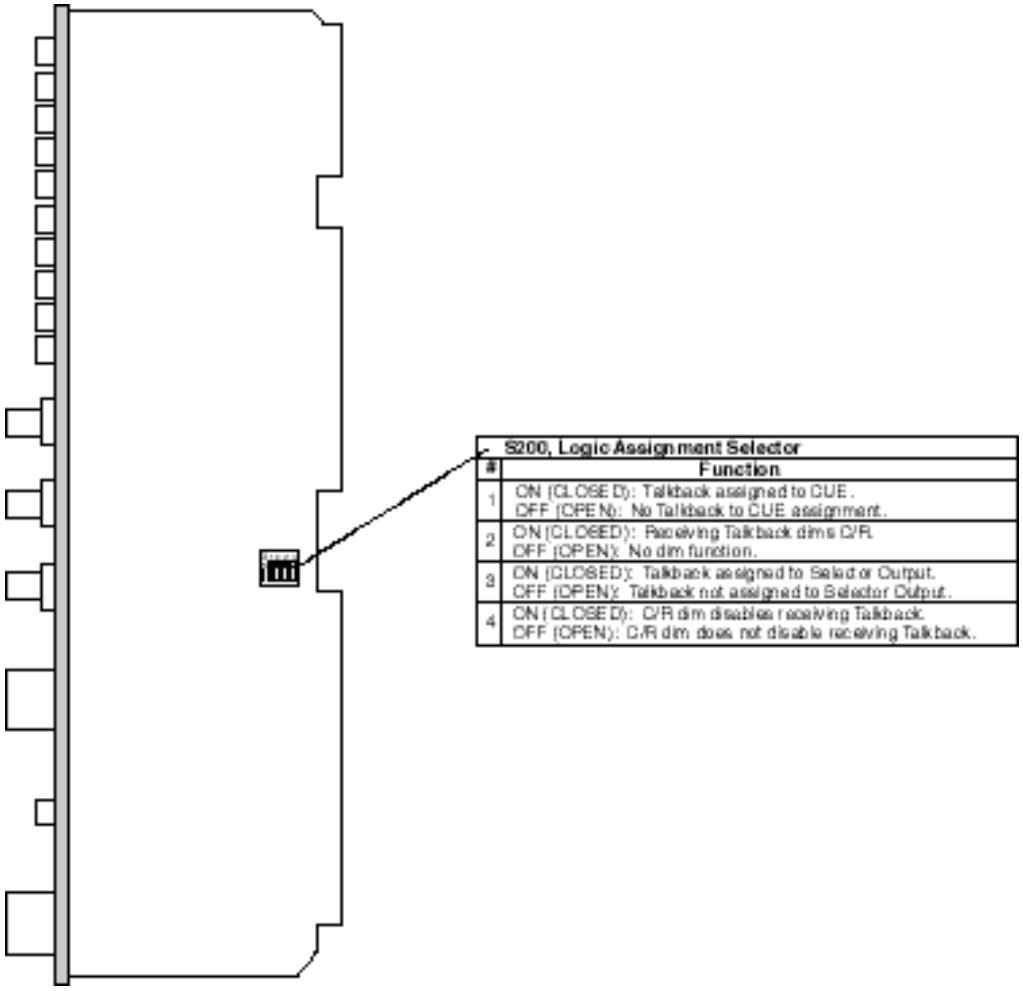
Switch S205 is a two-station switch, with S205-1 determining whether CUE will reset and S205-2 determining whether SOLO will reset when the module is turned ON.

Switch S207 enables the ready lamp function for each input. When enabled, the module OFF lamp is not illuminated when the module is OFF, but instead functions as a "ready" lamp, following the status of the connected machine's (cart, tape, etc.) ready status indicator.

2.9.3 Control Room Monitor Module Option Switch

The Control Room Monitor Module has a four-station internal option switch and an Auto-Cue option. The illustration below provides the location of this switch, and defines its functions. See the following page for a description of the Auto-Cue option.

Station S200-1 allows Talkback to be to be assigned to the console CUE system. The CUE output will



be dimmed by 10 dB while Talkback is inserted at unity level.

Station S200-2 allows the Control Room speakers to dim when the Control Room is receiving incoming Talkback communication. Please note that the Control Room speakers already dim whenever the Control Room is talking to another location.

Station S200-3 allows the Talkback circuitry to be assigned to the “Selector Output”. The monitor feed to this direct output will be dimmed by 10 dB while Talkback is inserted at unity level.

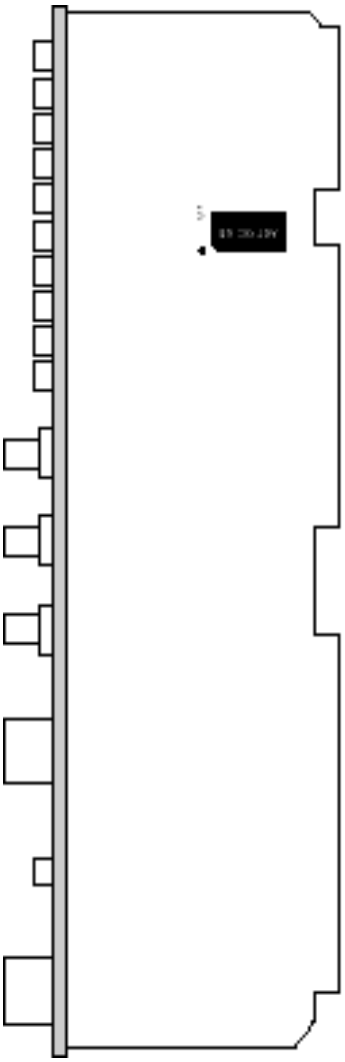
Since Control Room Monitor Module dims its monitor output whenever the Control Room is talking to another location, closing switch S200-4 causes the dim function to block incoming Talkback signals. This option prevents other locations from talking to the Control Room while it is talking, and may be desirable where the console operator and/or producer want the absolute priority of communication.

AUTO-CUE OPTION

The Auto-Cue headphone monitoring system provides the following facility whenever the front panel HEADPHONE MODE selector is placed in the AUTO position. When an input module CUE button is engaged, the console operator's headphone output will switch from the normal stereo monitor selection to one of two user assignable modes - stereo CUE to the left and right headphones, or monaural monitor to the left headphone and monaural CUE to the right. Selection of the desired Auto-Cue mode can be made by orienting header/jumper U7 in its 16-pin socket in either of the two positions defined below.

2.9.4 Two-Studio Monitor Module Option Switch

The illustration below provides the location of the Two-Studio Monitor Module internal option switch,

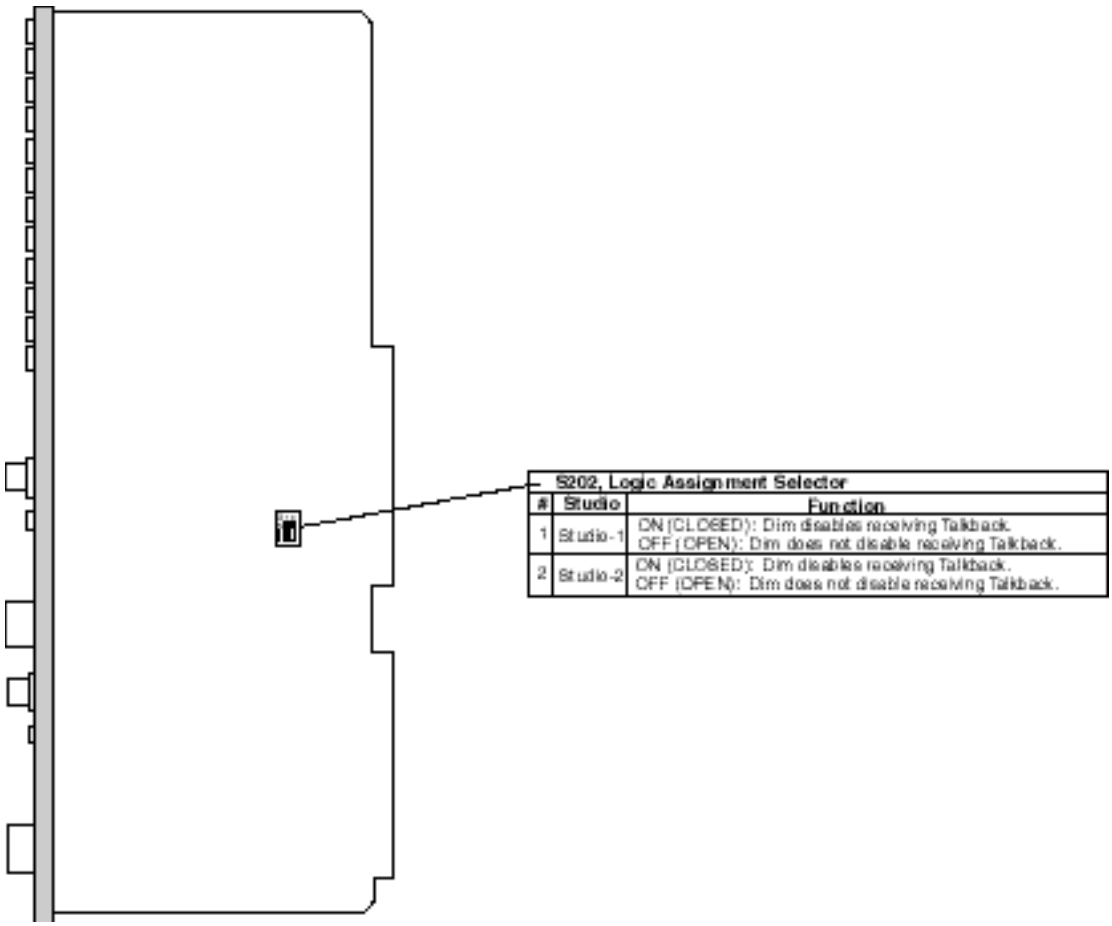


MODE 1: Stereo Cue is fed to left and right headphones, while source monitor is cut off.

MODE 2: Cue is summed to the right headphone, source monitor is summed to left headphone.

and defines its functions.

Switch S202 is a two-station switch which determines how the Studio-1 and Studio-2 dim functions affect Talkback communication. Closing station S202–1 causes the Studio-1 dim function to block incoming Talkback signals to Studio-1. Closing station S202-2 causes the Studio-2 dim function to

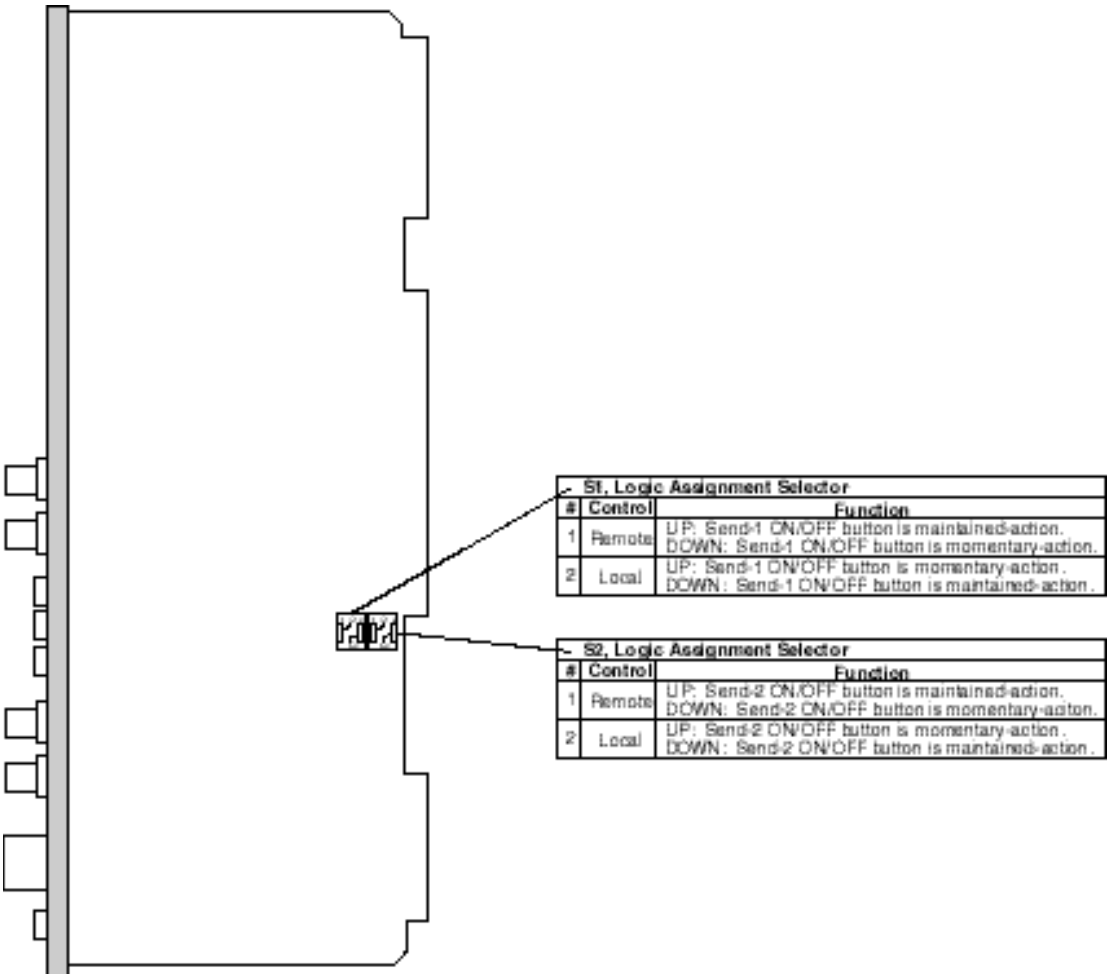


block incoming Talkback signals to Studio-2. Since the dim function is the result of the Studio talking to another location, this function prevents other locations from talking to a Studio while it is talking.

2.9.5 Send And Return Module Option Switches

The illustration below provides the location of the Send And Return Module internal option switches, and defines their functions.

Switch S1 is a two-station switch which determines whether the Send-1 local and/or remote ON/OFF buttons are momentary- or maintained-action. When momentary-action is selected for the local and/or remote ON/OFF buttons, Send-1 is active only when the ON/OFF button is held depressed.



Switch S2 is a two-station switch which determines whether the Send-2 local and/or remote ON/OFF buttons are momentary- or maintained-action. When momentary-action is selected for the local and/or remote ON/OFF buttons, Send-2 is active only when the ON/OFF button is held depressed.

The momentary-action function may be desired when using Sends for special effects applications.

2.9.6 Telco Mix Module Option Switches

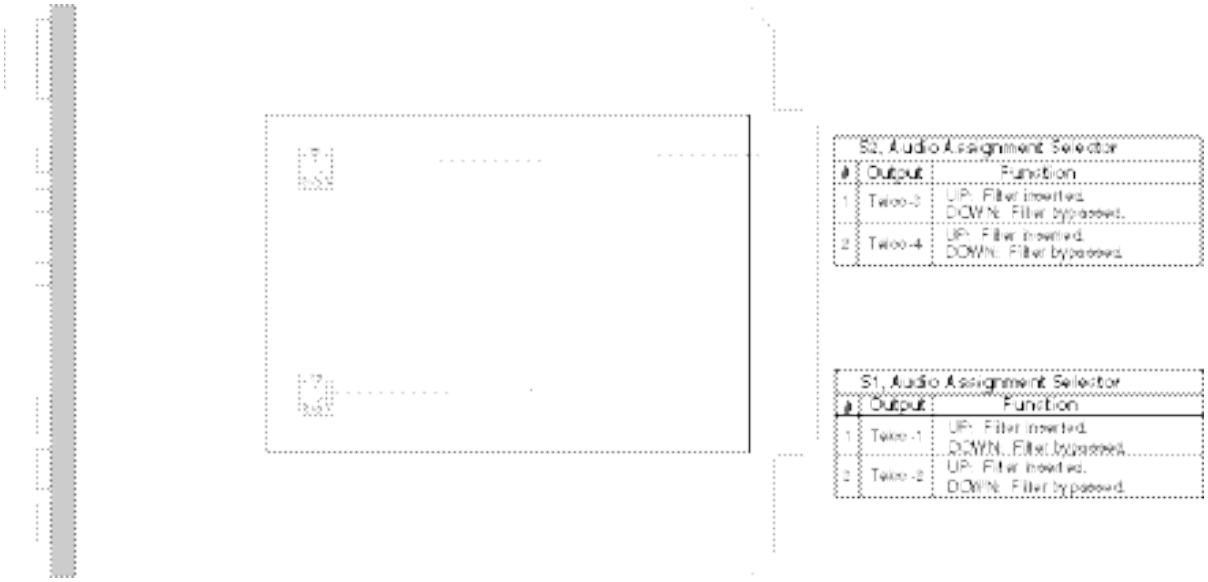
The Telco Mix Module is equipped with four band-pass filters, one for each of the outputs available for connection to telephone hybrids. The filters are three pole, 18 dB/octave designs with a band-pass

of 300 Hz to 3 kHz. The purpose of the filters is to limit the frequency response to a range within the null capabilities of professional grade hybrid systems. The filters may not be required or desirable for other mix-minus applications where hybrid-type facilities are not used, so each filter is equipped with a bypass switch.

The illustration below provides the location of these switches, and defines their functions.

2.9.7 Slate/Talkback/Test Oscillator Module Option Switch

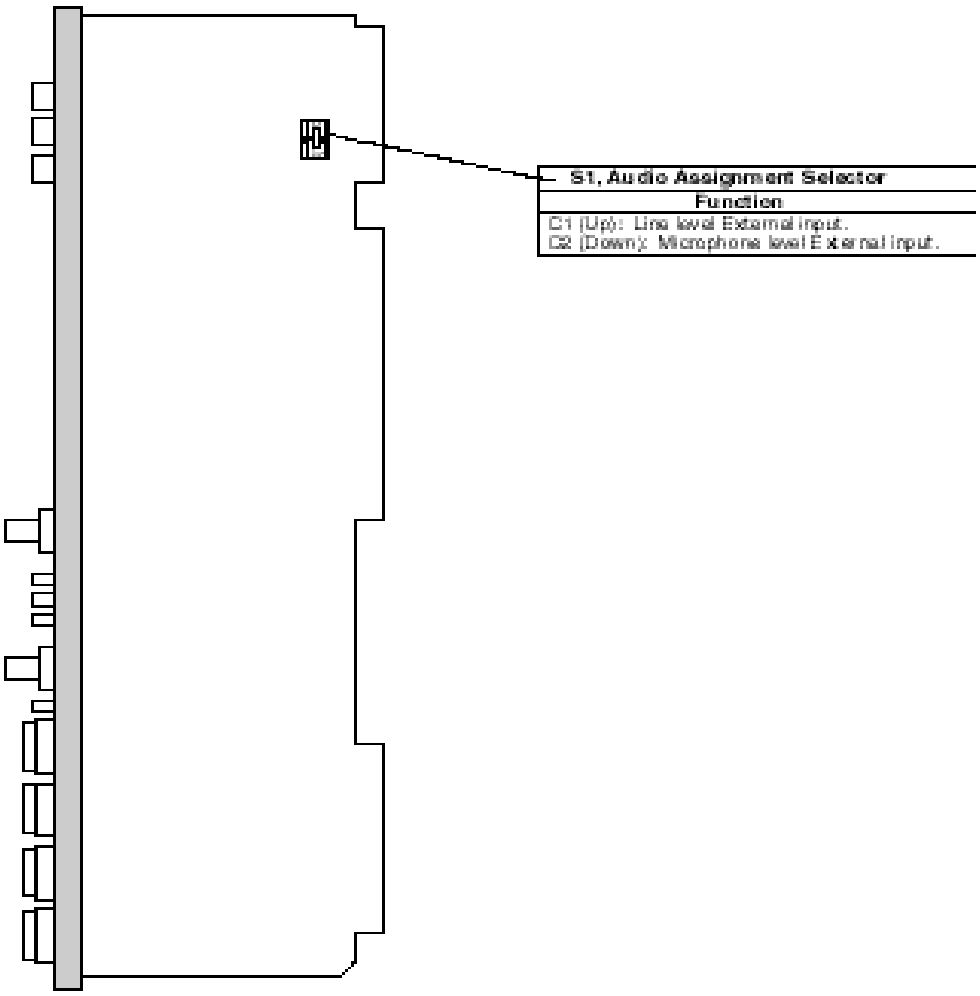
The Slate/Talkback/Test Oscillator Module has one internal option switch, which sets the External Talk audio input to be either microphone or line level. The illustration below provides the location of this



switch, and defines its function.

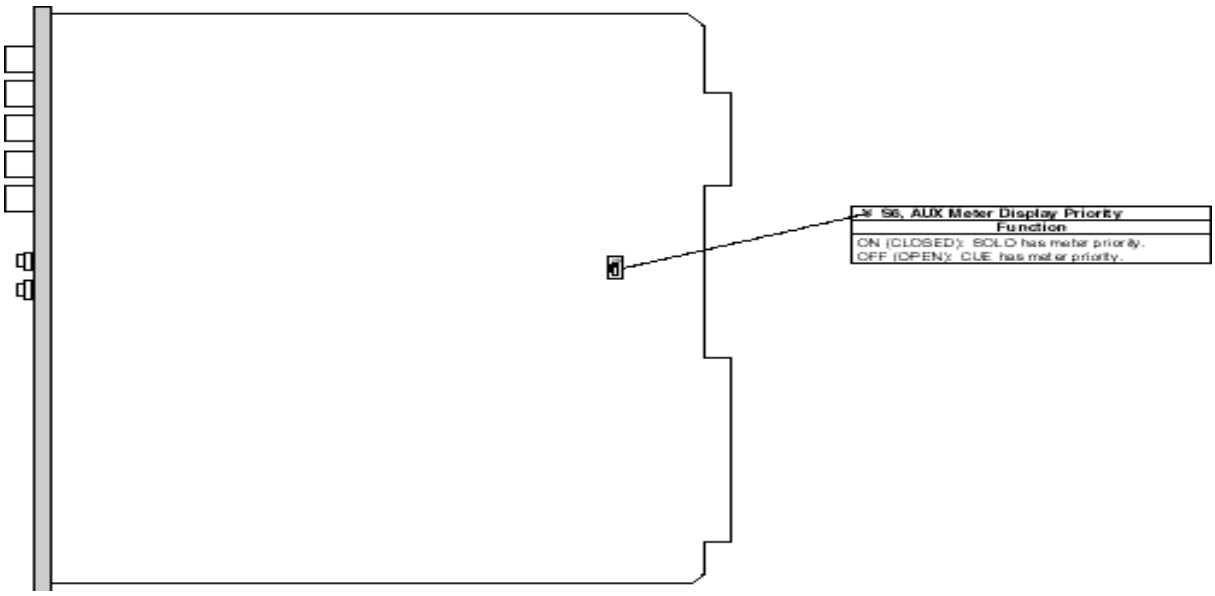
2.9.8 Meter Switcher Module Option Switch

The Meter Switcher Module has one internal option switch, which sets the priority of the AUXILIARY meter display between CUE and SOLO. The illustration below provides the location of this switch, and defines its function.



