

ESA-10 CONSOLE MANUAL

REVISION SCHEDULE

Revision Number -- Number 1

Effective Date -- July 1, 1984

Serial Numbers Effected -- Number 10021 On

Revisions This Change -- Mic Pre-Amp -- Schematic
Mic Pre-Amp -- PC Layout
Mic Pre-Amp -- Parts List
Control Board -- Parts List
Input Mother Board -- Parts List
Line Amp Mother Board -- Schematic
Line Amp Mother Board -- Schematic
Line Amp Mother Board -- Parts List
Cue Amp -- Schematic
Cue Amp -- PC Layout
Cue Amp -- Parts List
Bar Graph Meter -- Schematic
Bar Graph Meter -- PC Layout
Bar Graph Meter -- Parts List
Auxiliary Selector Control -- Schematic

Additions This Change -- Revision Schedule
RFI Shielding (Engineering Notes)
Remote Start Interface (Engineering Notes)

TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE</u>
	I. Installation and Wiring	
Illustration	Internal Control Layout	-
Illustration	Equipment Interconnection	-
---	Level Reference Guide	1
10.00	Console Placement	2
10.01	Table Cut-Outs	2
10.02	Power Supply	2
10.03	Power Supply Voltages	2/3
10.04	Power Supply Fuses	3
10.05	Power Supply Switching	3
10.06	Power Supply Separate Clock Power	3
10.07	Grounding	4
10.08	Mic Inputs	4
10.09	Mics -- External Processing	4
10.10	Mics -- Stereo/Mono Connections	4
10.11	Line Level Sources	5
10.12	Auxiliary Switchers	5
10.13	Auxiliary Switchers -- Input Selecting	5
10.14	Auxiliary Switchers -- Output Directing	5
10.15	External Inputs	6
10.16	Internal Oscillator	6
10.17	Program and Audition Outputs	6/7
10.18	Fixed Program Output	7
10.19	Muting Relays	7
10.20	Auxiliary Relay Contacts	8
10.21	Remote Start Contacts	8
10.22	Monitor Outputs	8/9
10.23	Headphones	9
10.24	Cue Circuitry	9
	II. Calibration and Level Set	
12.00	Introduction	10
12.01	Set-Up Meter	10
12.02	Line Level Input -- Calibration	11
12.03	Line Level Input -- Standard Level	11
12.04	Line Level Input -- Low Level	11/12
12.05	Mic Level Input -- Calibration	12
12.06	Mic Level Input -- Standard Gain	12
12.07	Mic Level Input -- Increased Gain	12
12.08	Mic Level Input -- External Processing	12
12.09	Output Level -- Adjustment	12/13
12.10	LED Meter -- Calibration	13

II. Calibration and Level Set CONTINUED

12.11	LED Meter -- Sensitivity	13
12.12	LED Meter -- Peak Flasher	13
12.13	LED Meter -- Peak Mode Operation	14
12.14	LED Meter -- Auxiliary	14
12.15	External Input Trims	14
12.16	Headphone Level Trims	14/15
Illustration 12A	Gain Strap Locations	-
Illustration 12B	Meter Control Locations	-

III. Function Programming

14.00	Introduction	16
14.01	Muting Busses	16
14.02	Cue Mode Selection	17/18
14.03	Timer Auto-Reset	18
14.04	Remote Start Function	18/19
14.05	Clock Operation	20
Illustration 14A	Muting Strap Locations	-
Illustration 14B	Cue Timer, Remote Control Strap Locations	-
Illustration 14C	Clock Control Location	-

IV. Operation

16.00	Introduction	21
16.01	Input Assignment	21
16.02	Mic Use	21/22
16.03	Channel Switching	22
16.04	Cue-Circuitry	22
16.05	Cue-On Detent	22
16.06	Cue-In Place	23
16.07	Cue-Auto	23
16.08	Output Routing	23
16.09	Mix-Minus Bussing	23/24
16.10	Monitor Select Switches	24
16.11	Monitor/Headphone Level Controls	24
16.12	Auxiliary Switcher -- Input Selector	25
16.13	Auxiliary Switcher -- Output Director	25
16.14	Bar Graph Meters	25
16.15	Bar Graph Meters -- Peak and Average	25
16.16	Bar Graph Meters -- Auxiliary	26
16.17	Timer	26
16.18	Clock	26

