



# Broadcast Console

99-1000-1CU (12-input mainframe, 110 VAC)  
99-1000-1CUX (12-input mainframe, 230 VAC)

99-1000-2CU (20-input mainframe, 110 VAC)  
99-1000-2CUX (20-input mainframe, 230 VAC)

## Operations & Technical Manual

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PR&E 75-40

Revision B.1 • 7/04



Broadcast Communications Division

# The AirWave Digital Broadcast Console

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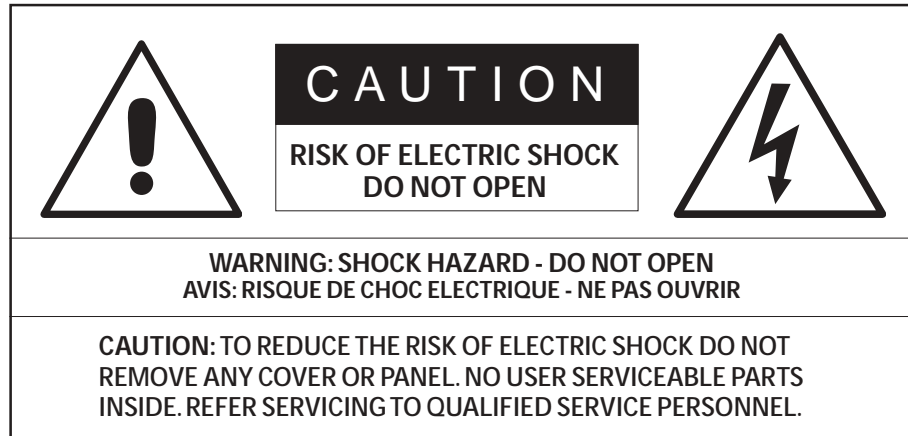
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# Safety Instructions

1. **Read All Instructions.** All safety and operating instructions must be read before operating the product.
2. **Retain All Instructions.** All safety and operating instructions must be retained for future reference.
3. **Heed All Warnings.** All warnings on the product and those listed in the operating instructions must be adhered to.
4. **Follow All Instructions.** All operating and product usage instructions must be followed.
5. **Heat.** This product must be situated away from any heat sources such as radiators, heat registers, stoves, or other products (including power amplifiers) that produce heat.
6. **Ventilation.** Slots and openings in the product are provided for ventilation. They ensure reliable operation of the product, keeping it from overheating. These openings must not be blocked nor covered during operation. This product should not be placed into a rack unless proper ventilation is provided through following the manufacturer's recommended installation procedures.
7. **Water and Moisture.** Do not use this product near water—for example; near a bath tub, wash bowl, kitchen sink or laundry tub; in a wet basement; or near a swimming pool or the like.
8. **Attachments.** Do not use any attachments not recommended by the product manufacturer as they may cause hazards.
9. **Power Sources.** This product must be operated from the type of power source indicated on the marking label and in the installation instructions. If you are not sure of the type of power supplied to your facility, consult your local power company.
10. **Grounding and Polarization.** This product is equipped with a polarized AC plug with integral safety ground pin. Do not defeat the safety ground in any manner.
11. **Power Cord Protection.** Power supply cords must be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to the cords at AC wall plugs and convenience receptacles, and at the point where the cord plugs into the product.
12. **Lightning.** For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the AC wall outlet. This will prevent damage to the product due to lightning and power line surges.
13. **Overloading.** Do not overload AC wall outlets, extension cords, or integral convenience outlets as this can result in a fire or electric shock hazard.
14. **Object and Liquid Entry.** Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
15. **Accessories.** Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious damage to a child or adult, and serious damage to the product. Any mounting of the product needs to follow manufacturer's installation instructions.
16. **A Product and Cart Combination** should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and the cart combination to overturn.
17. **Servicing.** Refer all servicing to qualified servicing personnel.
18. **Damage Requiring Service.** Unplug this product from the wall AC outlet and refer servicing to qualified service personnel under the following conditions:
  - a. When the AC cord or plug is damaged.
  - b. If liquid has been spilled or objects have fallen into the product.
  - c. If the product has been exposed to rain or water.
  - d. If the product does not operate normally (following operating instructions).
  - e. If the product has been dropped or damaged in any way.
  - f. When the product exhibits a distinct change in performance. This indicates a need for service.
19. **Replacement Parts.** When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or that have the same characteristics as the original parts. Unauthorized substitutions may result in fire, electric shock, or other hazards.
20. **Safety Check.** Upon completion of any repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.
21. **Cleaning.** Do not use liquid cleaners or aerosol cleaners. Use only a damp cloth for cleaning.

# Hazard / Warning Label Identification



**WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THE POWER SUPPLY OR CONSOLE TO RAIN OR MOISTURE.**



The **Exclamation Point symbol**, within an equilateral triangle, alerts the user to the presence of important operating and maintenance (servicing) instructions in product literature and instruction manuals.



The **Lightning Flash With Arrowhead symbol**, within an equilateral triangle, alerts the user to the presence of uninsulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

**WARNING**—This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions in this manual it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device (pursuant to Subpart J of Part 15 FCC Rules), which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

# Manual Revisions

**T**his page provides a quick reference of the current document pages and their revision level. When a revision to this document is received from Harris, replace the old manual pages with the new ones. Discard the old pages and post the new Manual Revisions page in place of this page.

Revision	Affected pages	Comments
<i>A</i>	<i>All pages</i>	<i>3/99 First Release</i>
<i>B</i>	<i>All pages Operation 3-4</i>	<i>10/99 Corp. Name Change 7/00 Telco Upgrade</i>
<i>B.1</i>	<i>Gen Info 3-4</i>	<i>7/04 specification corrections</i>

# General Information

# 1

**T**hanks for joining the growing ranks of broadcasters employing Harris Corporation products designed by Pacific Research & Engineering. Harris Corporation supplies audio products and systems to the world's leading broadcast facilities. Our mission is to provide the finest quality products, systems, documentation and after-sale support. We invite comments and suggestions for improvements to this documentation and to all of our services.

AirWave Digital is a very sophisticated console with an extensive range of features contained in a compact design. To obtain maximum benefit from the console's capabilities, read the *Installation*, *Operation* and *Equipment Description* chapters prior to product installation.

## PRODUCT OVERVIEW

Each Airwave Digital mainframe ships standard with one each of these modules:

- Microphone Preamp
- Monitor
- Output
- Timer Control

The modules are installed into their standard positions in the mainframe along with the Input modules ordered. Additional Mic Preamps, Analog or Digital Remote Line Selectors, and up to two Telco modules, or various accessory panels, may also be installed per the order. If required, blank panels are available to cover unused module positions.

AirWave Digital's motherboard and module area is completely contained within a welded steel chassis for strength and RFI immunity. The meter panel is hinged at the rear, locking down over the upper part of each module, covering the audio and logic connectors and the Logic Settings switches. Beneath the meter panel, the chassis bottom is open for easy cable access.

## Module Descriptions

### *Microphone Preamplifier*

Contains five preamplifiers with individual gain controls under a security cover. Phantom power (+45VDC) is selectable for each input. The preamplifier outputs are +4 dBu balanced for connection directly to an Input module or to outboard mic processing equipment. One module is supplied standard, but additional Mic Preamplifier modules can be installed into any RLS or input position.

### *Input*

Each Input module can be configured as an analog module (with two balanced, stereo inputs), or as a digital module (with two AES-3 inputs) through a plug-in SIM (Single In-Line Module). Each Input module features two input selection (A or B), channel on/off control, fader level con-

trol (with the selectable global fader start feature), Cue and Off-Line control and output selection to three program buses. Faceplate channel trim controls allow the analog version to accept input levels from -10 dBu to +4 dBu.

The module's inputs are electronically switched through a faceplate A/B Input selector. Logic wiring to/from external peripherals connects to a 24-pin logic connector on the faceplate. Logic and module function options for the A or the B input are set through a ten-position faceplate DIP switch. A second, optional interface connector is available for separate logic control for the A and B inputs.

#### *Telco Input/Output*

Up to two optional Telco modules can be installed into the mainframe next to the monitor module. These provide the audio and logic connections for up to two telephone hybrids and two-channel recorders. A faceplate trim control allows the module to work with hybrid outputs from -10 dBu up to +4 dBu.

Each Telco module's output (Feed to Caller) can be set manually to any one or a combination of the three program buses and the Off-Line mix bus. The Autofeed function automatically switches the Feed to Caller between the Off-Line mix and the assigned bus with the highest priority when the Telco module is turned off and on (for more information, see the Telco Operation section).

#### *Monitor*

A double-width module with the monitoring and communication controls for a control room (C/R) and separate studio or voice booth. Volume controls for C/R and studio speaker volume, C/R headphone and Cue are included with independent source selection for each room (three external inputs, Pgm-1, Pgm-2, Pgm-3 and Telco). The module includes a C/R to studio talkback system

with built-in adjustable electret talkback mic. Both C/R and studio warning outputs are provided.

#### *Output*

Contains the various analog stereo line output amplifiers and the AES-3 digital outputs for the Program-1 (Pgm-1), Program-2 (Pgm-2) and Program-3 (Pgm-3) buses. A monaural analog output of the Pgm-1, Pgm-2 or Pgm-3 bus (operator-selected) is also provided. Each balanced analog output uses a nominal level of +4 dBu. Each digital output is AES-3 compatible.

This module also has faceplate buttons for the right-hand signal level meter selection, Program-2 or Program-3, with momentary Cue bus level metering. The module also has two DIP switches for selecting if Fader Start is enabled and the metering scale (VU or PPM).

#### *Timer Control*

Provides manual or automatic control over the digital timer located in the meter panel. This module also routes power to the clock/timer assembly and provides an external reset for a studio mounted timer. It also provides for a AA battery backup voltage to hold the console's logic settings in case of momentary power outage.

#### *Remote Line Selector (RLS)*

Two line selectors are available: an analog RLS and a digital RLS. Each is a 7x2 input selector. The analog version uses balanced, line-level mono or stereo signals. The digital version uses AES-3-compatible digital signals. Two banks of seven switches provide manual, exclusive source selection, among the seven common external input signals for the two outputs.

#### **Power Supply**

The separately packaged rack mount power supply is fully regulated and protected by inter-

nal fuses and electronic safeguards against excessive current.

The power supply has five regulated output voltages. Two outputs ( $\pm 16$  volts) power the analog audio circuitry. A third (+5 volts) powers the DSP and logic control circuitry. The remaining outputs power the clock/timer assembly (+12 volts) and supplies phantom powering (+45 volts) for condenser microphones connected to the Microphone Preamplifier module.

## SPECIFICATIONS

AirWave Digital's specifications are significantly more complete, and the related test conditions more defined, than those usually shown for consoles in this class. Be sure to follow the test conditions and measure in the units as stated.

The specifications are for a fully-loaded AirWave Digital-20 mainframe.

### *Test Conditions:*

Specifications are for the basic signal paths, per channel, with 600 ohm loads connected to the analog program outputs.

0 dBu corresponds to an amplitude of 0.775 volts RMS regardless of the circuit impedance. This is equivalent to 0 dBm measured into a 600 ohm circuit for convenient level measurement with meters calibrated for 600 ohm circuits.

Noise specifications are based upon a 22 kHz measurement bandwidth. The use of a meter with 30 kHz bandwidth will result in a noise measurement increase of approximately 1.7 dB.

Total Harmonic Distortion (THD) is measured at a +23.5 dBu output level using a swept signal with a 22 kHz low pass filter.

FSD = Full Scale Digital, +24 dBu

### Microphone Preamplifiers

*Source Impedance:* 150 ohms

*Input Impedance:* 5 k ohms minimum, balanced

*Input Level Range:* Adjustable, -70 to -30 dBu

*Input Headroom:* >20 dB above nominal input

*Output Source Impedance:* 220 ohms balanced

*Nominal Output Level:* +4 dBu, balanced

*Output Load Impedance:* 2.5 k ohms minimum

### Analog Line Inputs

*Source Impedance:* 600 ohms or less

*Input Impedance:* >40 k ohms, balanced

*Input Level Range:* Adjustable, -10 to +4 dBu

*Input Headroom:* 20 dB above nominal input

### Analog Main Outputs

*Output Source Impedance:* 80 ohms balanced

*Output Load Impedance:* 600 ohms minimum

*Nominal Output Levels:*

Program/Monaural Outputs: adj. +4 dBu

Telephone Mix-Minus: set at +4 dBu

Telephone Recorder Mix Feed: +4 dBu

*Maximum Output Levels:*

Program and Monaural: +24 dBu

Telco Mix-Minus: +24 dBu

Telco Recorder Mix Feed: +24 dBu

### Digital Inputs & Outputs

*Reference Level:* +4 dBu (-20 dB FSD)

*Digital I/O:* Thru digital Input or RLS modules and the digital program outputs.

*Signal Format:* AES-3, S/PDIF (input only)

*AES-3 Input Compliance:* 24-bit

*AES-3 Output Compliance:* 24-bit

*Digital Reference Frequency:* Internal crystal

*Internal Sample Rate:* 48 kHz

*Processing Resolution:* 24-bit fixed with extended precision accumulators

*Conversions:* A/D is 24-bit Delta-Sigma, 128x with sample rate conversion on all digital inputs. D/A is 24-bit Delta-Sigma, 128x

*Latency:* <1 ms, Mic in to Monitor out; <300  $\mu$ s digital input to digital output



## Monitor Outputs

*Output Source Impedance:* 400 ohms, balanced

*Output Load Impedance:* 2.5 k ohms or greater

*Output Level:* +4 dBu nominal, +24 dBu max.

*Console Headphone Output:* 0 dBu, >8 ohm load

*External Headphone Amplifier Output:*

Source Impedance: 400 ohms

Load Impedance: 2.5 k ohms or greater

Output Level: +4 dBu nominal, +22 dBu max.

## Frequency Response

*Microphone or Line Input to Program Output:*

+0 dB/-0.5 dB, 20 Hz to 20 kHz

*Telco Input to Program Output:*

+0 dB/-2.0 dB, 20 Hz to 20 kHz

## Dynamic Range

*Analog Input to Analog Output:*

89 dB ref. to FSD, 91 dB "A" weighted to FSD

*Digital Input to Analog Output:*

92 dB ref. to FSD, 95 dB "A" weighted to FSD

## Equivalent Input Noise

*Microphone Preamp:* -127 dBu, 150 ohm source

## Total Harmonic Distortion + Noise

*Mic Pre Input to Mic Pre Output:* <0.005%, 20 Hz to 20 kHz, -38 dBu input, +18 dBu output, 100 k ohm load, 22 kHz filter bandwidth.

*Analog Input to Analog Output:* <0.02% at 1kHz, +18 dBu input, +18 dBu output, 600 ohm load, 22 kHz filter bandwidth.

<0.05%, 20 Hz to 20 kHz, +18 dBu input, +18 dBu output, 600 ohm load, 22 kHz filter bandwidth.

*Digital Input to Digital Output:* <0.0016%, 20 Hz to 20 kHz, +18 dBu input, +18 dBu output, 20 kHz filter bandwidth

*Digital Input to Analog Output:* <0.005% at

1 kHz, +18 dBu input, +18 dBu output, 600 ohm load, 22 kHz filter bandwidth.

<0.05%, 20 Hz to 20 kHz, +18 dBu input, +18 dBu output, 600 ohm load, 22 kHz filter.

## Crosstalk Isolation

*Program-to-Program:* >90 dB, 20 Hz - 20 kHz

*A Input to B Input:* >83 dB, 20 Hz - 20 kHz

*B Input to A Input:* >86 dB, 20 Hz - 20 kHz

## Stereo Separation

*Analog Program Outputs:* >87 dB @ 1 kHz,

>78 dB, 20 Hz to 20 kHz

## Console Power Requirements

*Fully configured AirWave Digital-12:* 120 watts at 115 VAC,  $\pm 8\%$ , 50/60 Hz

*Fully configured AirWave Digital-20:* 170 watts at 115 VAC,  $\pm 8\%$ , 50/60 Hz

*Power Supply Main fuse rating:* 1.25 amp at 230 VAC (IEC), 2.25 amps at 115 VAC (UL)

## Power Supply Voltages

*Phantom power:* +45 VDC at 0.100 Amp

*Audio power:*  $\pm 16$  VDC at 1.00 Amp (each leg)

*Digital & Logic power:* +5 VDC at 6.5 Amps and +12 VDC at 4.0 Amps

## Power Supply Ground

Chassis grounded through AC cord.

DC voltages floating from chassis.

## Power Supply Connection

*AC input:* IEC power cord

*DC output:* Keyed multi-pin connector

Harris Corporation reserves the right to change specifications without notice or obligation.

## **WARRANTY**

The AirWave Digital console carries a manufacturer's warranty which is subject to the following guidelines and limitations:

- A)** Except as expressly excluded herein, Harris 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 Mason, Ohio, packaging and transportation prepaid, with return packaging and transport 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 subparagraph A) above; 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.

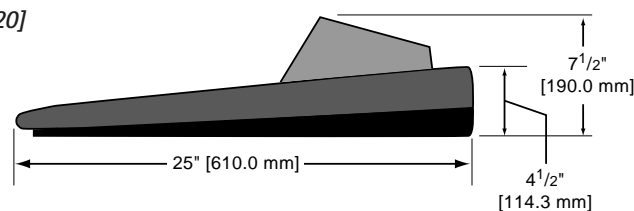
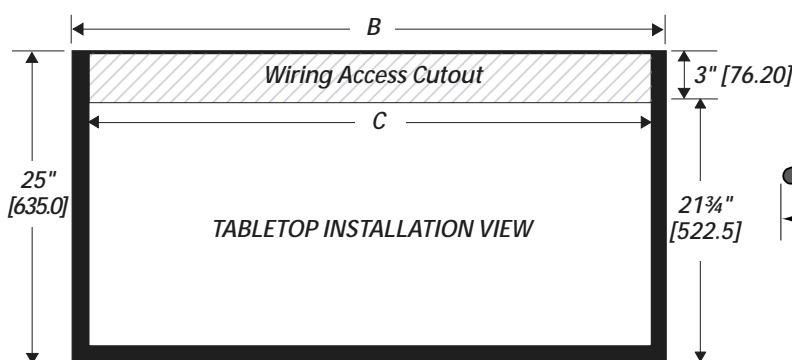
# Installation

## 2

The AirWave Digital mainframe can sit on top of, or be recessed into, the studio furniture countertop. A minimum of two inches of rear clearance and 13½ (343.0 mm) inches of vertical clearance above the countertop is required to fully open the meter panel to its service position.

The AirWave Digital console shipment consists of:

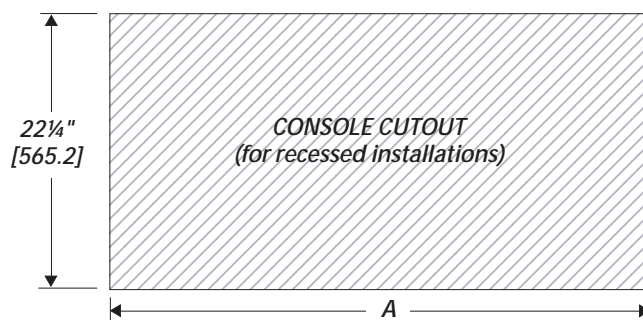
- The 12- or 20-input mainframe with the standard modules installed: Monitor, Timer Control, Output and Microphone Preamp.
- Also installed are the Input, RLS and Telco modules, accessory panels and blank panels that were ordered with the mainframe.
- The rack-mount power supply.
- The AirWave Tool kit (AA batteries, AMP MOD IV Crimp and contact removal tools, hex driver, pot knob removal tool and clock set magnet tool).
- Audio and Logic connector kits for the mainframe and for each module ordered. The kits contain all the AMP MOD IV connector housings and receptacle contacts needed for installation.



CONSOLE SIDE VIEW, with dimensions

Dimension Table			
Mainframe	A	B	C
AirWave-12	32" [812.8]	33" [838.2]	28 1/2" [723.9]
AirWave-20	44" [1117.6]	45" [1143]	40 1/2" [1028.7]

Millimeter dimensions in brackets. All dimensional tolerances are +¼" [6.350], -0" [0.0]. Typical front setback is 12" [304.8]. Allow 2" [50.80] clearance behind mainframe and 13½" [342.9] clearance above the meter panel.



To simplify console installation, logic cable wiring diagrams for specific peripheral equipment are available from Harris Corporation. Custom engraving for the button caps and colored fader knobs are also available. See Chapter 7, *Accessories*, for details.

**INSTALLATION NOTE:** Do not locate the console near intense electromagnetic hum fields, such as those produced by large power transformers and by audio amplifiers which use inexpensive power transformers operating in or near saturation. Strong electromagnetic fields may impair the performance of AirWave Digital and neighboring equipment. Audio cables must also be routed to achieve maximum practical distance from all AC power mains wiring.