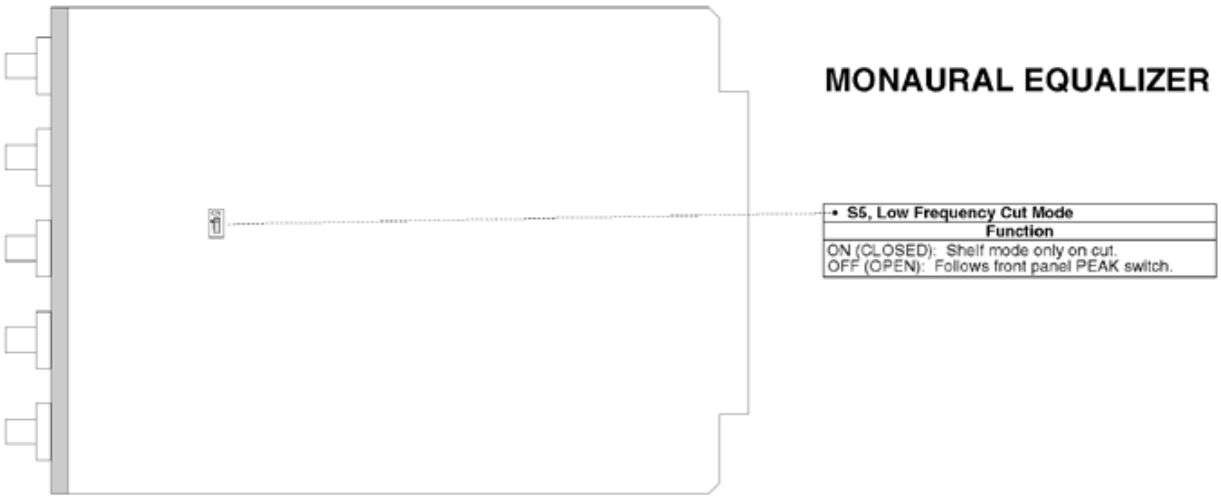
2.9.9 Monaural and Stereo Equalizer Module Option Switches

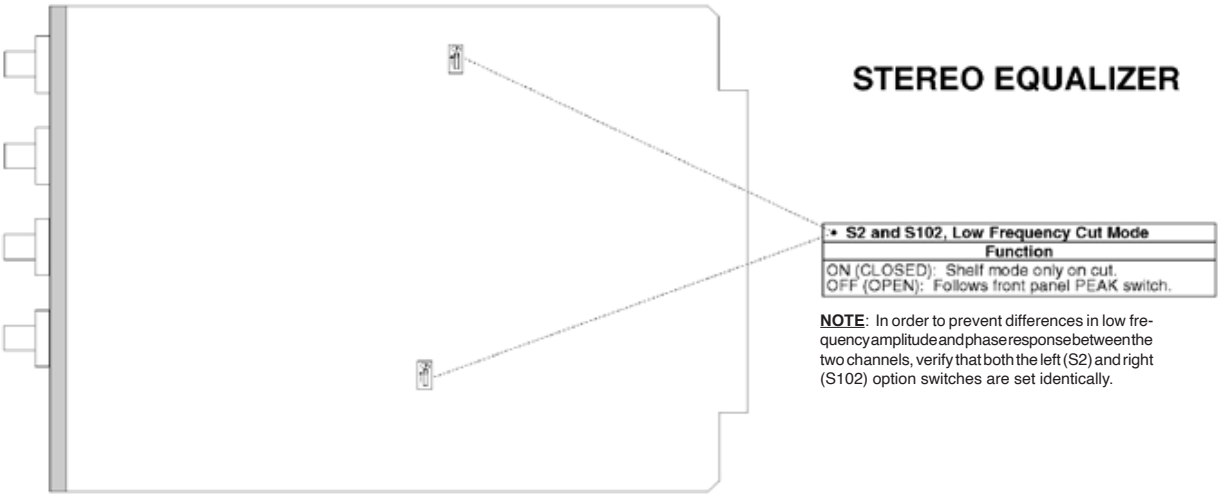
The Monaural and Stereo Equalizer Modules are equipped with internal option switches which allow the bass response to always be shelf-mode on cut regardless of the setting of the front panel peak/shelf switch. With the option switches set in the ON position, the front panel peak/shelf switch controls only



the boost mode. The purpose of this function is to recognize the realities of low frequency equalization of speech, music or mixed program material. While it is desirable to have both peak and shelf options available in the boost function, it is very rare to use the reciprocal of the peak mode in cut functions. Since peak is the more often selected boost mode, the option switch eliminates the need to be constantly switching the peak/shelf switch between boost and cut operations. For a frequency response graph illustrating this function, see Graph E of Figure 3.1 (located immediately after Section 3.16).

The illustration below provides the location of these switches, and defines their functions.

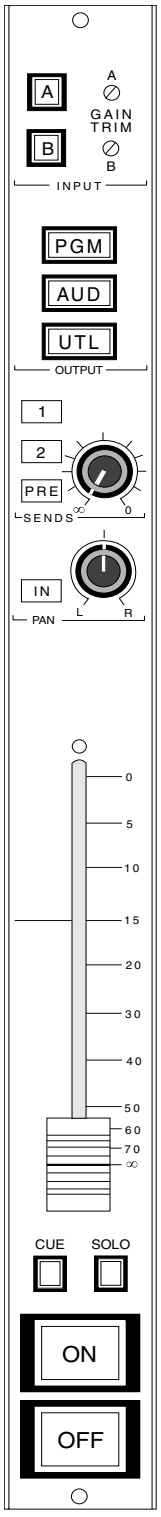




3.0 OPERATION

This chapter contains sections describing AMX module operating controls.

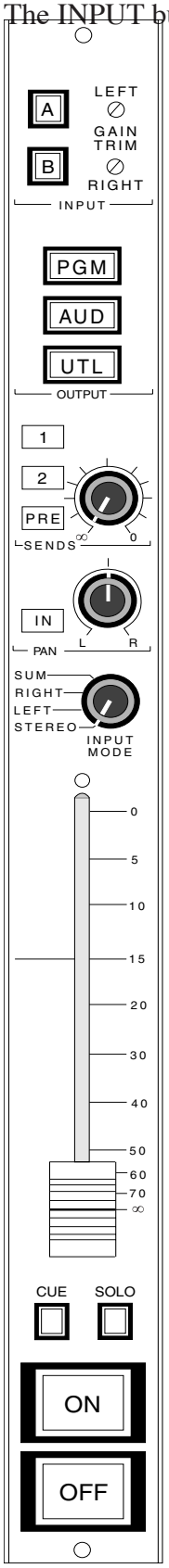
3.1 MICROPHONE INPUT MODULE



- The INPUT buttons select between microphones connected to the A and B inputs of the module.
- The recessed GAIN TRIM controls adjust the microphone preamplifier gain for each of the two inputs.
- The OUTPUT buttons provide the ability to assign the module to any combination of the PROGRAM, AUDITION and UTILITY output buses.
- The SEND-1, SEND-2 and PRE-fader buttons assign the pre- or post-fader microphone signal to the console Send circuitry. The rotary control adjusts the Send level.
- The PAN control with INsert switch allows positioning of the microphone signal in the stereo image.
- The mixing fader is a stepless, infinite resolution control with a reference line at the -15 dB point. The reference is the nominal position for a properly adjusted input level to achieve “0” VU on the console output meters.
- The electronic alternate-action CUE button routes the pre-fader signal to the console CUE monitoring and automatic metering systems. The CUE button lamp flashes to tally its ON status. A steady tally indication is available with the installation of an optional jumper wire in the lamp driver logic (reference Section 5.4).
- The electronic alternate-action SOLO button routes the input signal (after the fader and pan controls) to the console SOLO monitoring and automatic metering systems. The SOLO button illuminates to tally its ON status.
- The ON button turns the module on and initiates the appropriate muting commands, as programmed during installation. In addition, the ON button may be optionally set to provide a momentary cough function while held depressed (reference Section 2.9.1).
- The OFF button turns the module off and cancels the muting commands.

3.2 STEREO LINE INPUT MODULE

- The INPUT buttons select between stereo sources connected to the A and B inputs of the module.



- The recessed GAIN TRIM controls adjust the input gain of the the LEFT and RIGHT preamplifiers.

- The OUTPUT buttons provide the ability to assign the module to any combination of the PROGRAM, AUDITION and UTILITY output buses.

- The Send-1, Send-2 and PRE-fader buttons assign the pre- or post-fader signal to the console Send circuitry. The rotary control adjusts the Send level. Reference Section 5.3 for stereo Send operation.

- The PAN control with INsert button may be used to adjust the left-right balance of a stereo signal, or to position a monaural or sum mode signal in the left-right stereo image.

- The INPUT MODE selector determines the module mode as follows:

STEREO	Discrete stereo channels.
LEFT	Left to both channels.
RIGHT	Right to both channels.
SUM	Sum of left and right to both channels.

- The mixing fader is a stepless, infinite resolution control with a reference line at the -15 dB point. The reference is the nominal position for a properly adjusted input level to achieve “0” VU on the console output meters.

- The electronic alternate-action CUE button routes the pre-fader stereo signal to the console CUE monitoring and automatic metering systems. The CUE button lamp flashes to tally its ON status. A steady tally indication is available with the installation of an optional jumper wire in the lamp driver logic (reference Section 5.4).

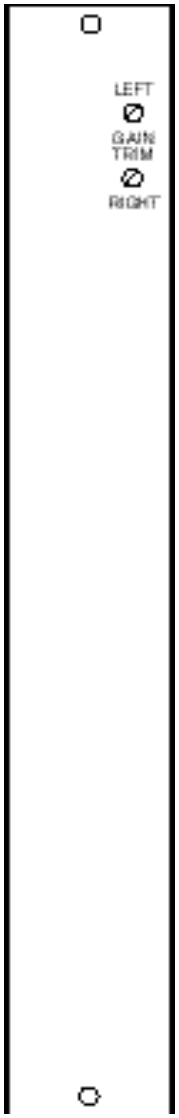
- The electronic alternate-action SOLO button routes the stereo signal (after the fader and pan controls) to the console SOLO monitoring and automatic metering systems. The SOLO button illuminates to tally its ON status.

- The ON button turns the module on and initiates machine start control, timer reset or muting commands, as programmed during installation.

- The OFF button turns the module off and initiates machine stop control commands as programmed during installation. In addition, the OFF tally may be set to act as a machine ready status indicator (reference Section 2.9.2).

3.3 STEREO LINE OUTPUT AMPLIFIER

- The recessed LEFT and RIGHT GAIN TRIM controls adjust the gain of the line output distribution

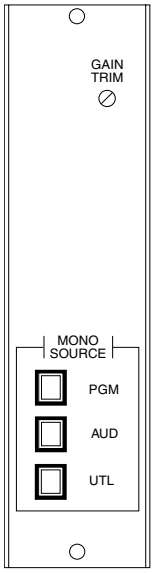


amplifiers

3.4 MONAURAL LINE OUTPUT AMPLIFIER

- The recessed GAIN TRIM control adjusts the gain of the monaural line output

distribution amplifier.

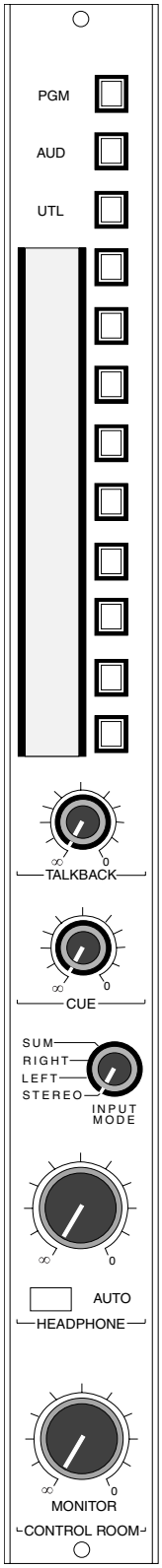


- The MONO SOURCE buttons allow for the selection of any combination of the PROGRAM, AUDITION and UTILITY output buses to be summed as the monaural output.

3.5 CONTROL ROOM MONITOR MODULE

- The 12-station MONITOR INPUT switch selects the monitor source from the PROGRAM, AUDITION or UTILITY buses, or any one of nine external

sources.



NOTE: Legend strip dimensions are provided in Section 2.1.

- The TALKBACK control adjusts the level of Talkback communication received in the Control Room via the adjustable Talkback output or the CUE output (when Talkback is assigned to CUE per Section 2.9.3).

- The CUE control sets the level of the Control Room Monitor CUE output.

- The INPUT MODE selector determines the module monitor and headphone output modes as follows:

STEREO	Discrete stereo to monitors and headphones.
LEFT	Left to both monitor and headphone channels.
RIGHT	Right to both monitor and headphone channels.
SUM	Sum of left and right to both monitor and headphone channels.

- The HEADPHONE control adjusts the output level for the console operator's headphone system.

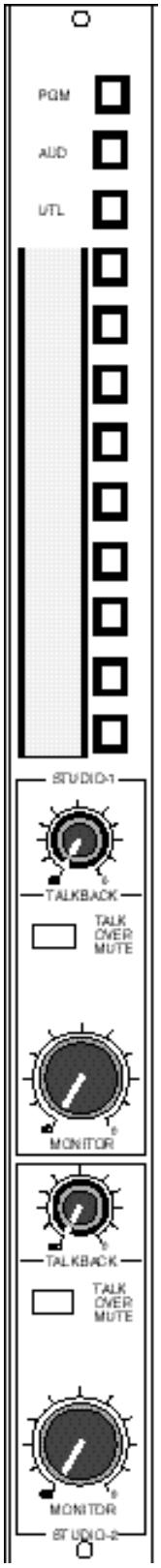
- The headphone AUTO button enables the Automatic-Cue switching system for the console operator's headphones. With this button engaged, whenever an input module is placed in CUE the console operator's headphone output will switch from the normal stereo MONITOR INPUT selection to one of two modes - stereo CUE to both headphones, or monaural monitor to the left headphone and monaural CUE to the right headphone (reference Section 2.9.3).

- The MONITOR level control adjusts the volume of the Control Room monitors.

3.6 TWO-STUDIO MONITOR MODULE

- The 12-station MONITOR INPUT switch selects the monitor source from the PROGRAM, AUDITION or UTILITY buses, or any one of nine external

sources.



NOTE: Legend strip dimensions are provided in Section 2.1.

STUDIO-1 CONTROLS

- The TALKBACK control adjusts the level of Talkback communication received in Studio-1.
- The TALK OVER MUTE button is an alternate action switch which, when engaged, will allow communication to Studio-1 even when there is a live microphone in the studio and the studio speakers are muted. This function is usually limited to off-air work, such as recording and production. However, some "personality" formats are designed to have the console operator talking to the hosts on-air.
- The MONITOR control adjusts the volume of the Studio-1 speakers.

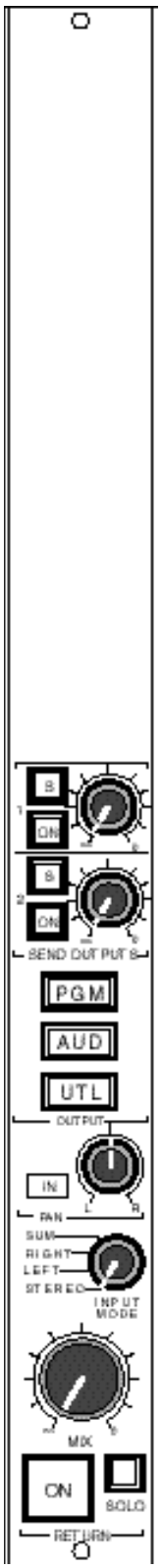
STUDIO-2 CONTROLS

- The TALKBACK control adjusts the level of Talkback communication received in the Studio-2.
- The TALK OVER MUTE button is an alternate action switch which, when engaged, will allow communication to a Studio-2 even when there is a live microphone in the studio and the studio speakers are muted.
- The MONITOR control adjusts the volume of the Studio-2 speakers.

3.7 SEND AND RETURN MODULE

- The electronic ON buttons control the Send outputs. These buttons may be maintained- or momentary-action, as determined by internal option switches

(reference Section 2.9.5). The SOLO buttons route the pre-fader Send mix bus signals to the SOLO monitoring and automatic metering systems. The two rotary controls adjust the Send levels.



- The OUTPUT buttons provide the ability to assign the stereo Return signal to any combination of the PROGRAM, AUDITION and UTILITY output buses.

- The PAN control with INsert switch may be used to adjust the left-right balance of a stereo Return signal, or to position a monaural or sum mode signal in the left-right stereo image.

- The INPUT MODE switch selects Return mode as follows:

STEREO	Discrete stereo channels.
LEFT	Left to both channels.
RIGHT	Right to both channels.
SUM	Sum of left & right to both channels.

- The MIXing fader is a stepless, infinite resolution control.

- The electronic alternate-action SOLO button routes the Return stereo signal to the console SOLO monitoring and automatic metering systems. The SOLO button illuminates to tally its ON status.

- The electronic alternate-action ON button turns the module Return circuitry ON and OFF.

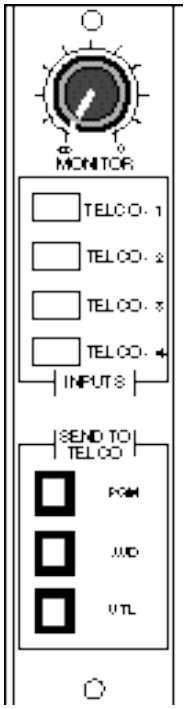
3.8 TELCO MIX MODULE

The Telco Mix Module produces the two Telco Monitor Outputs and the four outputs to be fed to the callers. Each of these caller feeds is a mix-minus output

consisting of the selected SEND TO TELCO bus (normally the UTILITY bus, as described below) plus all selected callers minus the caller himself. This mix-minus matrix is best illustrated by the module block diagram contained in Section 7.1.8.

NOTE: In order to assign a caller to a console output bus (such as the PROGRAM bus for "on-air" telco operations), select the desired bus on the Stereo Line Input Module being used as the caller's Telco input and turn the module ON. However, do not assign the caller's input module to the SEND TO TELCO bus, as the callers are added to the base mix using the TELCO INPUT assignment buttons, as described below.

- The MONITOR control adjusts the level of the variable Telco Monitor Output.



NOTE: Both Telco Monitor Outputs (fixed and variable) are non-muted caller-only outputs.

- The TELCO INPUT assignment buttons may select any combination of up to four input feeds from the Stereo Line Input Modules assigned as telephone hybrid inputs. The buttons assign these inputs to the module mix matrix where the four telco outputs and the monitor mix are generated.

- The SEND TO TELCO assignment switch selects which console bus or buses will be fed to all callers (normally the UTILITY bus, as described below).

UTILITY BASE MIX

The UTILITY bus is normally assigned to be the base mix bus for Telco operations. In order to accomplish this, configure the console as follows:

1. Assign all input modules to be included in the base mix to the UTILITY bus except the Line Input Modules being used as Telco inputs.

2. Select the UTILITY bus on the SEND TO TELCO assignment switch.

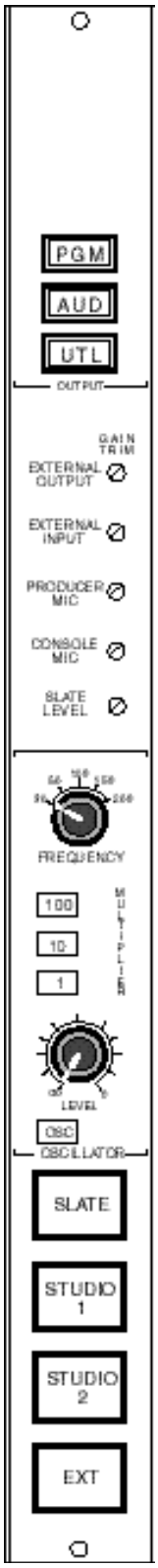
3. Add the callers to the base mix using the TELCO INPUT assignment buttons.

3.9 SLATE/TALKBACK/TEST OSCILLATOR MODULE

- The OUTPUT buttons provide the ability to assign the test oscillator and slate circuitry to any

combination of the PROGRAM, AUDITION and UTILITY output buses.

- The recessed EXTERNAL OUTPUT and EXTERNAL INPUT GAIN TRIM controls adjust the levels of the signals being sent and being received via the external Talkback outputs and inputs.



- The PRODUCER MIC GAIN TRIM control adjusts the level of the microphone preamplifier for the producer.

- The CONSOLE MIC GAIN TRIM control adjusts the level of the Talkback/ Slate microphone preamplifier for the console electret microphone.

- The SLATE LEVEL GAIN TRIM control adjusts the level of the 30 Hz slate tone mixed with the console microphone signal during slate functions.

  NOTE: This control is factory-adjusted to give a -6 VU meter reading.

- The FREQUENCY selector and MULTIPLIER buttons set the operating frequency of the built-in test oscillator.

- The OSC button defeats the Slate circuitry and connects the test oscillator to the bus or buses selected by the output assignment buttons.

- The OSCILLATOR LEVEL control adjusts the tone level of the test oscillator.

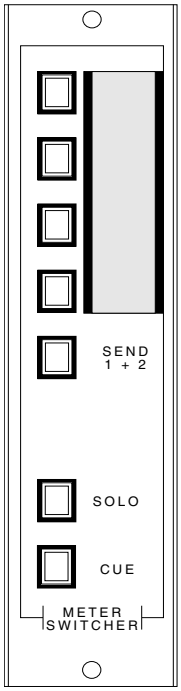
- The SLATE button sends a mix of the 30 Hz Slate tone oscillator and the console Talkback microphone signal to the bus or buses selected by the OUTPUT assignment buttons.

- The three Talkback buttons provide communication to two Studios and an EXTernal location.

3.10 METER SWITCHER MODULE

- The five-station METER SOURCE switch selects the source to be fed to the AUXILIARY meters. The module shown is for the AMX-26, 30 and 34 mainframes and has one input designated for metering Sends, and four external inputs available for metering the optional monaural and telco mix modules,

remote modulation readouts, etc. The AMX-18 and 22 mainframes use one of these external inputs for UTILITY metering, while the smaller AMX-10 and 14 mainframes use two of these inputs, one for AUDITION and one for UTILITY metering.



NOTE: Legend strip dimensions are provided in Section 2.1.

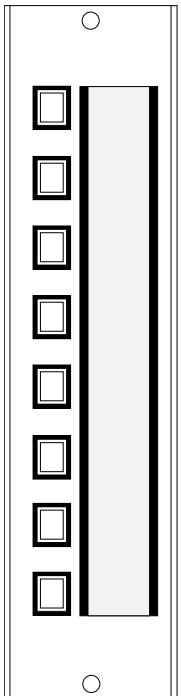
- The SOLO and CUE tallies illuminate to indicate when either function is engaged somewhere in the console, and the SOLO or CUE level is displayed on the AUXILIARY meters.

NOTE: SOLO or CUE metering priority may be set by means of an internal option switch (reference Section 2.9.8).

3.11 REMOTE LINE SELECTOR MODULE

- Up to four Remote Line Selectors may be installed in the AMX mainframe. Each module consists of an eight-station selector switch which can select from any of the eight Remote Line Selector inputs. The stereo output of each module is then brought out to the console connector panel for routing to console input positions, tape recorder inputs, etc.

NOTE: Legend strip dimensions are provided in Section 2.1.