SECTIONPAGE

V. Theory of Operations

18.01	Power Supply	27/28
18.02	Input Stage	28/29
18.03	Control Board	29/30
18.04	Mic Pre-Amp	30/31
18.05	Line Amp	31
18.06	Monitor Amp	32
18.07	Cue Amp	32/33
18.08	Headphone Amp	33
18.09	Bar Graph, Meter	33/34
18.10	Clock and Timer	34/35

VI. Maintenance and Trouble Shooting

20.00	Introduction	36
20.01	Circuit Board/Parts Exchange	36
20.02	Factory Repair	36
20.03	Control Board	37
20.04	Channel Circuitry	37
20.05	Line Amps	37
20.06	Headphone Plug-In Board	37
20.07	Monitor Plug-In Board	37
20.08	Monitor/Headphone Control Boards	37
20.09	Mic Pre-Amps	37
20.10	Clock and Timer	38
20.11	Bar -- Graph Meters	38
20.12	Power Supply	38
20.13	Incandescent Bulb Replacement	39

TYPEDRAWING
NUMBER

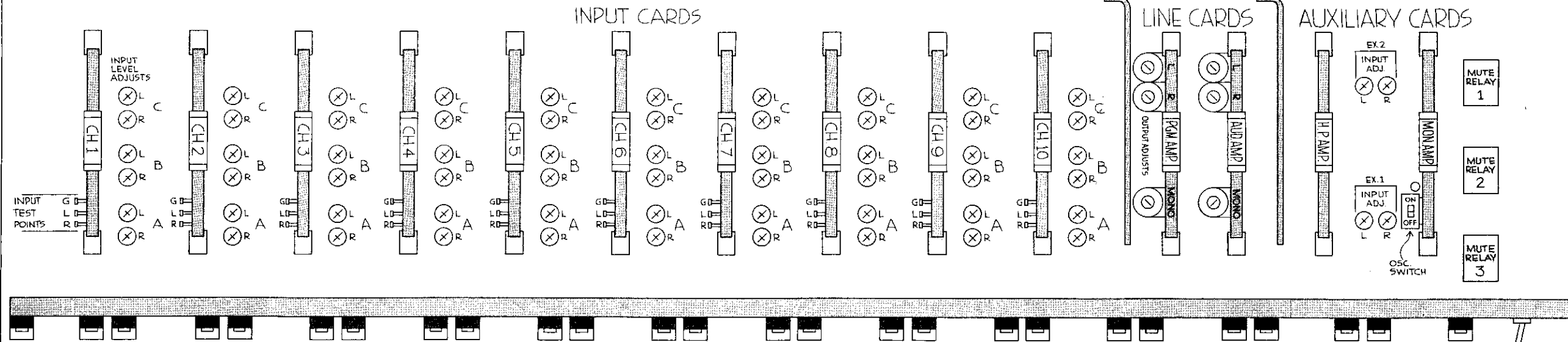
VII. Schematics/Parts Layouts/Parts Lists

One Line	Diagram with Gain Structure	-	-
Schematic	Power Supply	40	PWR 1/2
P.C. Layout	Power Supply	41	PWR 1
Parts Layout	Power Supply	42	PWR 2
Parts List	Power Supply	43-46	(4 Pages)
P.C. Layout	Power Supply Interface	47	PSC 1
-	(No Separate Schematic for this Board)	-	-
Parts List	Power Supply Interface	48	(1 Page)
Schematic	Mic Pre-Amp	49	MA 1
P.C. Layout	Mic Pre-Amp	50	MA 1
Parts List	Mic Pre-Amp	51	(1 Page)