## MAINFRAME CONFIGURATION

AirWave Digital continues PR&E's design philosophy of positioning the input modules in the physical center of the mainframe. This gives the operator equal reach to peripheral equipment lo-

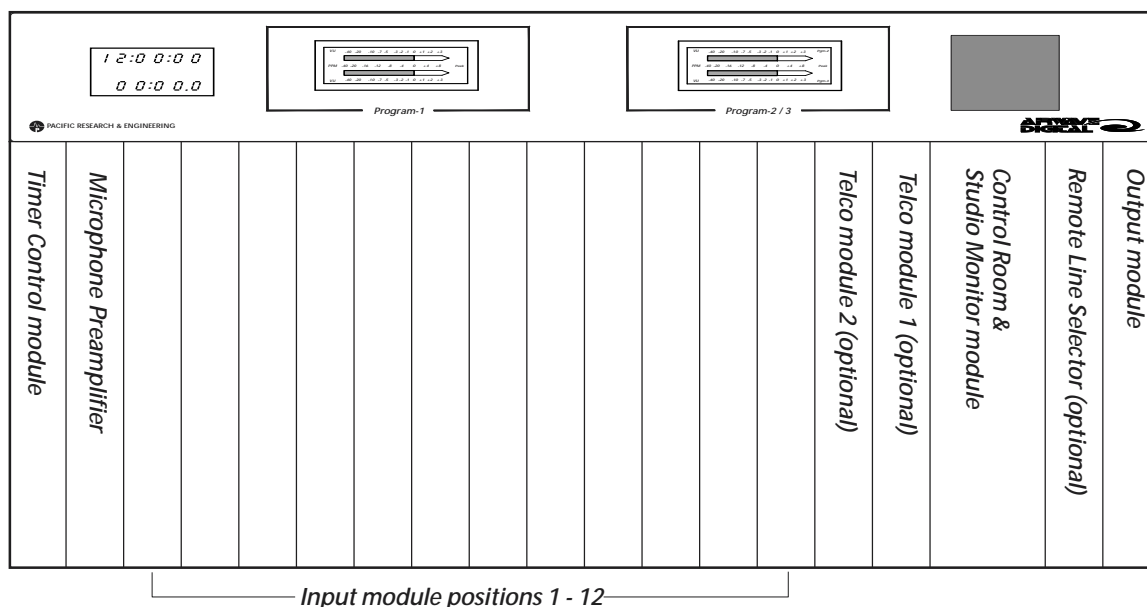
## Module Placement

The 12 (or 20) Input module positions can have any combination or order of Input modules, Mic Preamps, Remote Line Selectors (RLS) or custom remote panels installed. The remaining console positions are fixed. The Timer Control, Mic Preamp, Monitor, Output and the two optional Telco modules must be positioned as shown in the illustration. However, the two Telco positions may alternately have Input modules installed in them. The RLS position, between the Monitor and Output modules, can only be used for either an RLS or a Mic Preamp.

## The Meter Panel

Two Bargraph meters provide level monitoring for Pgm-1 and either Pgm-2 or Pgm-3 with momentary Cue bus selection. The meter scale (VU or PPM) is set via DIP switch on the Output module. The cue/talkback speaker, a clock and event timer are also on the panel.

### AirWave Digital-12 Module Configuration



**Note:** The AirWave Digital-20 mainframe has eight additional Input module positions.

## CONNECTOR ACCESS

The meter panel is set into its service position to access the module connectors. To move the meter panel to its service position, simultaneously press on the latch buttons, located on the ends of the meter panel, while lifting and rotating the panel rearward.

**Note:** When opened to its service position, exercise caution to ensure the panel does not accidentally fall closed.

To ease initial wiring, the meter panel can be completely removed from the mainframe chassis. Set the panel to its service position and unplug all meter panel cabling to the speaker, meters and clock/timer. With another person holding the meter panel unlatch the two hinges, by moving the two release pins into their detent positions, to free the meter panel. To reinstall the meter panel, first align the hinge parts together and then release the pins out of their detents.

## POWER SUPPLY

The power supply is typically rack mounted in the console cabinetry below and to the left or right of the supporting countertop. The power supply must be installed so that the ten-foot DC power cable, that is fastened to the right end of the mainframe motherboard, is not under tension.

**DC GROUNDING NOTE:** The DC outputs of the power supply are not referenced to the power supply chassis and, therefore, are floating from the AC safety ground. *Do Not Connect* audio or logic supply ground wiring to the chassis of the power supply.

**AC GROUNDING NOTE:** Do not defeat the safety ground in any way. Doing so may provide a potentially dangerous condition to the operator.

Refer to the *AirWave Universal Power Supply Technical Manual* (PR&E # 75-41) for complete power supply installation details.

## GROUNDING & SHIELDING

The broadcast facility's *technical ground* should only connect to the mainframe chassis ground stud. The stud is located next to the DC power supply cable entry point into the chassis. Terminate the facility's technical ground wire in a crimped lug.

Connect the audio shields at both the console and the peripheral when all system components share a common ground potential and are using isolated ground AC outlets tied individually back to the main technical ground.

If isolated ground AC outlets are not available, connect the cable shields at the console end only. The shields should be floated (left unconnected) at the peripheral device. Ensure the peripheral devices connect to a clean ground through their power cords, or through separate ground wires to the facility's technical ground.

**POWER SUPPLY GROUNDING NOTE:** The power supply chassis is connected to the safety or "U" ground wire in the AC mains supply cable. Audio signals are not referenced to this ground in any way by the console.

**AUDIO GROUND NOISES:** Buzz pickup is generally electrostatic—such as capacitive coupling between an audio line and a power line. Do not route audio lines in the same wireway as an AC power line.

## INSTALLING BACKUP BATTERIES

Two AA batteries are supplied in the Installation Tool Kit. They supply a “Keep Alive” voltage that holds each module’s logic state during momentary power outages. They mount in battery clips on the Timer Control module circuit board. Observe the correct polarity (marked on the circuit board) when installing the batteries.

**Note:** Replace batteries yearly to ensure continuous backup protection. Remove one or both batteries to prolong battery life when the console will be unpowered for an extended period.

## SETTING THE CLOCK

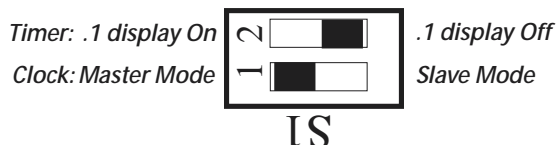
The digital time-of-day clock can be a master or a slave. In master mode, the factory preset, clock timing is derived from a temperature-controlled quartz crystal oscillator. In slave mode, clock timing is derived from a TC76/TC89-compatible ESE master clock reference signal.

*Master clocks are available from:*  
**ESE**  
142 Sierra St.  
El Segundo, CA 90245.  
Telephone: 310.322.2136  
[www.e-se-web.com](http://www.e-se-web.com)

The operating mode is set by switch S1, #1 on the clock/timer circuit board. To access the clock/timer board, open the meter panel to its service position. The clock/timer board is mounted behind the clock/timer display on the meter panel.

With the clock set to master mode, it’s necessary to manually set the clock once power is ap-

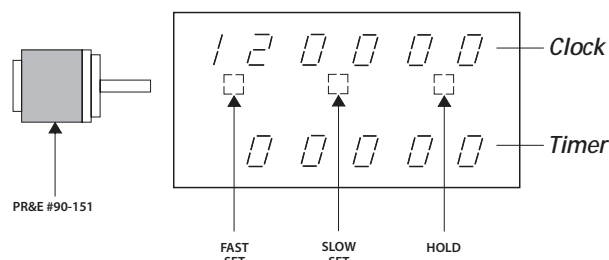
### Clock/Timer Option Switches



*Switch S1, on the Clock/Timer printed circuit board, as viewed with the meter panel in its service position. Factory default settings shown.*

plied to the console. Three magnetically-activated Hall-effect sensors are used to adjust or hold the time. They are positioned below and between each pair of 7-segment displays, just behind the display face. Clock set magnet tool (PR&E # 90-151) is used to activate the Hall-effect sensors.

### Setting the Clock



**Note:** The plastic clock/timer bezel may be scratched if the tool is moved while in contact with the lens.

To set the time, place the end of the magnet tool directly against the plastic face over the appropriate sensor. Use *Fast Set* to quickly advance the time and *Slow Set* to slowly advance the time. To synchronize the clock display to real time, set the clock a few seconds ahead and use *Hold* to freeze the display. To start the clock, move the tool away from *Hold*.

When an ESE time code signal is connected to BNC connector, J3, on the clock/timer circuit board, and slave mode is selected (S1, #1, is set to the right), the clock does not need to be set. Should the ESE time code signal fail, the clock automatically defaults to its internal crystal reference oscillator, blinking an LED below the clock display to indicate the loss of time code.

### Timer Display

The Event Timer displays time in minutes, seconds and tenths of seconds. The tenths of seconds display is normally turned off while the timer runs. It can be turned on while running by moving clock/

timer circuit board switch S1, #2, to the left. The tenths of seconds are always displayed while the timer is in the Stop or Hold modes, regardless of the setting of switch S1, #2.

## Cabling & Wiring

Before beginning the installation, draw a facility wiring plan listing the console interconnections with peripheral devices. Identify and create tags for all audio and logic cabling. List each connection in a master facility wiring logbook to facilitate wiring installation, future system wiring changes, equipment updates and system troubleshooting. Refer to *Module Connections*, pages 17 through 23 later in this chapter, for the audio and logic connector pin-out definitions.

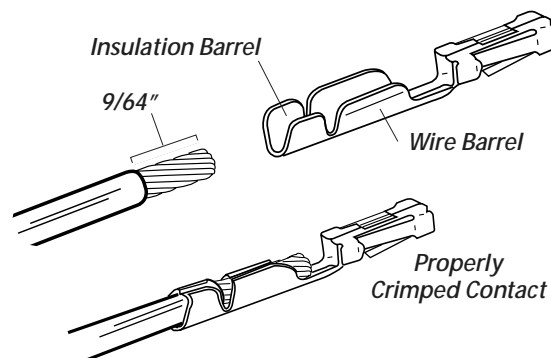
Analog audio connections require two-conductor stranded, insulated, foil-shield cable containing a separate shield drain wire (equivalent to Belden 8451, 9451 or 8761).

AES/EBU connections require 110 ohm two-conductor stranded, insulated, foil-shield cable containing a separate shield drain wire (equivalent to Belden 1800A).

Logic control cables require stranded, 22 AWG, multiple conductor, non-shielded, jacketed cable (equivalent to Belden 9423, 8457 or 9421). The number of conductors needed is determined by the application. Typically five and eight wire cables are most often used for constructing logic cables (there are only 18 distinct signals on the Logic Interface connector, of which only a handful may actually be used for any given application).

### WIRE PREPARATION

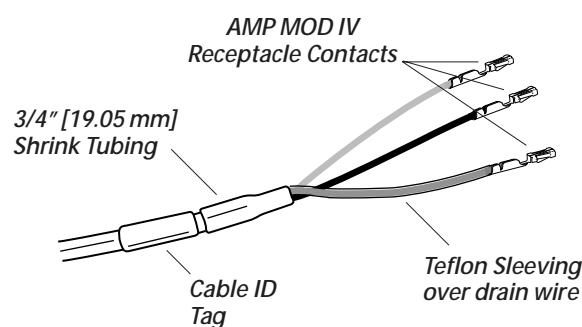
All AirWave Digital audio and logic wiring terminates in AMP MOD IV receptacle contacts at the console. Stranded wire of 22 to 26 AWG, with insulation diameters of .040 to .060 inch, can be used with the AMP MOD IV receptacle contacts.



### AMP MOD IV Receptacle Contacts

Follow these steps for audio wire preparation:

1. Strip the cable insulation jacket and foil shield back 1½" [38.10 mm].
2. Remove the foil shield and sleeve the drain wire with 20 AWG Teflon sleeving, leaving 9/64" [3.572 mm] of the drain wire exposed.
3. Cover the cut end of the jacket with ¾" [19.05 mm] of heat-shrink tubing, centered on the cut. Shrink this tubing to hold the drain wire sleeving in place.
4. Strip the signal wire insulation back 9/64" [3.572 mm].
5. Crimp the receptacle contacts onto the wire and insulation.



### Audio Wire Preparation

**Audio Cable Shield Note:** To ensure your installation follows recommended grounding procedures, you must sleeve all drain wires with Teflon sleeving and put heat shrink tubing over all cable jacket cut ends to insulate the shield wire.

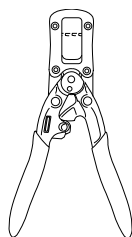


Logic control cables are fabricated in a similar manner to the audio wiring. Strip the jacket insulation back 1½" [38.10 mm], sleeve the cut end with ¾" [19.05 mm] of shrink tubing and strip the insulation from each wire 9/64" [3.572 mm].

## CRIMP TOOL OPERATION

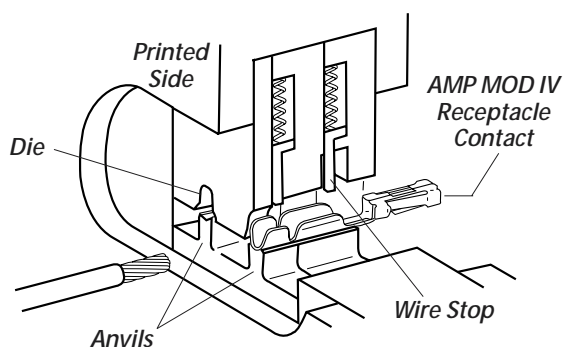
A ratcheting AMP MOD IV hand crimper is included in the tool kit. The tool crimps both the insulation and wire barrels on the AMP MOD IV receptacle contacts in one crimp action.

**AMP MOD IV  
Crimp Tool**



Follow these instructions for using the ratcheting crimp tool:

1. Hold the crimp tool with the printed side up. Insert the contact from the opposite side, with the barrel openings up, until the insulation barrel end is flush to the opening of the die. Close the tool only until the anvil holds the contact in place. Refer to the cutaway view.
2. Insert the stripped wire into the contact until it hits the tool's wire stop. Hold the wire in

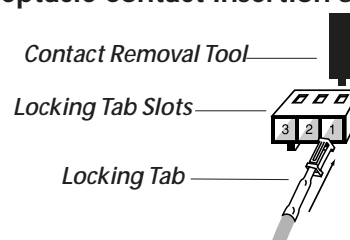


**Enlargement Of Crimper  
(cutaway view)**

place while squeezing the tool handles to crimp the contact onto the wire. The tool handles automatically release and spring open after the crimp cycle is complete.

A properly crimped contact receptacle is inserted and locked into the appropriate connector housing following the pin-out diagrams found in the *Module Connections* section (pages 17 to 23). Note that the receptacle contact must be inserted with its locking tab side facing the locking tab slots on the side of the connector housing. A light "click" will be felt as the contact's locking tab engages the locking tab slot.

## Receptacle Contact Insertion & Removal

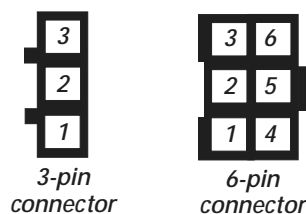


A Contact Removal Tool (PR&E 70-129) is used to depress the locking tab if the contact and wire need to be pulled out of the connector.

## AUDIO CONNECTIONS

Audio connector pin assignments take visual advantage of the three-pins-per-row design of the three-pin and six-pin AMP MOD IV connectors for both analog and digital connections.

## Audio Connector Pin Numbering



*Pin numbering shown from the wire entry end, oriented from the board operator's perspective.*



When plugged into a module, the audio shields are the pins closest to the console operator, the audio low wires are the middle pins and the audio high wires are the back pins. For stereo, the left channel wires connect to the left column of pins and the right channel wires to the right-hand column of pins (all from the operator's perspective).

## Microphone Inputs

### Pin Signal Description

1	Shield (connects directly to the chassis)
2	Low (- input)
3	High (+ input)

## Two-Channel Line Inputs and Outputs

### Pin Signal Description

1	Shield for left channel or signal 1
2	Low (- input), left channel or signal 1
3	High (+ input), left channel or signal 1
4	Shield for right channel or signal 2
5	Low (- input), right channel or signal 2
6	High (+ input), right channel or signal 2

## Analog Connections

There are no analog interstage patch points within the AirWave Digital input or output modules. To use a patch bay, connect the line level outputs from the peripheral devices directly to the patch bay and then normal these to the appropriate analog Input modules. Likewise, AirWave Digital's analog outputs may also be routed through a patch bay normalled to standard peripherals such as analog On-Air processing gear, recorders, telephone hybrids, etc.

The Microphone Preamplifier module's line-level outputs (+4 dBu, nominal, balanced) can also be routed through a patch bay normalled to an Input module. If mic processing is required, the Preamplifier module's outputs may be routed through line-level mic processing equipment and then to an Input module. When mic-level input capable processors are used, the microphone

should be connected to the mic processor with the processor's line-level output directly connected to an Input module.

## Digital Connections

Digital outputs use three-pin connectors wired like the Mic Inputs. These connections output AES-3 compatible signals (often referred to as AES/EBU signals).

**Note:** The outputs cannot be directly connected to a S/PDIF input. A signal translation interface must be used to do this.

## AES/EBU Digital Outputs

### Pin Signal Description

1	Shield (connects directly to the chassis)
2	Low (- input)
3	High (+ input)

Because Input and RLS modules are available with either an analog or a digital input, the connectors on these modules use six-pin AMP MOD IV connectors even when the module is configured for digital signals. Connect the AES/EBU signal to pins 1, 2 and 3 only. There is no connection on pins 4, 5 and 6.

## AES/EBU Digital Inputs

### Pin Signal Description

1	Shield for AES/EBU signal
2	Low (- input)
3	High (+ input)
4	no connection
5	no connection
6	no connection

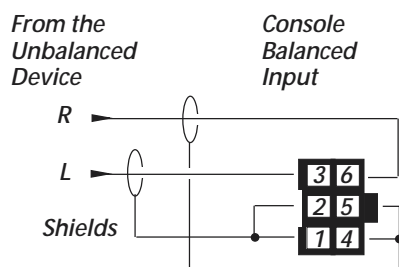
Routing digital audio signals through a patch bay is not recommended.

## UNBALANCED CONNECTIONS

Even though all analog inputs and outputs are active and balanced, unbalanced consumer or “semipro” equipment can be connected. For best results unbalanced devices should connect to the console through an IHF-PRO match box.

If a match box is not available, connect unbalanced signals per the following illustration. Keep unbalanced cable lengths as short as possible.

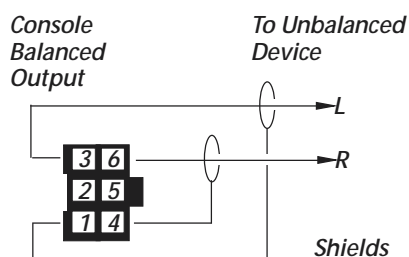
### Connecting an Unbalanced Device to an AirWave Analog Input



When an unbalanced device must be connected to an AirWave analog balanced output, and an IHF-PRO match box is not available, do not tie the low (-) and shield pins together to “unbalance” the signal. The low pin must always be left “floating,” as shown in the following illustration, when unbalancing an AirWave output.

### Connecting an Unbalanced Device to an AirWave Analog Output

(Nominal Output is -2 dBu)

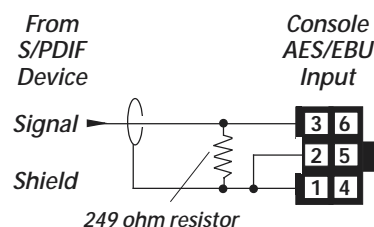


(Make no connections to pins 2 & 5)

## S/PDIF Signals

When a S/PDIF digital output is connected to an AirWave digital input, a 249 ohm resistor is used to properly load the 75 ohm S/PDIF cable. Install the resistor onto the connector following the diagram. Alternately, an unbalanced-to-balanced line transformer may be used to connect a S/PDIF signal to an AES/EBU input.

### Connecting an S/PDIF Device to an AirWave AES/EBU Input



**Note 1:** AES/EBU output signals cannot connect directly to S/PDIF inputs, a signal conversion interface must be used.

**Note 2:** Some S/PDIF outputs may not work with the AirWave’s digital inputs, even with the additional load resistor, due to nonstandard signal levels or protocols in the S/PDIF product.

## LOGIC CONNECTIONS

Each Input module comes standard with one 24-pin logic connector to control a device connected to either the A or B input. The optional 99-1003 Dual Logic Interface plug-in can be added to any Input module to provide a separate logic connection for each input.

When a peripheral device is connected, one of the main functions of the logic interface is to start the peripheral at module on. The peripheral device logic can, in turn, control the Input module; turning the module audio off at the end of an event and then controlling the Off lamp illumination to indicate the peripheral device status.

When a Guest Panel is connected, its remote On, Off, Cough and Talkback buttons control the module while the logic control outputs from the module control the button tallies in the Guest Panel.