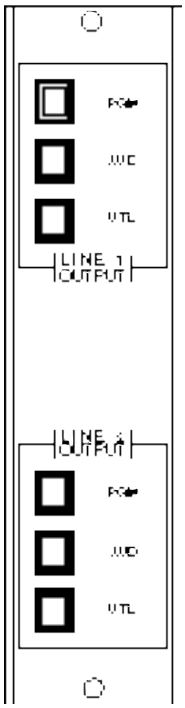


3.12 LINE OUTPUT SWITCHER MODULE

- The LINE-1 and LINE-2 OUTPUT switches select from the PROGRAM, AUDITION or UTILITY output buses for routing to the rear panel LINE OUTPUT SWITCHER connectors.

3.13 TIMER CONTROL PANEL

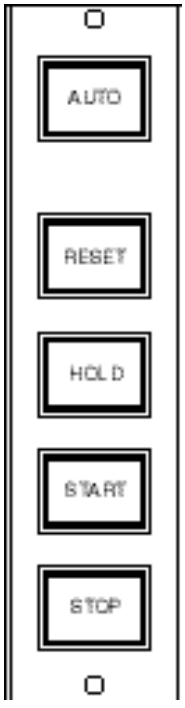
- When the mechanical maintained-action AUTO button is engaged, the timer will reset and restart



whenever a Stereo Line Input Module with the timer reset function enabled is turned ON (reference Section 2.9.2). The AUTO button illuminates to tally its ON status.

- The RESET button resets the timer to zero.

- The HOLD button will hold the timer display at the present time count while the running time count



continues internally. Releasing the HOLD button will display the running time count.

- The START button starts the timer.

- The STOP button stops the timer.

NOTE: The Timer Control Panel schematic is located in Section 8.6.6.

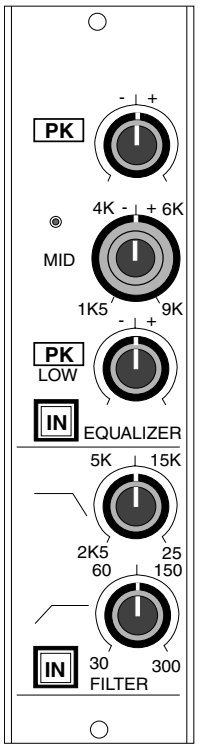
3.14 MONAURAL EQUALIZER MODULE

Figure 3.1 (located immediately after Section 3.16) contains Graphs A through H, which provide frequency response data for the equalizers and filters described in this section.

- The HIGH control adjusts the amount of boost and cut of the high frequencies. The center frequency of operation is 9 kHz. The PK button switch changes the shape of the equalization curves from shelving (reference Graph A) to

peaking (reference Graph B).

- The outer knob of the concentric MID control tunes the operating frequency of this stage (reference Graph C), while the inner knob adjusts the amount of boost and cut (reference Graph D). The frequency tuning range is 1.5 kHz to 9 kHz. The "automatic parametric" feature of this circuit continuously increases the "Q" of the equalizer with increasing amounts of boost and cut.



- The LOW control adjusts the amount of boost and cut of the low frequencies. The center frequency of operation is 80 Hz. The PK button switch changes the shape of the equalization curves from shelving (reference Graph A) to peaking (reference Graph B). An internal option switch, as described in Section 2.9.9, can set the cut mode as shelving with the PK switch engaged (reference Graph E).

- The IN button inserts the three-band equalizer system into the signal path.

- The high and low pass control knobs set the cutoff frequencies of the two tuneable 18 dB/octave filters (reference Graph F).

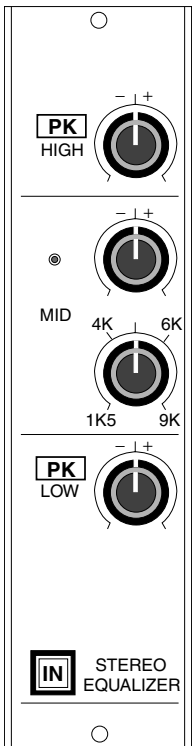
- The IN button inserts the filter system into the signal path.

3.15 STEREO EQUALIZER MODULE

Figure 3.1 (located immediately after Section 3.16) contains Graphs A through H, which provide frequency response data for the equalizers described in this section.

- The HIGH control adjusts the amount of boost and cut of the high frequencies. The center frequency of operation is 9 kHz. The PK button switch changes the shape of the equalization curves from shelving (reference Graph A) to peaking (reference Graph B).

- The upper knob of the two MID controls tunes the center frequency of this stage (reference Graph C), while the lower knob adjusts the amount of boost and cut (reference Graph D). The frequency tuning range is 1.5 kHz to 9 kHz. The "automatic parametric" feature of this circuit continuously increases the "Q" of the equalizer with increasing amounts of boost and cut.



- The LOW control adjusts the amount of boost and cut of the low frequencies. The center frequency of operation is 80 Hz. The PK button switch changes the shape of the equalization curves from shelving (reference Graph A) to peaking (reference Graph B). An internal option switch, as described in Section 2.9.9, can set the cut mode as shelving with the PK switch engaged (reference Graph E).

- The IN button inserts the three-band equalizer system into the signal path.

3.16 VOICE PROCESSOR MODULE

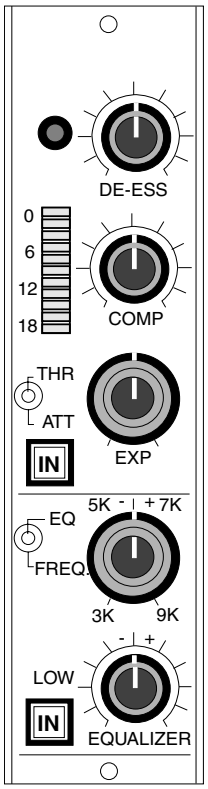
Figure 3.1 (located immediately after this Section) contains Graphs A through H, which provide frequency response data for the equalizers described in this section.

- The DE-ESS potentiometer sets the threshold of operation for the de-essing control circuitry. The LED illuminates to indicate de-essing action.

- The COMPressor control sets the fixed gain value of the compressor VCA. Since the threshold of the compressor is fixed, the COMPressor control has

the same effect as the traditional compressor input control.

- The LED dot/bar graph display is used to indicate both the amount of expander attenuation and the degree of compression. The expander attenuation is displayed as single illuminated segments (dots) while a bar graph is used to indicate the gain reduction of the compressor.



- The EXPander ATTenuation knob controls the amount of static attenuation and the EXPander THReshold knob adjusts the sensitivity of the expander control circuits.

- The IN button inserts the expander, compressor and de-esser into the audio signal path.

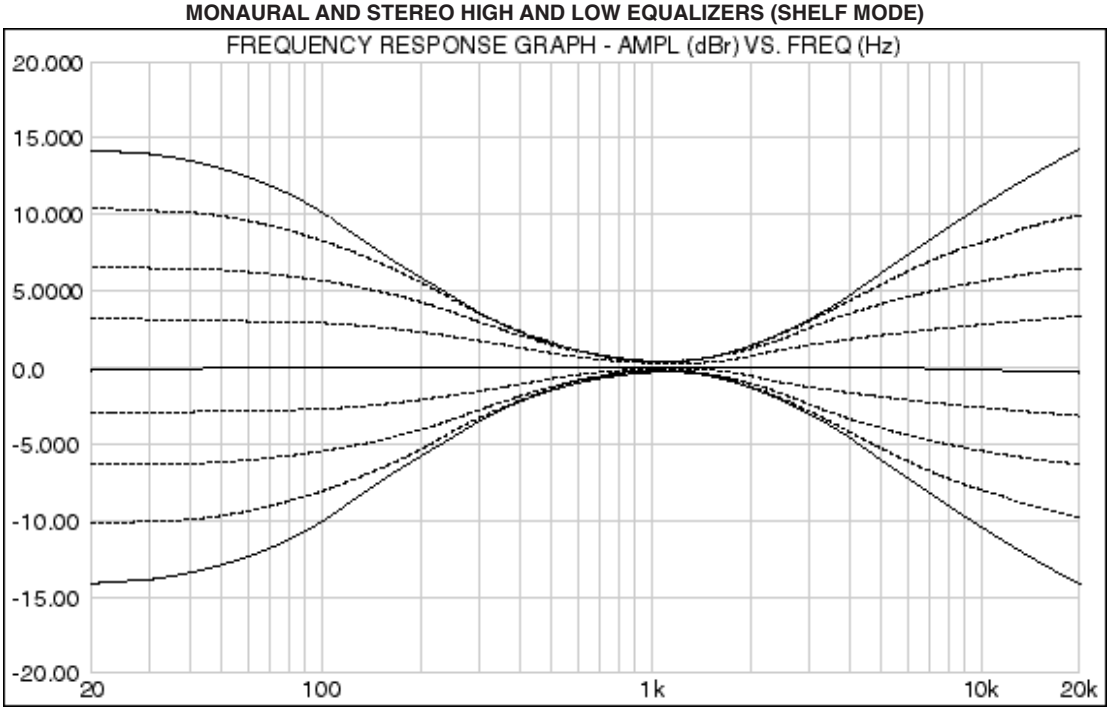
- The FREQuency knob tunes the center frequency of operation for this stage (reference Graph G), and the EQualizer knob adjusts the degree of boost and cut of the high frequency equalizer (reference Graph H).

- The low frequency knob adjusts the amount of boost and cut of the low frequencies (reference Graph H). The center frequency of operation is 80 Hz.

  NOTE: The low frequency cut mode is always shelving.

- The IN button inserts the equalizer into the circuit path.

GRAPH A
MONAURAL AND STEREO HIGH AND LOW EQUALIZERS (SHELF MODE)



GRAPH B
MONAURAL AND STEREO HIGH AND LOW EQUALIZERS (PEAK MODE)

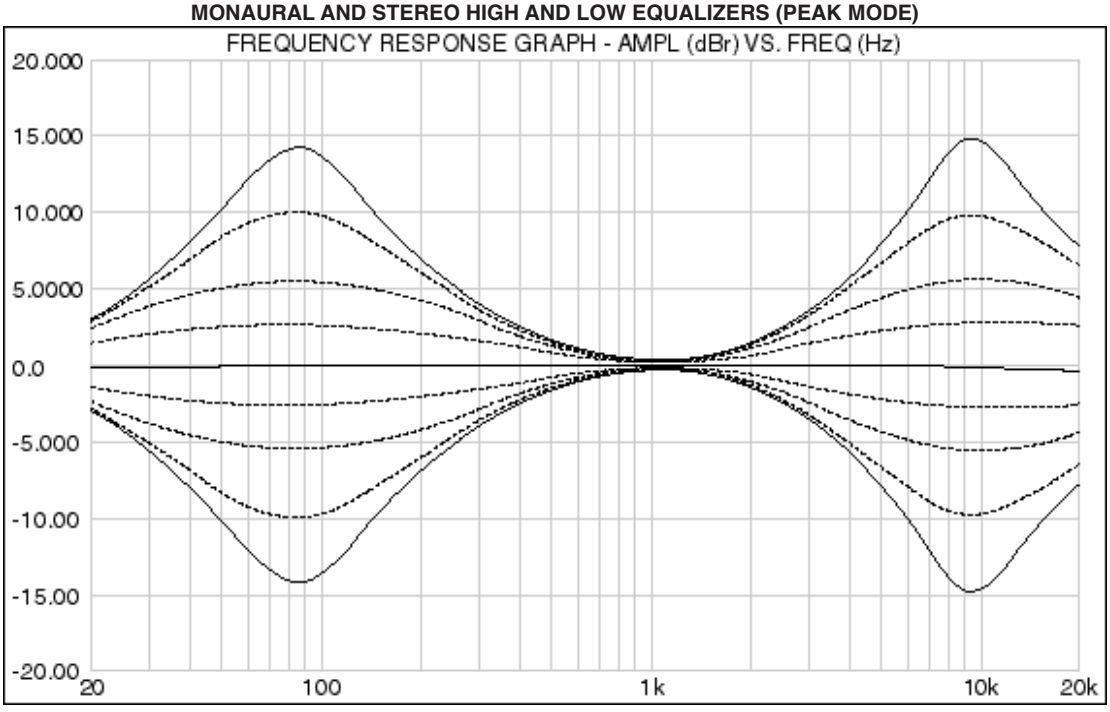
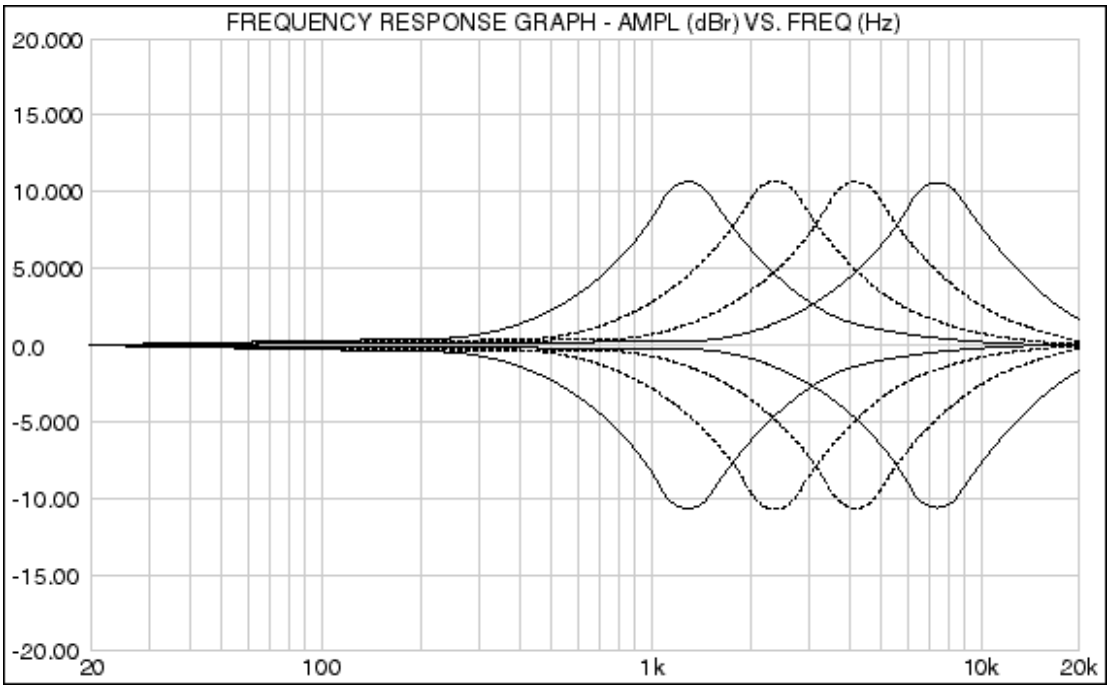


FIGURE 3.1 EQUALIZER AND VOICE PROCESSOR MODULE FREQUENCY RESPONSE GRAPHS (PAGE 1 OF 4)

GRAPH C
MONAURAL AND STEREO MID-RANGE EQUALIZER FREQUENCY CONTROL



GRAPH D
MONAURAL AND STEREO MID-RANGE EQUALIZER LEVEL RANGE

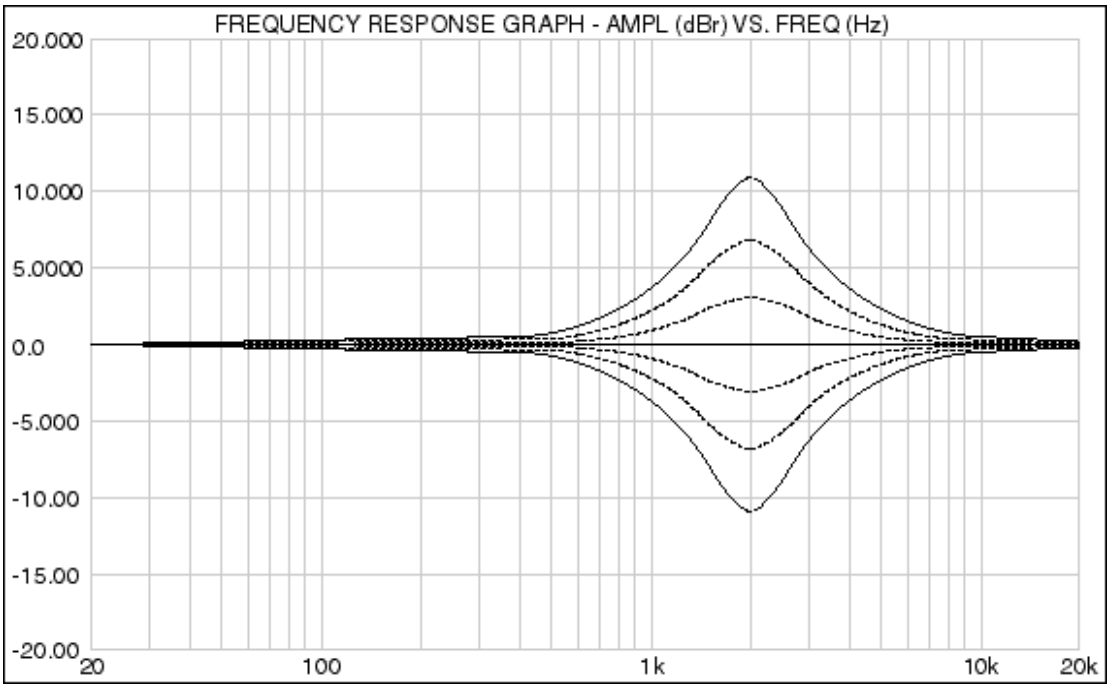
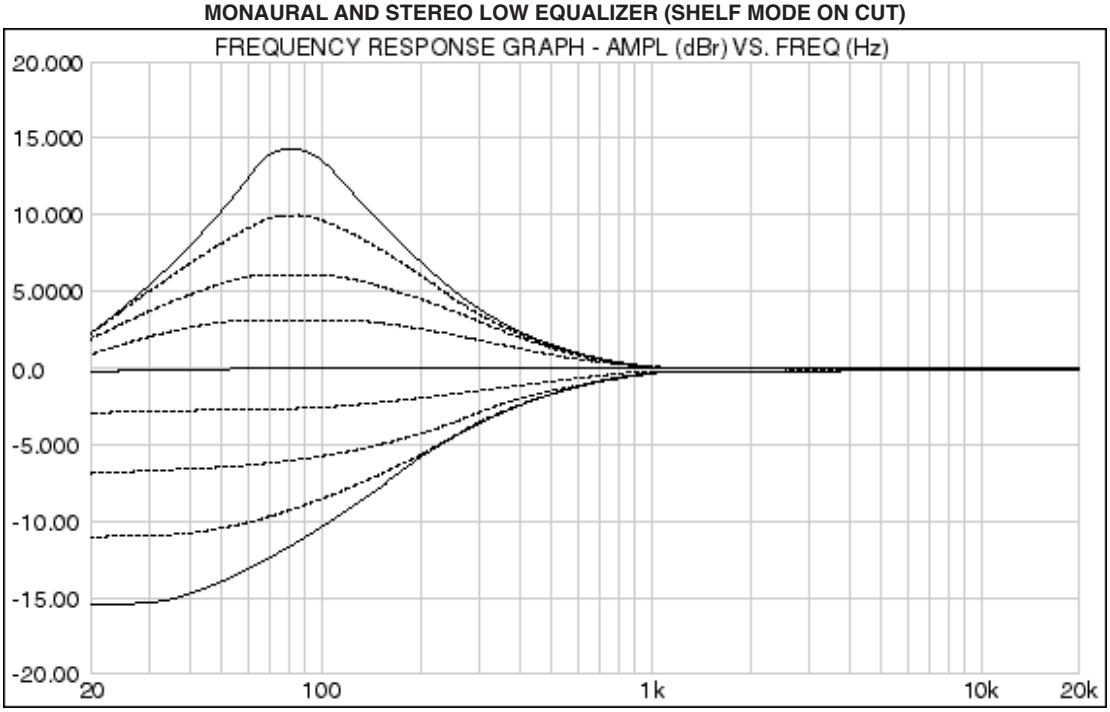


FIGURE 3.1 EQUALIZER AND VOICE PROCESSOR MODULE FREQUENCY RESPONSE GRAPHS (PAGE 2 OF 4)

GRAPH E
MONAURAL AND STEREO LOW EQUALIZER (SHELF MODE ON CUT)



GRAPH F
MONAURAL EQUALIZER MODULE HIGH AND LOW FILTERS

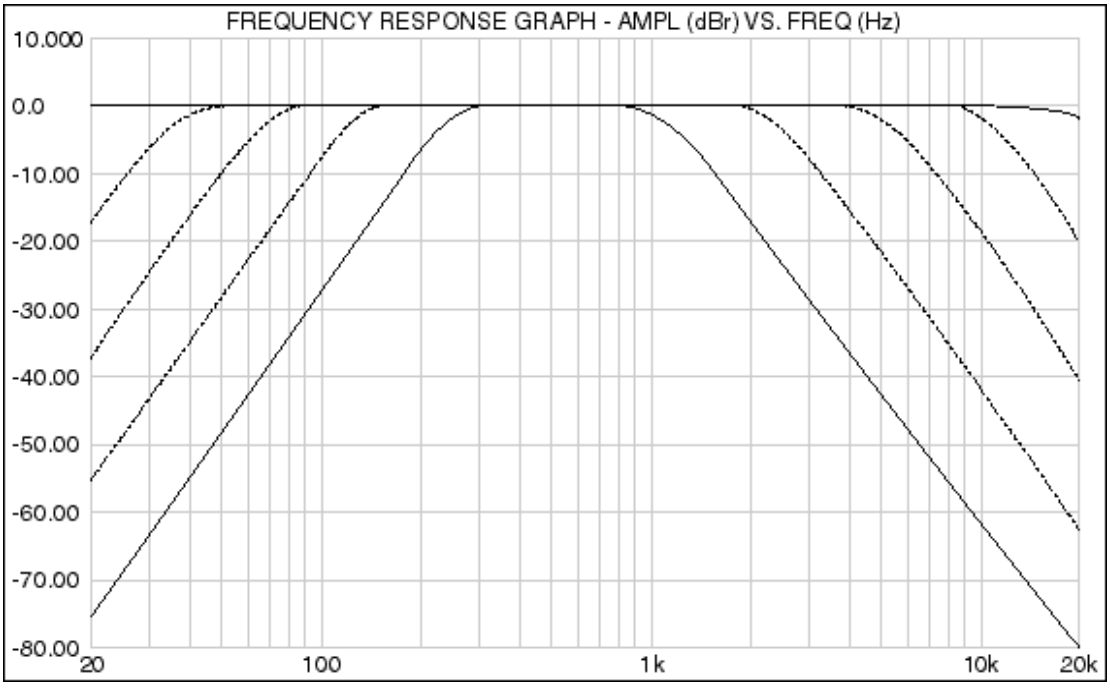
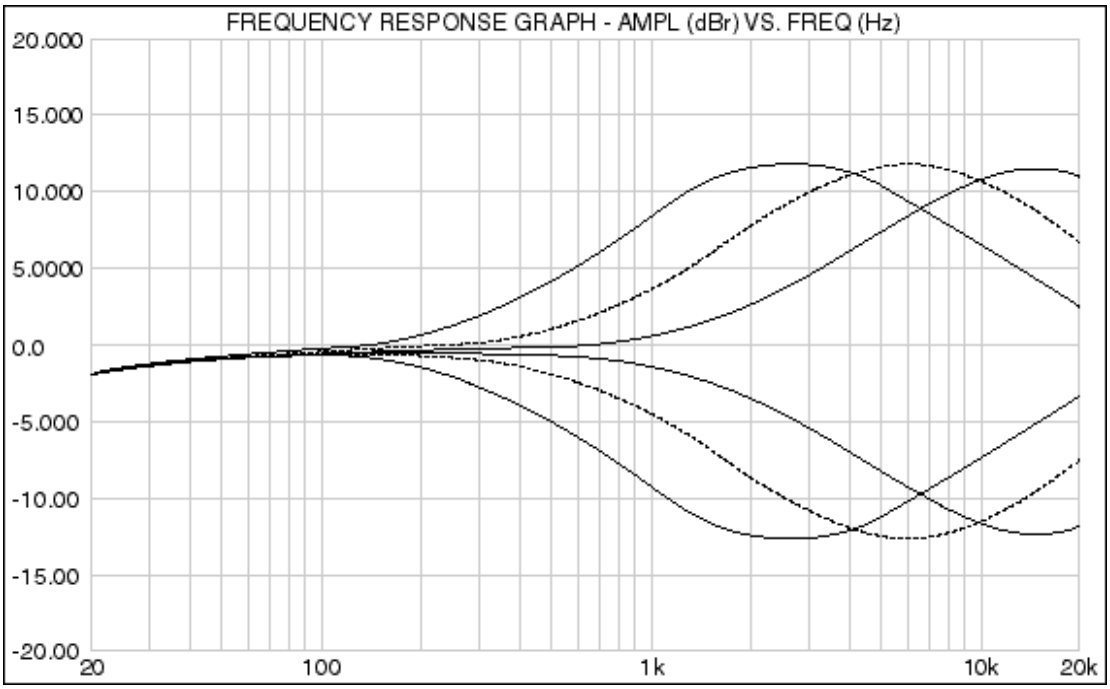