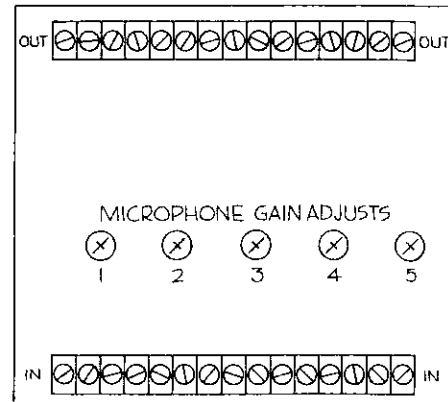
<u>TYPE</u>		<u>PAGE</u>	<u>DRAWING NUMBER</u>
VII. Schematics/Parts Layouts/Parts Lists CONTINUED			
Schematic	Input Plug-In	52	IS 1
P.C. Layout	Input Plug-In	53	IS 1
Parts List	Input Plug-In	54-56	(3 Pages)
Schematic	Control Board	57	CB 1A
P.C. Layout	Control Board	58	CB 1A
Parts List	Control Board	59/60	(2 Pages)
Schematic	Input Mother Board	61	IM 1
P.C. Layout	Input Mother Board	62	IM 1
Parts List	Input Mother Board	63/64	(2 Pages)
Schematic	Line Amp Plug-In	65	LA 1
P.C. Layout	Line Amp Plug-In	66	LA 1
Parts List	Line Amp Plug-In	67/68	(2 Pages)
Schematic	Line Amp Mother Board	69	LM 1
P.C. Layout	Line Amp Mother Board	70	LM 1
Parts List	Line Amp Mother Board	71	(1 Page)
Schematic	Monitor Amp Plug-In	72	MON
P.C. Layout	Monitor Amp Plug-In	73	MON
Parts List	Monitor Amp Plug-In	74-76	(3 Pages)
Schematic	Headphone Amp Plug-In	77	HPA
P.C. Layout	Headphone Amp Plug-In	78	HPA
Parts List	Headphone Amp Plug-In	79/80	(2 Pages)
Schematic	Headphone/Monitor Mother Board	81	HMM 1
P.C. Layout	Headphone/Monitor Mother Board	82	HMM 1
Parts List	Headphone/Monitor Mother Board	83	(1 Page)
Schematic	Headphone/Monitor Control Board	84	HPMC
-	(No Separate Parts Layout or Parts List for this Board)		
Schematic	Cue Amp	85	QA 1
P.C. Layout	Cue Amp	86	QA 1
Parts List	Cue Amp	87	(1 Page)
Schematic	Auxiliary Selector Control Board	88	AS 1
P.C. Layout	Auxiliary Selector Control Board	89	AS 1
Parts List	Auxiliary Selector Control Board	90	(1 Page)

<u>TYPE</u>		<u>PAGE</u>	<u>DRAWING NUMBER</u>
VII. Schematics/Parts Layouts/Parts Lists CONTINUED			
Schematic	Bar Graph Meter -- Display Board	91	VM 1
P.C. Layout	Bar Graph Meter -- Display Board	92	VM 1
Schematic	Bar Graph Meter -- Signal Board	93	VM 2
P.C. Layout	Bar Graph Meter -- Signal Board	94	VM 2
Parts List	Bar Graph Meter -- Display and Signal Board	95-97	(3 Pages)
Schematic	Clock -- Display and Signal Board	98	CLK 1/2
P.C. Layout	Clock -- Signal Board	99	CLK 1
P.C. Layout	Clock -- Display Board	100	CLK 2
Parts List	Clock -- Display and Signal Board	101/102	(2 Pages)
Schematic	Timer -- Display and Signal Board	103	CLK 1/2
P.C. Layout	Timer -- Signal Board	104	CLK 1
P.C. Layout	Timer -- Display Board	105	CLK 2
Parts List	Timer -- Display and Signal Board	106/107	(2 Pages)
Parts List	Mechanical Parts	108/109	(2 Pages)
VIII. Engineering Notes			
	Specifications		
	Warranty/Repair Policy		
	Using Active-Balanced Circuitry		
	RFI Shielding		
	Remote Start Interface (Optional Accessory)		