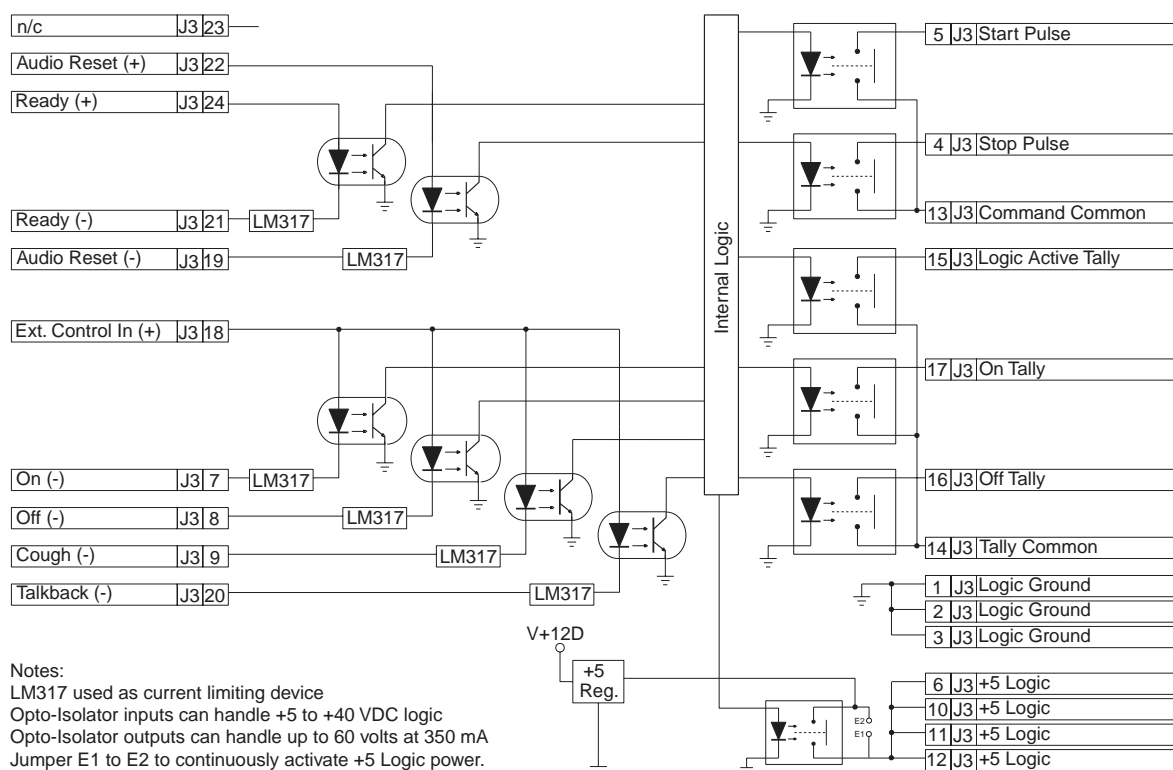
## THE LOGIC INTERFACE

A simplified schematic for the Input module interface is shown below. The dual logic plug-in is identical. Logic outputs (shown on the right) are isolated from peripheral devices by five solid-state devices functioning like single-pole mechanical relays. The “relay contacts” can switch external voltages of up to 60 volts at 350 mA.

Each press of the On button generates a 220 ms pulse from the Start Pulse relay. Each press of the Off button generates a 220 ms pulse from the Stop Pulse relay. These two relays are commoned together at Command Common. The other three relays, Logic Active Tally, On Tally and Off Tally, are also “commoned” together at the Tally Common output.

The six logic inputs (on the left side of the illustration) are opto-isolated and current limited so any logic voltage from +5 to +40VDC can be used.

**Simplified Schematic, Input Module Logic Interface**



The On, Off, Cough and Talkback inputs allow remote mic panel switches to control the Input module through active low logic signals (pull to ground). To enable these inputs jumper the External Control In (+) connection to +5 Logic.

The Audio Reset and Ready inputs can use either active low logic (pull to ground) or active high logic (pull to +VDC) from peripheral devices. With active high logic, Ready (-) and Audio Reset (-) are tied to logic ground on the peripheral device. Ready (+) and Audio Reset (+) then connect to the appropriate logic outputs on the peripheral device.

When active low logic is used by the peripheral device, Ready (+) and Audio Reset (+) connect to the logic supply voltage on the peripheral device, and Ready (-) and Audio Reset (-) connect to the appropriate logic outputs.

In normal operation the +5 Logic supply is turned off when the interface is not enabled for the input selected. Circuit board pads E1 and E2 can be jumpered to supply +5 Logic voltage at all times for special applications.

## AirWave Digital Quick Logic Guides

Pages 13 through 16 offer quick guides to configuring the console logic. Page 13 contains an AirWave Digital Logic Interface Glossary, Logic Settings switch definitions and a copy of the simplified logic schematic from the previous page. Pages 14, 15 and 16 show connection diagrams for a Guest Panel (remote mic panel), a CD player and a digital delivery system, respectively.

**Note:** To completely isolate the console from a peripheral device, use only the control input and output connections. These are decoupled from the console's ground and power supply through opto-isolator devices.

The Logic Ground and +5 Logic connections are referenced to the console's logic power supply and ground. Connect these only to a peripheral

device with isolated logic connections or to a Guest Panel. Connecting these to a non-isolated peripheral device can result in a ground loop between the console and the peripheral.

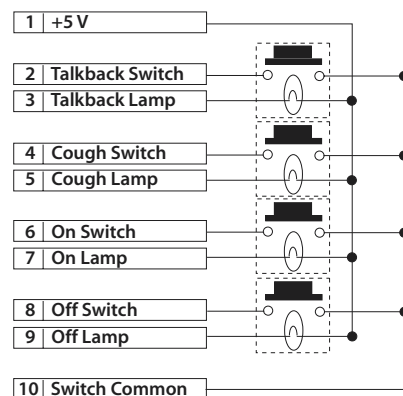
## Input Module Logic and Microphones

The two main functions of microphone logic are to automatically mute the monitor speakers in the room with the "hot" mic and to command the appropriate hot mic warning light.

The warning commands come from the Monitor module, but it is the first four Logic Settings switches on each Input module that tell the monitor module whether the A and/or B input is a control room or a studio microphone.

Page 14 summarizes setting up an Input module as a microphone input. To activate the Guest Panel logic functions, turn on Logic Settings switch 7 and set switch 8 for the appropriate A or B input. To enable the remote control inputs (On, Off, Cough, Talkback), jumper External Control In (+) to +5 Logic on the logic connector.

## Guest Panel, Simplified Schematic for 99-949-1 or -2



Momentary SPST switches are used to construct a remote mic control panel like that shown above. Connect one side of each control panel switch to the appropriate logic connector pin. Common the other side of each switch (Switch Common on the control panel illustration) to Logic Ground.

The Logic Active Tally output controls the lamps for the Cough and Talkback switches. The On Tally and Off Tally outputs control the On and Off switch lamps. The other side of each lamp (+5 V) connects to +5 Logic. Use 6.3 volt lamps, with less than 50 mA current draw, for all remote panels supplied by the console.

### Input Module Logic and Peripheral Devices

Peripheral devices are controlled through the Start, Stop and Command Common logic outputs.

In the connection example on page 15, active low logic is used, thus Command Common is connected to the logic ground on the peripheral device (labeled command common by Denon).

In the example on page 16, active high logic is required, thus Command Common is connected to +5 Logic. Note that this voltage is more typically supplied directly by the peripheral device to prevent ground loops.

Peripheral devices control the module through the Audio Reset and Ready logic inputs. On page 15, only the Ready function is shown being used. Ready performs an Audio Reset, to turn off the module without generating a Stop Pulse, in addition to then controlling the Off lamp illumination.

On page 16, Audio Reset (+) and Ready (+) connect to +5 Logic on the module. The Ready (-) command and the Audio Reset (-) command are pulled low by the active low logic relay outputs on the peripheral device, which all tie to the module's Logic Ground (pin 1).

For peripheral devices that require a steady On or Off signal, the On and Off tallies can be used. When the Off Tally is used in this manner, Logic Settings switch #9 (Lamp Bypass) must be set to the left (On) so that the Off lamp is not controlled by the Ready logic.

## ADDITIONAL LOGIC CONNECTIONS

There are three additional AirWave Digital logic connections on the Monitor module, Telco module and the Timer Control module.

An 8-pin connector on the Monitor module carries the logic control outputs for the Control Room and Studio warning light interfaces. The Monitor module logic connection and block diagram are on the next page.

The Telco module includes a 3-pin connector for a Start and a Stop Pulse output for triggering a hybrid or other remote device at module on and off.

A 3-pin connector on the Timer Control module carries the remote timer reset logic. The Timer Control module logic connection and description are in the *Timer Module Remote Connection* section on page 23.

### Monitor Module Logic

There is one 8-pin logic connector for the "hot mic" logic command outputs for the Control Room and Studio on-air warning lamp systems.

Each logic command output is isolated using a solid-state relay with a pair of normally open "dry-contacts." These *relay contacts* can switch external voltages of up to 60 volts at 350 mA for direct interface to most lamp control devices.

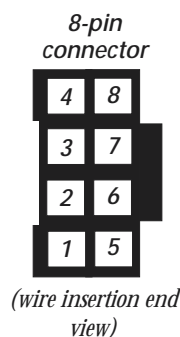
If an external five volt lamp relay is used, one side of the interface relay can be jumpered to +5 Volts (pins 2 and 6) or to Logic Ground (pins 1 and 5) to create an active high or active low output, respectively.

The simplified schematic on the next page shows the logic outputs for the Control Room and Studio warning lamp interface externally jumpered to yield an active high output from the relay.

When an active low logic output is needed on the Control Room, jumper pins 1 and 3 together and use pin 4 as the Control Room warning output. Jumper pins 5 and 7 together and use pin 8

when the Studio warning output requires an active low logic output.

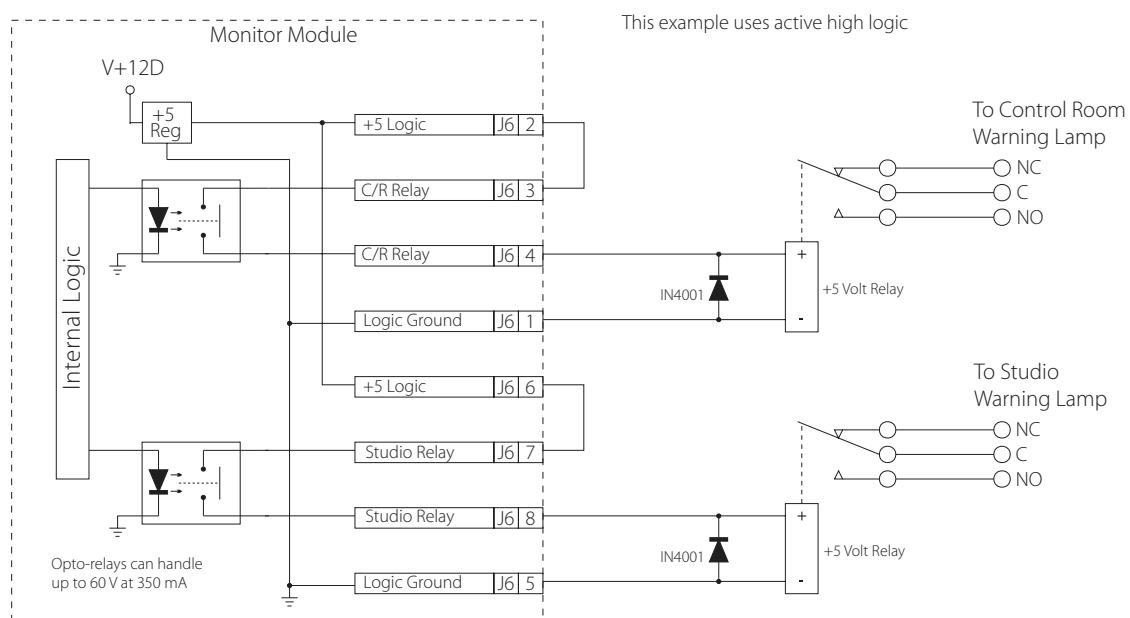
**Note:** Jumpering the solid-state relay to either +5 Volts or Logic Ground defeats ground isolation between the console and the warning lamp interface.



## Warning Lamp Connector Pin Definitions

PIN	SIGNAL	FUNCTION
1	Logic Ground	Console logic ground
2	+5 Logic	+5 volt supply
3	C/R Relay	Control Room Warning Lamp Interface "N/O relay contact"
4	C/R Relay	Control Room Warning Lamp Interface "C relay contact"
5	Logic Ground	Console logic ground
6	+5 Logic	+5 volt supply
7	Studio Relay	Studio Warning Lamp Interface "N/O relay contact"
8	Studio Relay	Studio Warning Lamp Interface "C relay contact"

## Simplified Schematic for the Warning Lamp Interface



**Note:** Do not use the solid-state relay "contacts" to directly switch the AC line voltage to a lamp.

## Module Connections

Each module's connections are covered on a separate page in this section.

### MICROPHONE PREAMPLIFIER MODULE CONNECTION

There are five 3-pin microphone input connectors on the Microphone preamplifier module. Connect only low impedance, balanced, dynamic or condenser microphones, with nominal mic output levels of -70 to -30 dBu, to these inputs.

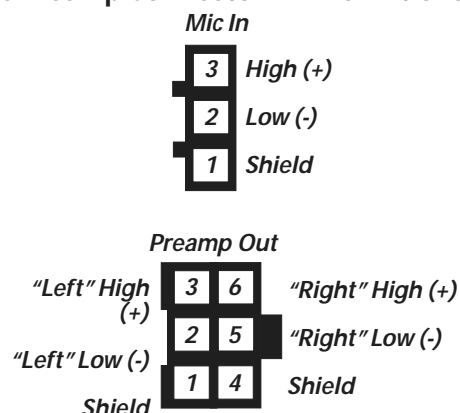
Each input connects to a separate mic preamp driving its own line-level balanced analog output connector. The 6-pin output connectors are wired in parallel using the standard pin-out sequence.

The Preamp output signal level is +4 dBu. The outputs are normally jumpered to an analog Input module's A or B input using a short patch cable. Alternatively, the Preamp output can be routed through external patching and/or

mic processing gear before feeding an Input module with an Analog SIM installed.

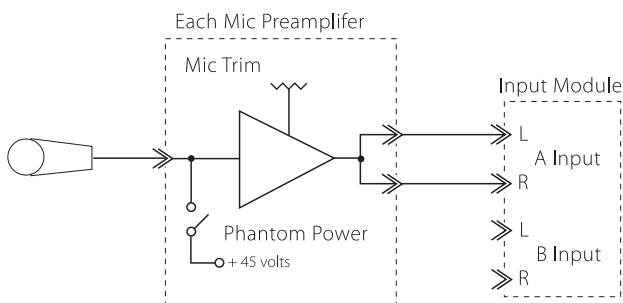
See Chapter 3 *Microphone Preamplifier Module* for a feature description of the Microphone Preamp module.

### Mic Preamp Connector Pin Definitions

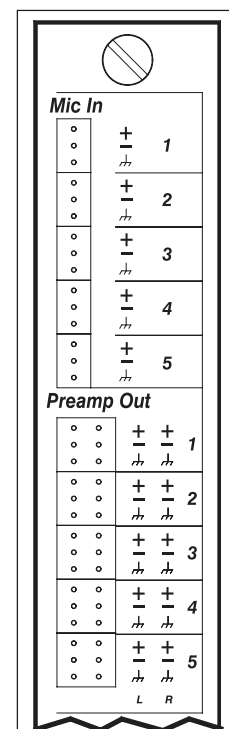
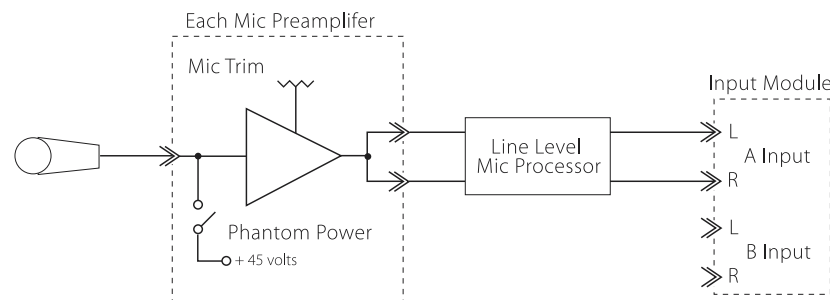


(Connectors shown from wire insertion end)

### Direct Connection: Mic Preamp to Input module using patch cable.



### Alternative Connection: Mic Preamp to an external line level processor and then to an Input module.



**Mic Preamp Module Connectors**

## INPUT MODULE CONNECTION

Three connectors come standard on each Input module: two 6-pin audio input connectors and one 24-pin logic interface connector. The logic connector is DIP switch set for use with either the A or B input. An optional B Logic Interface card (PR&E # 99-1003) can be installed to provide separate A and B logic control.

The A and B audio inputs support either analog or digital signals, depending upon the type of Input SIM (Single In-line Module) installed. For analog audio, an Analog Input SIM (PR&E # 99-1001) is installed. It accepts signals from -10 dBu to +4 dBu, balanced or unbalanced. With a Digital Input SIM (PR&E # 99-1002) installed, the module accepts AES-3 or S/PDIF inputs.

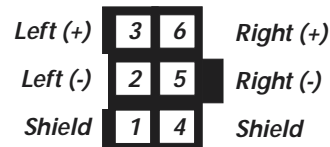
The faceplate Trim L and Trim R controls set the input reference level when an Analog SIM is installed.

**Note:** The two controls are not active when a Digital SIM is installed.

Refer back to page 8 for connection information on using unbalanced analog or digital devices with an Input module.

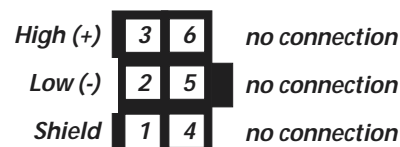
Typical logic connections are shown on fold-out pages 14, 15 and 16. See Chapter 3 *Operation* for a description of the logic functions and audio controls on the module.

### Analog Input Signals

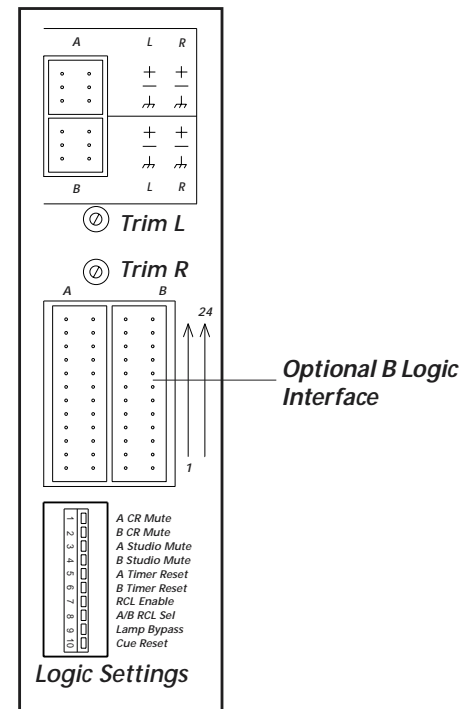


(wire insertion end view)

### Digital Input Signals

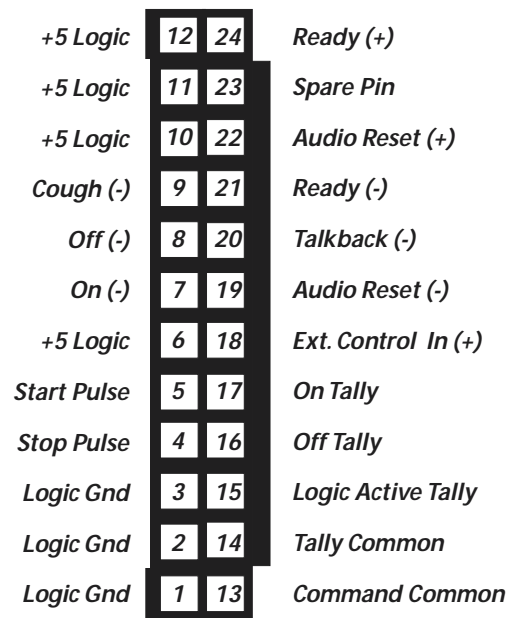


(wire insertion end view)



*The Input module connectors, Logic Settings switches and Input Trim Controls are hidden under the meter panel in normal operation.*

### Logic Connectors



(wire insertion end view)



## TELCO MODULE CONNECTION

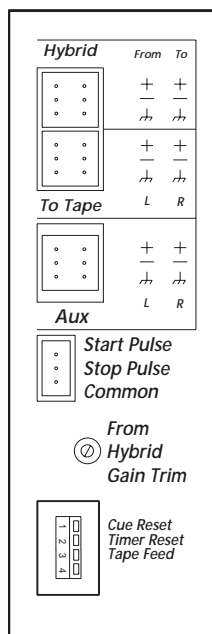
There are three 6-pin connectors and one 3-pin connector on this module.

The top 6-pin connector (*Hybrid*) connects the audio from the telephone hybrid to the left-hand pins (1, 2, 3) and the mix-minus audio returning to the hybrid on the right-hand pins (4, 5, 6).

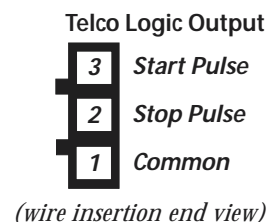
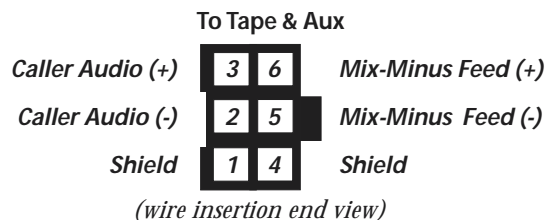
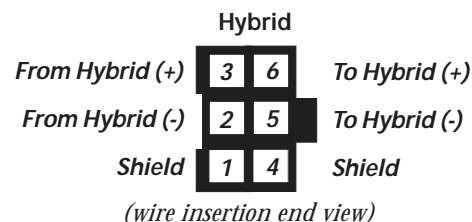
The two other 6-pin connectors (*To Tape* and *Aux*) carry identical two-channel connections (caller only on the left and the mix-minus return feed to the caller on the right) for a recording device and for an external monitor.

To monitor the second optional Telco module (Telco 2) in the Studio, the Telco 2 Aux output must be jumpered to an *Ext. Input* on the Monitor module. Refer to the illustration on page 2 for Telco 2's mainframe position.

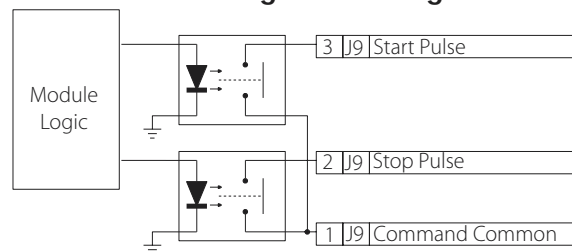
The 3-pin logic connector carries the Start and Stop logic commands for controlling a Hybrid. Both Start and Stop use a single common connection. See Chapter 3 *Telco Input/Output Module* for a feature description of the controls and Logic Settings switches.