FIGURE 3.1 EQUALIZER AND VOICE PROCESSOR MODULE FREQUENCY RESPONSE GRAPHS (PAGE 3 OF 4)

GRAPH G
VOICE PROCESSOR MODULE HIGH EQUALIZER FREQUENCY CONTROL



GRAPH H
VOICE PROCESSOR MODULE HIGH AND LOW EQUALIZERS

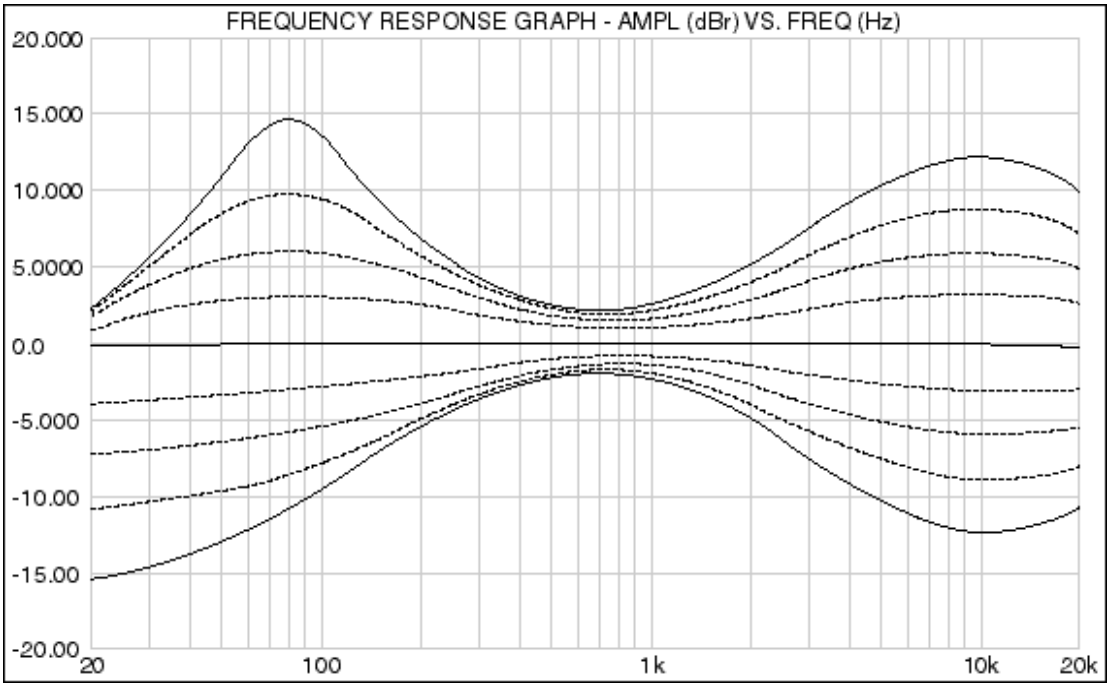


FIGURE 3.1 EQUALIZER AND VOICE PROCESSOR MODULE FREQUENCY RESPONSE GRAPHS (PAGE 4 OF 4)

4.0 EQUIPMENT DESCRIPTION

This chapter describes the function(s) and circuitry of the various components incorporated in the AMX console and its associated modules. Included are sections describing the mainframe, Microphone Input Module, Stereo Line Input Module, Stereo Line Output Amplifier, Monaural Line Output Amplifier, Control Room Monitor Module, Two-Studio Monitor Module, Send and Return Module, Telco Mix Module, Slate/Talkback/Test Oscillator Module, Meter Switcher Module, Remote Line Selector Module, Line Output Switcher Module, Monaural Equalizer Module, Stereo Equalizer Module, Voice Processor Module, VU Meter Power Regulator, VU Meter Buffer Amplifier, and Power Supply Assembly.

Corresponding diagrams and schematics are located in Chapter 7.

4.1 MAINFRAME

4.1.1 Function

The console mainframe contains all the interconnection wiring required to accommodate a full complement of modules. Each input position is wired in a universal fashion and, therefore, will accept either a Microphone Input or Stereo Line Input Module. Processing module positions are wired "in-line" with each input module position. A jumper is installed beneath the processing module position blank panel when no module is in place.

NOTE: Complete mainframe wiring diagrams are contained in Section 7.28.

4.1.2 Circuitry

The only active electronic components in the mainframe are the VU meter power regulator assembly and the meter buffer amplifiers. These are described in detail in Sections 4.17 and 4.18, respectively. The meter buffer amplifiers are mounted on their respective meters, and the regulator assembly is mounted in the rear of the console immediately below the meters.

NOTE: The AMX power supply assembly provides ±22 volt DC power to the console mainframe. This is regulated to ±16 volts DC by the VU meter regulator assembly and by regulator assemblies on all AMX modules except output amplifiers, which regulate the ±22 volt DC power to ±18 volts DC (reference the module schematics located in Chapter 7).

The meter panel assemblies for the AMX-10 and AMX-14 are equipped with sets of stereo meters for PROGRAM and AUXILIARY. The AUDITION and UTILITY outputs are metered on the AUXILIARY meters, as selected by the Meter Switcher Module. The meter panel assemblies for the AMX-18 and AMX-22 are equipped with sets of stereo meters for PROGRAM, AUDITION and AUXILIARY. The UTILITY output is metered on the AUXILIARY meters, as selected by the Meter Switcher Module.

The meter panel assemblies for the AMX-26, AMX-30 and AMX-34 are equipped with individual sets of stereo meters for PROGRAM, AUDITION, UTILITY and AUXILIARY.

4.2 MICROPHONE INPUT MODULE

4.2.1 Function

The Microphone Input Module accommodates a wide range of input levels to permit the use of all contemporary microphones. Input preamplifier gain is adjustable over the nominal input level range of -60 dBu to -35 dBu. The A/B input selector provides two microphone inputs per module, each with programmable monitor mute selection for Control Room or either of two Studios. The mute circuitry incorporates an automatic 40 millisecond delay before the microphone is turned on, permitting "room reverb" to decay off mic.

The PAN control allows for positioning of the signal in the stereo image, and the PROGRAM, AUDITION and UTILITY buttons provide the ability to assign the module to any or all of the console stereo output buses. The modules have been modified at the factory to allow for phantom powering of condensor microphones connected to either of the two inputs (reference Section 5.1).

4.2.2 Circuitry

AUDIO

Transformer coupled microphone input preamplifier U1 utilizes variable feedback control to provide an overall voltage gain range of 24 dB to 50 dB. Gain trim controls R9 and R10 are provided to adjust the preamplifier gain for the A and B inputs respectively. The gain is adjusted to provide a nominal -10 dBu level to the Patch Output line. The Patch Input signal is buffered by balanced differential amplifier U2 operating at unity gain. This amplifier provides input common mode noise isolation and signal drive to the mix fader, CUE relay K3, Talkback relays K4 and K5, and send PRE/post switch S5.

The mix fader "in-hand" attenuation is 15 dB, which is recovered by fader buffer amplifier U3 to the –10 dBu internal system level. The output of U3 is routed to the pan pot and the pan INsert switch. The left and right outputs of the pan circuit are buffered and amplified 3 dB by dual amplifier U4, and routed to channel on/off relay K1, SOLO relay K6, and the post position of the Send PRE/post switch. The channel on/off relay routes the signal to the output bus assignment button switches.

The outputs of the send PRE/post switch are controlled by the dual channel send potentiometer, and routed through send relay K2 to the two send circuit ON/off button switches. This module may be modified for post-PAN stereo Send operation by following the procedure outlined in Section 5.3.

LOGIC

The selection of the A or B input to the module results in the selection of the corresponding set of control logic. A contact on input selector switch S2 is connected to pin 9 of U200, U201, U202 and U212. The set of logic controls for input A are chosen when this line is low and the logic controls for input B are chosen when this line is high. U200 and U201 select the A and B remote control inputs, U202 selects the status of A and B programming switch S207, and U212 selects A and B tally output drivers. Pressing the ON button on the module, or on the selected input's remote control panel, will cause the output of U207A to go high and toggle flip-flop circuit U208 to the "on" state. The low output from pin 4 of the flip-flop is connected to U206 pin 9, and U211 pins 12 and 8. If the logic programming switch

has been set for a microphone located in the Control Room, the output of U206 will turn on transistor Q200 to pull down the Control Room mute bus. In the same manner U211D/Q201 and U211C/Q202 provide Studio-1 and Studio-2 monitor muting for inputs programmed to those locations.

The high output from pin 3 of the flip-flop is connected to the inputs of U215B and U211B. The other inputs of U215B are normally high; therefore, the high provided by the flip-flop will give a high output to the tally lamp and audio relay drive circuits U213A/Q229 and U216B/Q228. The input to U216B is delayed with a 40 millisecond network consisting of R273 and C237. Circuit U211B is used as an inverter and, along with U213B and Q230, removes the tally voltage from the OFF light. The outputs of U213A and U213B are also connected to U212 for routing to the appropriate remote tally lamp driver circuitry. Each of the four tally outputs has its own lamp driver, shown schematically as Lamp Driver B, and each of the two 12 volt output sources has its own driver, shown schematically as Lamp Driver A.

The lamp is driven by a low being applied to R280, which pulls down the base of Q211 via conducting FET Q210. Q210 normally operates at zero bias.

NOTE: If a short should occur in the load, Q210 will be pinched off to remove the base current from Q211. This protection circuit is reset by switching off the drive and removing the short.

Pressing the OFF button on the module, or on the selected input's remote control panel, will cause the output of U214 to go high and toggle flip-flop circuit U208 to the "off" state. Time delay network R273, C237, R274 is bypassed by CR209 to eliminate any delay in turning the audio relay off. Operation of either the A or B input selector button places a momentary low pulse into the input of U214, which will key the channel logic to the "off" state to prevent any input switching transient from being routed into the console mix buses.

The CONSOLE COUGH ENABLE switch is intended for use with a microphone located at the console. This switch connects the ON button directly to U215B to provide momentary channel muting whenever the ON button is held depressed.

The remote control cough muting function is achieved by pulling low the appropriate A or B cough line, which is selected by U201, and routed through U215B to U215A. Whenever any of the inputs to U215A are low, the "on" tally lights are extinguished and the channel outputs are muted. When the cough line is released, the outputs are unmuted and the "on" lamps illuminated.

Pressing the CUE button gives a high output from U207B to CUE bistable U210A. When the CUE function is engaged, U210A output pin 1 goes high to turn on CUE relay K3, and pull the CUE command bus low via Q203. Output pin 2 goes low and is routed to Control Room monitor mute selector U206B. A Control Room microphone selection causes a high at the output of U206, saturating Q200, and pulling down the Control Room mute bus to prevent feedback. This change of state is also routed to network C222 and R223, through U209A, to reset SOLO bistable U210B if this function was engaged. The CUE bistable output is also coupled to a lamp flashing circuit for the CUE lamp. The lamp flashing circuit may be defeated by strapping together points E200 and E201 on the printed circuit board. The module will be taken out of the CUE mode when the channel ON button is pressed, if CUE RESET ENABLE switch S204B pins 2 and 3 are closed.

Pressing the SOLO button gives a high output from U207C to SOLO bistable U210B. When the SOLO function is engaged, U210B output pin 13 goes high to turn on SOLO relay K6, and pull the SOLO command bus low via Q204. Output pin 12 goes low and is routed to Control Room monitor mute selector U206B. A Control Room microphone selection will causes a high at the output of U206B, saturating Q200, and pulling down the Control Room mute bus to prevent feedback. The change of state is also routed to network C219 and R220, through U209B, to reset CUE bistable U210A, if the CUE function was engaged. The low at pin 12 also drives Q206 to turn on the lamp in the SOLO button. The module will be taken out of the SOLO mode when the channel ON button is pressed, if SOLO RESET ENABLE switch S204A pins 1 and 4 are closed.

A remote control "privacy" mode is available which prevents the module from being able to enter the CUE or SOLO functions. This INHIBIT function is routed from logic input selector U201 through U208 to both U209A and U209B. The inhibit function puts a high into the reset inputs of both the CUE and SOLO bistables to lock them in the "off" mode.

Circuit U200 selects the input A and B Talkback selection functions. Pin 14 is low for Talkback to the Control Room, pin 4 for Studio-1, pin 5 for Studio-2, and pin 13 for the External location. Circuit U202 is used as the input microphone location status selector, as determined by module programming switch S207. Pin 13 will be low for a Control Room microphone, pin 14 for Studio-1, pin 4 for Studio-2, and pin 5 for the External location. The outputs of U200 and U202 are routed to gates U203, U204, U205, and U206B. These gates provide the logic controls for a location to Talk to any other location, dim the monitor levels at the originating location, and command the Talkback function at the destination location.

For an input module to Talk to the Control Room, one of the Talk to Control Room lines is pulled low by a "Talk to Control Room" pushbutton switch. This will cause a low at U200 pin 14, which is routed to U203 pin 1, which will generate a low output at U203 pin 7. The low at U203 pin 7 is routed to U215A pin 3, giving a low at the output of U215A, which is routed to U215B. The "on" tally circuit will be de–energized. The low at U203 pin 7, via inverter U213F, saturates Q221, pulling down the Talk to Control Room bus, and also drives U216C via time delay network R253, R254, C229 and CR203. The output of inverter U216C drives Talkback relay K5 at pin 6.

The other Talkback functions operate in a similar fashion. One of the input control lines is pulled low by a pushbutton switch, the appropriate output from A/B selector U200 will then be low, and the logic in U203, U204, U205 and U206 will pull down the appropriate control bus, dim the monitor, engage the Talk circuit, and mute the signal from being on program lines at the same time. This logic design also prevents a microphone from Talking to its own location.

Send relay K2 is energized through Q228. When option switch S206 is ON, Sends are always active with PRE-fader selection, regardless of the ON/OFF status of the module.

4.3 STEREO LINE INPUT MODULE

4.3.1 Function

The Stereo Line Input Module will accommodate nominal input levels from -12 dBu to +8 dBu. The A/B input selector allows for the selection of either of two stereo inputs. Separate logic controls are available for each input for the remote control of tape machines and/or other sources, and the INPUT MODE switch allows for the selection of a STEREO, MONO, LEFT or RIGHT source to be sent to the output assignment switches.

4.3.2 Circuitry

AUDIO

NOTE: The stereo audio path consists of two identical sets of circuitry. For clarity and simplicity, only the left channel is described below.

The input to the module is a balanced, symmetrical input, instrumentation amplifier. This amplifier is configured with three operational amplifiers, contained on plug-in function amplifier A1, operating with a cross-coupled input stage feedback gain trim control. The voltage gain range from module input to the output of the amplifier is -18 dB to +2 dB. The gain trim control is adjusted to provide a level of -10 dB to the Patch Output line.

The Patch Input signal is buffered by balanced differential amplifier U1A operating at unity gain, and then routed to the INPUT MODE switch. The output of the mode switch is connected to the mix fader, CUE bus relay K2, and PRE/post fader send switch S3.

The mix fader "in-hand" attenuation of 15 dB is recovered by fader buffer amplifier U2A to the -10 dBu internal system level, and routed to the PAN pot and the pan insert switch. The pan switch selects between the attenuated output of the fader buffer and the output of the pan pot, and then routes the signal to amplifier U3A, which operates at a gain of 3 dB. The output of U3A is connected to channel on/off relay K3, SOLO relay K4, and to PRE/post fader send switch S3. The channel on/off relay then routes the signal to the output bus assignment switches and the direct output lines.

The outputs of the two-section send fader are routed through send relay K1 to the two send ON/off switches. The two Send signals are a monaural mix of the left and right channels. However, this module may be modified for stereo Send operation by following the procedure outlined in Section 5.3.

LOGIC

The module is provided with two sets of control logic, one for each of the A and B inputs. This logic includes the capacity to provide independent machine and remote controls for the ON, OFF, CUE, and SOLO functions for each input. A contact on the A/B input selector switch is routed to integrated circuit switches U206, U200, U212 and U201. U206 selects the A/B logic status of the module, as determined by programming switches S200, U200 (the A and B remote control input lines), and U212, U201 (the A and B output tally lamp and control pulse lines).

When the module or the selected input's remote control ON button is pressed, the output of U202A will go high. This output is routed to channel on/off flip-flop U209, and CUE and SOLO reset enable

switches S205-1 and S205-2, respectively. The low "on" output from U209 pin 3 is routed to the monitor mute gates in U207, to delay circuit R239, C213, R240 and U208D, to channel and send on/off relay drive transistor Q204, and also to on relay K3 and send relay K1. This low is also connected to output switch U212, and to "on" lamp drive transistor Q205. The high "on" output from U209 pin 11 is routed to "off" lamp gate U205A, through "start" pulse generator circuit U211A to output switch U212, and through timer "reset" pulse generator U211B to transistor Q207.

When the module or the selected input's remote control OFF button is pressed, the output of U203 will go high. This output is connected to channel on/off flip-flop U209, and resets it to the "off" state. The output of U209 pin 3 goes high, and bypasses the turn-on delay network via diode CR202 to turn off the channel and send relays. The channel audio is also switched off when either the A or B input selector switch is operated by generating a short pulse into "off" gate U203 pins 11 and 12, respectively.

Output driver short-circuit protection is provided to prevent damage caused by shorts in the output lines. As an example of this protection, consider the case when the A INPUT ON TALLY lamp is powered; a short circuit will drop the gate of Q208 to ground, which turns the FET off and removes the drive current from the base of output transistor Q209.

The module's OFF lamp may be remotely controlled by applying a low to the selected remote READY input. This is routed through U200 pin 4 to U205A pin 2, which will result in a low output at pin 9, keying "on" OFF lamp driver Q206. This provides the facility of using the module's OFF lamp to tally the ready state of remote controlled equipment.

Pressing the module or the selected input's remote control CUE button causes a high to appear at the output of U202B, which is connected to U210A. Circuit U210A is connected in a bistable configuration, with each positive-going transition causing the output of U210 to change state. The output of this CUE bistable is routed to CUE relay K2, CUE logic bus drive transistor Q224, SOLO reset circuit U205C, and to the CUE lamp flasher circuit of U202 and U208. The circuitry around U202 and U208 is a free-running multivibrator. The lamp flasher may be defeated by installing a jumper between E212 and E213 on the printed circuit board. The output of the lamp flasher circuit is connected to CUE lamp drive transistor Q225, and to remote CUE tally output switch U201.

Pressing the module or the selected input's remote control SOLO button causes a high to appear at the output of U202C, which is connected to U210B. Circuit U210B is connected in a bistable configuration, with each positive-going transition causing the output of U210 to change state. The output of this SOLO bistable is routed to SOLO relay K4, SOLO logic bus drive transistor Q226, CUE reset circuit U205B, and SOLO lamp drive transistors Q227 and Q228. The low output from transistor Q227 is also routed to remote SOLO tally output switch U201.

4.4 STEREO LINE OUTPUT AMPLIFIER

4.4.1 Function

The Stereo Line Output Amplifier contains the mixing and distribution amplifiers for a console line

output. The console mainframe is supplied with three of these modules; one each for the PROGRAM, AUDITION and UTILITY buses. Each module supplies four distribution outputs, with each output capable of supplying up to +28 dBm. The main output is an active balanced design. Patch send and return points are available for the connection of external processing equipment and/or a patch field.

4.4.2 Circuitry

NOTE: The stereo audio path consists of two identical sets of circuitry. For clarity and simplicity, only the left channel is described below.

Bus summing amplifier A3 is a discrete JE-990 type operational amplifier constructed on a plug-in module. The output of the summer is connected to inverting amplifier U1 to provide an in-phase output to the bus patch point. Both of these amplifiers operate at unity gain and, therefore, provide a nominal level of -10 dBu to the Bus Patch Output.

The Patch Return input signal is buffered by balanced differential amplifier U4 operating at unity gain. The output of U4 is routed to variable gain amplifier U5, and also to monaural mixing amplifier U6. Voltage gain amplifier U5 is adjusted by front panel Gain Trim control R26, and has sufficient range to adjust the output level from +4 dBu to +8 dBu. The output of U5 is connected to line output amplifiers A1 and A2 operating as a push-pull pair to provide balanced drive to the console distribution output lines.

NOTE: The early version of the Stereo Line Output Amplifier was designed to accommodate the optional installation of a Jensen type JE-123A transformer in the main output, meter and monitor lines. This option was discontinued in 1986 due to lack of interest.

4.5 MONAURAL LINE OUTPUT AMPLIFIER

4.5.1 Function

The Monaural Line Output Amplifier may select or mix any combination of the PROGRAM, AUDITION and UTILITY stereo signals to derive a monaural output. The output is an active balanced design, and will accommodate the optional installation of a transformer. A patch send and return point is available for the connection of external processing equipment and/or a patch field.

4.5.2 Circuitry

The monaural input signals to the Monaural Line Output Amplifier are supplied by the three Stereo Line Output Amplifiers. One or more of these signals is selected by the front panel MONO SOURCE switch, and connected to balanced input mixing amplifier U1. This amplifier operates at unity gain, and its signal is routed to the Patch Send output.

The Patch Return input signal is buffered by balanced differential amplifier U2, operating at unity gain and routed to variable gain amplifier U3. Voltage gain amplifier U3 is adjusted by front panel Gain Trim control R30, and has sufficient range to adjust the output level from +4 dBu to +8 dBu. The output of U3 is connected to line output amplifiers U4 and U5, operating as a push-pull pair to provide balanced drive to the output lines.

The module was designed to accommodate the optional installation of a Jensen type JE-123A transformer in the main output line (reference the Schematic in Chapter 7).

4.6 CONTROL ROOM MONITOR MODULE

4.6.1 Function

The Control Room Monitor Module allows for the monitoring of PROGRAM, AUDITION, UTILITY, or any of nine stereo line inputs by means of an interlocking monitor selector. The module consists of five sections: monitor, SOLO, CUE, Talkback and headphone. Each section has a relationship with the others that can be best appreciated by reviewing the module block diagram located in Chapter 7.