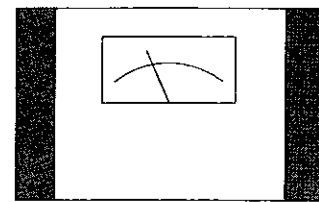
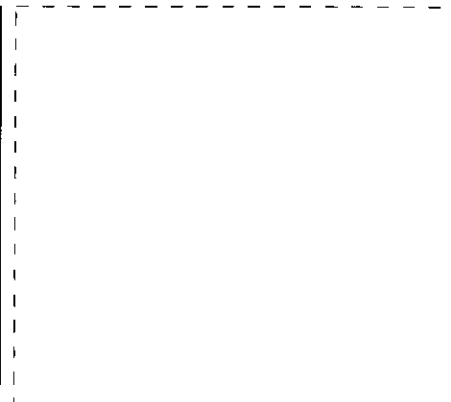
Internal Control Layout



MICROPHONE PRE-AMPS

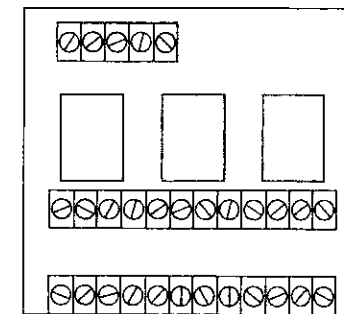


OPTIONAL MICROPHONE PRE-AMPS

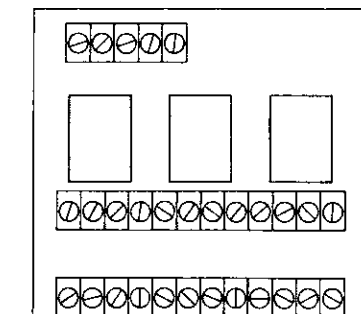


SET-UP METER

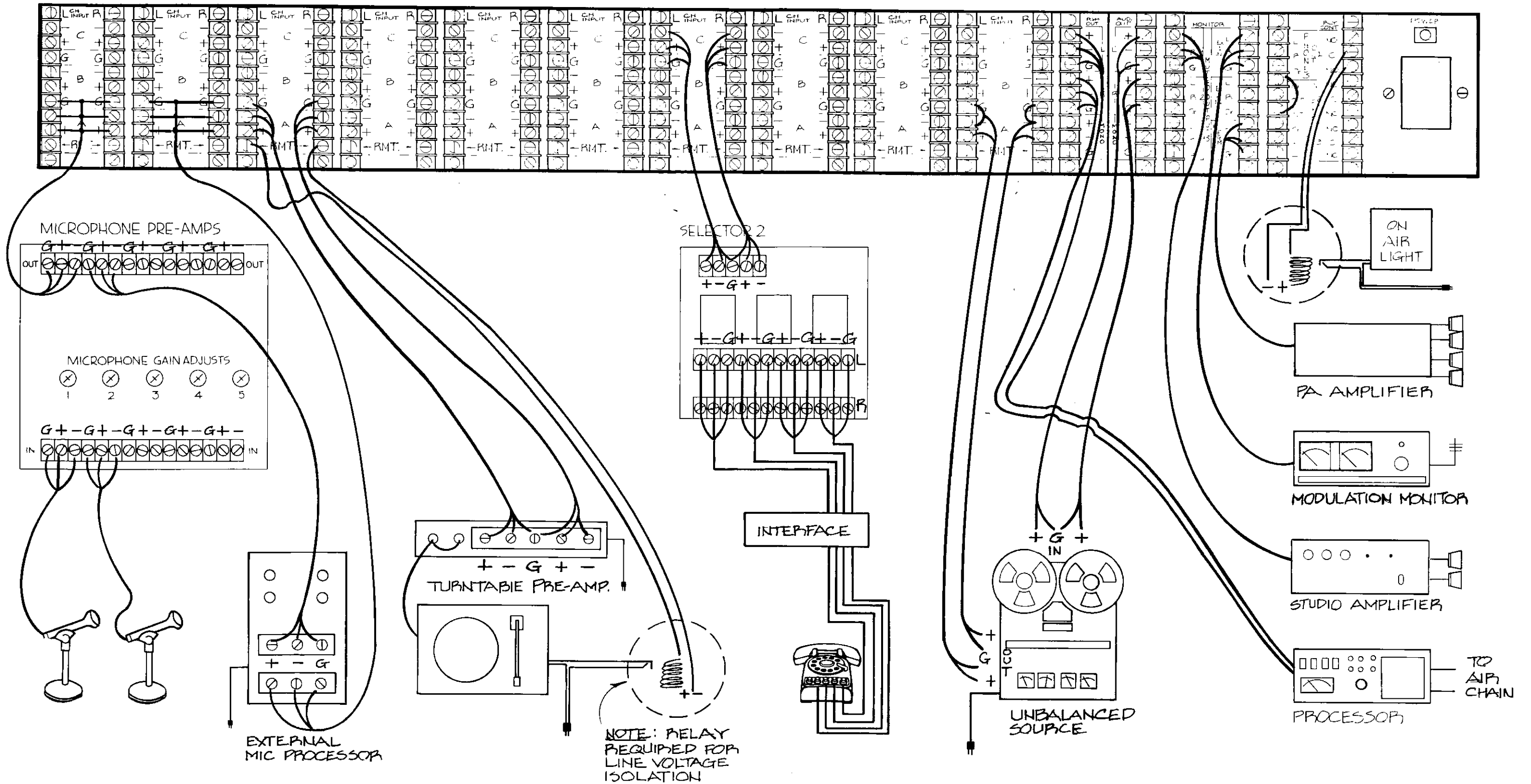
SELECTOR 1



SELECTOR 2



Equipment Interconnections



LEVEL REFERENCE GUIDE

	Input Impedance	Int Level Adj.	Nominal Level	Max Level	Bal- anced
line inputs	10k	yes	0 dbm	+30 dbm	yes
line inputs (gain straps out)	10k	yes	-20 dbm	+30 dbm	yes
mic inputs	236	yes	-50 dbv	-25 dbv	yes
external inputs	4.7k	yes	1 V	30 V	no

	Output Impedance	Int Level Adj.	Nominal Level	Max Level	Bal- anced
program outputs	200	yes	+8 dbm	+25 dbm	yes
audition outputs	200	yes	+8 dbm	+25 dbm	yes
mono inputs	200	yes	+8 dbm	+25 dbm	yes
mic pre-amp output	200	yes	0 dbm	+25 dbm	yes
monitor outputs	330	muted	1 V	10V RMS	no
fixed program out.	10k	no	1 V	10V RMS	no
headphones	47		load dependent	12V .4W	no

	Maximum Voltage	Maximum Current	Maximum Wattage
remote start contacts	50 VDC	300 MA	10W
muting contacts	48 VDC	1 AMP	24W

INSTALLATION AND WIRING

10.00 Console Placement

Because neither ventilation, nor access to the rear is required, the console may be placed in any convenient operating position. Opening the lid provides access to all operational components and connection points. The lid requires no rear clearance.