*Telco Input/Output Module Connectors, Trim Control and Logic Settings Switches*

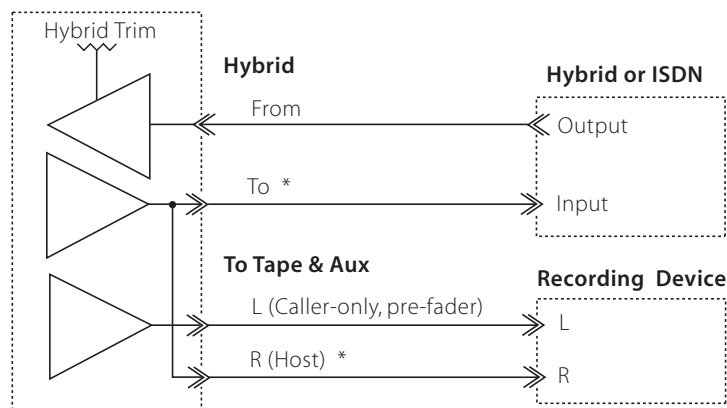


### Telco Logic Block Diagram



**Note:** The Start Pulse is triggered by the Telco Module On command. The Stop Pulse is triggered by the Module Off command. Each pulse width is 220 ms in length.

## Typical Single Telco Module Hybrid and Recorder Connection Telco Input/Output Module



\* Contains the caller Mix-Minus Feed, which follows the Pgm-1, Pgm-2, Pgm-3, Offline status of the Telco module.

## OUTPUT MODULE CONNECTION

The analog program bus outputs (Pgm-1, Pgm-2 and Pgm-3) use the AirWave standard 6-pin analog stereo pin-out sequence. The digital outputs for Pgm-1, Pgm-2 and Pgm-3 use a 3-pin AMP MOD IV connector. The two analog mono outputs (Main and Aux) are combined onto a single 6-pin connector.

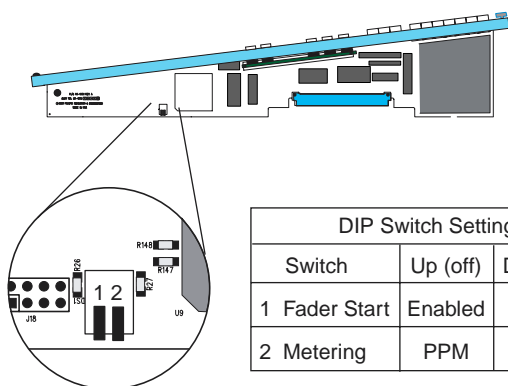
Pgm-1 Main is the main on-air analog output signal converted from the Program-1 digital bus. The Pgm-1 Monitor output jumpers to the Monitor module to provide the Program-1 bus monitor signal. The Pgm-1 Aux output is an additional isolated output.

The Pgm-2 Main and Aux outputs are the balanced analog outputs of the Program-2 bus. The Pgm-3 output is the balanced output of the Program-3 bus.

The left-hand pins (1, 2, 3) on the Mono connector carry the Main Mono audio output. The right-hand pins (4, 5, 6) carry an isolated Aux Mono audio output.

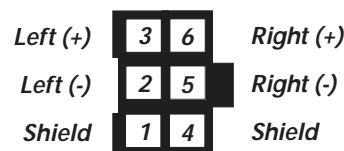
See Chapter 3 *Operation, Output Amplifier Module* for a functional description of the faceplate controls.

Two circuit board switches set the style of metering used and whether the Fader Start function is active. Fader Start allows the fader movement to automatically control module on and off. When the fader is moved from full-off the module is turned on. When the fader is moved back to full-off the module turns off. DS1, switch 1 enables/disables the Fader Start function. DS1, switch 2 sets the type of metering between VU (Volume Unit, USA standard) and PPM (Peak Program, European standard).

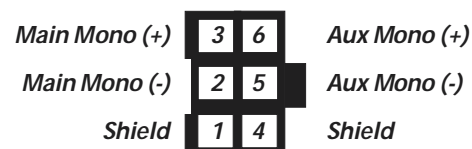


DIP Switch Settings		
Switch	Up (off)	Down (on)
1 Fader Start	Enabled	Disabled
2 Metering	PPM	VU

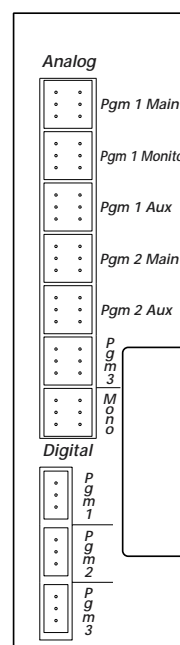
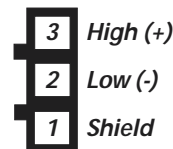
### Main Outputs: Pgm-1, Pgm-2, Pgm-3 Monitor Output: Pgm-1



### Mono Output



### Digital Outputs: Pgm-1, Pgm-2, Pgm-3



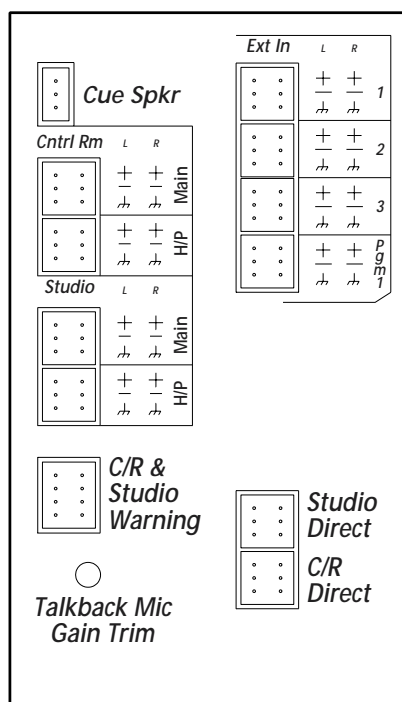
Output Module Connectors

## MONITOR MODULE CONNECTION

Ten 6-pin connectors, using the AirWave Digital standard audio pin-out sequence, are on this module. The 3-pin *Cue Spkr* output is pre-wired to the Cue Speaker. Two direct (fixed level, non-muting) outputs are available: *C/R Direct* follows the control room monitor selector and *Studio Direct* follows the studio selector. These can drive guest headphone amplifiers.

The *Cntrl Rm Main* output feeds the amplifier for the control room monitor speakers. This output is controlled by the control room monitor level control and the control room mute logic. The *Cntrl Rm H/P* output may be used to drive an outboard headphone amplifier. This output is controlled by the control room headphone level control.

The *Studio Main* output feeds the amplifier for the studio monitor speakers. The *Studio H/P* output may be used to drive an outboard headphone amplifier having level control. The Studio Main output is level controlled by the studio monitor control and muted by the studio mute logic coming from the Input modules.



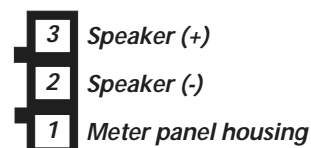
**Monitor Module Connectors with  
Talkback Mic Gain Trim Control**

The 8-pin *C/R & Studio Warning* connector drives the appropriate warning/On-Air light controller through solid-state relay contacts. See pages 11 and 12 for additional module logic connection information.

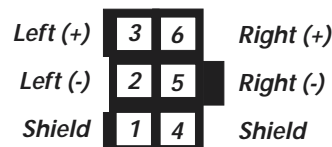
The Pgm-1 input is connected to the Output module's Pgm-1 Monitor output using the supplied jumper cable. The other three External inputs can come from any +4 dBu balanced sources.

See Chapter 3 *Monitor Module* for functional descriptions and operational information.

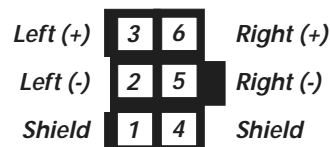
### Cue Speaker output



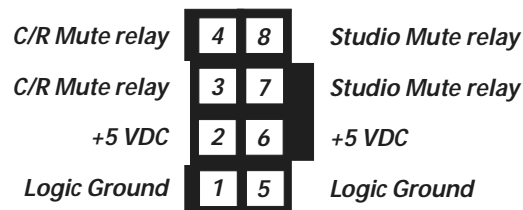
### Pgm-1 and External Inputs



### All Outputs (Cntrl Rm, Studio, Studio Direct, C/R Direct)



### C/R & Studio Warning connector



(wire insertion end view on  
all connector drawings)

## REMOTE LINE SELECTOR (RLS) MODULE CONNECTIONS (FOR ANALOG AND DIGITAL VERSIONS)

Both RLS versions use nine 6-pin connectors. On the analog version they follow the standard stereo audio pinout sequence. On the digital version, the digital input and output signals connect to pins 1, 2 and 3 only.

The digital RLS inputs are designed for AES/EBU (also referred to as AES-3) signals, although they can also handle most S/PDIF signals. The digital outputs are AES/EBU-compatible.

**Note:** AES/EBU outputs cannot directly connect to an S/PDIF input. A digital signal converter must be used.

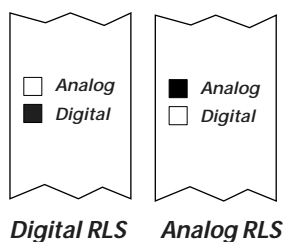
The analog RLS inputs can be any balanced or unbalanced line-level devices with reference levels of -10 dBu to +4 dBu. The analog RLS outputs are at the same reference level as the inputs (-10 dBu up to +4 dBu). The RLS outputs are typically connected to an Input module or a recording device. Refer back to page 8 for unbalanced device connection information.

**Note:** There are no level adjustments on the RLS module, therefore all analog input sources must use the same reference level. The RLS is an active device, therefore, the inputs and outputs *cannot* be swapped to make a 2 x 7 device.

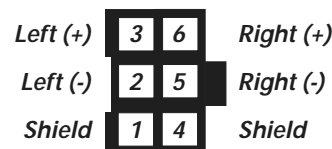
The Remote Line Selector module's buttons are spaced so that a Brother P-Touch™ or similar labelling machine can be used to identify the input sources. The lines next to each RLS button are spaced 1/2" [12.70 mm] apart so that either 3/8" [9.525 mm] or 1/2" [12.70 mm] label tape with two lines of type can be used.

See Chapter 3 *Remote Line Selector (RLS) Module* for more operational information.

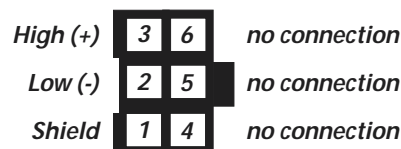
### Identifying the RLS Type



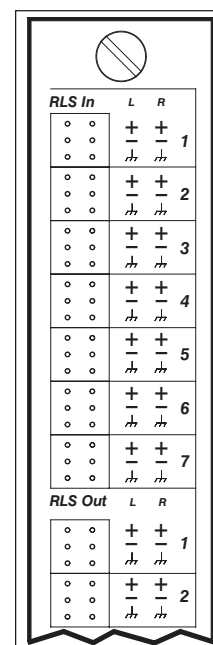
### Analog RLS Inputs & Outputs



### Digital RLS Inputs & Outputs



(wire insertion end view on both connector drawings)

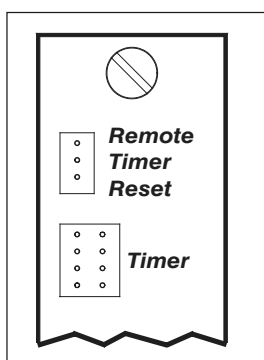


### Remote Line Selector Module Connectors

## TIMER MODULE REMOTE CONNECTION

There are two connectors on the Timer module. The 8-pin connector is pre-wired to the internal Clock/Timer Assembly. A 3-pin connector is available for resetting and starting a remote timer.

Two normally-open "relay contacts" are used to connect to the Timer. Typically the relay contacts connect to the reset and ground connections on the timer as shown in the examples below. See Chapter 3 *Timer Control Module* for more information.



Timer Module Connectors

### Remote Timer Reset

	SIGNAL	FUNCTION
3	Relay	Contact "C"
2	spare	---
1	Relay	Contact "N/O"

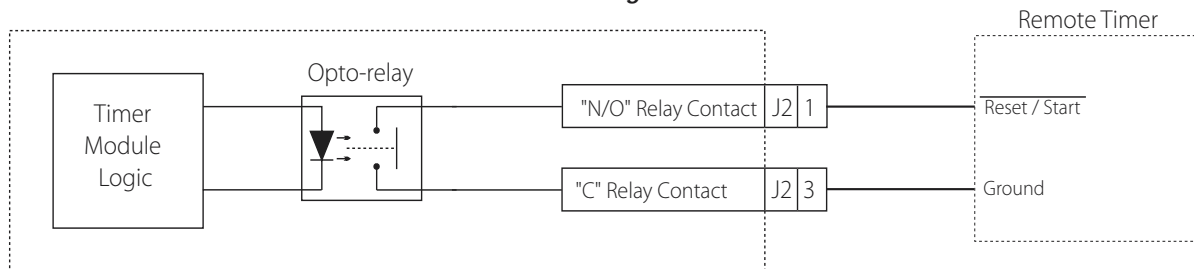
### Timer (pre-wired)

PIN	SIGNAL	FUNCTION
1	Logic GND	Logic ground
2	+12 D	+12 volt supply
3	Start	Start command
4	Stop	Stop command
5	Reset	Reset command
6	Hold	Hold command
7	spare	---
8	spare	---

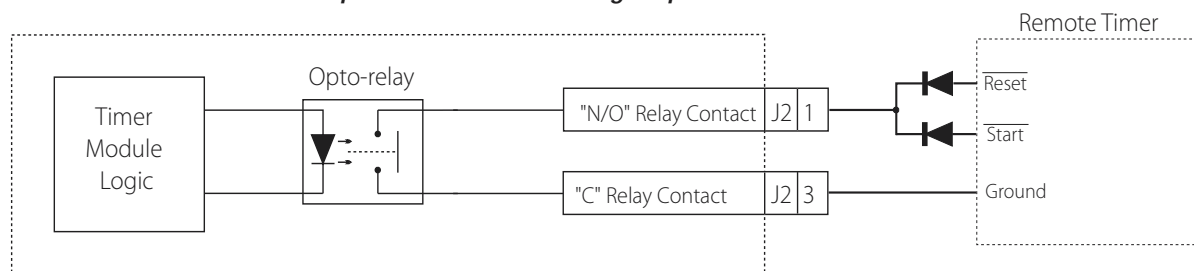
(wire insertion end view on all connector drawings)

## Typical Timer Reset Connections

### Connection When Timer Resets and Auto Starts With a Single Reset Pulse



### Connection When Timer Has Separate Reset and Start Logic Inputs



# Operation

The operational functions for each module and component in the AirWave Digital console is covered in this chapter.

## Input Modules

AirWave Digital has six types of input modules available: Microphone Preamplifier, analog or digital Input, Telco Input/Output and analog or digital Remote Line Selector (RLS).

Any combination of Input, Microphone Preamp and RLS modules may be installed into the Input module positions in the mainframe. Up to two Telco modules can be installed in their dedicated mainframe positions (immediately to the left of the Monitor module), although any other Input module can also be installed into these positions. The RLS position (between the Monitor and Output modules) can only have an RLS or Microphone Preamp module, or a tape remote or other custom panel installed in its position.

### MICROPHONE PREAMPLIFIER MODULE

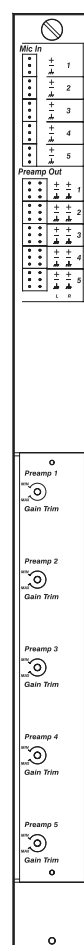
The Microphone Preamplifier module amplifies from one to five low-level microphone signals to line-level. The +4 dBu output of each preamplifier can be jumpered directly to an Input module, an analog RLS, routed to a patch bay or connected to an external line-level signal processor.

The module contains five high-performance transformerless microphone preamplifiers with a

board-mounted DIP switch (DS1) for switching phantom power to any input. In the illustration inputs 2 and 4 are shown switched on.

Five faceplate-accessible gain trim controls set the preamp gain as required for the application.

Multiple Microphone Preamplifier modules may be used in the AirWave Digital mainframe.

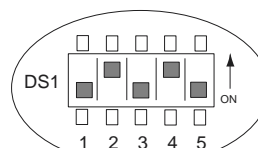


### Microphone Inputs 1 - 5

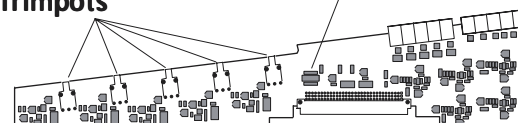
**Preamplifier Outputs 1 - 5** *Mic signal paralleled to left and right outputs.*

**Trim pots for Inputs 1 - 5** *Normally hidden behind a security cover; allows nominal microphone signal levels of -70 dBu to -30 dBu.*

### Phantom Power Selection



### Mic Pre Gain Trim pots



## ANALOG OR DIGITAL INPUT MODULE

The Analog version controls preamplified microphones or analog line-level sources on both inputs. The digital version controls AES-3 or S/PDIF digital sources on both inputs. Input modules can be reconfigured in the field by changing the plug-in SIM card. The functional differences for the digital version are listed within brackets.

**A/B Inputs** *Two balanced analog stereo line-level inputs (A & B). [Two differential AES-3 compatible inputs on connector pins 1, 2, 3 only]*

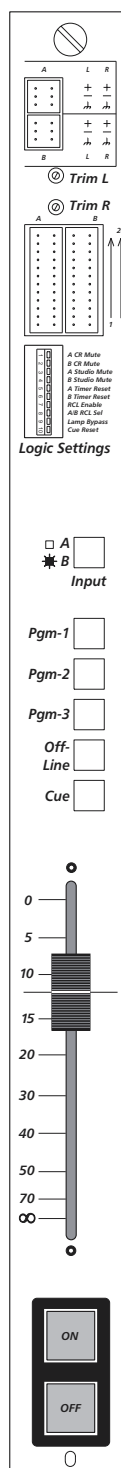
**Logic Connector(s)** *Connects a mic remote control panel or a peripheral device for remote control of both the device and the module. Refer to the Input Module Connections Quick Reference (page 13 of the Installation chapter) for more information on the control functions. An optional B Logic Interface can be added for separate logic control on each input.*

**A/B Input Selector** *Selects the active input (A or B). The button is lit when the B input is selected. Changing inputs while the module is On turns the module Off.*

**Off-Line** *When active (button lit), the pre-fader and pre-On/Off audio is sent to the Telco module's off-line telephone foldback bus.*

**Fader** *100 mm level control. Set the fader to the reference line (-12 dB) to achieve 0 VU on the program output meters with a nominal +4 dBu analog input signal (and properly adjusted input level trimpots). [Set the control to nominal, -12 dB to provide unity gain of digital input signals]*

**Yellow Off Button** *Turns the module off, removing the module's audio from all program buses. May also turn off Cue and initiate the logic control commands Stop Pulse and Off Tally following the Logic Settings switch positions.*



**Input Level Trimpots** *Individual gain adjustment of the module's left and right channels (post A/B selection). [Not active with a digital SIM installed]*

**Logic Settings switches** *Sets the module's logic control functions for the A and B inputs. When the B Logic Interface is installed, the A/B RCL Set Switch is not active. Refer to the Input Module Connections Quick Reference (page 13 of the Installation chapter) for more information on the switch functions.*

**Pgm-1, Pgm-2, Pgm-3** *Assigns the module to any combination of the Program 1, Program 2 and Program 3 buses. The buttons are lit when assigned to a bus.*

**Cue** *Sends the pre-fader audio to the console's Cue speaker and to the console operator's headphones. The button is lit while Cue is active.*

**Red On Button** *Turns the module on, applying the module's audio to the selected program buses. It may also initiate logic control commands Start Pulse, Timer Reset, On Tally, Cue Off and mute the control room or studio speakers (and turn on the appropriate warning lamp) following the Logic Settings switch positions.*



## TELCO INPUT/OUTPUT MODULE

The optional Telco Input/Output module interfaces a telephone hybrid with the console. The module also provides a host/caller recorder connection. One or two Telco modules may be installed.

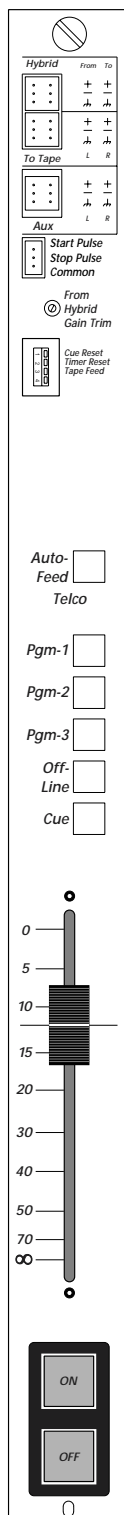
**Hybrid From** connects the caller audio from the telephone hybrid and **To** sends the selected console mix-minus audio back to the hybrid.

**Logic Output** A Start Pulse and a Stop Pulse is available for hybrid control. Each is a solid-state relay tied to a single isolated common.

**Logic Settings Cue and Timer**, when set to the left, reset the Cue function and/or the Timer reset at module On. **Tape Feed** is only active when two Telco modules are installed. It sets how the other caller's voice gets mixed on this module's **To Tape** and **Aux** outputs. When set to the left, both callers are mixed together on the left channel. When set to the right, the other caller is mixed with the right channel mix-minus audio.