4.6.2 Circuitry

AUDIO

NOTE: The stereo audio paths for the monitor, solo, cue and headphone sections consist of two identical sets of circuitry. For clarity and simplicity, only the left channel of each section is described below.

The input to the monitor is selected by the front panel 12-station push button switch assembly. The input to the module is a balanced, symmetrical input, instrumentation amplifier. This amplifier is configured with three operational amplifiers, contained on the plug-in function amplifier A1, operating with cross-coupled input stage feedback. The voltage gain from module input to the output of the instrumentation amplifier is -8 dB for consoles operating at a +8 dBm reference level, and -4 dB for consoles operating at a +4 dBm reference level. The output of this stage is routed through the SOLO relay, INPUT MODE switch, dim relay, MONITOR level control, mute relay, and output buffer amplifier U4A. This buffer operates at unity gain, as supplied by the factory. The gain of this stage may be increased to 6 dB with the installation of R28 and C19 as shown in the schematic in Chapter 7 of this document.

The output of the monitor input stage is also routed through Talk to selector output relay K1 to select buffer amplifier U1A. The 6 dB loss of the Talk to direct relay circuit is made up by the 6 dB gain of amplifier U1A. The output of the INPUT MODE switch is also routed to the AUTO-CUE FUNCTION header, and relays K5 and K6.

The SOLO bus input is summed by amplifier U2A and inverted by U3A. The output is connected to the SOLO METER output terminal, and to SOLO relay K2 in the monitor section.

The CUE bus input is summed by amplifier U5A and inverted by U6A. The output is connected to the CUE METER output terminal and AUTO-CUE FUNCTION header U7. The output of U6A is also routed through the front panel CUE level control, mute relay K9, and output buffer amplifier U10A. The 6 dB loss of the Talkback insert circuit is made up by the 6 dB gain of the buffer amplifier.

The headphone signal from AUTO-CUE relays K5 and K6 is routed through Talkback insert relay K7 and the HEADPHONE level control, to plug-in amplifier assembly A2. The line amplifier operates at a fixed gain of 12 dB.

The Talkback to Control Room bus signal is summed by U8A and inverted by U8B. The output of U8B is connected to the TALKBACK OUTPUT terminal, to Talkback insert relays K1 and K7, and to the TALKBACK level control. The output of the TALKBACK control is routed to Talk to CUE relay K8A, Talkback mute relay K8B, and output buffer amplifier U9. This buffer operates at unity gain, as supplied by the factory. The gain of this stage may be increased to 6 dB with the installation of R61 and C44 as shown in the schematic.

LOGIC

The Control Room monitor system may be muted by a low applied to the MUTE CR logic bus or by a low applied to the REMOTE MUTE CR input line. In either case, the low command causes a high output on gate U200A. This high signal is routed to monitor mute relay K4, MUTE OUTPUT transistor Q200, and through inverter U201F to warning lamp driver circuit Q201 and Q202.

The Control Room monitor system may be dimmed by a low applied to the DIM CR logic bus or by a low applied to the REMOTE DIM CR input line. In either case, the low command causes a high output on gate U200D. This high is routed through gate U202D to dim relay K3, and to DIM OUTPUT transistor Q203.

The TALK CR bus is driven low whenever a Microphone Input Module, or the External input to the Slate/Talkback/Test Oscillator Module, initiates communication to the Control Room. This low is routed through gate U202B and inverter U201B to Talk to headphone relay K7. This low may also be applied to Talk to CUE relay K8A by closing internal option switch S200-1, and to Talk to direct relay K1 by closing switch S200-3.

The Talk to Control Room command may also be set to dim the Control Room monitor system by closing switch S200-2, which directs the high output of U201B to monitor dim relay K3.

The Control Room monitors are automatically dimmed whenever the console initiates Talkback to another location. This low dim command comes into the monitor module on the DIM CR bus. This low command may be routed by option switch S200-4 through inverter U201E and gate U202B to hold the input of U201B high. This high locks out the Talk to Control Room logic, and establishes a priority of communication in the Control Room's favor.

The CUE system is activated whenever a low is applied to the CUE logic bus. This results in a high output from inverter U201D, which is routed to auto-CUE relays K5 and K6 and the CUE TO METER SW output.

The SOLO system is activated whenever a low is applied to the SOLO logic bus. This results in a high output from inverter U201C, which is routed to SOLO relay K2 and the SOLO TO METER SW output.

4.7 TWO-STUDIO MONITOR MODULE

4.7.1 Function

The Two-Studio Monitor Module is expressly designed for applications where separate voice/announce booths or conference Studios are required. This module provides the monitor, headphone and Talkback facilities for up to two Studios. Monitoring of PROGRAM, AUDITION, UTILITY, or any of nine external sources is provided by means of an interlocking monitor selector.

The module consists of a common monitor source selector and two identical sets of "guest" and "talent" headphone outputs, fixed and variable level monitor outputs, and Talkback to Studio circuits. Each section of each Studio's monitor circuitry has a relationship with the others which can best be appreciated by reviewing the module block diagram located in Chapter 7 of this document.

4.7.2 Circuitry

AUDIO

NOTE: The stereo audio paths for the monitor and headphone sections consist of two identical sets of circuitry. For clarity and simplicity, only the left channel of the Studio-1 section is described below.

The input to the Studio monitors is selected by the front panel 12-station push button switch assembly, and routed to the balanced, symmetrical input, instrumentation amplifier. This amplifier is configured with three operational amplifiers contained on plug-in function amplifier A1, operating with cross-coupled input stage feedback. The voltage gain from module input to the output of the instrumentation amplifier is -8 dB. The output of this stage is connected to the module MONITOR SELECT OUT terminals, to Talk to talent headphone relay K3, and to the input of mute Studio relay K1.

The output of Talk to talent headphone relay K3 is buffered by amplifier U3A, which operates with 6 dB of gain to recover the 6 dB loss of the Talkback insert circuit. The output of U3A is connected to the module TALENT HEADPHONE OUT terminal.

The output of the mute Studio relay is routed through dim relay K2 and feeds both the fixed and variable level monitor circuits. The "fixed level" signal is routed through Talk to Studio relay K4 and buffer amplifier U4A. Dim relay K2, when energized, inserts a fixed 12 dB attenuator into the signal path. The gain of U4A is 6 dB to recover the 6 dB loss of the Talkback insert circuitry. The output of U4A is connected to the module FIXED OUTPUT LEFT terminal.

The "variable level" signal path includes the front panel mounted MONITOR level control, Talk to Studio relay K5, and buffer amplifier U5A. The gain of U5A is also 6 dB to recover the loss of the Talkback insert circuitry. The output of U5A is connected to the module VARIABLE OUTPUT LEFT terminal.

The TALK TO STUDIO BUS-1 signal is summed and inverted by dual amplifier U1, and routed to Talk to talent relay K3 and Talk to Studio relays K4 and K5. An additional output from U1 is connected to the TALK TO STUDIO-1 OUT terminal. The resistor network around each of the Talkback relays causes the monitor signal to be dimmed by 10 dB whenever the relay is energized to insert the Talkback signal, and allows the Talkback signal to be inserted at unity gain over the attenuated monitor signal.

LOGIC

The Studio-1 monitor system may be muted by a low applied to the MUTE STUDIO-1 logic bus, or by a low applied to the REMOTE MUTE input line. In either case, a low input will cause a high output from gate U200D. This high is routed through Q201 to monitor mute relay K1, REMOTE MUTE COMMAND transistor Q200, through inverter U203E to warning lamp driver circuit Q202 and Q203, and to front panel TALK OVER MUTE switch S200.

The Studio-1 monitor system may be dimmed by a low applied to the DIM STUDIO-1 logic bus, or by a low applied to the REMOTE DIM input line. In either case, a low input will cause a high output from gate U200A. This high is routed through Q205 to drive dim relay K2, and to REMOTE DIM DRIVE COMMAND transistor Q204. The logic bus dim command is also connected to internal option switch S202 ("dim disables Talk"). This switch provides the ability to establish a one-way priority of communication from the Studio by switching the DIM STUDIO command to inhibit the receipt of TALK TO STUDIO commands. This is accomplished by closing switch S202, which then routes the dim command through inverter U202C to Talk to Studio gate U201.

The TALK STUDIO-1 bus is driven low whenever a Microphone Input Module assigned to Studio-1 initiates communication to another location. This low is routed to Talk to Studio gate U201, and to inverter U203D. Gate U201B provides the control logic for the TALK OVER MUTE feature. The output of U201B is routed through inverter U202E to Talk to Studio relays K4 and K5. The output of inverter U203D drives Talk to talent headphone relay K3 and REMOTE TALK COMMAND transistor Q206.

4.8 SEND AND RETURN MODULE

4.8.1 Function

The Send and Return Module contains both the two Send amplifiers and the stereo Return circuits. The Send portion of the module contains the mixing and output amplifiers for the effects/foldback channels. The Return signal may be assigned to the PROGRAM, AUDITION or UTILITY output buses.

4.8.2 Circuitry

SEND AUDIO

NOTE: The two Send output circuits are identical. For clarity and simplicity, only the audio signal path for Send-1 is described below.

The Send-1 bus signal is summed and inverted by amplifiers U101A and U101B, which are operating at unity gain. The output of U101B is routed through send on/off relay K100 and the front panel SEND–1 master fader to balanced line output amplifiers U102A and U102B. Amplifier U102A operates with a gain of 22 dB while inverting amplifier U102B operates at unity. Therefore, the total voltage gain from input to balanced output of the line amplifiers is 28 dB. This gain provides a master fader "in-hand" attenuation of 10 dB for an output level of +8 dBu.

The output of U101B is also connected to solo relay K1A. When energized, this relay routes the pre–

fader signal to both of the stereo SOLO buses via resistors R321 and R421.

SEND LOGIC

NOTE: The logic circuitry for the two send circuits are essentially identical. For clarity and simplicity, only the circuitry for Send-1 is described below.

Pressing the send ON button will pull down the input to inverter U3B, which will deliver a high output to S1A and the input of U8C. If S1A is as shown, pin 2 closed to pin 4, the high output from U3B will be applied to the input of U6D. Each time the ON button is pressed, bistable U5A will be toggled by the positive-going signal applied to its input, and its output will change state. The output of bistable U5A is connected to one input of gate U4A. A high at any input to this device will cause a high at its output. This high is applied through inverter U7B to ON lamp drive transistor Q3, and to transistor Q2 to drive send on/off relay K100. The output of U4A also drives inverter U7C, which activates Send-1 ON Tally transistors Q4 and Q5.

Note that the circuit, as described, is an alternate-action system in which the send is switched on when the ON button is pressed, and is switched off when the ON button is pressed again. If switch S1A is set to connect pin 2 to pin 3, the bistable is removed from the circuit. Under this condition the send will be switched on only while the ON button is held down. The remote ON function operates in a similar manner, using U3D as an input buffer and S1B to determine the choice between alternate action and momentary control.

The SOLO function operates in a similar manner except that the switching is always alternate-action. The input buffering is done by U3F and the toggling by U9A. The output of U9A at pin 2 is applied to SOLO lamp driver Q1. The output of U9A pin 1 operates SOLO relay K1. The output of U9A pin 1 also drives OR gate U4C. Any logic high at the input to this gate results in a high output, which pulls down the SOLO BUS via transistor Q6. Operating the SOLO button again will toggle bistable U9A to turn off the SOLO mode. If a local or remote send ON button is pressed, a high will be delivered to one of the inputs of U8C. Either of these highs will cause a high on the output of U8C, which will reset the SOLO bistable to the “off” condition.

RETURN AUDIO

NOTE: The stereo return circuits consist of two identical sets of circuitry. For clarity and simplicity, only the left channel is described below.

The input signal is buffered by balanced differential amplifier U300B, operating with a gain of -8 dB. The output of U300B is routed through the front panel INPUT MODE switch, MIX level control, and buffer to the PAN control and pan insert switch. The output of the pan circuitry is buffered by U302B, and then connected to channel on/off relay K300 and SOLO relay K301. The output of channel relay K300 is connected to the stereo mix bus assignment buttons, while the output of SOLO relay K301 is routed through resistor R320 to the SOLO LEFT BUS terminal.

RETURN LOGIC

Pressing the local RETURN ON button causes the output of U10F to go high. This high is connected through gate U6A to the input of bistable U12A, which causes the bistable to toggle. The output of U12A pin 1 will go high. This high is inverted by U7F to operate the remote "on" lamp via Q14 and Q15, inverted by U10E to energize ON relay K300 and the ON tally via Q13, and routed through gate U11B to turn off remote "off" tally drive circuit Q16 and Q17. Pressing the ON button again toggles U12A, causing pin 1 to go low and drive remote "off" lamp drive circuit U11B, Q16 and Q17. The additional circuitry around remote tally drive circuits is for short-circuit protection on the external lines.

Unlike the module's controls, the remote controls are not alternate action, but are independent "on" and "off" controls. Pressing a remote ON button causes a high output from U10B, which is routed to U11C. If U12A is in the off state (pin 2 high), then U11C will deliver a high at its output. This will toggle U12A via U6A. Pressing the remote ON button again causes no further action because U11C pin 10 will then be low. Pressing a remote OFF button causes a high output from U10D, which is routed to U6B, causing a high output. This high is routed to U12A to reset the bistable to the off state. Further operation of the remote OFF button has no effect.

Pressing the SOLO button causes a high output at U7A, which toggles SOLO bistable U12B with output pin 13 high and pin 12 low. The high output from U12B pin 13 is routed through U4C to SOLO bus drive transistor Q6. The high output of U12B also energizes SOLO relay K301. The low output from U12B pin 12 saturates transistor Q12 to drive the SOLO button lamp. Pressing the SOLO button again toggles U12B, de-energizing the SOLO relay and extinguishing the SOLO button lamp. Pressing either the local or remote ON buttons will produce a high output from U8B, which will reset solo bistable U12B.

4.9 TELCO MIX MODULE

4.9.1 Function

The Telco Mix Module produces up to five unique output mixes from up to four telephone caller inputs and a selection of the PROGRAM, AUDITION or UTILITY bus. The module receives its inputs from those Stereo Line Input Modules designated as telco inputs, and creates a unique output for each caller which includes the selected bus plus all other callers except the caller's own voice (i.e., "mix-minus"). Each mix-minus output may be band-pass limited with internally switchable filters for improved hybrid operation (reference Section 2.9.6).

In order to assign a caller to the PROGRAM, AUDITION and/or UTILITY output buses, the desired bus must be selected on the Stereo Line Input Module being used as the caller's Telco input.

The Telco Mix Module also creates a "monitor mix", which is the summed inputs of all callers. This mix may also be used for applications where it is desired to create one or more custom mix-minus foldback mixes or CUE feeds.

4.9.2 Circuitry

The inputs for the four telephone input module signals are applied to the inputs of balanced differential

amplifiers U2A, U2B, U3A and U3B; the outputs of these buffers are routed to the front panel INPUT telco on/off selectors. A monaural mix of each of the three main console output buses is connected to the SEND TO TELCO switch. The output of this selector is buffered by balanced differential input amplifier U1. The input buffer amplifiers all operate at unity gain and provide a level of -10dBu to the mix-minus matrix.

The telco monitor mix matrix consists of resistors R44, R45, R46, R47 and mixing amplifier U4. Amplifier U4 operates with a voltage gain of 30 dB resulting in an output level of +8 dBu, which is connected to the front panel MONITOR control and the METER and DIRECT OUTPUT terminals.

NOTE: The four telco mix-minus circuits are identical. For clarity and simplicity, only the return to Telco-1 path is described below.

The Telco-1 mix matrix consists of resistors R56, R57, R58, R59 and summing amplifier U5A which operates at unity gain. The -10 dBu output of U5A is routed to the band-pass filter circuit and to filter in/out switch S1A. The highpass filter is a three-pole, 18 dB/octave, design using U1A and its related components. The output of the highpass filter is applied to a lowpass filter, also a three-pole design, using U1B and associated parts. The 3 dB points of the resulting band-pass filter are slightly below 300 Hz and slightly above 3400 Hz. The output of the filter is connected to the filter in/out switch S1A.

The signal as chosen by the filter in/out switch is connected to output amplifiers U2A and U2B. The first stage operates at a gain of 4 dB and the second, inverting stage, at unity. The input to output gain of the push-pull pair is 10 dB, resulting in an output level of 0 dBu.

4.10 SLATE/TALKBACK/TEST OSCILLATOR MODULE

4.10.1 Function

The Slate/Talkback/Test Oscillator Module provides a slate tone oscillator, Talkback facilities, and a test oscillator for the AMX console.

Slate commentary may be added to a tape recording via the console-mounted electret microphone and/or from a Producer's microphone. A low-distortion spotter tone (nominal 30 Hz, adjustable), with carefully controlled envelope rise and fall times, may be recorded with the commentary for ease of fastwind identification of the cuts on a track.

The console and Producer microphones can Talk to any two Studios plus a remote or External location. The External location can also Talk back to the Studios, as well as to the Control Room.

The test oscillator generates low-distortion, stable amplitude tones to allow system test and line-up with any 15 frequencies. The tones may be assigned to any combination of the PROGRAM, AUDITION and UTILITY mix buses.

4.10.2 Circuitry

The Slate/Talkback/Test Oscillator module contains five major circuit sections, as follows:

Slate Tone Oscillator
Console Microphone/Amplifier
Producer Microphone Input
Test Oscillator
Talkback

The interrelationship of these five sections is best understood by referring to the module block diagram located in Chapter 7 of this manual.

SLATE TONE OSCILLATOR

Pressing the SLATE button causes a high output from U15A, which is connected to one input of U20A. When a Producer's remote SLATE button is pressed, the output of U15B, which is connected to the other input of U20A, goes high. Either input will cause a high output from U20A to the base of Q1, which drives opto-isolator U12, and applies +15 volts to the slate oscillator supply line. The output of U20A is also connected to the base of Q2, which pulls the Control Room monitor mute bus low.

The low frequency slate tone is produced by function generator U13, which generates a 30 Hz signal whenever the supply line is energized. The frequency of the signal is determined by timing capacitor C78 and resistor network R115, R117 and R116 (the frequency trimmer). The output of U13 is taken from pin 2 (the distortion at this point is about 2% and there is a modest keying transient). This signal is applied to bandpass filter U14B to eliminate the keying transient and reduce the harmonic distortion. This filtering also shapes the envelope rise and fall time. The frequency of this filter is determined by C82, C83, R122, R120 and R121,the tuning control. Additional filtering is provided by R118, C81 and R119. The output of the filter is routed to the front panel SLATE TONE level control, and then to slate relay K7.

As soon as the slate oscillator supply line is keyed on, a positive voltage is applied to comparator U14A via diode CR11. The output of the comparator is used to switch on slate relay K7. Therefore, when the slate tone is requested, K7 immediately switches on and 200 milliseconds later the output of the bandpass filter builds up and provides tone into the slate relay. The output of the relay is routed via R123 to the out position of the front panel OSC button switch. When the OSC switch is in the out position, the slate tone is connected to buffer amplifier U11, whose output may be routed to Program, Audition, and Utility.

When the slate oscillator supply line is keyed off, function generator U13 immediately stops oscillating, and the ringing output of the bandpass filter decays over a 200 millisecond interval. Shortly thereafter the C76 discharges through R109, and the comparator output goes negative to de-energize slate relay K7. The overall sequence is: whenever the slate tone is keyed on, relay K7 is immediately energized and the slate tone builds up in amplitude; when the slate tone is keyed off, the tone is allowed to decay and then relay K7 is switched off.

Pressing the console SLATE button also keys on the console's electret microphone. While the button is pressed, U15A presents a high to the time-delay network using R143 and C106. The network output

is applied to U18A about 40 milliseconds after the SLATE button is pressed. The output of U18A goes high, energizing relay K1A, and routing console microphone to the "out" position of the OSC switch.

When the Producer's SLATE button is pressed, the slate tone and the Producer microphone are keyed on. Pressing the button causes a high output from U15B, which is routed through delay network R145 and C107 to U18B. As with the console slate system, about 40 milliseconds after the Producer's SLATE button is pressed, the output of U18B goes high. This operates the Producer microphone, keying relay K1B, and the signal is routed to the "out" position of the OSC switch.

CONSOLE MICROPHONE/AMPLIFIER

The console microphone is an electret type, and is powered by a filtered +11 volt DC supply derived by CR1, R1, R2 and C1. The signal from the microphone is connected to preamplifier U1A, which operates with a mid-band voltage gain of 40 dB. The output of the preamplifier is routed through front panel CONSOLE MIC level control R148, and then to amplifier U1B, which operates with 31 dB of mid-band gain. The reactive components around the microphone preamplifier stages have been chosen for a response characteristic favoring speech frequencies.

PRODUCER MICROPHONE INPUT

The Producer microphone input is a conventional design intended to be driven by a 150 ohm microphone, which is coupled to the preamplifier using input transformer T1. The first stage of the amplifier uses U2A operating with a mid-band gain of 32 dB. The output of this stage is routed through the front panel PRODUCER MIC level control to amplifier U2B, which operates with 21 dB of mid-band gain. As with the console microphone preamplifier, the reactive components around these circuits have been chosen to favor speech frequencies. The output of U2B is connected to Producer mic relay K1B.

TEST OSCILLATOR

The built-in multi-frequency test oscillator is of the Wein-bridge configuration, with an AGC loop to keep the operating level precisely defined. U10 and the associated circuitry form the basic oscillator. Positive feedback around this amplifier is via the frequency-determining network. The output of U10 is applied to the top end of the network, and the midpoint of the network is fed back to the non-inverting input of U10. The resistor/capacitor network has maximum transmission and minimum phase shift at only one frequency, which is the frequency of oscillation.

The frequency-determining network uses a pair of fixed value capacitors and a set of 5 pairs of resistors, which are selected by the front panel FREQUENCY switch assembly. Additional pairs of fixed value capacitors are switched into the network to provide three ranges of frequencies.

Negative feedback for U10 is provided with R86 in parallel with opto-coupler U9, R85, R84, and feedback adjustment control R83. The oscillator's AGC circuit operates by adjusting the amount of negative feedback around the circuit. The output of U10 is connected to full-wave, absolute value, rectifier system U7A and U7B. The output signal of U7B is a precise full wave rectified version of the oscillator output signal. It is connected to the non-inverting input of comparator U8A, and the reference voltage connected to the inverting input. The reference voltage is +5.9 volts, as set by voltage

divider R79 and R81.

Should the oscillator output peak amplitude rise above +5.9 volts, the comparator will deliver a more positive output. This is applied to the input of voltage-to-current converter U8B, to drive the LED in opto-coupler U9 harder. This lowers the resistance of the output side of the coupler to increase the negative feedback around U10, and thus reduces the output amplitude of the oscillator to its design value.

If the oscillator output amplitude should drop, the output from comparator U8A will be less, which causes the opto-coupler LED to be driven less. This reduces the negative feedback around the oscillator, and the amplitude of the oscillation will be increased to its design value.

Comparator U8A continuously delivers a DC control signal, which may be measured at the AGC test point. It is set to a nominal value of +6 volts by adjusting oscillator feedback control R83. This voltage should remain within the limits of +5.5 to +6.5 volts.