10.01 The console mounts on any sturdy table, with no large table cut-outs required. After placing the console to determine proper location, mark the cable slots through the chassis bottom plate on the table surface. The slots include up to four oval holes for input and output wiring, one rectangular hole for the power supply cable and several round holes, which can be used, if desired, for mic and external input cables. After drilling holes, replace the console in position and secure with two screws through the two holes provided in the front of the chassis bottom plate.

10.02 Power Supply

All console operating voltages are provided by an external rack mounted supply, which can also be placed on a shelf or floor near the console. Ten feet of connectorized cable is provided. Longer lengths, up to 20 feet total, may be added or ordered from the factory.

10.03 The unit contains five supplies which operate different console functions. These are:

Clock Supply 14 VDC and 14 VAC for the clock and timer.

B Supply ± 18 VDC for the main audio section.

C Supply ± 12 VDC (unregulated) for the muting relays and cue amp.

D Supply +6.25 VDC for audio and digital control circuits.

M Supply +3.8 VDC (factory set) for the LED meters.

10-04 Power supply front panel fuses protect B, C, D, and M voltages as well as both the switched and unswitched AC line inputs. LED lamps, wired after the fuses, indicate supply status.

10-05 The internal console on/off switch activates a relay in the power supply which controls all voltages except the clock supply. The clock and timer keep running, and hold their time sets if the console is turned off. A toggle switch inside the power supply activates the on/off relay for service when the supply is not connected to the console.