**Pgm-1, Pgm-2, Pgm-3, Off-line** When lit and the module is On, assigns the caller audio to the Pgm-1, Pgm-2, Pgm-3 or Off-line buses or any combination of these buses. Also sends the associated program mix-minus feed to the caller based on a preset priority structure (with Off-line being the highest and Pgm-3 being the lowest priority). When two Telco modules are installed, both will automatically share the same assignments.

**Red On Button** Turns the module On, applying the caller's audio to the selected buses. The caller Feed is also switched to the mix-minus output of the selected bus with the highest priority. When the Timer reset switch is set to the left, the timer is reset. When the Cue reset switch is set to the left, and the Cue is on, the Cue function for this module is turned off.



**To Tape/Aux To Tape** connects the caller audio to the left channel, and the mix-minus audio (either Off-line or the Pgm assignment mix-minus) to the right channel of a call recorder. These same signals are available on the **Aux** connector. With two Telco modules installed, the left-hand module's **Aux** output can be jumpered to an **External In** on the Monitor module for separate Telco 2 tape feed monitoring.

**From Hybrid Gain Trim** Sets the level of the incoming caller audio from the hybrid. Can be from -10 dBu up to +4 dBu.

**Autofeed** When lit, the module performs automatic switching as described under Telco Operation on the next page. When unlit, the output assignments must be manually selected and the feed to the caller will be determined by a preset priority structure (with Off-line being the highest and Pgm-3 being the lowest priority). When two Telco modules are installed, both will automatically share the same assignments.

**Cue** When lit sends the pre-fader, pre-On/Off audio to the console-mounted Cue speaker and to the console operator's headphones.

**Fader** 100 mm level control. Set the fader at the reference line (-12 dB) to achieve 0 VU on the program output meters with a properly adjusted hybrid input level.

**Yellow Off Button** Turns the module Off, removing the caller's audio from the selected buses and changing the caller Feed to the Off-Line bus when Autofeed is active. When the Cue reset switch is set to the left, and the Cue is on, the Cue function for this module is turned off.



## TELCO OPERATION

The first Telco module (Telco 1) is always installed to the left side of the Monitor Module. A second Telco module (Telco 2) can be installed to the left of Telco 1.

When two Telco modules are installed, the two modules must track certain switch settings to ensure the correct mix-minus is always sent back to the two callers. Thus the Program bus select, Off-line select and Autofeed buttons on the two modules are automatically linked together so that changing any setting on either module affects both modules.

There are two main operational modes for the Telco module(s): Manual and Autofeed.

### Assignment Priority

The mix-minus output that the caller receives is determined by a preset priority structure. The priority is as follows from highest to lowest:

- Off-line
- PGM 1
- PGM 2
- PGM 3

For example, if the caller is assigned to feed all four buses simultaneously, the caller will hear the Off-line mix-minus because it is at the top of the priority list. If the caller is feeding PGM 1, PGM 2 and PGM 3 simultaneously, the caller will hear the PGM 1 mix-minus. If the caller is assigned to feed PGM 2 and PGM 3 simultaneously, the caller will hear the PGM 2 mix-minus.

Even when the caller is being assigned to non-adjacent outputs, the priority structure still applies. For example; if the caller is assigned to feed PGM 1 and PGM 3, the caller will hear the PGM 1 mix-minus.

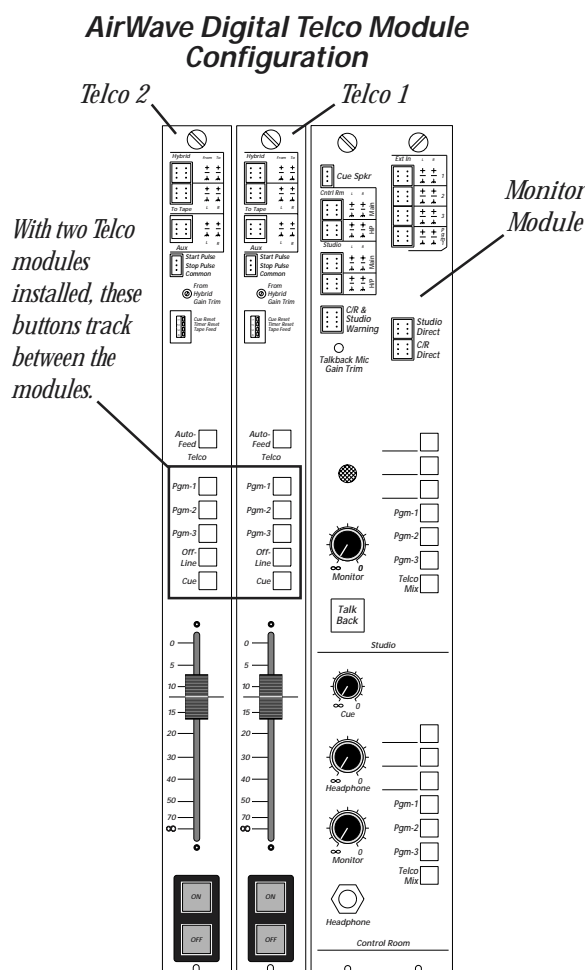
In Manual Mode (Autofeed button is not lit), the caller will hear the output of the selected bus with the highest priority regardless of the Telco Module's On/Off status.

## Autofeed Mode

Any one Program bus or combination of Program buses can be selected as On-line assignments in Autofeed mode (Autofeed button is lit). When the module is On, the caller feed is the mix-minus output of the selected Program bus with the highest priority.

**NOTE:** The Off-line bus is not available as an On-line assignment when in Autofeed mode.

When the module is turned Off, the caller feed automatically changes to the Off-Line bus and the Off-line button is lit. The selected On-Line assignment buttons **wink** to indicate which Program buses are assigned. If no buses are assigned, the three Program buttons **flash together** to indicate no buses are selected and the caller will *not* go on-air when the module is turned on.



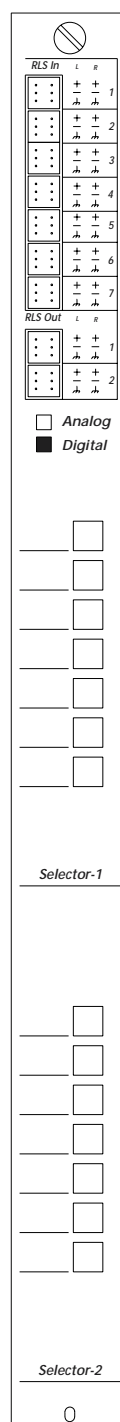
## REMOTE LINE SELECTOR (RLS) MODULE — ANALOG OR DIGITAL VERSION

Each RLS module version (stereo analog or AES-3 digital) contains two electronic switches which share seven common inputs to create a pair of 7 x 2 switchers. The seven sources are independently selectable between the two outputs. There are no signal level trim adjustments on this module. The functional differences of the digital version are within the brackets.

**RLS In** *The seven stereo line-level inputs. Inputs must be at equivalent reference input levels between -10 dBu and +4 dBu. [The seven AES-3 signals connect to pins 1, 2 and 3 only. There is no connection to pins 4, 5 and 6.]*

**RLS Type** *A Digital RLS is illustrated. The Analog box is filled for an Analog RLS.*

**Selector-2** *The seven buttons select the input assigned to **RLS Out 2**. Only one button can be selected at a time.*



**RLS Out** *The line-level outputs from Selector-1 and Selector-2. The RLS is a unity gain device, thus the output reference level is equal to the selected input's reference level. [The two AES-3 signals are output on pins 1, 2 and 3 on each connector. There is no connection to pins 4, 5 and 6.]*

**Selector-1** *The seven buttons select the input assigned to **RLS Out 1**. Only one button can be selected at a time.*

## Output Module

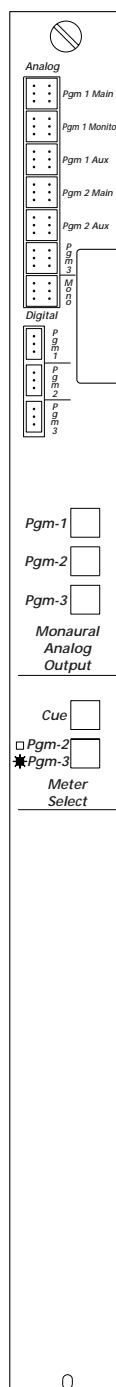
The Output module has the DACs (Digital-to-Analog Converters) for the analog signals (Pgm-1, Pgm-2, Pgm-3, Cue and Telco Mix-Minus) and the line output amplifiers for the three stereo analog Program buses (Pgm-1, Pgm-2 and Pgm-3) and the two Mono outputs (Main and Aux). It also has the output drivers for the three digital Program outputs. Operator selection of the Mono source and the right-hand meter is also on this module.

**Pgm-1 Main, Monitor, Aux** *Main is the on-air analog Program 1 balanced stereo output. The **Monitor** output is jumpered, using the supplied cable, to the Monitor module. The **Aux** output is a resistively-isolated output.*

**Mono** *The **Main** Mono output (pins 1, 2, 3) and a resistively-isolated **Auxiliary** Mono output (pins 4, 5, 6) are on a single connector. Both are analog outputs.*

**Pgm-1, Pgm-2, Pgm-3** *The differential (transformer-coupled) AES/EBU digital outputs for the three program buses.*

**Cue** *A momentary button to route the Cue bus to the right-hand level meters, overriding the Pgm-2 or Pgm-3 level indication while the button is held.*



**Pgm-2 Main and Aux, Pgm-3 Main** *The analog outputs (balanced stereo) of the Program-2 and Program-3 buses.*

**Meter Panel Latch** *opening.*

**Pgm-1, Pgm-2, Pgm-3** *Selects the monaural analog output source. Only one source (Program-1, Program-2 or Program-3) can be selected. The selected analog stereo source is then resistively-summed to mono before being amplified for the active balanced **Mono** outputs.*

**Pgm-2/Pgm-3 Meter Select** *When lit indicates that the right-hand meter is displaying the Program-3 output levels. When unlit indicates the right-hand meters are displaying the Program-2 output levels.*

# Monitor Module

The Monitor module contains the monitor source selectors, monitor control and Talkback facilities for the control room and one studio.

**Cue Spkr** *Cue/Talk bus amplifier output. Prewired to the meter panel Cue Speaker.*

**Cntrl Rm** *The Control Room volume controlled outputs. **Main** connects to an external amplifier for the Control Room speakers. **H/P** connects to an external headphone amplifier.*

**C/R & Studio Warning** *Logic output to the Control Room and Studio warning light interfaces.*

**Talkback Mic Gain Trim** *Sets the level of the Talkback mic into the studio outputs.*

**Talkback Mic** *Allows communication to the studio while the **Talkback** button is pressed.*

**Monitor** *Controls the level of the **Studio Main** output.*

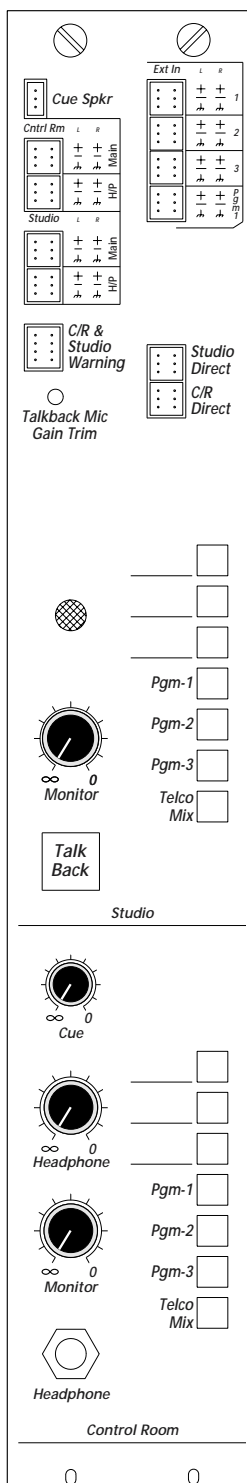
**Talkback** *Sends the Talkback mic to the **Studio Main** and **H/P** outputs while pressed.*

**Cue** *Controls the level of the **Cue Spkr** output.*

**Headphone** *Controls the volume of the headphone audio sent to the **headphone jack** and to the **Cntrl Rm H/P** output.*

**Monitor** *Controls the volume of the **Cntrl Rm Main** output.*

**Headphone Jack** *Low- or high-impedance stereo headphones can be plugged into this jack. To prevent headphone or hearing damage, always turn the **Headphone** control fully counterclockwise before plugging in headphones.*



**Ext In** *External line level inputs that feed the top three buttons on each Source Selector. The **Pgm-1** input comes from the Output module, using the supplied cable, to feed the **Pgm-1** monitor selector button.*

**Studio** *The selected outputs from the Studio Monitor Source Selector. **Main** connects to an external amplifier for the Studio monitor speakers. **H/P** connects to an external headphone amplifier for the Studio headphones.*

**Studio Direct** *Fixed volume output of the Studio Source Selector. Note that Talkback is not in this output.*

**C/R Direct** *Fixed volume output of the Control Room Monitor Source Selector.*

**Studio Monitor Source Selector** *Selects the audio sent to the Studio outputs from the three external audio inputs, **Pgm-1**, **Pgm-2**, **Pgm-3** and the **Telco 1 Mix** (which is the Telco 1's mix-minus on one channel with the Telco 1 caller on the other channel). Multiple sources can be selected for simultaneous monitoring.*

**C/R Monitor Source Selector** *Selects the audio for the control room outputs and the headphone jack from the three external audio inputs, **Pgm-1**, **Pgm-2**, **Pgm-3** and the **Telco 1 Mix** (which is the Telco 1's mix-minus on one channel with the Telco 1 caller on the other channel). Multiple sources can be selected for simultaneous monitoring.*

# Timer Control Module

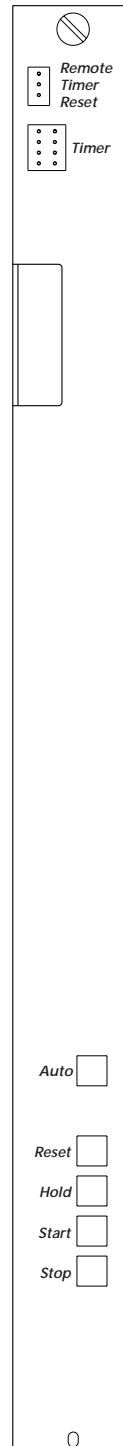
The Timer Control module is pre-wired to the Clock/Timer assembly in the meter panel. The Timer can be manually controlled using the Timer Control module buttons. When the Auto function is active the Timer is automatically controlled through the Timer reset control logic from the Input modules.

**Remote Timer Reset** *Logic output to reset a remote timer.*

**Meter Panel Latch** *opening.*

**Reset** *Resets the timer to 00:00.00. If the timer was already counting, the timer will then continue to count up from 00:00.00. Reset pressed while the timer is stopped simply returns the time display to 00:00.00.*

**Start** *Immediately starts the timer from the displayed time.*



**Timer** *Supplies power and logic control to the clock/timer.*

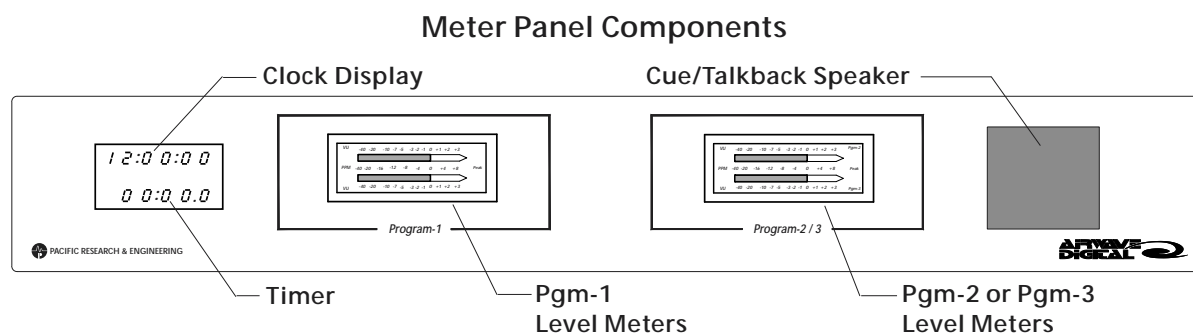
**Auto** *When Active (lit), the timer automatically resets to 00:00.00 and immediately starts counting whenever an Input module, with its timer reset function enabled, is turned On. When the Auto button is not lit, the timer is disabled from automatic Input module control.*

**Hold** *When pressed and held, stops the timer's display to show the elapsed time as the timer continues to run. Releasing Hold jumps the time display to the current run time.*

**Stop** *Immediately stops the timer, leaving the stopped time displayed.*

## Meter Panel

The meter panel holds the Clock/Timer assembly, the two sets of bargraph level meters and the Cue/Talkback speaker. The clock has no external controls. Clock time setting requires the use of the Clock Setting Magnet Tool (supplied in the Tool Kit) when the clock is set for master mode. In slave mode, where clock timing is derived from an ESE time code signal, the clock does not need to be set. See the section in Chapter 2, *Installation, Setting the Clock*, for information on setting the time.



The electronic meter movements have no individual meter calibrations or alignments. The meters use IEEE standard 152-1991 (standard audio program level measurement). When set for PPM display mode, via the Output module DIP switch, the PPM indications will light and a +4 dBu sine wave output signal will display at -8 on the PPM scale. When set for displaying VU, the VU indications will light and a +4 dBu sine wave output will display at 0 on the VU scale. Each of these settings corresponds to -20 dBFS (decibels below Full Scale digital output).

The meters display the left channel audio output on the top row and the right channel audio on the bottom row of each meter. The right hand meter can momentarily show the Cue bus level by pressing the Cue button on the Output module. While this button is pressed the top row of LEDs show the Cue bus output level.

The Cue/Talkback speaker's impedance is 45 ohms with a 3-watt power-handling capacity. The speaker volume is controlled by the Cue volume control on the Monitor module. A 3-watt amplifier IC on the Monitor module drives the speaker. Refer to Chapter 5, *Maintenance & Alignment, Meter Panel Assembly* for speaker replacement procedures.

# Equipment Description

**T**his chapter has technical descriptions of the mainframe, each AirWave Digital module, the clock/timer assembly and the power supply.

## MAINFRAME

The AirWave Digital mainframe consists of a welded all-steel bottom chassis with a hinged overbridge-style meter panel. The modules' metal faceplates complete the mainframe enclosure by fastening to the chassis through a knurled captive fastener at the top of the faceplate and a hex-head faceplate screw at the bottom.

Each circuit board has one keyed 96-pin gold-plated Euroconnector that plugs into the motherboard from the top. The motherboard consists of two connectorized sections in the AirWave Digital-12 and three sections in the AirWave Digital-20. The motherboard sections fasten to formed metal supports on the bottom of the chassis. The steel motherboard supports run the width of the mainframe for rigidity.

To ensure high RFI shielding, all wiring shields ground directly to the chassis through the faceplate and knurled fastener right at the input connectors. A ground screw near the DC power cable entry point ties the mainframe chassis to the technical ground reference.

The ten-foot DC power cable is soldered to the right end of the right-hand motherboard section. A keyed connector fastens the power cable to the rack-mount AirWave Universal Power Supply.

## MICROPHONE PREAMP MODULE

For this section refer to the three Microphone Preamplifier module schematic pages (92-961) in Chapter 6.

Each of the five balanced microphone inputs feed a SSM2017, a precision surface-mount microphone preamplifier IC. It unbalances and amplifies the mic signals up to -10 dBu. The preamp ICs are protected against switching transients and DC voltage surges by the Zener diodes, resistors and coupling capacitors found between the input connector and the preamp IC.

DIP switch DS1 has five switches to turn phantom power on or off to the five mic inputs. The switches ship from the factory set in the off position. Only those individual inputs that are powering condenser microphones should be set for phantom power on. The +45 volts is then coupled to the inputs via a pair of 6.81 k resistors.

Faceplate-accessible trimpots (RV1 - RV5) set the preamp gain for a nominal output signal level of +4 dBu.

TP1 - TP5 allow the internal nominal -10 dBu signal level to be monitored. Dual OP275 opamps boost and differentially balance the -10 dBu signals to +4 dBu at the mic preamp output.

6-pin output connectors simplify connection to Input modules, paralleling the left and right channels.

Polyswitch resettable fuses, F1 and F2, protect against board component short circuits. Once the over-current is removed, the fuses automatically reset. Test point TP6 is the -16 VDC check point. TP9 is the +16 VDC check point. TP8 is the phantom supply check point. The ground reference test point is TP7.



## INPUT MODULE

For this section refer to the two Input Module schematic pages (drawings 92-1004) and to the two SIM schematic pages (drawings 92-1001 and 92-1002) in Chapter 6.

### Analog SIM

The two identical balanced inputs (A and B) connect directly to the SIM socket. With an Analog SIM (99-1001) installed, the stereo audio signals are unbalanced and amplified by OP275 dual differential opamps on the SIM card. Four single-pole single-throw (SPST) solid-state analog switches toggle between the two inputs according to the faceplate A/B button selection.

The selected stereo input is then routed through trimpots R59 and R60 (Trim R and Trim L). The outputs of the trimpots go through buffer/amplifier U4 before being converted into digital signals by U5, a single chip ADC (Analog-to-Digital Converter). The ADC chip output (SDATA\_SIM) is routed back to the Input PCA through the SIM socket.

### Digital SIM

With a Digital SIM installed (99-1002), the AES/EBU input is coupled to an AES/EBU Receiver (U2) through an isolating transformer (T1) and the A/B selection relay (K1).