The wide-band distortion of the oscillator is quite low. However, distortion in the low frequency region is trimmed by DIST ADJ control R78. This is not a "nulling" type of control; it provides a trade-off between distortion and AGC-loop dynamics. It is normally set for an oscillator total harmonic distortion figure of 0.1% at 20 Hz. It is characteristic of the circuit that the distortion will roll off at 6 dB per octave above 30 Hz, until it falls to the midband value of about 0.015%. The distortion at 30 Hz may be lowered to about 0.05%, however, amplitude transients during frequency changing (pressing various frequency selecting buttons) will be more noticeable. Changing the setting of R78 will not significantly affect the distortion of frequencies above 200 Hz. It is normal for the oscillator distortion to rise slightly at frequencies above 5 kHz, until it reaches a value of about 0.05% at 20 kHz.

When the test oscillator is not selected, it is muted by injecting a voltage into the AGC loop at R71 to cancel oscillation.

The output of the oscillator is connected through the front panel OSCILLATOR LEVEL control to the "in" position of the front panel OSC button switch.

TALKBACK

Intercommunication facilities are contained in this module to allow various locations in the broadcast operation to Talk to each other. Rather than use separate speaker/microphone assemblies, use is made of the existing broadcast microphones, input modules, associated preamplifiers, and existing monitors.

The console has a built-in electret microphone, which is located in the center of the meter panel. A Producer may also be located in the Control Room; however, the Producer's position is usually far enough from the console that it would be difficult to operate the console Talkback facilities directly. Therefore, remote controls have been provided for that position, along with an input for the Producer's microphone.

When a person with a broadcast microphone wants to Talk to a particular location, use is made of that microphone and the preamplifier in its input module.

The EXTERNAL location is usually a telephone-call screening booth, announce booth, or even a two-way link to a traffic reporter. Circuitry is provided for microphone or line level input along with balanced line level output, for use with the EXTERNAL location facility. Remote control is provided for Talking to the console and the two Studios.

When the console operator presses the Talk to STUDIO-1 button, the output of U15C goes high, which is routed through U21A which then goes high, driving Q3 to pull down the Talk to STUDIO-1 logic control bus. The high output of U15C is also routed through delay circuit R125, C100 and U19A to Talk to Studio-1 relay K2A, which routes the Talkback signal to the TALK TO STUDIO-1 audio bus. The high output of U15C is also routed through U22A to U20B, and causes a high to appear at the output of U20B. This saturates Q7, pulling down the DIM C/R BUS.

Operating the console STUDIO-2 button causes a chain of events schematically similar to operating the STUDIO-1 button. When the STUDIO-2 button is pressed the output of U15D goes high, which is routed to U21B which then goes high, driving Q4 to pull down the Talk to Studio-2 control bus. The high output of U15D is also routed through delay circuit R127, C101 and U19B, to Talk to Studio relay K2B, which connects the audio signal to the TALK TO STUDIO-2 mix bus. The high output of U15D is also routed to U22A, U20B to DIM C/R BUS transistor Q7.

Pressing the EXT Talkback button on the console causes a high output from U15E, which is routed through delay circuit R129, C102 and U19C, to Talk to External relay K3A. The high output from U15E is also routed through U22A and U20B to DIM C/R BUS drive transistor Q7, and through U21C to TALK TO EXT CMD transistor Q6.

The Producer's Talkback functions are a duplicate of the console's facilities, so that the Producer may also Talk to the same locations.

Pressing the Producer's STUDIO-1 button causes a high output from U15F, which is routed through U21A which then goes high, driving Q3 to pull down the Talk to STUDIO-1 logic control bus. The high output of U15F is also routed through delay circuit R131, C103 and U19D, to Talk to Studio-1 relay K3B, which routes the Talkback signal to the TALK TO STUDIO-1 audio bus. The high output of U15F is also routed through U22B to U20B, which saturates Q7, pulling down the DIM C/R BUS.

Operating the Producer's STUDIO-2 button causes a chain of events schematically similar to operating the STUDIO-1 button. When the STUDIO-2 button is pressed, the output of U16A goes high, and is routed to U21B which then goes high, driving Q4 to pull down the Salk to Studio-2 control bus. The high output of U16A is routed through delay circuit R133, C104 and U19E, to Talk to Studio relay K6A which connects the audio signal to the TALK TO STUDIO-2 mix bus. The high output of U16A is also routed to U22B, U20B and Q7 to the DIM C/R BUS.

Operating the Producer's EXT Talkback button causes a high output from U16B, which is routed through delay circuit R135, C105 and U19F, to Talk to External relay K6B. The high output from U16B is also routed through U22B and U20B to the DIM C/R BUS drive transistor Q7. The high output of U16B is also routed to gate U21C to drive TALK EXT CMD logic bus transistor Q6.

The microphone preamplifier for the External location is very similar to that for the Producer's microphone. It makes use of both halves of dual amplifier U3, with the front panel EXTERNAL INPUT adjusting the level. The External preamplifier has a switchable pad, located before the input transformer in order that line-level input signals can be accommodated. The EXTERNAL remote controls operate similarly to the Producer controls, with the addition of the ability to Talk to the Control Room.

Pressing the External STUDIO-1 button will cause a high output from U16C to U21A, which will drive transistor Q3 to pull down the Talk to Studio-1 control bus. The high output of U16C is also routed to relay K4A, which connects the External audio signal to the TALK TO STUDIO-1 mix bus.

Pressing the External STUDIO-2 button will cause a high output from U16D to U21B, which will drive transistor Q4 to pull down the Talk to Studio-2 control bus. The high output of U16D is also routed to relay K4B, which connects the External audio signal to the TALK TO STUDIO-2 mix bus.

Pressing the External CONTROL ROOM button will cause a high output from U16E to relay K5, which will route the External audio signal to the TALK TO CONTROL ROOM mix bus. The high output of U16E also is connected to transistor Q5, which pulls the TALK C/R BUS low.

Any of the Microphone Input Modules can Talk to the External location. This is accomplished by that module pulling down the TALK EXT CONTROL BUS, causing the output of U16F, which is routed to U21C, to go high. The high output of U21C drives transistor Q6, which pulls down the remote TALK EXT CMD line. The Microphone Input Module which pulled down the Talk to External control bus also applies audio to the Talk to External audio bus. Any signals on that bus are summed and inverted by amplifiers U6B and U6A. These amplifiers provide a balanced push-pull output to the TALK TO EXTERNAL terminals. The gain of this output stage is set by the front panel EXTERNAL OUTPUT gain trim control.

4.11 METER SWITCHER MODULE

4.11.1 Function

The Meter Switcher Module drives the AUXILIARY meters in the AMX meter panel. This module also provides switchable metering facilities for the AUDITION and UTILITY outputs in the smaller mainframe sizes. The unassigned inputs may be used to meter user determined external sources.

The module automatically defaults from the selected status whenever a CUE or SOLO button is engaged on any module. The AUXILIARY meters will then display the nominal operating level at the CUE or SOLO point selected. This enables quick input level check when displaying CUE, and very convenient level line-up when displaying SOLO. The SOLO metering function eliminates the need to use one of the main output buses for preview and level setting.

NOTE: SOLO or CUE metering priority may be set by means of an internal option switch (reference Section 2.9.8).

4.11.2 Circuitry

The signal path for the manual selector to the Auxiliary meters is through the normally closed contacts of meter relays K1 and K2.

When a console module is placed in the CUE or SOLO mode, the Control Room Monitor Module routes the appropriate CUE or SOLO stereo signal and logic command to the Meter Switcher Module. The CUE command is connected to U5A, and the the SOLO command to U5C. A meter display priority is required, since it is possible for the Meter Switcher to receive CUE and SOLO commands at the same time from different console modules. This priority is selected by internal switch S6. CUE will have priority when this switch is open, and SOLO will have priority when it is closed.

The output of CUE logic circuit U5A is routed to CUE tally light drive transistor Q1, CUE select relay K3, and through diode CR3 to the base of meter relay drive transistor Q3. The output of SOLO logic circuit U5B is routed to SOLO tally light drive transistor Q4, and through diode CR2 to the base of meter relay drive transistor Q3.

Whenever the CUE or SOLO function is engaged, transistor Q3 will drive meter relays K1 and K2 to select the output of amplifiers U1 and U2. These amplifiers are required to bring the -10 dBu nominal level of the stereo CUE or SOLO signal up to either the +4 dBu or +8 dBu level required by the Auxiliary meters. The gain of left channel amplifier U1A is adjusted by trim potentiometer R5, and right channel amplifier U2A is adjusted by trim potentiometer R19. These amplifiers, along with their unity gain inverters, U1B and U2B, provide balanced outputs through the meter relays to the Auxiliary meters.

4.12 REMOTE LINE SELECTOR

4.12.1 Function

The Remote Line Selector provides a selection of eight stereo input signals switched to one output. Up to four parallel-input selector modules may be installed in the AMX. The inputs and outputs for the modules are all brought out to the connector panel for ease of assignment. Typical applications include use as a line pre-selector ahead of input modules and tape recorders.

4.12.2 Circuitry

This module consists of one eight-station stereo selector switch fed from eight common remote inputs. The switch used is equipped with a mechanical lockout mechanism to prevent actuation of two or more buttons simultaneously.

4.13 LINE OUTPUT SWITCHER MODULE

4.13.1 Function

The Line Output Switcher Module selects an independent output from the PROGRAM, AUDITION or UTILITY distribution amplifiers for each of two console output lines. The module may be used as

a transmission line selector, a tape recorder input selector, etc.

4.13.2 Circuitry

This module consists of two three-station stereo selector switches, each equipped with a mechanical lockout to prevent actuation of two or more buttons simultaneously.

4.14 MONAURAL EQUALIZER MODULE

4.14.1 Function

The Monaural Equalizer Module provides both equalization and filter facilities in one compact module. The tunable filter section consists of high-pass and low-pass filters. The equalizer section, which may be switched in and out independently of the filter section, contains bass and treble equalizers which are each independently switchable from peaking to shelving modes. The midrange equalizer is adjustable both with regard to the amount and to the frequency of equalization, and covers a mid-band frequency range of approximately 1.5 kHz to 9 kHz.

4.14.2 Circuitry

A balanced differential amplifier (U1) is used for the input to the equalizer module. This amplifier operates at unity gain, and is intended for operation with signals at the console interstage nominal level of -10 dBu.

Capacitors C13, C14 and C16, along with the resistors R11, R13 and R15, are the frequency-determining components for the high-pass filter using U2 as the active element. The resistors are in series with the three-section potentiometer used for tuning. The remaining components around this stage keep the bandpass shape constant at the various cutoff frequencies. In its bandpass, this stage has an essentially flat amplitude response and unity gain. Capacitors C67, C68 and C69, operating with resistors R67, R68 and R69 are the frequency determining components for the low-pass filter, which uses U9 as the active element. The resistors are in series with the three-section potentiometer used for tuning.

The bass and treble equalizers have been combined into a single stage. The signal is applied to R23, which is connected to the non-inverting input of amplifier U3A. Feedback is applied to the inverting input of the amplifier via R26.

Between R23 and R26 is a potentiometer (HIGH) whose wiper is connected to ground via capacitor C42. When the wiper is at the R23 end of the pot, the high frequency components of the signal are rolled off by the action of C42 to ground. When the wiper is at the R26 end of the pot, C42 reduces the feedback at high frequencies causing the gain at those frequencies to increase. R40 stops the bypass at a high frequency and, therefore, forms a “shelf” in the treble amplitude response. For the peak response characteristic, capacitor C42 is resonated by a synthesized inductor formed by U5 and its associated circuitry. When this inductor is entered into the circuit by operating switch S4, the series combination of C42 and the inductor form a resonant circuit, and the boost and cut are at the resonant frequency.

Also connected between R23 and R26 is a second potentiometer (LOW) whose wiper is connected to ground via a synthesized inductor formed by the circuitry around U4. When the wiper is at the R23 end of the pot, the pass components of the program signal are rolled off by the action of the inductor bypassing the low frequencies to ground. When the wiper is at the R26 end of the pot, the inductor reduces the feedback at low frequencies, causing the gain at those frequencies to increase. The inductor is effectively in series with R32, which forms a shelf in the bass response. At each end of the bass potentiometer are capacitors which are shorted out in the shelving mode. Those capacitors are unshorted in the peaking mode (by the action of the LOW PK switch), in which case they work with the inductor to form a resonant circuit. The capacitor used in the low frequency cut mode may be shunted by internal option switch S5 to produce the "forced-shelf-on-cut" feature of the equalizer.

As with the bass and treble equalizer, the midrange equalizer is of unity gain. It is based on the circuitry around U3B. The wiper of the boost/cut control is connected to a relatively complex resonant circuit using U6 and both halves of U7. The circuitry is configured in a manner such that at the boost end of the amplitude control the input signal is bandpassed and applied to summer U3B, causing an increase in the overall amplitude response. At the cut end of the control the bandpass signal is applied as negative feedback, causing a dip in the amplitude response.

4.15 STEREO EQUALIZER MODULE

4.15.1 Function

The Stereo Equalizer Module consists of two identical sets of circuitry under the control of dual channel potentiometers and switches. It contains two separate, but coupled, three band equalizers. High and low frequency equalization is switchable between peaking and shelving modes. Midrange equalization is adjustable with regard to both the amount and the frequency of equalization, and covers a mid-band frequency range of approximately 1.5 kHz to 9 kHz.

4.15.2 Circuitry

NOTE: The stereo audio path consists of two identical sets of circuitry. For clarity and simplicity, only the left channel is described below.

A balanced differential amplifier (U1) is used for the input to the equalizer module. This amplifier operates at unity gain, and is intended for operation with input signals at the console interstage nominal level of -10 dBu.

The bass and treble equalizers have been combined into a single stage. The signal is applied to R12, which is connected to the non-inverting input of amplifier U2A. Feedback is applied to the inverting input of the amplifier via R16. Between R12 and R16 is a potentiometer (HIGH) whose wiper is connected to ground via capacitor C42. When the wiper is at the R12 end of the pot, the high frequency components of the signal are rolled off by the action of C42 bypass to ground. When the wiper is at the R16 end of the pot, C42 reduces the feedback at high frequencies, causing the gain at those frequencies to increase. R40 stops the bypass at a high frequency and, therefore, forms a "shelf" in the treble amplitude response. For the peak response characteristic, capacitor C42 is resonated by a synthesized

inductor formed by U4 and its associated circuitry. When this inductor is entered into the circuit by operating switch S3, the series combination of C42 and the inductor form a resonant circuit so that the boost and cut are at the resonant frequency.

Also connected between R12 and R16 is a second potentiometer (LOW), whose wiper is connected to ground via a synthesized inductor formed by the circuitry around U3. When the wiper is at the R12 end of the pot, the low frequency components of the signal are rolled off by the action of the inductor bypass to ground. When the wiper is at the R16 end of the pot, the inductor reduces the feedback at low frequencies, causing the gain at those frequencies to increase. The inductor is effectively in series with R32, which forms a "shelf" in the bass response. At each end of the bass potentiometer are capacitors which are shorted out in the shelving mode. Those capacitors are unshorted in the peaking mode by the action of the LOW PK switch, in which case they form a resonant circuit with the inductor. The capacitor used in the low frequency cut mode may be shunted by internal option switch S2 to produce the "forced-shelf-on-cut" feature of the equalizer.

NOTE: When producing the "forced-shelf-on-cut" feature on the left channel (S2), ensure that the right channel (S102) is set identically in order to prevent differences in low frequency amplitude and phase response between the two channels.

The midrange equalizer is a resonant type. This equalizer is adjustable with regard to both the degree and the frequency of equalization. As with the bass and treble equalizers, the midrange equalizer is of unity gain, and is based on the circuitry around U2B. The wiper of the boost/cut control is connected to a relatively complex resonant circuit using U5 and both halves of U6. This resonant circuit is tunable from about 1.5 kHz to about 9 kHz. The circuitry is configured in a manner such that at the boost end of the amplitude control the input signal is bandpassed and applied to summer U2B, causing an increase in the overall amplitude response. At the cut end of the control, the bandpass signal is applied as negative feedback, causing a dip in the amplitude response.

4.16 VOICE PROCESSOR MODULE

4.16.1 Function

The Voice Processor Module contains two major function sections. The first section is a switch-insertable equalizer, which covers the frequency range normally required for voice signal correction and enhancement. The second section contains the expander, compressor, and de-esser systems. The expander threshold and attenuation are used to achieve noise reduction during pauses in speech, while the compressor provides signal "smoothing and density". The de-esser senses and operates only on the treble region which provides adjustable control over excessive sibilance without the undesirable side-effects of broadband designs.

4.16.2 Circuitry

A balanced differential amplifier U1A is used for the input to the module. This amplifier operates at unity gain and is intended for operation with signals at the console interstage nominal level of -10 dBu.

The bass equalizer is formed by the circuitry around amplifier U2A and synthesized inductor U2B. This

circuit operates at unity gain when the wiper of bass control R201 is set for flat response, mid-rotation. Rotating the control counter-clockwise attenuates the bass components of the program material into the input of U2A. Clockwise rotation attenuates the bass components of the feedback signal, increasing the gain of U2A at those frequencies. The inductor circuitry of U2B resonates with capacitor C12 in the boost mode, producing a peaking type response. The treble equalizer is also of unity gain, and is configured using the circuitry around U3A , U3B, U4A and U4B. The wiper of TREBLE control R204 is connected to a resonant circuit using U3B and both halves of dual amplifier U4. This resonant circuit is tunable from 3 kHz to 9 kHz using the two sections of frequency control R202/203. The entire bass and treble equalizer section is switched in or bypassed using EQUALIZER switch S1.

The output of the equalizer switch is routed to the expander/compressor section. This circuit has been designed specifically for producing a smooth, dense sound. The basic control element in the compressor is an integrated voltage-controlled amplifier (VCA) using U19 and buffer amplifier U5. The output of the VCA buffer is connected to COMPRESSOR IN/OUT switch S3.

The VCA output signal is also routed to the compressor control system using U6A and U6B. This path includes frequency determining network R139, R52 and C40 to eliminate "pumping" or "ducking" due to strong bass content in program material. The components around CR5, CR6, and CR7 are for the reduction of ripple on the AGC control bus. This technique contributes significantly to the excellent low frequency distortion performance of the compressor, while retaining an extremely fast recovery time.

The AGC voltage is applied to the precision OR circuit using U9B and U9C. The output of the OR is applied, along with a DC signal from front panel COMPressor control R207, to U9D and then to the control port of the VCA U19. Trimmer R93 is used to null the distortion within the VCA circuit itself.

The audio signal which drives the input of the VCA is also routed to the expander side-chain control circuitry using U7 and U8. The output of this chain is also a DC signal which is applied to the precision OR circuit which controls the VCA. The sensitivity of the expander side-chain is determined by the setting of the front panel EXPander THReshold control. The degree of gain-reduction in the absence of audio is determined by the setting of the front panel EXPander ATTenuation control.

The output of OR circuit U9C and U9D, as applied to U9D, represents the compression portion of the gain-control signal. It is metered by using display driver circuit U20 and front panel LED display DS-3. Trimmer R92 is the calibration control for the display. When the gain-reduction voltage generated by the compressor circuitry is greater than the attenuation voltage from the expander circuitry, mode-switch comparator U9A operates switching transistor Q2. This changes the voltage on display driver U20 pin 9 so that the display is switched from a dot display (expansion) to a bar-graph display (compression). In this manner, the same display is utilized to show both the expansion and compression modes.

The "O dB" LED is illuminated at all times. In a similar manner, the "18 dB" LED is dimly illuminated to provide a scale-length reference in darkened Control Rooms. The "18 dB" LED will be illuminated to a "normal" level when 18 dB of compression is used, and will be lit to a greater degree when 20 dB of compression is used. This is accomplished by connecting both the 18 dB and 20 dB driver outputs to the last LED segment. The display is calibrated by applying a low-level signal (below the threshold of compression), setting the EXPander THReshold control to minimum, setting 12 dB of gain-reduction using the EXPander ATTenuation control, and adjusting R92 to illuminate the "12" LED.

The audio output from the VCA is routed to the de-esser section. The audio path circuitry involves U10, U11, and U12. The output of VCA buffer amplifier U12A is applied to the control system using U14 and U15A. The sensitivity of this control loop is adjusted by front panel DE-ESS control R208. Treble content in the program material above the threshold set by the DE-ESS control will produce a DC control voltage at output U15A, which is applied to the control port of the VCA. The control voltage is monitored by the DE-ESS LED indicator, which is driven by U15B. The output of the de-essing circuitry is routed through internal level-match trimmer control R118 to the output buffer and to front panel IN/OUT switch S3. R105 is used to null the internal distortion of the de-esser VCA.

4.17 VU METER POWER REGULATOR

4.17.1 Function

The VU meter power regulator assembly is mounted in the rear of the console mainframe immediately below the meters, and provides regulated ±16 volt DC power to the VU meter buffer amplifiers.

4.17.2 Circuitry

The +22 volt console power is regulated down to +16 volts by series regulator U1. The -22 volt console power is regulated down to -16 volts by series regulator U2. The various small components around the regulators are used to set the output voltage and improve the noise and transient response of the regulators.

4.18 VU METER BUFFER AMPLIFIER

4.18.1 Function

The console VU meters are driven by balanced isolation buffer amplifiers, which are mounted on their respective meters. The assemblies fully conform to American National Standard C16.5-1954.

4.18.2 Circuitry

The VU meter buffer amplifier consists of dual integrated circuit amplifier U1 configured for a balanced symmetrical input, and operating with cross-connected feedback. The gain of the amplifiers is adjusted by trim potentiometer R8. The output of the two amplifiers is coupled to the VU meter through the recommended source resistance of 3600 ohms. Light emitting diodes DS1 and DS2 provide over-drive protection to the meter movement.

4.19 POWER SUPPLY ASSEMBLY

4.19.1 Function

The fully regulated power supply provides four separate voltage outputs, and is protected with magnetic circuit breakers, as well as electronic safeguards against excessive current.

4.19.2 Circuitry

The power supply has three discrete power modules: a bipolar 22 volt audio supply, a 12 volt logic supply and a 48 volt "phantom" supply. Each module has its own magnetic circuit breaker, power transformer and regulator circuitry. Color-coded voltage test points are located on the front panel for ease of routine measurement.

The bipolar 22 volt, 5 amp, audio supply is configured by two identical +22 volt monopolar supplies which are powered from two separate secondary windings of power transformer T1. The first secondary of T1, terminals 6 and 7, is rectified by diode bridge CR1, filtered by capacitor C1, and regulated by series regulator U1. The various small components around the regulator are used to set the output voltage and improve the noise and transient response of the regulator. When the supply is initially turned ON, Q2 is turned ON by Q1 to provide startup current through R7. After a short time, Q1 and Q2 turn OFF, leaving regulator U1 to provide all of the console current. The second secondary of T1, terminals 8 and 9, is rectified by diode bridge CR2, filtered by capacitor C2, and regulated by series regulator U2. The high current, low noise regulators are a plug-in integrated circuit design and are mounted on the large heat sink located on the right side of the power supply (as viewed from the front). The outputs of these two supplies are coupled in series for the required bipolar configuration with the common point referred to as "Audio Common". Inside the console mainframe this coupling only occurs at the two power terminals labeled "Audio Common".

The monopolar 12 volt, 10 amp, logic supply uses a higher power version of the same type of integrated circuit regulator used in the audio supply. The secondary of T2, terminals 6 and 7, is rectified by diode bridge CR3, filtered by capacitor C3, and regulated by series regulator U3. The various small components around the regulator are used to set the output voltage and improve the noise and transient response of the regulator. This regulator is mounted on the large heat sink located on the left side of the power supply (as viewed from the front).