10-06 If the studio is not run full time, and the console is de-activated by switching the AC supply, a separate, full-time AC circuit may be provided to power the clock and timer. Wire the AC cable through the hole provided in the rear of the power supply box. Break the jumpers between terminals 1 and 5 and terminals 2 and 3 on the rear terminal strip and connect the AC line to terminals 1 and 2. Refer to parts layout drawing #PPW-2 for a pictorial of these connections.

10-07 For RFI protection, and to minimize ground loops, a single point ground system is employed in the console wiring. This ground is reference for all audio circuits and is tied to both console and power supply chassis. It can be accessed at the stud on the rear of the power supply and should be tied from this point only to the station ground.

10-08 Mic Inputs

The console employs a unique and simple method of connecting mics directly to any console input, or through external processing equipment. This is accomplished by wiring mic level lines first to one of the five balanced mic pre-amp inputs (an additional 5 are available as an option) on the mic pre-amp board on the left side of the console chassis base. These pre-amplifiers boost the mic signals to line level outputs. The balanced outputs are then manually wired to any console input in the same manner as other line-level inputs. No terminating resistor is required when wiring a mic pre-amp output directly to a console line input.

To isolate mic and line level cables, mic lines should be brought into the console through the designated hole, located in front of the mic pre-amp.

10-09 Because the mic pre-amp outputs are balanced and at line level, they can be wired through patch panels or external processing equipment before being connected to a console input.

10-10 Stereo mic sources can be created by using two of the available mic pre-amps. Single mic sources can be wired to feed both left and right channels by simply paralleling the mic pre-amp output into a channel left and right input.

10-11 Line Level Sources

Balanced line level inputs are wired to any of the 30 console inputs. Unbalanced sources may require that the - and G terminals be strapped together on that particular input. The console utilizes active balanced circuitry which may require a different approach to system grounding than you are currently utilizing. Consult the section titled "Active Balanced Circuitry" in the "Engineering Notes" section of the manual for more information. Note that for mono sources, the left and right inputs must be connected together. This will not load down a source since they are 10k inputs.

10-12 Auxiliary Switchers

Two banks of auxiliary 4 position switchers are provided for additional signal routing control. These passive, bi-directional, relay controlled, circuits are located on the right side of the console chassis base, and controlled by push buttons on the console surface. Inputs and outputs must be manually wired to the appropriate sources.

10-13 A switcher can be used as an input selector by wiring up to four sources to the input side of the circuit board and connecting the common to any console input. One typical application would be to select between four phone lines, while utilizing only one console input. It is not recommended that mic level signals be applied to these switchers.

10-14 A switcher can be used as an output director by wiring up to four feeds to the input side of the switcher board and connecting the common to the input of a tape machine or other send. One typical application would be to switch a tape recorder input between "program", "audition" and other external inputs.

10-15 External Inputs

Two stereo, high impedance, unbalanced external inputs are provided for signal monitoring. These inputs provide a load of no less than 4.7k ohms. Both inputs can be displayed on the auxiliary meter and selected as sources on the main monitoring circuit. Only external input #1 can be monitored in the headphones. These inputs are intended mainly as air-signal monitors, to be connected to the output of a modulation monitor, or other receiver. Level trims for these inputs are located by the monitor plug-in card.

10-16 Internal Oscillator

A 1000 Hz tone is included as a test source and signal generator. Its output is balanced, and the level, while adjustable, is factory set to give .78V rms into a bridging load. The oscillator circuitry, level control and on/off switch are located on the monitor plug in circuit board.

The output of the oscillator appears on the main connector bulkhead. It can be permanently wired into any console input, wired to a patch panel, or used only during set up and test.

10-17 Program and Audition Outputs

Both output circuits provide identical stereo performance. Connections, located on the main connector bulkhead, are available for balanced, left and right channel outputs, and a summed mono feed. Level controls, located on the program and audition plug-in cards, attenuate all output levels. Outputs are low impedance, line level, but can

operate into any load greater than 600 ohms. If connected to unbalanced feeds, do not tie the "-" and "G" screws together. Rather, connect the source to the "+" and "G" terminals and leave the "-" terminal unused. For more information on active balanced circuits, see the pages titled "Active Balanced Circuitry", in the "Engineering Notes" section of this manual.