U2 converts the incoming AES/EBU signal into a serial data signal (SDATA) with a separate left/right clock (FSYNC) and serial clock (SCLK). In normal operation, the SDATA signal is routed through an Asynchronous SRC (Sample Rate Converter), U4, to synchronize the incoming digital audio with the DSP (via the FS64 clock). The output, SRC\_DATA is then routed back to the Input module through the SIM socket as SDATA.

The SRC can be bypassed by physically jumpering E1 to E2. This switches which section of U1 is active. Normally the odd pins couple the

signals through to the output while the even pins are in a tri-state mode (at a high impedance). With E1 jumpered to E2, the RX\_SDATA from AES/EBU receiver U2 is connected directly to the Input module via the even pins of U1, while the odd pins are at a high impedance.

If valid digital audio is not received, or if there are excessive errors (e.g., loss of lock, parity errors, biphasic encoding violation), an ERF (Error Flag) signal is sent back to the Input module where a NOR gate in U15 mutes the SDATA signal.

### Input Module

Every Input module fader gets its reference voltages (both High and Low) from the DSP. Each fader's wiper output connects via a separate line to the DSP for individual channel level control.

The faceplate assignment switches (A/B select, bus assignment, Cue, Off-Line) are all on a single universal switch SIM. Each is a momentary SPST switch with an integral LED indicator. The switches connect directly to the gate array chip (FPGA, U14) while the LEDs on the switches are controlled by the FPGA through FET switches Q1 - Q4, Q13 and Q14.

The module's On/Off switches mount on a sub-assembly (PR&E # 95-969-1). Each switch is a momentary SPST with incandescent lamps controlled by the FPGA through FETs Q5 - Q12 and Q15. The FETs not only turn the lamps on or off, they also generate an AC-like voltage to increase lamp life over normal DC powering.

When the Cue or Off-Line function is active, pre-fader controlled audio is applied to the appropriate summing bus. When any Program select button is active, fader-controlled audio for that channel is then connected to the selected digital Program bus.

The ten-position Logic Settings DIP switch (DS1) is used to tell the FPGA whether logic control is to be active on the A or B input along with



what type of logic signals to use. Either the A or the B input can be selected to use the logic control features in the standard module. With the optional B Logic Interface (PR&E # 99-1003) installed, each input has its own logic control.

There are five logic control outputs and six logic control inputs on each logic interface (92-1004, page 2 of 2). All control inputs (U8 - U13) and outputs (U1 - U5) are optically coupled for isolation and to prevent ground loops. The control inputs are also current limited by U16 - U21 (LM317 regulators) so that any external logic level, from +5 to +40 VDC, can be accommodated.

Polyswitch resettable fuses, F1 - F4, protect the +12, +5, -16 and +16 VDC supply against short circuit damage by board problems. TP1, TP2, TP3 and TP4 are available for checking the +12, +5, +16 and -16 volt supplies after the poly fuses.

## TELCO INPUT/OUTPUT MODULE

Refer to the two Telco Input/Output Module schematics (92-1005) in Chapter 6.

The Telco Input/Output module is an optional module. Up to two of the modules can be installed into one mainframe in dedicated positions next to the Monitor module.

A single Telco module must be installed in the first position to the left of the Monitor module. A second Telco module can be installed next to the first Telco module. This position automatically configures the second module as "Caller 2," while the first Telco module remains as "Caller 1."

Each Telco module handles interfacing one telephone hybrid. All of the caller mix-minus audio control and caller audio program assignment is built into the module.

The balanced From Hybrid input (shown on page 1 of the schematic) is unbalanced and gain controlled through the two halves of opamp U1. The hybrid input gain is set by faceplate trimpot, RV1 (FROM HYBRID GAIN TRIM).

The output of the second half of the opamp connects to: U15 (an ADC, Analog-to-Digital Converter), to the left channel of the To Tape and Aux outputs (through buffer/balancing opamps U2, U9 and U10), and is coupled through the motherboard to the other Telco module (as CALLER\_OUT).

The ADC, U15, outputs digital data (SDATA) to the DSP through the motherboard connector. The digital audio data is handled as in the Input modules, being converted back into analog on the Output module as required for the Cue, mix-minus and analog program outputs.

The fader, like those on the Input modules, also connects directly to the DSP board, controlling the audio level in the digital domain.

The output assignment switchboard plugs into a SIM socket (see page 2 of the schematic). Each assignment switch is a momentary type with an LED indicator driven by FETs Q10 - Q15. The module On and Off switch assembly plugs into the main PCA. The two switches are momentary SPST with incandescent lamp illumination driven by FETs Q1 - Q9.

The To Hybrid audio output (U3, U13, U14) carries a sum of the Telco mix-minus (TEL1\_MM) and the caller's audio from the other Telco module (CALLER\_IN), if one is installed.

The Telco mix-minus audio (TEL1\_MM) comes from a DAC (Digital-to-Analog Converter) on the Output module. It is buffered by one-half of opamp U3 on the Telco module. In addition to going to the To Hybrid output, TEL1\_MM also goes to the right channel Tape/Aux output through U2, U11 and U12.

The CALLER\_IN audio (from the other Telco module) may also be summed with TEL1\_MM following the setting of a DIP switch. The DIP switch controls whether U5 switches CALLER\_IN to the left or to the right channel of the Tape/Aux/Monitor outputs.

## Tape / Aux Outputs

With one Telco module installed, the left channel output is just the caller. The right channel output is the caller mix-minus audio (TEL1\_MM), which is the output of the assigned bus with the highest priority.

With two Telco modules installed, the Tape Feed switch (DS1, switch 3) becomes active. This switch sets how the caller audio from the other Telco module gets mixed into the Tape and Aux outputs on that module.

When the Tape Feed switch is set to the left, both callers are mixed together onto the left channel. When it is set to the right, the other caller gets mixed with the mix-minus audio (TEL1\_MM) on the right channel.

## Monitoring Caller 2

Caller 2 can be monitored through the Cue bus or through the Telco 1 Mix. To monitor Caller 2 separately from Caller 1 in the Studio requires that an audio jumper be connected from the Aux output of the second Telco module to an External Input on the Monitor module.

## Autofeed

When the Autofeed function is active, the module status (On or Off) affects the mix-minus switching. When the module is On, the Program mix-minus output with the highest priority is automatically sent to the caller. When the module is turned Off, the Off-line bus audio is automatically switched to the caller.

In Manual Mode (Autofeed is not active), the selected source with the highest priority (Off-line, Pgm-1, Pgm-2 or Pgm-3) is sent to the caller regardless of whether the module is On or Off.

**Note:** If Off-Line is the only bus selected in Manual Mode, the caller will not go on-air when the Telco module is turned On since there is no Program bus assignment.

A front panel DIP switch sets cue, timer and record output options. When the Cue Reset switch is set to the right, the Cue function is turned off when the Telco module is turned On or Off. When the Timer Reset switch is set to the right, Telco module On resets the Timer.

The Tape Feed switch is only active when two Telco modules are installed. When set to the left, the CALLER\_IN audio (from the other Telco module) is mixed with the module's caller audio on the left To Tape output. When set to the right, the audio from the other Telco module is mixed with the mix-minus audio (TEL1\_MM) on the right To Tape output.

Polyswitch resettable fuses, F1, F2, F3 and F4, are used on the +12, +16, -16 and +5 VDC connections to protect against short circuit damage. TP4 (-16 volts), TP5 (+5 volts) and TP8 (+16 volts) allow the voltages to be checked after the fuses.

## MOTHERBOARD

Two motherboard sections are used in the AirWave-12, while three are used in the AirWave-20. Each motherboard fastens to the bottom of the mainframe and plugs together using a Motherboard Interconnect jumper (95-974). The power supply cable is hard-wired to the right-hand motherboard section (schematic 92-1009).

## DSP BOARDS

Two DSP (Digital Signal Processing) boards are used in the AirWave-12, while three are used in the AirWave-20. Each board plugs into the motherboard at a right angle from the modules and are fastened to the mainframe's inside rear frame.

There are no adjustments or controls on the DSP boards. Refer to the Motherboard schematics (92-1007, 92-1008 and 92-1009) in the following discussion. Because of the proprietary nature of the DSP boards, a schematic is not included.

The DSP is based on Motorola's 24-bit fixed point DSP integrated circuits. 24-bit data words provide 144 dB of dynamic range. The DSP operates at a nominal sample rate of 48 kHz with on-board crystal synchronization. The internal resolution of 56-bits provides 336 dB of computational dynamic range.

Two DSP options are available from the factory: 44.1 kHz internal sampling and/or external AES-11 reference.

The left hand DSP card (DSP 1) connects to the first eight Input module positions (see 92-1007, P12 for its connector pin-out) on both the AWD-12 and the AWD-20. Each of the first eight Input module positions connect their SDATA outputs, along with their switch outputs and fader wiper voltage, directly to the DSP board. When the Fader Start Logic option is enabled on the Output module, a control signal from the DSP (FADER\_ON) is used to turn on the module as the fader is moved from its full off position.

On the AWD-20, the next eight channels (inputs 9 - 16) connect to DSP 2, identical to DSP 1 except for its EPROM.

The right-hand DSP (DSP 3) handles the remaining four Input module positions for each size console and the two Telco positions (which may alternately have Input modules installed). This DSP also creates the main digital output (MIX\_SDATA) and the meter outputs (DISPLAY SERIAL DATA 1 and 2). See schematic 92-1009, P12 for pin out information for DSP 3.

Each DSP board is linked to the other(s) via a 6-conductor flex cable on the motherboard. Each board generates its own DSP Go and Fader High and Low reference signals. DSP 1 generates the system clocks and system reset signals.

## OUTPUT MODULE

Refer to the six Output Amplifier module schematics (92-1006) in Chapter 6.

The right-hand DSP board outputs the MIX\_SDATA digital data stream to the Output module FPGA (U9). The FPGA (see 92-1006, page 6 of 6) divides the individual data streams carried within the multiplexed data to form the cue and off-line buses (CUE/TEL\_STRMB), and the three individual program buses (PGM1\_STRMB, PGM2\_STRMB, PGM3\_STRMB) from this multiplexed input.

The various Program 1 outputs are on 92-1006, page 1 of 6. The PGM1\_STRMB (from the FPGA) drives U22, an AES/EBU transmitter, and U25, a DAC (Digital-to-Analog Converter).

The AES/EBU chip converts the serial data into an AES-3 compatible signal that is transformer (T1) coupled to the Pgm-1 digital output. There are no level adjustments on the digital outputs.

The DAC's left and right outputs are capacitively-coupled to the two buffers in U1. Output trim controls, RV2 and RV3, set the output level of the right and left channels, respectively, for a nominal +4 dBu. Output amplifiers U6, U7, U8 and U10 create the balanced Main and Aux outputs. The Aux output is resistor-isolated from the Main output. The Pgm-1 Monitor output is connected (via the supplied patch cord) to the Pgm-1 monitor selector input on the Monitor module.

The Program 2 output is on page 2 of the schematic. It is identical to the Program 1 output without the additional Monitor output (the monitoring connection is done via the motherboard to the Monitor module).

The Program 3 output is on page 3 of the schematic. It is identical to the Program 2 output, except it does not have an Aux output.

The two Mono outputs (Main and Aux) are selected from among the three program buses by U36, a three-input analog switch. The left and right channel inputs come from the DAC buffer outputs on each program amplifier. U36 is controlled by the three faceplate program select switches. The

switches are on a SIM card that plug into the SIM socket (on page 5 of the schematic).

The output of U36 (an analog switch) is buffered and trimmed by U5 and balanced by U19 and U21 to create the Main Mono output. RV1 sets the output level to +4 dBu. The Aux Mono output is resistor-isolated from the Main output.

A DAC (U28) converts the CUE/TEL\_STRMB output from the FPGA into the analog Cue and Telco mix-minus signals. Both halves of U4 buffer these signals. The Cue signal goes to the Monitor module while the Telco mix-minus signal goes to the Telco module(s).

The Output module also has a board-mounted DIP switch (DS1) that sets whether the global Fader Start Enable function is on or off and whether the meters display VU or PPM.

Four polyswitch resettable fuses (F1, F2, F3 and F4) protect the supply against short circuit damage. TP9, TP10, TP12 and TP16 are used to check the +16, -16, +5 and +12 volt supplies, respectively.

## MONITOR MODULE

The Monitor module is a double-width module with two independent circuit boards plugging into two motherboard positions. Refer to the nine Monitor module schematic pages (four pages for 92-964, five pages for 92-965) found in Chapter 6.

The left hand circuit board is the Monitor 1 board (92-964 schematic). It contains the monitor controls (Cue, Monitor, Headphone levels) for the Control Room, the Talkback to the Studio mic and control circuits, and the master level control for the Studio monitor speakers.

The right hand circuit board is the Monitor 2 board (92-965 schematic). It is the same circuit board as in the Analog Remote Line Selector module. When used as a Monitor 2 board, a different FPGA chip is installed and several additional parts

are stuffed into the board for logic control of the Monitor module. A complete circuit description for this board is found later in this section under *Remote Line Selectors*.

The Monitor 1 board is divided between the Control Room functions and the Studio functions.

### Control Room Functions

The CR Select Input comes from the Monitor 2 board seven-button Control Room monitor source selector. Being a balanced signal, the left and right channels are unbalanced by the two halves of opamp U1 and capacitively coupled to both the CR Monitor Pot and to the CR headphone signal assignment switcher U8.

The output of the CR monitor pot goes through mute switch U5 (controlled by the CR Mute logic bus) before being buffered and balanced for output by U2 and U3. This creates the main CR Monitor Output.

### Studio Functions

The Studio Select Input comes from the Monitor 2 board seven-button Studio monitor source selector. The balanced signals are unbalanced by opamp U9 and capacitively coupled to both the Studio Monitor Pot and to the Talent headphone circuit (switcher U39 and opamps U15 and U16).

Talkback is inserted into the studio monitor signal by U10 under control of the ST Talkback command. U11 and U12 amplify and balance the signal for the ST Monitor Output.

### Cue/Talkback

The Cue/Talkback audio is summed by one-half of opamp U4 and capacitively coupled to the Cue pot and to the headphone signal assignment switcher. The output of the Cue pot connects to the Cue speaker amplifier IC (U23) which is muted by Q1. Q1 is controlled by the Cue Mute logic signal that comes from U35 (Monitor 2 FPGA).

A built-in electret Talkback microphone is amplified and buffered by opamp U13. Trimpot (RV1) sets the mic volume for the monitor and headphone feed. The Talkback mic audio is switched into the Studio Monitor Output and the Talent H/P audio by switcher ICs U10 and U39 in response to the Talkback button being depressed and held.

### CR Headphone

The CR headphone audio is either the selected source monitor or the Cue/Talk bus. When the Cue/Talk logic signal (from U35, the Monitor 2 FPGA) goes high, the monitor audio is cut off and Cue/Talk audio is fed to the console headphones. The CR Headphone Level control sets the level to the headphone amplifier U22 (for the module headphone jack) and to the balanced CR Headphone Output driver circuit (opamps U7 and U14).

Polyswitch resettable fuses, F1, F2 and F3, are used on the +5, +16 and -16 VDC connections to protect against short circuit damage. TP3, TP8 and TP9 can be used to check the +5, -16 and +16 volt supplies, respectively.

## REMOTE LINE SELECTORS (RLS)

There are two RLS modules available: Analog and Digital. Refer to the Analog RLS schematic (92-965, four pages) and the Digital RLS (92-1012, two pages) in Chapter 6.

### Analog RLS

The Analog RLS has seven line-level buffering and switching circuits with two outputs in a 7 x 2 matrix. The line-level signals (RLS 1 - RLS 7) are AC coupled into the module. Opamps (U1 - U7) unbalance the left and right signals, which are capacitively coupled to the solid-state assignment switches (U20 - U33). Pressing a front panel Ext. 1 - 7 button routes the External input audio through the switches to U11 - U14, which buffer

and rebalance the audio for the outputs (RLS 1 and RLS 2).

Each front panel selector switch bank is on a plug-in assignment switch board. Each RLS select switch is a momentary type with an LED indicator driven by Q1 - Q14.

Polyswitch resettable fuses, F1, F2 and F3, are used on the +5, +16 and -16 VDC connections to protect against short circuit damage. TP1, TP9 and TP8 can be used to check the +5, +16 and -18 volt supplies, respectively.

### Digital RLS

The seven Digital RLS inputs can be resistively (in the -1 version) or transformer-coupled (in the -2 version) into the seven differential line receiver/transmitter chips (U2 - U8). Five of the ICs (U2 - U6) only use the receiving half of the chip, while U7 and U8 use both halves, with the two transmitters creating the two RLS outputs (J8 and J9).

The seven outputs from the receivers go to U1, the FPGA (Field Programmable Gate Array) that handles all switching and switch lamp control. The FPGA responds to the two banks of seven faceplate switches, only allowing one switch to be active at a time per bank. All switches for each bank are on an Assignment Switchboard (95-968-4). The boards plug into SIM sockets J10 and J11. The switch lamps are driven by FETs Q1 - Q14.

The Digital RLS uses only +5 volts, protected by a Polyswitch resettable fuse, F1. TP1 is available to check the +5 volt supply after the fuse.

## TIMER CONTROL MODULE

For this section refer to the Timer module schematic page (92-960) in Chapter 6.

The Timer module routes power and timer control to the clock/timer assembly through the timer connector. A remote timer reset command is also output through the remote timer reset connector.

The module holds the logic-state backup batteries used in case of momentary power outage. Two AA batteries ensure the console powers back up in the same logic state when power fails momentarily.

The faceplate timer control switches (Start, Stop, Reset, Hold) manually control the timer section of the clock/timer assembly. The Auto button controls whether the timer reset bus logic is connected to the timer. When Auto is active (button lit) the timer automatically resets at module On for any module with the Timer Reset logic function turned on (Logic Settings switches 5 or 6 set to the operator's left).

## CLOCK/TIMER ASSEMBLY

For this section refer to the clock/timer schematic page in Chapter 6.

The clock/timer consists of a clock/timer display and a main clock/timer circuit board. A ribbon cable connects the display board to the main clock/timer circuit board.

The display board has the eleven 7-segment displays for the clock and timer and three Hall-effect switches. The Hall-effect switches are used for setting the time when the clock is run in manual mode.

The clock/timer is built around a microcontroller IC (U1). The microcontroller handles both the timer and clock display functions. For a 12-hour clock display a PR&E # 21-122-1 microcontroller is used (standard with the AirWave Digital). For a 24-hour clock display a PR&E # 21-122-2 microcontroller can be substituted.

The +12 volt supply, from the timer control module, is regulated on-board to generate the +5 volt and +8 volt supplies. The +8 volts is used exclusively by the clock oscillator circuit.

The clock oscillator (U2, Q21, U10) controls the clock timing when the Master/Slave switch (S1, #1) is in Master mode. In Slave mode, the clock

timing signal comes from an ESE TC76 or TC89 time code signal input on BNC connector J3. The time code signal is buffered (U9, Q23, U3) and applied to the microcontroller. If ESE time code is lost, the microcontroller will revert to using the internal oscillator as the timekeeping reference (flashing LED CR3 to indicate time code loss).

The timer can be controlled through the console's timer reset bus (when the Auto function is active) and manually through the timer control module buttons.

S1, #2 controls whether the tenths of seconds display is turned on while the timer is running. The tenths of seconds are always displayed when the timer is stopped.

## BARGRAPH METERS

The two sets of meters are mounted on a single board in the meter panel. The meter input (J1) comes from the right-hand motherboard connector J2. Refer to the two page meter schematic (92-1011) in Chapter 6.

Each of the four meters (Pgm-1 Left, Pgm-1 Right, Pgm-2/Pgm-3 Left and Right) is made up of three 10-segment LEDs (D1 - D4, D7 - D14) with a dual LED (D5, D6) Full Scale Peak Indicator. Two 8-input NPN drivers (U3 and U4) supply anode current, while two 4-input NPN drivers supply cathode current sinking. The drivers are controlled directly by the programmable microprocessor (U1).

U8, a 555 oscillator, supplies an 80% duty cycle 2 kHz multiplexing signal to the microprocessor. This signal also is used to set the LED brightness. Both meters can be set to display Volume Units (VU) or Peak Program (PPM). The type of display is set by an internal DIP switch on the Output module. This controls the logic level of the DISPLAY VU/~PPM line which, through NOR gate U2, either lights the PPM or VU LEDs in the two meters through drivers Q1 or Q2. Likewise,



the ~PGM2/PGM3 line controls NOR gate U7 to turn on either the PGM2 LED or the PGM3 LED through drivers Q3 or Q4. This is in response to the setting of the Output module's PGM-2/PGM-3 meter switch.

The meter supply voltages (+5V LOGIC and LED POWER) are protected through polyfuses F1 and F2.

## AIRWAVE UNIVERSAL POWER SUPPLY

For this section refer to the two power supply schematic pages in Chapter 6. For a more complete discussion of the Power Supply refer to the *AirWave Universal Power Supply Technical Manual* (PR&E # 75-41).

The AirWave Universal Power Supply (AUPS) consists of a power transformer, selectable for 115 VAC or 230 VAC operation, chassis-mounted rectifiers and filter capacitors and a regulator circuit board mounted to a heat sink.

The power supply is protected by a replaceable AC mains fuse located in the power entry module, thermal circuit breakers (auto-reset type) within the transformer primary, internal fuses on the transformer's critical secondary outputs and self-protected current-limiting regulators.

The power transformer has four secondary windings. Three are wired to bridge rectifiers and filter caps mounted on the chassis floor, while the fourth is connected to a bridge rectifier (CR6) and filter cap on the regulator circuit card. All voltage regulators fasten to the heat sinks.