NOTE: The regulator/heat sink assemblies used for the audio and logic supplies are each capable of delivering up to 10 amps of current to the AMX console. This capacity requires proper thermal installation of the regulators on the heat sinks to provide efficient heat dissipation. Even though the regulators are of a plug-in design, replacement of any of the power regulators should be performed by personnel experienced in working with high power devices.

The 48 volt supply consists of printed circuit assembly #90-148, and is powered by transformer T1, rectified by diodes CR1 and CR2, and filtered by capacitor C1. The regulator is a discrete design, using a highly filtered zener diode reference and a series pass Darlington transistor. The output noise is extremely low, in keeping with the requirements for the phantom powering of microphones.

5.0 OPTIONS AND MODIFICATIONS

This chapter describes available AMX options and modifications. Included are sections describing phantom microphone powering, +8 dBu to +4 dBu output level conversion, stereo Sends, input module steady CUE indication, using Send circuits for Telco operations, and the Talkback/Intercom Module.

5.1 PHANTOM MICROPHONE POWERING

The AMX is equipped with a +48 volt "phantom" power supply for the powering of condenser microphones connected to the Microphone Input Modules. This "phantom" power is available whenever the MICROPHONE toggle switch on the AMX power supply is placed in the ON position. All necessary modifications to the Microphone Input Modules have been accomplished at the factory (see note below), so condenser microphones may be connected just like any other microphone.

NOTE: For microphones connected to the "A" input, jumper wires have been installed between points E1 and E3 on the Microphone Input Module PC assembly. For microphones connected to the "B" input, jumper wires have been installed between points E2 and E4 (reference the schematic located in Chapter 7).

5.2 OUTPUT LEVEL CONVERSION (+8 dBu to +4 dBu)

All consoles are set for a +8 dBu output level at the time of factory test, unless a +4 dBu level is specified at the time of order. In order to convert a +8 dBu console operating level to +4 dBu, it will first be necessary to change resistors on the Control Room Monitor Module and Telco Mix Module PC assemblies as follows:

1. Change 10k ohm, 1% resistors R5 and R105 on the Control Room Monitor Module PC assembly to 4.32k ohm, 1% (PR&E #1-4321). This change provides a gain match between the Monitor Selector and the SOLO bus levels.

2. Change 3k ohm, 5% resistor R51 on the Telco Mix Module PC assembly to 5.1k ohm, 5% (PR&E #2-512). This change rectifies the Telco Meter Output for +4 dBu operation.

Once these resistors have been changed, align the console to the +4 dBu operating level in accordance with the following procedures:

STEREO LINE INPUT MODULES

Apply a 1 kHz test signal at +4 dBu (600 ohm source) to both the left and right module inputs. Adjust the module GAIN TRIM controls for a -10 dBu output at the module Patch Sends.

STEREO LINE OUTPUT AMPLIFIER

Apply a 1 kHz test signal at -10 dBu (600 ohm source) to both the left and right Patch Returns. Adjust the module GAIN TRIM controls for a +4 dBu output into a balanced bridging load.

MONAURAL LINE OUTPUT AMPLIFIER

Apply a 1 kHz test signal at -10 dBu (600 ohm source) to the module Patch Return. Adjust the module GAIN TRIM control for a +4 dBu output into a balanced bridging load.

VU METER BUFFER AMPLIFIER CALIBRATION

The gain trim control for each VU meter buffer amplifier is located on the buffer amplifier PC assembly.

PROGRAM, AUDITION and UTILITY meters: Apply a 1 kHz test signal at -10 dBu (600 ohm source) to both the left and right Patch Returns of the appropriate Stereo Line Output Amplifier. Adjust both meter gain trim controls for 0 VU.

AUXILIARY meters: Apply a 1 kHz test signal at +4 dBu to Meter Switcher Module external INPUT 1. Adjust both meter gain trim controls for 0 VU.

METER SWITCHER MODULE

NOTE: The Meter Switcher Module amplifiers should be adjusted after the VU meter amplifiers have been calibrated.

The Meter Switcher Module has a pair of amplifiers which boost the level of the CUE and SOLO VU meter signals from -10 dBu to +8 dBu. The gain trim controls for these amplifiers are located on the module PC assembly (R5 and R19) and are accessible by removing the adjacent modules, or by using an extender board.

Apply a 1 kHz test signal at -10 dBu to the left and right Patch Returns of a Stereo Line Input Module. Place the module in CUE and adjust the Meter Switcher Module gain trim controls for a 0 VU level on the AUXILIARY meters.

5.3 STEREO SEND OPERATION

Normally, the input module Send 1 and Send 2 signals are a monaural sum of the left and right input signals. However, the Stereo Line Input Modules may be modified for stereo Send operation by cutting the two jumpers between points E1 and E2 and points E3 and E4 on the module PC assembly. Removing both of these jumpers provides a monaural mix to either Send-1 or Send-2. However, when both Send assignment buttons are depressed the left module channel is routed to Send-1 and the right to Send-2.

Microphone Input Modules may also be modified in this manner by cutting the jumpers between points E5 and E6 and points E7 and E8 on the module PC assembly. This modification allows the post-fader microphone signal to be manipulated in the stereo image by means of the module PAN control.

NOTE: PRE-fader Microphone Input Module operation will be the same as before this modification.

5.4 INPUT MODULE STEADY CUE INDICATION

Under normal circumstances, the Microphone and Stereo Line Input Module CUE button lamp flashes to tally its ON status. This function can be modified to provide a steady indication on both local and remote CUE tallies by adding a jumper wire between two "E" points on the module PC assemblies. On Microphone Input Modules, insert the jumper wire between points E200 and E201. On Stereo Line Input Modules, insert the jumper wire between points E212 and E213.

5.5 USING SEND CIRCUITS FOR TELCO OPERATIONS

The AMX Telco Mix-Minus System provides the console operator with the ability to communicate with up to four individual callers at one time (as described in Section 3.8). However, in some cases, it may be desirable to have the additional capability to take calls both "on-air" and "off-air" without changing the configuration of this system.

This can be accomplished by utilizing the two console Send outputs as a second, "off-air", mix-minus system. Once configured per the instructions contained in this section, these Send outputs are routed, in addition to the Telco Mix-Minus System outputs, to the telephone hybrid, and connected via a relay. This relay is energized by the ON tally of the Stereo Line Input Module being used as a Telco input. When the input module is turned ON, the caller is placed "on-air", and is fed the Telco output. When the module is turned OFF, the caller is "off-air", and is fed the Send output (reference Figure 5.1).

In order to configure the Send outputs as mix-minus outputs, console input module internal option switches must be set as follows:

1. On Stereo Line Input Modules assigned as Telco inputs, set internal option switch S7 to enable the module Direct Output to be continuous. This will cause the audio signal to be sent to the Telco Mix Module regardless of the ON/OFF status of the input module, thereby allowing the connection of the intercom speaker via the caller-only Telco Mix Module Monitor Output, as shown in Figure 5.3.

2. On all Microphone and Stereo Line Input Modules, set internal option switch S206 so that the Sends are always active with PRE-fader selection.

Once these internal option switches have been set, the steps for connecting the Telco and Send outputs to the telephone hybrid(s), and for assigning signal sources to the Send outputs, vary, depending on whether one or two Send outputs are being used. Both procedures are provided below.

NOTE: Each Send output requires an individual telephone hybrid.

SINGLE SEND OPERATION (Using One Hybrid)

In systems where a single Send output is being used, connect Telco Output 1 and the Send-1 Output to the telephone hybrid as shown in Figure 5.1 (on the following page).

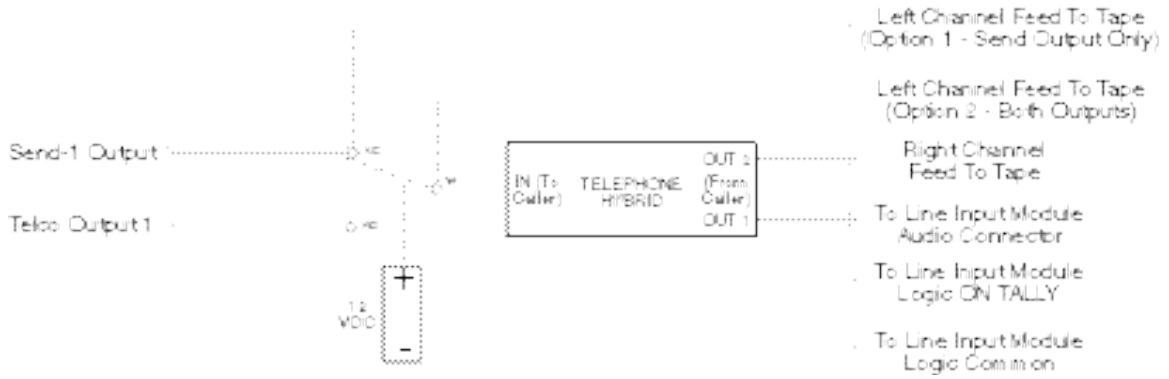


FIGURE 5.1 SEND MIX-MINUS CONNECTION USING A SINGLE TELEPHONE HYBRID

Once this has been accomplished, assign signal sources to the Send-1 output as follows:

1. Depress the PRE-fader and SEND-1 buttons on all input modules to be added to the Send–1 output, including the console operator's Microphone Input Module.

   NOTE: When assigning input signals to the Send-1 bus, do not assign Caller-1 audio to the Send-1 bus, since it is undesirable for the caller to hear his/her own voice.

2. Turn Send-1 ON via the Send And Return Module.

3. Adjust input and Send And Return Module rotary faders as required.

   NOTE: The Send-1 output can be metered on the AUXILIARY meters by selecting Send 1+2 on the Meter Switcher Module. Send-1 will be on the left meter.

DUAL SEND OPERATION (Using Two Hybrids)

In systems where both Send outputs are being used, connect Telco Outputs 1 and 2 and the Send-1 and Send-2 outputs to the two telephone hybrids as shown in Figure 5.2 (on the following page).

Once this has been accomplished, assign signal sources to the Send-1 and Send-2 outputs as follows:

1. Depress the PRE-fader and SEND-1 buttons on all input modules to be added to the Send–1 output. This includes Caller-1 audio, since Send-1 will be fed to Caller-2 and Send-2 will be fed to Caller-1, as shown in Figure 5.2.

2. Depress the PRE-fader and SEND-2 buttons on all input modules to be added to the Send–2 output, including Caller-2 audio.

3. Turn Send-1 and Send-2 ON via the Send And Return Module.

4. Adjust input and Send And Return Module rotary faders as required.

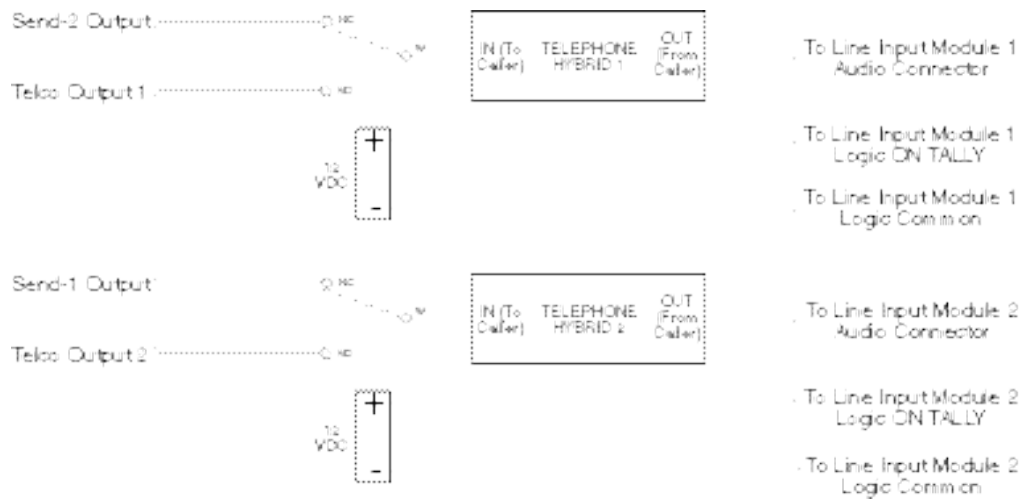


FIGURE 5.2 SEND MIX-MINUS CONNECTION USING TWO TELEPHONE HYBRIDS

NOTE: Both Send outputs can be metered on the AUXILIARY meters by selecting Send 1+2 on the Meter Switcher Module. Send-1 will be on the left meter and Send-2 on the right.

Connect tape equipment to the hybrid and console outputs as shown in Figure 5.1.

"OFF-AIR" TELCO MONITORING

Callers can be monitored during "off-air" Telco operations by means of the console CUE system, or an external speaker connected to the Telco Mix Module's variable Telco Monitor Output. When using the console CUE system, depress the CUE button(s) on the module(s) being used as the Telco input(s) to route caller audio to the console operator's headphones (the CUE buttons will reset when the module is turned ON). When connecting an external speaker, use a relay driven by the Control Room Warning Tally, so that the speaker will mute whenever the Control Room is muted, as shown in Figure 5.3.

5.6 TALKBACK/INTERCOM MODULE

The Talkback/Intercom Module (PR&E #99-371 and #99-371-1 with TALK OVER MUTE) was de-

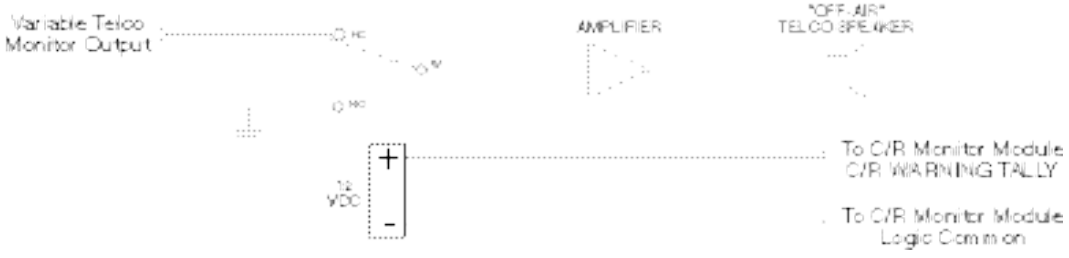


FIGURE 5.3 "OFF-AIR" TELCO SPEAKER CONNECTION

signed to enable Talkback communication between the Control Room and up to two external locations when no Two-Studio Monitor Module is present. This module, while lacking the full monitor control facilities of the Two-Studio Monitor Module, provides two-way Talkback audio and logic functions.

The Talkback/Intercom Module schematic is contained in Section 7.12. Installation, audio connection, remote control connection, internal options, and circuitry are described below. For assistance, please contact PR&E's Customer Service Department.

INSTALLATION

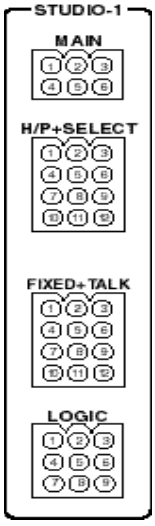
The Talkback/Intercom Module is installed in the mainframe position reserved for the Two-Studio Monitor Module (reference Figure 2.3), and uses the STUDIO-1 and STUDIO-2 rear panel Molex connectors for audio and logic connection.

AUDIO CONNECTION

In those cases where a Slate/Talkback/Test Oscillator Module is installed in the console mainframe, the console electret microphone will be the Talk To Studio Output source. When there is no Slate/Talkback/Test Oscillator Module present, a Microphone Input Module assigned to the Control Room (reference Section 2.9.1) will be the Talk To Studio Output source, with a customer supplied remote control panel controlling microphone Talkback logic (reference Section 2.8.1).

A Studio-assigned microphone connected to a console Microphone Input Module (reference Section 2.9.1) will be the Studio Talkback source. In the event that there is no Studio-assigned Microphone Input Module, a Talk From Studio Input is provided at the Studio connector for the connection of a high level microphone source. However, when this input is used, the signal is assigned to the Control Room bus only, and no Talkback communication between the two Studios is possible. Pin assignment for each Studio is identical. Audio pin assignment for the STUDIO-1 connector is defined below.

REMOTE CONTROL CONNECTION



AUDIO PIN ASSIGNMENT

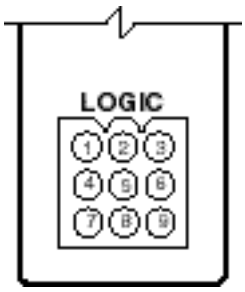
		Pin Number		
Signal	**Connector**	**Shield**	**Low**	**High**
- No Connection -	MAIN	1	2	3
- No Connection -	"	4	5	6
- No Connection -	H/P+SELECT	1	2	3
- No Connection -	"	4	5	6
- No Connection -	"	7	8	9
- No Connection -	"	10	11	12
Talk From Studio-1 Input	FIXED+TALK	1	2	3
- No Connection -	"	4	5	6
- No Connection -	"	7	8	9
Talk From Studio-1 Output	"	10	11	12

NOTE: The Talk From Studio Input and Talk To Studio Output are calibrated for a 0 dBu operating level.

When using a microphone connected to a console Microphone Input Module as the Studio Talkback source, connect microphone logic as defined in Section 2.8.1.

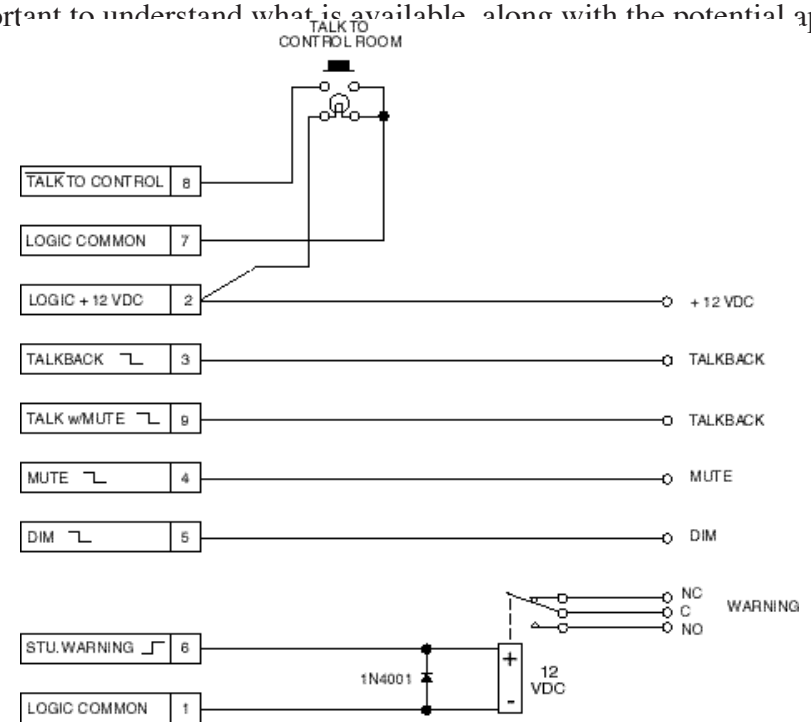
The Talkback/Intercom Module is equipped with many of the same logic features as the Two-Studio Monitor Module. Logic pin assignment for each Studio is identical, and is defined below.

The schematic below illustrates the full remote control capability of each Studio.



LOGIC PIN ASSIGNMENT	
Function	**Pin Number**
Logic Common	1
Logic +12 VDC	2
TALKBACK ⌐	3
MUTE ⌐	4
DIM ⌐	5
WARNING TALLY ⌐	6
Logic Common	7
$\overline{\text{TALK}}$ to Control Room	8
TALKBACK w/Mute ⌐	9

While it is unlikely that a "typical" installation will utilize all of the Talkback/Intercom Module logic facilities, it is important to understand what is available, along with the potential applications.



NOTES:

A) Button switch is momentary-action.
B) Lamp is 12-14 volt, 80 mA.
C) Relay is 12 volt DC, 100 mA maximum.
D) When the TALK TO CONTROL ROOM tally is connected as shown above, the switch lamp will be illuminated at all times.
E) The MUTE and DIM outputs are only active when Talkback is taking place via a console Microphone Input Module.

The TALK TO CONTROL ROOM control input dims the Control Room monitors and enables Talkback from the Studio to the Control Room when using a line level source connected to the Talk From Studio Input as the Studio Talkback source. This input will not be used when Talkback is taking place via a console Microphone Input Module, as each microphone input has its own Talkback control inputs (reference Section 2.8.1).

The TALKBACK control output is a current-sinking open collector, which is active (low) whenever the Studio is receiving Talkback from the Control Room. This command is intended for connection to active, self-contained, headphone and monitor systems, and is used to switch the Talkback signal into the headphone and monitor circuits. Such headphone and/or monitor systems are usually provided to the host and co-host positions.

The TALKBACK WITH MUTE control output is a current-sinking open collector, which is active (low) whenever the Studio is receiving Talkback from the Control Room. This output differs from the TALKBACK output (pin 3) in that it is disabled whenever the Studio is muted.

NOTE: The TALKBACK WITH MUTE output will function identically to the TALKBACK output by cutting the jumpers between points E1 and E2 (for Studio-1) and E3 and E4 (for Studio-2) on the Talkback/Intercom Module PC assembly. Also, PR&E #99-371-1 is equipped with a front panel TALK OVER MUTE button which, when depressed, performs the same function.

The MUTE control output is a current-sinking open collector, which is active (low) whenever a Microphone Input Module assigned to the Studio is turned ON. This command is provided for interface to intercoms, telephones and/or other external equipment which may need to be muted whenever a Studio microphone is "live".

The DIM control output is a current-sinking open collector, which is active (low) whenever Talkback is occurring from the Studio to another location via a console Microphone Input Module. This command is provided for similar applications as the MUTE Command.

The STUDIO WARNING tally is a 12 volt DC, 150 mA maximum, source output for connection to a magnetic or solid-state relay unit for driving the Studio entry warning light(s).

INTERNAL OPTIONS

The Talkback/Intercom Module is equipped with a two-station internal option switch (S3) which determines how the Studio-1 and Studio-2 dim functions affect Talkback communication.

NOTE: Since the Studio only dims when Talkback is occurring via a console Microphone Input Module, this switch will have no effect when the Talk From Studio Input is being used.

Closing station S3-1 causes the Studio-1 dim function to block incoming Talkback signals to Studio-1. Closing Station S3-2 causes the Studio-2 dim function to block incoming Talkback signals to Studio–2. This switch is identical to the Two-Studio Monitor Module option switch (reference Section 2.9.4 for switch location).

CIRCUITRY

NOTE: The Studio-1 and Studio-2 audio and logic paths consist of identical sets of circuitry. For clarity and simplicity, only the Studio-1 audio and logic paths are described below.

Audio

The TALK TO STUDIO-1 bus signal is summed by U2A, amplified by U2B, and routed to the TALK STUDIO-1 output terminal.

The TALK FROM STUDIO-1 signal is fed to balanced differential input amplifier U1A. This signal feeds Talk to Control Room relay K1. When closed, Talkback audio is directed to summing resistor R11, and to the TALK TO CONTROL ROOM audio bus.

Logic

The TALK TO CONTROL ROOM input command forces the output of gate U10D high. Transistor Q13 conducts, causing Studio-1 Talk relay K1 to close. The output of U10D also feeds the input of gate U10B. The output of this NOR gate is inverted to drive TALK TO CONTROL ROOM bus switch Q14. These logic functions allow received Studio-1 Talk to connect to the console TALK TO CONTROL ROOM bus.