The power supply has five output voltages:

- +5 volts @ 6.5 A for the console's logic circuitry
- +12 volts @ 4.0 A for the clock/timer
- $\pm 16$  volts @ 1.0 A each for the audio circuitry
- +45 volts phantom @ 0.100 A for condenser microphones.

The +5 volt (U2) and +12 volt (U1) regulator circuitry is identical with only their divider resistor values being different. The  $\pm 16$  volt regulator

circuitry (U3 and U4) employs a dual voltage tracking device (U5) that monitors the regulated voltage outputs. If either voltage drops, the other will follow to keep the two voltages equal.

The +45 volt supply uses a pass-transistor design (Q1, Q2, CR5). Zener diode CR5 clamps the base voltage of Q1 and the collector of Q2 to a maximum of +47 volts. Q1 and Q2 automatically adjust the current to keep the supply voltage constant. The nominal output voltage will typically be +45 volts.



# Maintenance & Alignment

**F**or troubleshooting, the optional AirWave

Digital module extender (PR&E # 99-1014) allows easy access to any module's circuit board test points.

Note that two module extenders are required for troubleshooting the Monitor module.

## Parts and Repair Services

All of the switches, button caps and faders are easily field replaceable. Although schematics are included for field troubleshooting purposes, it is recommended that modules be returned to PR&E for circuit board service due to their surface mount construction.

### PARTS ORDERING & REPAIR INFORMATION

Spare parts, accessories and additional modules can be purchased through a sales representative or through PR&E's Customer Service Department. To expedite the ordering process, and ensure the correct parts are ordered, have the PR&E part numbers at hand when ordering.

Most repair parts are shipped the same day. Modules and other assemblies may have lead times exceeding two weeks, so order accordingly.

Parts returned to Harris for service, exchange, or credit must have a RA (Return Authorization) tracking number assigned to them by the Technical Services Department. Parts or components re-

turned without a RA number written on the outside of the packaging may be subject to customer return or to an additional handling fee.

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**General broadcast information:**  
**[www.broadcast.harris.com](http://www.broadcast.harris.com)**

All U.S. orders and serviced assemblies are shipped FOB Mason, Ohio using UPS Groundtrak, unless otherwise specified. FedEx or UPS two-day, overnight, and next morning delivery is available for most items. For next day delivery, orders must be placed before 2 p.m. ET, and shipping method must be specified at the time of order.

Assembly orders or repair services can be charged to American Express, VISA, or MasterCard. Orders may also be shipped COD, if you do not have an account with Harris. Contact a sales representative for account information.

### SPARE & REPLACEMENT PARTS INFORMATION

All PR&E parts are categorized using a two digit part type prefix, a dash, and a three or four digit part ID number (a second dash and a suffix number may also be used to identify part variations). The Replacement Parts table on the next page lists the AirWave Digital parts typically subject to wear

and tear. It is recommended that one or more of each of these be kept in the on-site spares stock.

### AirWave Digital Replacement Parts

PR&E #	Description or Use
11-53	Bridge Rectifier #
12-95	On, Off, Talkback lamp & housing
12-101	On, Off, Talkback lamp only #
20-106	Voltage Regulator, adjustable #
20-107	Voltage Regulator, adjustable #
24-98	Cue Pot
24-100	CR and Studio Monitor, Headphone Pot
25-853	Pgm and A/B select switch *
25-854	Autofeed switch *
25-855	Cue switch *
25-856	Off/Line switch *
25-858	Module On switch **
25-859	Module Off switch **
25-860	Talkback switch **
25-870	White button cap ***
25-871	Red button cap ***
25-872	Yellow button cap ***
90-1016	Input & Telco module fader

# Supplied in 76-728 Spare Parts Kit.

\* Used on the 95-968-x switchboards.

\*\* Used on the 95-969-1 and -2 switchboards.

\*\*\* Blank button cap numbers. Also used for custom button engraving. Add a -1 suffix for standard engraving (Talkback, On, Off).

The AirWave Digital Assemblies & Modules table lists the modules and assemblies available for field servicing of the AirWave Digital console.

### INSTALLATION KIT PARTS

The installation kits (Tool kit, Connector kit for the mainframe and for each Input, Telco, Mic Pre or RLS and a Spare Parts Kit) are shipped with each new console. The kit contents and quantities are listed in the table below.

#### Connector and Tool Kit Components

PR&E #	Description or Use	Qty.
<b>76-752</b>	<b>Mainframe Connector Kit</b>	—
14-482	3-pin AMP housing	9
14-484	6-pin AMP housing	21
14-486	8-pin AMP housing	1
15-938-1	Receptacle contacts	162
50-5	AA Lithium battery	2
<b>76-752-1</b>	<b>Input Connector Kit</b>	—
14-484	6-pin AMP housing	2
14-513	24-pin AMP housing	1
15-938-1	Receptacle contacts	22
<b>76-752-2</b>	<b>Telco Connector Kit</b>	—
14-484	6-pin AMP housing	3
14-482	3-pin AMP housing	1
15-938-1	Receptacle contacts	23
<b>76-752-3</b>	<b>Analog RLS Connector Kit</b>	—
14-484	6-pin AMP housing	9
15-938-1	Receptacle contacts	54
<b>76-752-4</b>	<b>Digital RLS Connector Kit</b>	—
14-484	6-pin AMP housing	9
15-938-1	Receptacle contacts	27
<b>76-727</b>	<b>AirWave Tool Kit</b>	—
70-44	Sifam knob removal tool	1
70-90	Hex Wrench	1
70-126	Crimp Tool	1
70-129	Contact Removal Tool	1
90-151	Clock Magnet Tool	1

### AirWave Digital Assemblies & Modules

PR&E #	Description or Use	PR&E #	Description or Use
23-1	Electret microphone	99-960	Timer Control module
23-2	Cue speaker	99-961	Microphone preamp module
80-1551	Blank Panel (one module space)	99-965-1	Monitor module
95-895-1	Clock/timer Assembly (12 hour)	99-966	Analog Remote Line Selector module
95-895-2	Clock/timer Assembly (24 hour)	99-1001	Analog Input SIM
95-968-2	Timer Control switchboard	99-1002	Digital Input SIM
95-968-4	Mon 2 & RLS switchboard	99-1003	B Logic Interface SIM
95-968-6	Output Assignment switchboard	99-1004	Line Input module
95-968-7	Line Input switchboard	99-1005	Telco Input/Output module
95-968-8	Telco switchboard	99-1006	Output Amplifier module
95-969-1	On/Off switchboard	99-1010-1	Left DSP Card
95-969-2	Talkback switchboard	99-1010-2	Middle DSP Card (AWD-20 only)
95-974	Motherboard Interconnect	99-1010-3	Right DSP Card
95-1007	Left-end Motherboard	99-1012	Digital Remote Line Selector module
95-1008	Mid-Motherboard (AirWave Digital-20 only)	99-1014	Extender Card
95-1009	Right-end Motherboard (with power cable)	99-1015	Power Supply Assembly
95-1011	Bargraph Meter assy.		

## Module Servicing

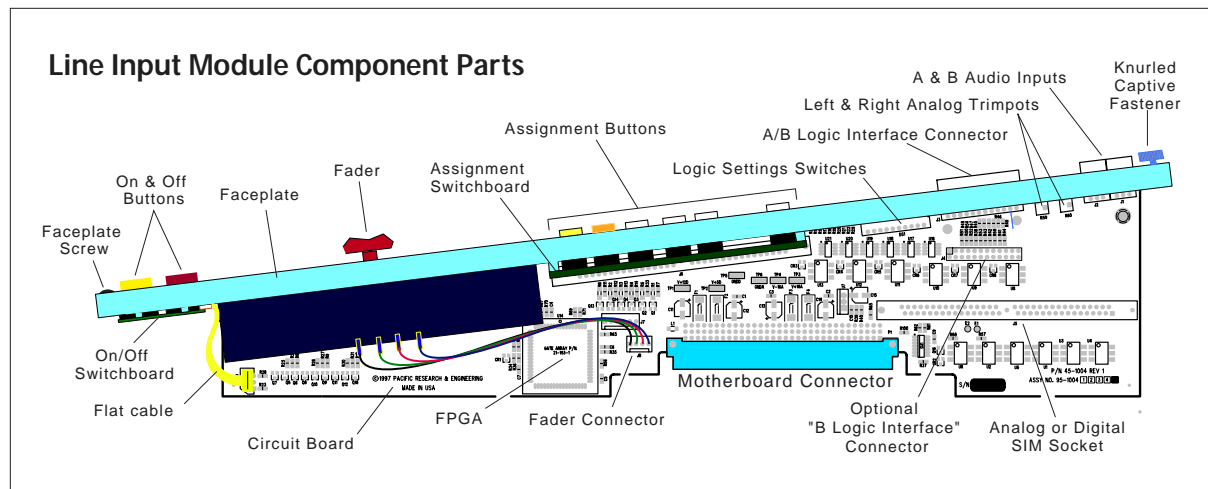
Input modules can be removed and installed with the console powered and on-air without causing audio interruption or noises in the program audio. When first plugged in, or when the console is first turned on, Input modules come up in their default turn-on state—no bus assignments active, the module in the Off state.

**Note:** Prior to removing any module from the motherboard, turn off all bus assignments and unplug all input, output and logic cables.

- Once the connectors start to mate, press straight down on the module's faceplate above the motherboard connector area to seat the module. Do not press on buttons or connectors while seating the module.

## MODULE DISASSEMBLY & REASSEMBLY

A module consists of a faceplate (the silk-screened metal panel) and a circuit board. There are two circuit boards on the double-width Monitor module. There may also be one or more switch-



To remove a module from the mainframe:

- Loosen the knurled captive fastener at the top of the module.
- Remove the 4-40 button head faceplate screw at the bottom of the module. The Air-Wave Digital Tool kit includes the hex driver.
- Use the knurled captive fastener to unplug the module from the motherboard and remove it from the mainframe.

To install a module:

- Set the module's faceplate on the front chassis module mounting tab.
- Lower the module into the mainframe and align the module's connector with the motherboard connector.

boards and a fader, as on the Input and Telco modules, or several potentiometers, as on the Monitor module, plugged into the circuit board.

Circuit boards fasten to the faceplate using flat head Phillips screws. Faders fasten to the faceplate using 1/16 inch button head screws and plug into a circuit board connector. Pots mount to the faceplate using lock washers and nuts and plug into circuit board connectors. The On and Off switches mount on the On/Off switchboard. The Talkback switch mounts on the Talkback switchboard. Both of these switchboards use a flat cable and circuit board connectors. The Assignment switchboards and the Input module SIM (Single In-line Module) mount in SIM sockets on the circuit board.

### Circuit Board Removal

To remove the circuit board from the faceplate:

1. Unplug all faders, pots and switchboards, as applicable.
2. Remove the Assignment switchboard support screws.
3. Remove the circuit board mounting screws.
4. Separate the circuit board from the faceplate.

Reassemble in reverse fashion, ensuring that the switchboard buttons and connectors protrude through the faceplate without binding.

### SIM Circuit Card Removal

1. If necessary, remove the circuit board from the faceplate per the previous instructions.
2. Using antistatic material, set the circuit board trace side down.
3. Press out on the two metal switchboard locking clips while lightly pressing on the bottom of the circuit card. The board tilts out of the locking clips toward the switch or component side.
4. Lift and remove the SIM card from the SIM socket.

### SIM Circuit Card Installation

1. Using antistatic material, set the circuit board trace side down.
2. Insert the SIM card with the edge contacts inserted into the SIM socket at about a 45° angle, with the switches/components angled down. The board is keyed so it will only mount in the correct orientation.
3. Press the circuit card into the socket while moving it to a vertical position. The locking clips will snap and hold the board in place.

When correctly positioned, the circuit card will be vertical to the circuit board and the two SIM socket alignment tabs will be set into matching holes on the SIM card.

### On/Off or Talkback Switchboard Removal

1. Remove the circuit board from the faceplate, per previous instructions.
2. Remove the #1 Phillips screws, lock washers and washers from the switchboard to remove it from the faceplate. There are two screws on the Talkback switchboard and four screws on the On/Off switchboard.
3. Unplug the flat wire cable from the switchboard connector. Note its orientation.

### Optional “B” Logic Interface Installation

1. Using antistatic material, set the module with its circuit board trace side down.
2. Position the “B” Logic card’s 24-pin logic connector into the faceplate opening at an angle in order to insert the card’s P1 connector into the circuit board connector pins. When properly mounted, the two 24-pin logic connectors will be physically aligned.

## MONITOR MODULE

The Monitor module has two circuit boards on one faceplate. Prior to removing the Monitor module, unplug the headphones from the module and turn off the external amplifiers for the Control Room and Studio monitors and headphones. This prevents possible transient noise damage to the loudspeakers and headphones.

The Monitor 1 circuit board must be removed in order to remove the Monitor 2 circuit board. All of the faceplate components—pots, headphone jack, Talkback mic, and the Monitor 2 circuit board, plug into the Monitor 1 board.

AirWave uses sealed pots that do not require “cleaning.” If it becomes necessary to replace a pot, remove the Monitor 1 circuit board from the faceplate by unplugging all cabling and removing the three mounting screws. Remove the colored end cap from the knob by prying it loose. Use the 70-44 Sifam Knob Removal Tool to loosen the lock

nut so the knob can be removed from the pot shaft. Use a 7/16 inch nutdriver to remove the shaft nuts.

## FADER SERVICING

There are no replaceable nor rebuildable parts on the AirWave Digital fader assembly. Fader service is comprised of cleaning and lubricating. All faders are conductive plastic, single-element faders (PR&E # 90-1016).

If the fader movement is rough, either the lubricant on the glide rails has evaporated or foreign material has gotten into the fader. Dow Corning 510 is the preferred glide rail lubricant as it will not migrate to the contact fingers like other lubricating oils.

### Fader Disassembly and Cleaning

1. Remove the module from the mainframe.
2. Remove the circuit board from the faceplate, per previous instructions.
3. Remove the fader knob and the two fader mounting screws, and then the fader from the faceplate.
4. Remove the snap-on fader assembly cover. It is held in place by round stamped bosses at each end. With the fader sitting label up and the connector pins to the front, a pry-point is on the right end of the fader cover.
5. Clean the fader using only a dry cotton swab, or a cotton swab wet with distilled water.

**Note:** The use of chemical cleaners on the conductive plastic will substantially shorten fader life. Never touch the fader slider contact fingers while cleaning the fader parts.

Use only a dry cotton swab, or a cotton swab wet with distilled water, to clean the fader parts. Always use a clean dry swab to dry off the conductive plastic tracks after cleaning. If the fader rails are noticeably dirty, wipe them off using a dry cotton swab before lightly lubricating the top rail with Dow Corning 510.

If coffee, a soft drink or other sugared liquid has been spilled into the fader, remove it from the module as soon as possible and remove the top cover of the fader. Hold the fader under hot running water while moving the fader slider back and forth to dissolve the sugars and other chemicals. Thoroughly dry the rails and conductive plastic using dry cotton swabs and then lubricate the top fader rail with Dow Corning 510.

### Lubricating the Glide Rail

Move the fader slider to the middle of its travel and place one drop of Dow Corning 510 lubricant on the top rail on either side of the fader slider bushings. Move the slider through its full travel to distribute the lubricant. Wipe off any excess lubricant from the rubber stops at each end of the glide rail. Normally only the top rail (the one the fader slider bushings glide on) requires lubricant.

## MICROPHONE PREAMP MODULE

The microphone trimpots are under a faceplate security cover. They are set at the factory for a +4 dBu output level with a -55 dBu, 1 kHz input. In the field, each trimpot can be adjusted for the specific microphone being used on that preamplifier.

## ANALOG LINE INPUT MODULE

The Trim L and Trim R trimpots (R60 and R59) set the left and right channel gain, respectively. To adjust these trimpots:

1. Set the fader at the -12 dB (nominal) mark and assign the module to Program 1.
2. Apply a 1 kHz signal at the nominal input level for that channel (from -10 dBu up to +4 dBu) to the left and right input connectors. Either the A or B input can be used, as the adjustment point is after the A/B switch.
3. Using the Program 1 bargraph meters, adjust the trimpots for 0VU (or -8 PPM).

## TELCO INPUT/OUTPUT MODULE

There is one trimpot adjustment on the Telco module. The trimpot (RV1) is used to set the input level from the hybrid (-10 to +4 dBu) so that a nominal +4 dBu output is available at the left To Tape output connector. To set RV1:

1. Connect a 1 kHz signal to the From Hybrid connector using the hybrid's output level.
2. Monitor the To Tape Left output.
3. Adjust RV1 for a +4 dBu output.

## OUTPUT MODULE

To access the Output module analog level trimpots, the module must be placed on an extender card (PR&E # 99-1014). There are seven trimpots to adjust the analog signal output levels. There are no adjustments for the digital outputs or for the bargraph meters.

Before adjusting the program output levels, the meter selector DIP switch (DS1, switch 2) must be set to VU and one Input module must first be set up as a "standard" so that a known input level is feeding the Output module amplifiers. To set up an Input module as a standard:

1. Connect an analog +4 dBu, 1 kHz balanced signal to the left and right inputs on the A Input.
2. Set the fader to the nominal -12 dB mark. Select A Input and assign the module to all three program buses.
3. Adjust Trim L and Trim R for 0VU dBu indications on the Program 1 left and right meters.

Do not change the standard module settings until after the Output module adjustments are completed. To set the Output module:

1. Place the Output module on an extender card.
2. Turn off all other Input and Telco modules, leaving only the "standard" Input module On,

feeding all three program buses with the 1 kHz input at nominal level.

3. Plug an AC Voltmeter into the analog Pgm-1 left output. Adjust RV3 for +4 dBu. Move the AC Voltmeter to the analog Pgm-1 right output. Adjust RV2 for +4 dBu.
4. Move the AC Voltmeter to the analog Pgm-2 left output. Adjust RV4 for +4 dBu. Move the AC Voltmeter to the analog Pgm-2 right output. Adjust RV5 for +4 dBu.
5. Move the AC Voltmeter to the analog Pgm-3 left output. Adjust RV6 for +4 dBu. Move the AC Voltmeter to the analog Pgm-3 right output. Adjust RV7 for +4 dBu.
6. Select Pgm-1 for the Monaural Output. Move the AC Voltmeter to pins 1, 2 and 3 of the Mono output connector. Adjust RV1 for +4 dBu.

## MONITOR MODULE

The only trimpot (RV1) on the Monitor 1 circuit board sets the built-in Talkback microphone's output level. It is adjusted through the front panel. There are no adjustments on the Monitor 2 board.

## CLOCK/TIMER ASSEMBLY

There is one frequency adjustment (C2) on the board. Allow at least one hour of powered operation to stabilize the internal oscillator before adjusting the frequency. To adjust the master clock oscillator, monitor the CLK test point using a x10 probe with a high-frequency counter. Adjust C2 for exactly 3.276800 MHz.

### Clock/Timer Troubleshooting

*Red LED flashing below clock:* Clock set for Slave mode without ESE time code on J3. Change switch S1, #1 from Off to On if ESE is not being used. Test ESE system if time code is feeding J3.



*No Clock nor Timer display:* Check for +12 volts on J1 or J2, pin 5. Check for +8 volts at the output of U5 and for +5 volts on U4. Check for clock signal at CLK.

*Clock Frozen:* U8 shorted.

*Clock rapidly incrementing:* U6 shorted.

*Clock runs very fast:* U7 shorted.

*Timer doesn't work in manual mode:* Shorted Reset or Hold switch or open Start switch.

*Timer doesn't work in Auto mode:* Auto switch not turned on. Timer Reset switches on the Input modules are not set On or not set for the selected input (A or B).

*One or more segments out:* Each numeric character is an identical independent seven-segment display in a socket, so substitution can identify if the display or the driver is defective.

**Note:** Some of the seven-segment displays are mounted upside down to form the upper dot in the H:M:S divider colons.

## TIMER CONTROL MODULE

The Keep Alive voltage is generated by two Lithium AA batteries on the Timer Control Panel. These batteries power the gate arrays during power outages so the console powers back up in the same state it was in when power was lost. There are no adjustments or DIP switches on this board.

## CUE SPEAKER REPLACEMENT

The Cue speaker is 45 ohms/3 watts. To test the speaker, remove the speaker leads and check the impedance. To replace the speaker, remove the four mounting nuts, lock washers and washers from the speaker. The speaker must be angled on its mounting screws to clear the meter panel.

## AIRWAVE UNIVERSAL POWER SUPPLY

Periodically check that the vent openings on the top of the chassis are not blocked and that there is no dust buildup on the heat sink fins.



**Caution:** To reduce the risk of electric shock, perform no servicing other than the fuse replacement unless you are qualified to do so. Refer servicing to qualified service personnel.

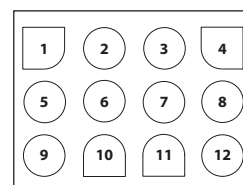
## Fuse Replacement

The AC line fuse in the power entry module (PEM) is the only user-replaceable component in the supply. To access the fuse, unplug the AC cord and use flatblade screwdriver to pop the top of the PEM coverplate.

115 VAC supplies use a 2.50 amp slo-blo UL-type fuse. 230 VAC supplies use a 1.25 amp slo-blo IEC-approved fuse. Verify the correct AC mains voltage appears in the PEM cutout after the coverplate is snapped back into place.

If the fuse blows again, switch off the power supply, unplug the console DC cable and replace the fuse. If this fuse blows, a serious problem is indicated within the power supply. If the fuse does not blow, a problem likely exists in the mainframe. In either case, refer servicing to qualified service personnel.

## Molex Power Supply Connector



PIN	SIGNAL	WIRE COLOR
1	+45 V, phantom	Green/Black
2	+16 V, audio	Red
3	Phantom GND	Green
4	Audio GND	Black
5	Audio GND	White
6	-16 V, audio	White/Black
7	+12 V, Lamps	Red/Black
8	+5 V, Logic	Orange
9	Logic GND	Blue
10	No Connection	
11	No Connection	
12	No Connection	

Refer to the AirWave Universal Power Supply manual (PR&E 75-41) for servicing information.

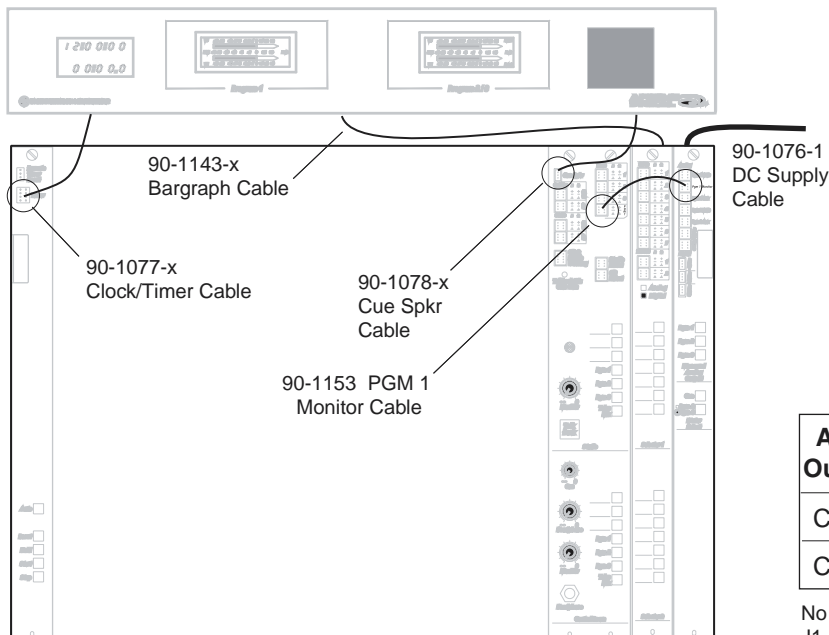


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**Note:** The analog supply voltages on all modules used in the AirWave Digital console are  $\pm 16$  VDC. On those modules also used in AirWave consoles, the schematics list these voltages as  $\pm 18$  VDC. The phantom supply voltage in AirWave Digital is +45 VDC even though it may be listed as +48 VDC on some schematics.



Cable Identification

90-1077-x, Clock/Timer Cable

AirWave Timer Logic Functions	P1 Pin	Wire Color	P2 Pin
Logic Ground	1	BLU / BLK	6
+12 volts	2	GRN / BLK	5
Start Command	3	RED / BLK	4
Stop Command	4	WHT / BLK	3
Reset Command	5	VIO	2
Hold Command	6	GRY	1

No connection: P1, pins 7, 8

90-1076-x, DC Power Supply Cable

AirWave Power Supply	P1 Pin	Wire Color	Motherboard Connections
+45 V (Phantom)	1	GRN / BLK	E3
+16 V (analog)	2	RED	E4
Phantom Gnd	3	GRN	J1
Audio Gnd	4	BLK	E1
Audio Gnd	5	WHT	E2
-16 V (analog)	6	WHT / BLK	E5
+12 V (lamps)	7	RED / BLK	E8
+5 V (digital)	8	ORG	E7
Digital/Lamp Gnd	9	BLU	E6

No connection: P1, pins 10, 11, 12

E1 - E8: Circuit board eyelets

J1: Ground lug fastened to Motherboard screw

### Cable Part Numbers

AWD-12	AWD-20
90-1076-1	90-1076-1
90-1077-1	90-1077-2
90-1078-1	90-1078-2
90-1143-1	90-1143-2
90-1153	90-1153

90-1078-x, Cue Speaker Cable

AirWave Cue Output Signals	P1 Pin	Wire Color	Cue Speaker
Cue + Output	3	RED	J1 Spkr +
Cue - Output	2	GRN	J2 Spkr -

No connection: P1, pin 1

J1 / J2: Solderless crimp connectors

90-1143-x, Bargraph Meter Cable

AirWave Meter Output	P1&P2 Pin	Wire Color
+5 Volts	1	RED
+5 Volts	2	ORG
Logic ground	3	BLK
Logic ground	4	DRAIN / No stripe
Logic ground	5	DRAIN / stripe
Serial data 1	6	RED / no stripe
Serial data 2	7	RED / stripe
VU/PPM select	8	WHT
PGM2/3 select	9	GRN
System reset	10	BLU

90-1153, Pgm 1 Monitor Cable

Program 1 Monitor	P1 & P2 Pin	Wire Color
Pgm 1L shield	1	GND
Pgm 1L (-)	2	BLK
Pgm 1L (+)	3	RED
Pgm 1R shield	4	GND / RED STRIPE
Pgm 1R (-)	5	BLK / RED STRIPE
Pgm 1R (+)	6	RED / RED STRIPE

## AIRWAVE DIGITAL CONSOLE WIRING

# Accessories

**P**R&E has a full line of logic cables designed for use with the AirWave Digital console and the *QuikBilt II* modular cabinetry. *QuikBilt II* cabinetry is economical, rapid-assembly, studio furniture designed for use with the AirWave console family. *QuikBilt II* cabinetry can be configured to create individualized studio furniture packages in either stand-up or sit-down styles.

PR&E's *PrimeLine* furniture line can also be used with an AirWave Digital console. *PrimeLine* offers pre-assembled cabinet components, in stand-up or sit-down heights, with pre-cut console and wiring access holes. *PrimeLine* cabinets can also be factory pre-wired since the cabinets are shipped blanket-wrapped via van line.

## BUTTON ENGRAVING

Input modules, and the optional Telco modules, come standard with their red and yellow button caps engraved ON and OFF. Custom engraving on the button caps can be ordered at the time of purchase, or engraved replacement button caps can be ordered at the time of installation once the input sources have been determined.

Each button cap can have up to two lines of engraving with up to four alphanumeric characters and a ½ character punctuation divider (space, period, hyphen, slash, backslash, etc.) on each line.

Engraving is normally done on the yellow button cap to identify the A input source on the top line and the B input source on the bottom line.

Custom engraving is specified when a blank button cap is ordered. For a yellow button cap, order PR&E # 25-872. For a red button cap, order PR&E # 25-871. For a white button cap, as used for the Talkback button, order PR&E # 25-870.

## FADER KNOBS

Input modules come standard with white fader knobs. The optional Telco modules come with black knobs. Various colored fader knobs are also available. The table identifies the PR&E part numbers by knob color and typical source.

PR&E #	Color	Source
32-710-1	black	Telco
32-712-1	red	Microphone
32-714-1	yellow	Cart decks
32-715-1	green	CD players / turntable
32-716-1	blue	Cassettes / reel-to-reels
32-719-1	white	Remotes
32-720-1	gray	Other Studios
32-721-1	orange	Multitrack channels

## CONSOLE REMOTE CONTROL PANELS

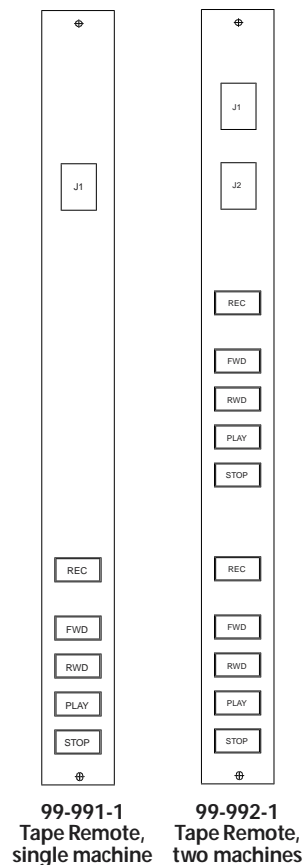
Any open console position (except for the Monitor, Timer and Output module positions) can be used to hold a remote control panel.

### Tape Remote Panels

There are two tape remote panels available for the AirWave consoles: 99-991-1 and 99-992-1. Each uses a single module space in the console.

The 99-991-1 is a single tape machine remote with five control buttons (Play, Stop, Record, Forward and Reverse). A 24-pin Molex connector is located at the top of the panel for easy interfacing to a tape machine using standard PR&E logic cables. The mating Molex connector and pins are included with the panel.

The 99-992-1 contains two separate five-button controllers in one panel. Two Molex connectors are located at the top of the panel.



### Custom Remote Control Panels

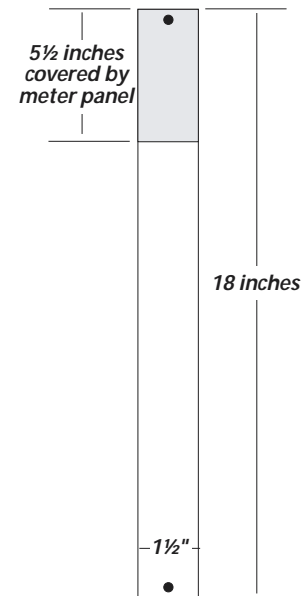
Blank module panels (PR&E # 80-1551) can be used to create custom control panels. The maximum width switch/button cap the panels can accommodate is 1" [25.40 mm] wide.

Because there are no bottom openings on the AirWave chassis, an opening must be punched at

the top of the panel, in the area covered by the meter panel, for the switch and lamp wiring to exit the mainframe. The use of a panel-mount connector is recommended.

Custom remote panels can also be fabricated by PR&E, contact a sales representative for more information.

### Blank Panel Dimensions PR&E # 80-1551



## GUEST PANELS

There are two Guest Mic Control Panels available for the AirWave consoles. PR&E # 99-949-1 is the cabinet-mount version and 99-949-2 is the turret panel-mount version. Each panel has four engraved buttons (Talkback, Cough, On, Off) with integral lamps. The Guest Panel schematic and the cable drawing for the 99-716-CU cable are on pages 3 and 4, respectively.

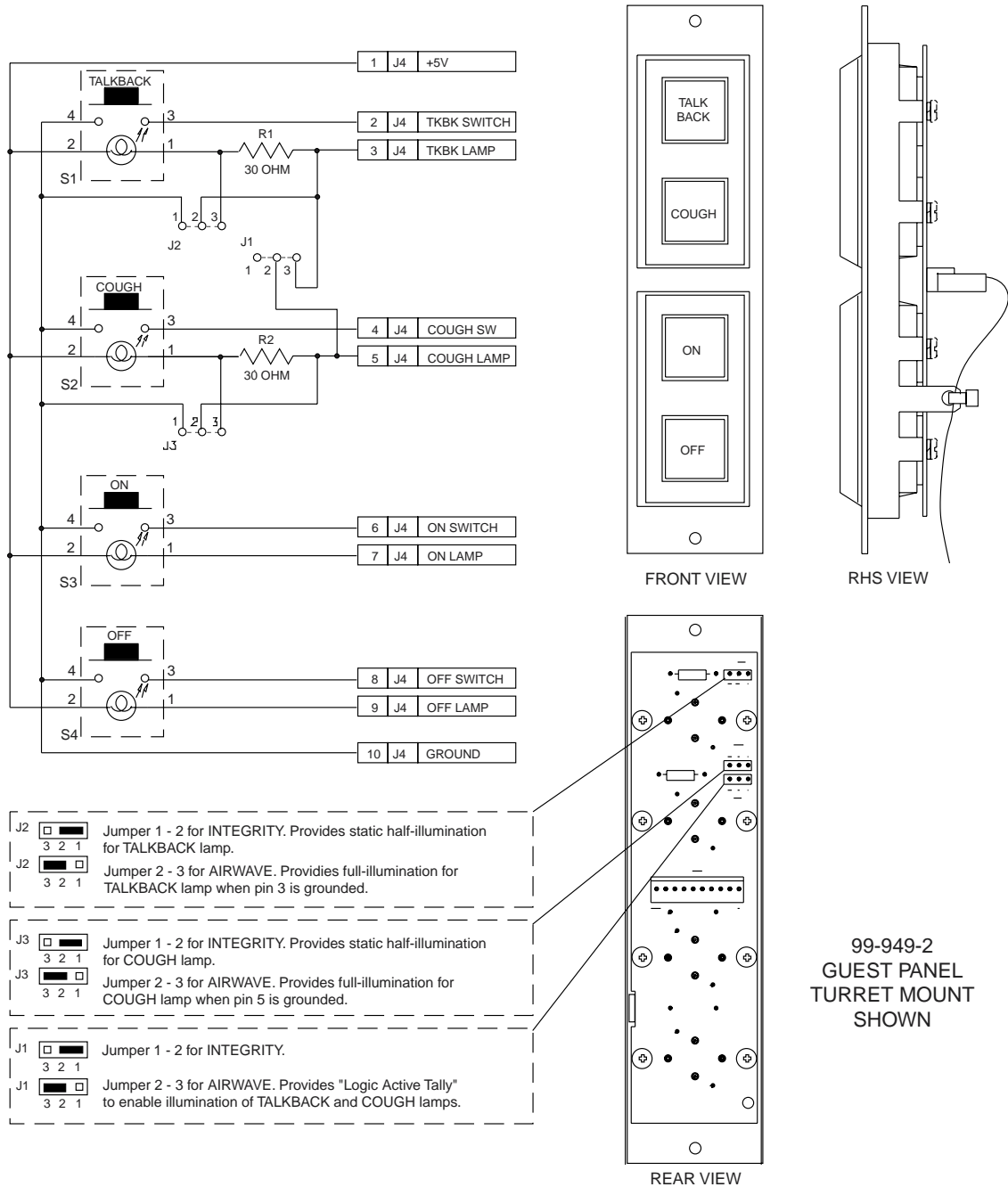
## LOGIC CONTROL CABLES

To assist in logic cable design and construction, logic wiring diagrams for many popular peripheral devices are available from the PR&E Technical Support Department.

Contact a sales representative for information about PR&E pre-made peripheral logic cables.

J4: Housing, wafer, 10-pin female locking Molex # 22-01-2107 (PR&E # 15-524)  
Terminals, gold, female crimp Molex # 08-58-0110 (PR&E # 15-8)

S1 - S4: Switch, 17mm JAE # 11LC17-0 (PR&E # 25-873)  
Lamp, JAE # 11LB17-0 (PR&E # 12-101)



THIS DOCUMENT APPLIES TO  
99-949-1 AND 99-949-2

TITLE  
GUEST PANEL, CABINET/TURRET MOUNT  
INTEGRITY, AIRWAVE



PACIFIC RESEARCH  
& ENGINEERING CORPORATION

DRAWN  
SJQ / RLM  
SHEET  
1 OF 1

DATE  
17-DEC-98  
APVD.  
1-JUN-97

DWG. NO.  
**71-949**

REV.  
**C**


J1: Housing, 24-pin AMP Mod IV # 2-87631-0 (PR&E # 14-513)  
Terminals, female AMP Mod IV # 102128-1 (PR&E # 15-938-1)

J2: Housing, wafer, 10-pin female locking Molex # 22-01-2107 (PR&E # 15-524)  
Terminals, crimp, gold female Molex # 08-56-0110 (PR&E # 15-8)

Cable: 9-conductor Belden # 9423 or equivalent

Wire: 26 AWG white hookup, UL1429 or equivalent

INPUT MODULE LOGIC FUNCTION	J1 Pin		J2 Pin	GUEST PANEL FUNCTION
+5 VDC	10	BLK	1	Tally +VDC
Talkback (-)	20	WHT	2	Talkback Switch
On Tally	17	RED	7	On Lamp
Off Tally	16	GRN	9	Off Lamp
Logic Active	15	BRN	5	Talkback/Cough Lamp
Logic Ground	1	BLU	10	Switch Common
On (-)	7	ORN	6	On Switch
Off (-)	8	YEL	8	Off Switch
Cough (-)	9	VIO	4	Cough Switch
+5 VDC Logic	6	WHT		
Ext. Cntrl In (+)	18			
Logic Ground	2	WHT		
Tally Common	14			

THIS DOCUMENT APPLIES TO 99-716-CU		TITLE CABLE, LOGIC, MIC INPUT MODULE TO GUEST PANEL (99-949-x), AIRWAVE		
	PACIFIC RESEARCH & ENGINEERING CORPORATION	DRAWN SJQ / RLM	DATE 14-AUG-97	DWG. NO. 71-716
		SHEET 1 OF 1	APVD.	REV. C

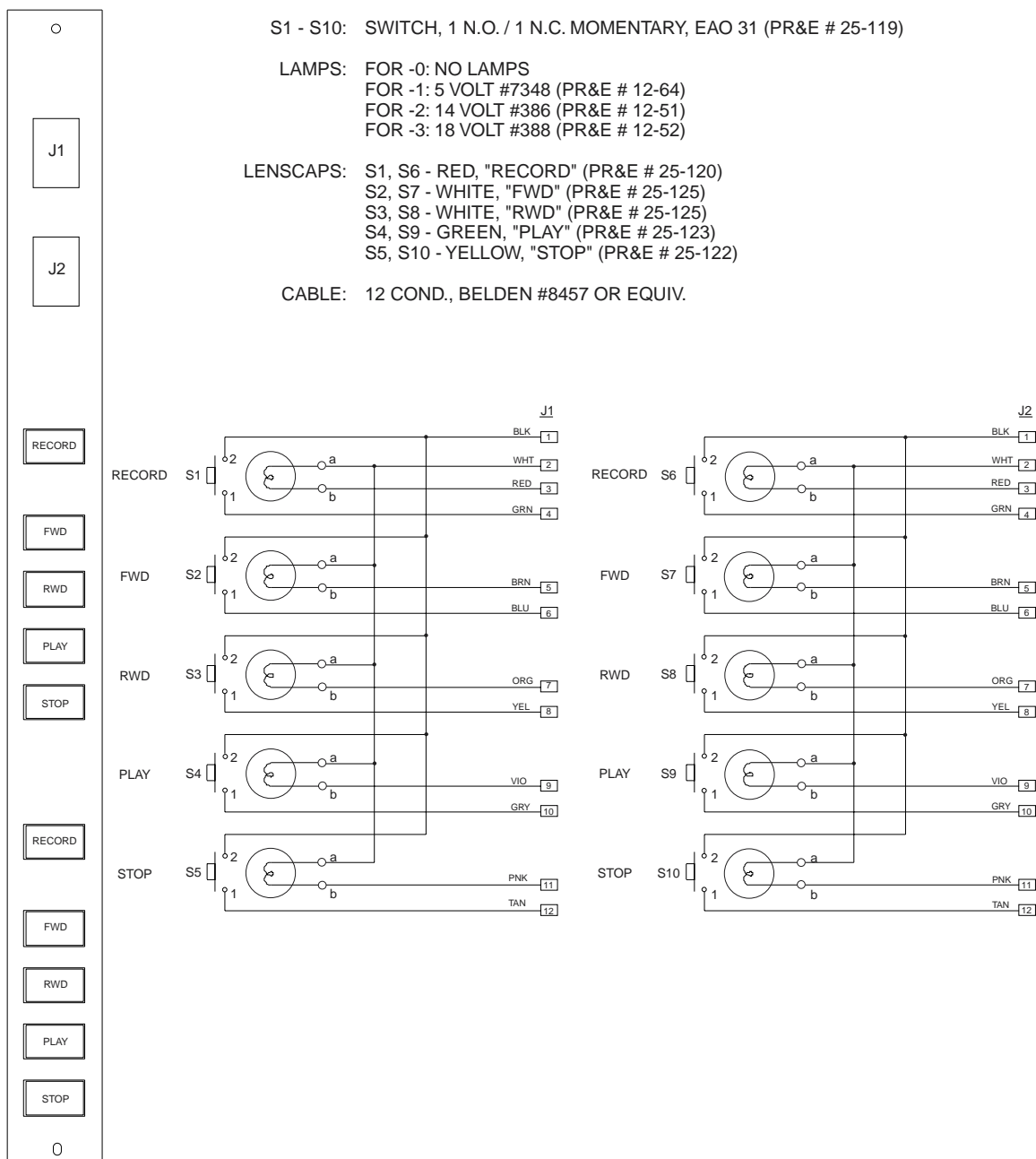
J1, J2: HOUSING, 24-PIN FEMALE, MOLEX #03-06-1241 (PR&E # 15-705)  
TERMINALS, FEMALE, MOLEX #02-06-1103 (PR&E 15-2)

S1 - S10: SWITCH, 1 N.O. / 1 N.C. MOMENTARY, EAO 31 (PR&E # 25-119)

LAMPS: FOR -0: NO LAMPS  
FOR -1: 5 VOLT #7348 (PR&E # 12-64)  
FOR -2: 14 VOLT #386 (PR&E # 12-51)  
FOR -3: 18 VOLT #388 (PR&E # 12-52)

LENSCAPS: S1, S6 - RED, "RECORD" (PR&E # 25-120)  
S2, S7 - WHITE, "FWD" (PR&E # 25-125)  
S3, S8 - WHITE, "RWD" (PR&E # 25-125)  
S4, S9 - GREEN, "PLAY" (PR&E # 25-123)  
S5, S10 - YELLOW, "STOP" (PR&E # 25-122)

CABLE: 12 COND., BELDEN #8457 OR EQUIV.



THIS DOCUMENT APPLIES TO  
99-992-0 THRU 99-992-3



PACIFIC RESEARCH  
& ENGINEERING CORPORATION

TITLE

AIRWAVE, DUAL TAPE REMOTE & WIRING

DRAWN  
JT / SR / RLM  
SHEET  
1 OF 1

DATE  
12-AUG-97  
APVD.

DWG. NO.  
71-992

REV.  
A



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