The five external commands are activated by three internal control buses. The MUTE STUDIO 1 bus is inverted by gates U6F. This gate output drives MUTE OUTPUT switch Q1 and the WARNING COMMAND driver, consisting of inverter U7E, Q2 and Q3. The MUTE STUDIO 1 command connects to gate U8B through the E1 to E2 jumper or the TALK OVER MUTE switch (when it is in the disengaged position). The output of U8B is inverted by U9E to turn on TALKBACK WITH MUTE switch Q5. Note that OR gate U8B is used as an inverted NAND gate.

The DIM STUDIO 1 bus command connects to gate U6A, is inverted, and drives DIM OUTPUT switch Q4. This bus signal also feeds DIM DISABLES TALK switch S3, which disables gates U8C and U8B from operating Talkback output switches Q5 and Q6.

The TALK STUDIO 1 bus will force gate U8C low if switch S3-1 is open. This gate output will be inverted by U7D to drive TALKBACK OUTPUT switch Q6 low. The output of U8C connects to U8B, which will allow the TALKBACK WITH MUTE switch to go low if the E1 to E2 is installed or the TALK OVER MUTE switch is disengaged.

6.0 MAINTENANCE AND ALIGNMENT

This chapter contains sections describing routine maintenance, troubleshooting, level alignment, the installation and servicing tool kit, the spare parts kit, and replacement parts for the AMX console.

6.1 ROUTINE MAINTENANCE

Routine maintenance is usually limited to checking button switches for proper operation and keeping panel surfaces clean. The panel surfaces are finished with a baked polyurethane paint and may be cleaned with a weak solution of dishwashing detergent. The procedures for checking power supply voltages, lamp replacement, button replacement, and collet knob removal are described below.

NOTE: The Penny & Giles faders used in AMX input modules (PR&E #24-115 for Stereo Line Input Modules and PR&E #24-116 for Microphone Input Modules) are not field serviceable.

6.1.1 Checking Power Supply Voltages

The AMX power supply is designed to provide very low noise power to the console. Banana jacks are provided on the front panel of the power supply for checking power supply voltages. Each output should be within 0.5 volts of its specified DC voltage. The outputs should also be checked periodically for ripple and noise using a sensitive AC voltmeter. The reading should be less than 350 microvolts RMS.

6.1.2 Lamp Replacement

NOTE: When replacing a lamp, replace it with an identical type. Do not substitute lamps of different voltage or current ratings.

Meter lamp replacement is accomplished by squeezing the mounting ears on the lamp socket to remove the socket from the rear of the lamp bracket assembly. Replace the bayonet based lamp with PR&E #12–21, and re-install the socket into the lamp bracket assembly.

Module ON and OFF lenses are removed by hand by lifting them straight up out of the switch housing, and are unique in that they unseat and withdraw the lamp with them. Install the wedge based replacement lamp (PR&E #12-20) into the socket in the switch housing, and re-install the lens.

Talkback, Return ON, and timer and machine remote control panel switches are EAO series 31, and the procedure for lamp replacement is as follows:

1. Remove the lens by using the tong-shaped EAO Lens Removal Tool (PR&E #70-40) to grasp the top and bottom of the lens and pull it straight out of the button housing.

   NOTE: Failure to use this tool will probably result in damage to the lens' molded retaining notches.

2. Remove the defective lamp using the rubber EAO Lamp Removal Tool (PR&E #70-41).

3. Install the replacement 14 volt, .08 amp lamp (PR&E #12-51) into the switch, and carefully snap the lens back into the body of the switch.

The CUE, SOLO and Send ON buttons are EAO series 19, and may be relamped by removing the button cap by hand and using the rubber EAO Lamp Removal Tool (PR&E #70-23) to extract the miniature bi-pin lamp. Note the orientation of the square cap's tangs as it is removed. The cap must be reinstalled in the same orientation. Install the replacement 12 volt, .07 watt lamp (PR&E #12-46) into the switch, and gently re-install the button cap.

6.1.3 Button Replacement

The square and rectangular "winkeye" button caps can be removed by applying even pressure to the back of the cap to dislodge it from the switch shaft. This can be accomplished using a two-prong device, such as a needlenose pliers. It may take considerable force to remove the button, so exercise caution. Carefully snap the replacement button onto the switch shaft.

6.1.4 Collet Knob Removal

The knobs used for the console's rotary controls are attached to the pot and switch shafts with collets instead of set screws. The machined brass collets provide the advantages of true alignment and concentricity with the axis of rotation, no set screws to score the shaft , the ability to clutch slip when excessive force is applied, and no holes in the side of the knob for the set screws. To remove a collet knob, carefully pry off the top cap of the knob using a thin blade or similar tool, then use the appropriate end of PR&E tool #70-44 to loosen the nut on the collet (as shown in Figure 6.1).

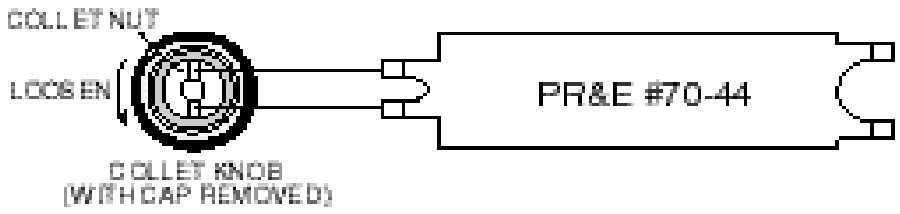


FIGURE 6.1 COLLET KNOB REMOVAL

Once the nut is loosened, the collet should release from the shaft. This nut should not need to be removed unless the collet refuses to release.

6.2 TROUBLESHOOTING (MODULE REMOVAL)

The modular construction of the console greatly enhances troubleshooting, since module substitution will usually isolate any problem.

NOTE: An important feature when troubleshooting the AMX is that modules may be removed or inserted with power supplied to the console.

To remove a module from the mainframe, remove the black button head retaining screws from the top and bottom of the module, and the silver button head screws from the module face. Screw the Module Pull/Extractor Tools (PR&E #70-43) into the holes vacated by the silver button head screws, and then use both hands to extract the module from the mainframe.

Once the module at fault has been identified, it is recommended that the Equipment Description section for the module in question be read thoroughly prior to troubleshooting that module. Use the appropriate module extender board (PR&E #99-272 for input, Slate/Talkback/Test Oscillator and Send And Return Modules; PR&E #99-274 for Control room and Studio Monitor Modules; PR&E #99-231 for Monaural Output, Telco Mix and Meter Switcher Modules; PR&E #99-230 for Processing Modules; and PR&E #99-273 for Stereo Line Output Amplifiers) or standard bench service techniques to isolate the problem.

NOTE: Most of the analog and logic components are socketed for ease of replacement.

WARNING: The CMOS logic devices are susceptible to destruction from static discharge while being handled. It is recommended that considerable caution be exercised when working with these parts.

6.3 LEVEL ALIGNMENT

All consoles are set for a +8 dBu output level unless +4 dBu is specifically requested at the time of order. It is very important that the test levels are maintained exactly as specified to avoid a build-up of tolerance errors. The GAIN TRIM controls on the output amplifiers should not require trimming unless components which affect amplifier gain have been replaced.

Input module GAIN TRIM controls should always be adjusted so that the input accommodates the signal level of the source equipment.

AMX modules were aligned at the time of factory test in accordance with the following procedures (**NOTE**: Instructions for aligning the console for an output level of +4 dBu are contained in Section 5.2):

MICROPHONE INPUT MODULES

Apply a 1 kHz test signal at -50 dBu (150 ohm source) to the module input. Adjust the module GAIN TRIM controls for a -10 dBu output at the module Patch Send.

STEREO LINE INPUT MODULES

Apply a 1 kHz test signal at +8 dBu (600 ohm source) to both the left and right module inputs. Adjust the module GAIN TRIM controls for a -10 dBu output at the module Patch Sends.

STEREO LINE OUTPUT AMPLIFIERS

Apply a 1 kHz test signal at -10 dBu (600 ohm source) to both the left and right Patch Returns. Adjust the module GAIN TRIM controls for a +8 dBu output into a balanced bridging load.

MONAURAL LINE OUTPUT AMPLIFIER

Apply a 1 kHz test signal at -10 dBu (600 ohm source) to the module Patch Return. Adjust the module GAIN TRIM control for a +8 dBu output into a balanced bridging load.

SLATE/TALKBACK/TEST OSCILLATOR MODULE

The slate tone level control is set for -6 VU.

The CONSOLE MIC GAIN TRIM control is set for a meter reading of 0 VU using a voice speaking at a "normal" level. This level is important since it sets the microphone level for the Talkback communication functions. It should be readjusted as required upon completion of installation.

The EXTERNAL OUTPUT, EXTERNAL INPUT and PRODUCER MIC GAIN TRIM controls are set for a 0 dBu output level with a -50 dBu, 150 ohm input.

VU METER BUFFER AMPLIFIER CALIBRATION

The gain trim control for each VU meter buffer amplifier is located on the buffer amplifier PC assembly.

PROGRAM, AUDITION and UTILITY meters: Apply a 1 kHz test signal at -10 dBu (600 ohm source) to both the left and right Patch Returns of the appropriate calibrated Stereo Line Output Amplifier. Adjust both meter gain trim controls for a 0 VU meter reading.

AUXILIARY meters: Apply a 1 kHz test signal at +8 dBu to Meter Switcher Module external INPUT 1. Adjust both meter gain trim controls for a 0 VU meter reading.

METER SWITCHER MODULE

NOTE: The Meter Switcher Module amplifiers should be adjusted after the VU meter amplifiers have been calibrated.

The Meter Switcher Module has a pair of amplifiers which boost the level of the CUE and SOLO meter signals from -10 dBu to +8 dBu. The gain trim controls for these amplifiers are located on the module PC assembly (R5 and R19) and are accessible by removing the adjacent modules, or by using an extender board.

Apply a 1 kHz test signal at -10 dBu to the left and right Patch Returns of a Stereo Line Input Module. Place the module in CUE and adjust the Meter Switcher Module gain trim controls for a 0 VU level on the AUXILIARY meters.

6.4 TOOL KIT

The following installation and servicing Tool Kit (PR&E #76-22) is provided with each console:

DESCRIPTION	PR&E#
MOLEX Connector Pin Crimp Tool	70-3
MOLEX Connector Pin Insertion Tool	70-8
MOLEX Connector Pin Extractor Tool	70-4
EAO Lens Removal Tool (series 31 button switch)	70-40
EAO Lamp Removal Tool (series 19 button switch)	70-23
EAO Lamp Removal Tool (series 31 button switch)	70-41
EAO Nut Wrench (series 19 button switch)	70-38
EAO Nut Wrench (series 31 button switch)	70-39
PR&E Module Pull/Extractor Tools (2)	70-43
SIFAM Double-Ended Spanner Wrench (for collet knobs)	70-44

6.5 SPARE PARTS KIT

The following Spare Parts Kit (PR&E #76-21) is supplied with each console. This kit is excluded from the limited warranty, and is provided to support initial installation only.

DESCRIPTION	QTY	PR&E#
Diodes		
1N4001	2	11-7
1N914B	2	11-13
Dual Operational Amplifiers		
LF353N	2	20-32
NE5532N	2	20-53
Dual Voltage Comparator, LM393	1	20-60
Integrated Circuits		
Dual D flip-flop, 4013	2	21-43
Dual Monostable, 4538	2	21-76
Dual 5-input Majority Gate, 4530	2	21-89
Dual 4-input AND, 4082	2	21-91
Dual 4-input OR, 4072	2	21-92
Dual SPDT Analog Switch, HI-307	2	21-93
Hex Inverter, 4584	2	21-46
Quad 2-input NAND, 4093	2	21-4
Quad 2-input OR, 4071	2	21-57
Quad 2-input NOR, 4001	2	21-61
Quad 2-input Multiplexer, 4551	2	21-90
Triple 3-input OR	2	21-67
Triple 2-input Analog Switch, 4053	2	21-71
8-input NAND, 4068	2	21-56
DESCRIPTION	**QTY**	**PR&E#**
Lamps		

12V, 0.7W bi-pin, 1099BPE	2	12-46
14V, .08A, .31 MSCP, 658	4	12-20
14V, .08A, .13 MSCP, 756	4	12-21
14V, .08A, 386	2	12-51
Operational Amplifier, NE5534	2	20-28
Relay, DPDT, 12 volt, Polarized, Gold Contact	2	28-5
Transistors		
NPN, MJE-181	2	7-1
NPN, MPS-6560	2	7-11
PNP, MJE-171	2	8-1
PNP, MPS-A63	2	8-4
PNP, MPS-U95	2	8-6
PNP, 2N3638A	2	8-8
Voltage Regulators		
Variable, 1.5A, Pos., LM317T	1	20-49
Variable, 1.5A, Neg., LM337T	1	20-59
Variable, 5A, LM338K	1	20-57
Variable, 10A, LM396	1	20-58

This kit should provide sufficient support spares for the initial operating period; however, it is recommended that this kit be replenished and kept on hand for service use.

In applications where any system "down-time" is unacceptable, it is recommended that the following modules be kept on hand as spares:

DESCRIPTION	**PR&E#**
Power Supply Assembly	99-238
Microphone Input Module	99-252
Stereo Line Input Module	99-253
Stereo Line Output Amplifier	99-258-1
Control Room Monitor Module	99-257

6.6 REPLACEMENT PARTS

The components used are, wherever possible, standard items of general availability. However, should difficulty be encountered locating any of the items, PR&E maintains a stock of replacement parts.

The power supply transformers and circuit breakers, Penny & Giles faders, potentiometers, VU meters, "winkeye" button switches, and all engraved button caps are manufactured to custom design specifications and are, therefore, available only from PR&E.

Following is a partial list of parts and assemblies used in the AMX console, and the PR&E part number for easy reference:

DESCRIPTION	PR&E#
Blank Panels	
6 inch	99-209
10 inch	99-271
16 inch	99-259
Button Caps	
Rectangular, White	25-771
Rectangular, White, “PRE”	25-771-1
Rectangular, White, “OSC”	25-771-5
Rectangular, White, “100”	25-771-6
Rectangular, White, “10”	25-771-7
Rectangular, White, “1”	25-771-8
Rectangular, Light Gray	25-772
Rectangular, Light Gray, “IN”	25-772-3
Rectangular, Light Gray, “1”	25-772-4
Rectangular, Light Gray, “2”	25-772-5
Button Caps, Illuminating	
Red, "ON" (Input Module)	25-2-1
Yellow, "OFF" (Input Module)	25-5-1
Rectangular, Orange, “SLATE”	25-121-1
Rectangular, White, “STUDIO 1”	25-125-1
Rectangular, White, “STUDIO 2”	25-125-2
Rectangular, White, “EXT”	25-125-5
Square, Red, “ON" (Return)	25-127-1
Square, Red, “ON” (Sends)	25-115-1
Square, White (Solo)	25-118
Square, White, “S”	25-118-1
Square, Yellow (Cue)	25-116
Button Caps, Self-Indicating ("Winkeye")	
Rectangular, Blk-Org, “PGM”	25-768-1
Rectangular, Blk-Org, “AUD”	25-768-2
Rectangular, Blk-Org, “UTL”	25-768-3
Square, Blk-Org	25-769
Square, Blk-Org, “A”	25-769-1
Square, Blk-Org, “B”	25-769-2
Capacitors	
Electrolytic, 1μF, 50V, Low Leakage	60-45
Electrolytic, 2.2μF, 50V, Low Leakage	60-50
Electrolytic, 4.7μF, 40V, Axial	60-21
Electrolytic, 10μF, 25V, Low Leakage	60-67
Electrolytic, 10μF, 25V, NP	60-84
Electrolytic, 10μF, 100V	60-41
DESCRIPTION	**PR&E#**
Electrolytic, 22μF, 16V	60-55
Electrolytic, 22μF, 25V	60-76
Electrolytic, 22μF, 25V, Axial	60-11

Electrolytic, 22μF, 25V, NP	60-85
Electrolytic, 47μF, 16V, NP	60-81
Electrolytic, 100μF, 16V, NP	60-82
Electrolytic, 100μF, 25V	60-52
Electrolytic, 100μF, 25V, NP	60-87
Electrolytic, 100μF, 63V	60-53
Electrolytic, 220μF, 16V	60-44
Electrolytic, 220μF, 16V, NP	60-83
Electrolytic, 220μF, 25V	60-78
Electrolytic, 220μF, 25V, NP	60-88
Electrolytic, 470μF, 80V	60-40
Electrolytic, 4700μF, 35V	60-94
Electrolytic, 16,000μF, 50WVDC	60-93
Electrolytic, 51,000μF, 40 WVDC	60-92
Metallized Polyester, .01μF, 400V	63-4
Metallized Polyester, .022μF, 250V	63-9
Metallized Polyester, .047μF, 250V	63-6
Metallized Polyester, .1μF, 100V	63-7
Metallized Polyester, .22μF, 100V	63-8
Metallized Polyester, .47μF, 100V	63-10
Monolythic, .1μF, 50V	62-5
Monolythic, 1μF, 50V	62-6
Polypropylene, 4700pF, 160V, Axial	64-23
Tantalum, .47μF, 35V	65-15
Tantalum, 2.2μF, 35V	65-14
Tantalum,10μF, 20V	65-6
Tantalum, 10μF, 25V	65-5
Tantalum, 10μF, 50V	65-8
Circuit Breakers	
For Audio Power Supply	30-27
For Logic Power Supply	30-28
For Microphone Power Supply	30-9
Cue Header Assembly	90-326
Diodes	
1N4001	11-7
1N4004	11-17
1N914B	11-13
MBR 350, 50V, 3A	11-39
Zener, 1N4757A	11-21
DIP Switches	
1 DPDT	26-11
DESCRIPTION	**PR&E#**
2 SPDT	26-12
1 SPST	26-7
2 SPST	26-10

Quad 2-Input AND, 4081	21-68
Quad 2-input Multiplexer, 4551	21-90
Triple 2-input Analog Switch, 4053	21-71
Triple 3-input OR	21-67
Wide Bandwidth Quad JFET Input Op Amp, LF347N	20-64
8-input NAND, 4068	21-56
IC Sockets	
6-Pin	16-107
8-Pin	16-108
14-Pin	16-114
16-Pin	16-116
Knobs	
11 mm, Grey	32-120
21 mm, Grey	32-138
11 mm, Grey, With Black Base Indicator	90-327-1
15 mm, Grey, With Black Base Indicator	90-327-2
Knob Caps	
Black (for 11 mm knob)	32-121
Blue (for 11 mm knob)	32-123
Gray (for 11 mm knob)	32-124
Green (for 11 mm knob)	32-122
Orange (for 11 mm knob)	32-127
Orange (for 15 mm knob)	32-136
Orange (for 21 mm knob)	32-140
Red (for 11 mm knob)	32-125
Red (for 21 mm knob)	32-139
Yellow (for 11 mm knob)	32-126
Lamps	
12V, 0.7W, bi-pin, 1099BPE	12-46
14V, .08A, 658	12-20
14V, .08A, 756	12-21
14V, .08A, 386	12-51
LED, Array, Red	12-59
LED, Red	12-53
Microphone Power Supply PCA, 120 VAC	90-148-1
Modules	
Control Room Monitor	99-257
Switching Board	45-146
Line Output Switcher	99-215
Meter Switcher	99-218-2
DESCRIPTION	**PR&E#**
Microphone Input	99-252
Output Assignment Switcher Assembly	95-143-1
Monaural Equalizer	99-415
Monaural Output Amplifier	99-216-1

Remote Line Selector	99-219
Send and Return	99-255
Output Assignment Switcher Assembly	95-143-2
Slate/Talkback/Test Oscillator	99-254
Output Assignment Switcher Assembly	95-143-3
Stereo Equalizer	99-416
Stereo Line Input	99-253
Output Assignment Switcher Assembly	95-143-1
Stereo Line Output Amplifier	99-258-1
Telco Mix	99-217
Two-Studio Monitor	99-256
Switching Board	45-146
Voice Processor	99-296
Module Extender Boards	
Control Room and Studio Monitor	99-274
Input, Slate/Talkback/Test Oscillator, Send And Return	99-272
Monaural Output, Telco Mix and Meter Switcher	99-231
Processing Modules	99-230
Stereo Line Output Amplifier	99-273
Operational Amplifier, NE5534	20-28
Output Amplifier Function Module PCA	95-119
Potentiometers	
Concentric Triple, Linear	24-105
Concentric Dual	24-118
Dual, 10K, Linear	24-109
Dual, 10K, CW Log	24-100
Dual, 10K, CW Log (2-Studio)	24-101
Dual, 25K, Linear	24-99
Quad, 10K, CCW Log	24-110
Single, 10K	24-111
Single, 10K, 1/2W, CCW, Audio Taper	24-20
Single, 10K, 1/2W, CW, Audio Taper	24-108
Single, 10K, Linear	24-102
Single, 10K, CW Log	24-98
Triple, CCW Log	24-103
Triple, CCW Log	24-104
Power Supply Assembly, 120 Volts	99-238
PPM Meter, 3.5", with Driver Amplifier	99-224-1
Regulator Board PCAs	
+12V Power Supply	95-89
DESCRIPTION	**PR&E#**
+/-22V Power Supply	95-91
Relays	
DPDT, 12V, 30mA, Polarized, Gold Contact	28-5
Opto-Isolator, 40mA, 1.65-2.0V	28-602

MJE181/1N914B	90-119-2
Trim-pots	
Single-Turn, 1K	24-51
Single-Turn, 10K	24-54
Single-Turn, 100K	24-58
Voltage Regulators	
Variable, 1.5A, Pos., LM317T	20-49
Variable, 1.5A, Neg., LM337T	20-59
Variable, 5A, LM338K	20-57
Variable, 10A, LM396	20-58
VU Meter, 3.5", with Buffer Amplifier	99-222-1

7.0 DRAWINGS AND SCHEMATICS

This chapter is made up of the following drawings and schematics:

7.28.2 Stereo Line Input Module Audio
7.28.3 Input Module Patch Send
7.28.4 Input Module Logic
7.28.5 Program Amplifier Output
7.28.6 Audition Amplifier Output
7.28.7 Utility Amplifier Output
7.28.8 Monaural Amplifier Output
7.28.9 Monitor Module Input
7.28.10 Control Room Monitor Module
7.28.11 Two-Studio Monitor Module
7.28.12 Send And Return Module
7.28.13 Telco Mix Module
7.28.14 Slate/Talkback/Test Oscillator Audio
7.28.15 Slate/Talkback/Test Oscillator Logic
7.28.16 Meter Switcher Module
7.28.17 Remote Line Selector Input
7.28.18 Remote Line Selector Output
7.28.19 Line Output Switcher
7.28.20 Timer Control

NOTE: On PR&E schematics, capacitor values are in microfarads (μF), unless otherwise specified, and resistors are 1/4 watt, 5%, unless otherwise specified.

PR&E DOCUMENT #75-9
STATUS PAGE
(Revision B - January 1997)

This listing provides a reference of current pages of this document, and their revision numbers (i.e., A.1, A.2, etc.). When a revision to this document is received from PR&E, simply replace the old pages with the new ones, discard the old pages, and post the new status page in the front of this manual (**NOTE**: It may be desirable to retain replaced status pages in order to have a record of document changes). If deemed necessary by PR&E's Engineering Department, comment information relating to any change may also be included on this page.

Page No.	Revision	Comments
ALL	A	New Release.
ALL	B	Corporate Name Change.

TABLE OF CONTENTS