If it is necessary to use an output transformer, a Jensen 123-CL from Jensen Transformers in Hollywood, CA, is suggested.

10-18

An unbalanced, high impedance, isolated output is available for the program channel only. This "fixed program" output is intended for connection to the station PA amplifier, telephone music-on-hold or other source that needs an air signal feed. This source must have its own input attenuator, since the feed does not have a dedicated trim pot, and should have a source impedance of greater than 5k ohms.

10-19

Muting Relays

Three internal relays can be randomly assigned to activate when any console input is switched on. A relay will energize if its buss has been strapped to a particular input switch at the control card (see the "Programming" section for connection information), if that input button has been depressed, and if the channel is in the "on" position.

Each three pole relay has a factory wired monitor send switched through two sets of contacts. Mute buss 1 also controls muting of the cue speaker, and is therefore intended to be activated by the input(s) assigned to the control room mic(s).

10-20 Auxiliary Relay Contacts

One set of normally closed and normally open contacts are brought out to the connector bulkhead for each of the three muting relays.

These contacts can be utilized to control on-air lights and speaker muting circuits. 110V AC circuits should be isolated through an outboard relay and not connected directly to these contacts.

10-21 Remote Start Contacts

A set of normally open relay contacts appear below the input connections for each channel. These contacts close when the channel is activated only if input "A" for that channel is selected. They can be utilized to automatically, remotely activate any machine whose output is connected to an "A" console input.

The contacts can be programmed to provide momentary or holding operation. Refer to the "Programming" section for more information.

The contacts are rated at 300 MA, at 50V (10 watts maximum).

10-22 Monitor Outputs

The console contains no internal monitor amplifier. Three, unbalanced, stereo monitor sends are provided - each switched by one of the console muting circuits. These sends follow the monitor selector switch on the console front panel. The front panel volume control affects #1 output only.

Individually muted sends may be wired to separate amplifiers for studios where live mics are used. An alternative to separate amplifiers is to keep one send unmuted and switch speaker feeds with the auxiliary muting relay contacts provided.

10-23 Headphones

An internal headphone amplifier provides drive for high impedance and 8 ohm phones. Input source selection is via front panel push-buttons.

A trim pot on the headphone plug-in card, sets the nominal operating level.

10-24 Cue Circuitry

An internal cue amplifier and speaker are mounted on the console front panel. Any input can be switched to the cue circuit via the detent position of the channel fader, channel cue switch, or channel on/off switch. Consult the "Programming" sections for details on activating individual or combinations of these cue-control options.

An external, 8 ohm, cue speaker may be connected to the cue "G" and "out" terminals on the connector bulkhead. When doing so, disconnect the jumper to the internal cue speaker terminal. Do not attempt to operate two cue speakers simultaneously.

CALIBRATION AND LEVEL SET

12.00 The ESA-10 console is equipped to allow the user to precisely measure and control every important operating signal level. By accessing each individual input and output and setting optimum operating levels, it is possible to maximize the console headroom, signal to noise ratio, and minimize distortion components. Each of the following console set-up procedures should be done carefully.

12.01 Set-Up Meter

 The internal set-up meter is provided to facilitate level set-up by providing a level reference for console performance. Calibrated test equipment can be substituted for even greater accuracy.

 The meter has true VU ballistics and is calibrated so that 0 VU = 2V RMS, the ideal attenuator drive level in the ESA-10. The meter can be used with test tones or program material. When using program material, the meter should average 0 VU with occasional +3 peaks.

 The meter can be used to check and calibrate individual channel inputs by clipping onto the input card test points, to check mic levels at the output of the mic pre-amp card, or to check and trim output levels by clipping onto various output connectors.

12.02 Line Level Inputs Calibration

Connect the test meter to the "G" and right or left test point of the input card being calibrated.

The front panel slide attenuators do not affect level at the test points, however, the channel front panel on/off switch must be on.

Select the input being calibrated on the corresponding front panel input push buttons.

Repeat the calibration procedures described in the following paragraphs with the test meter clipped to the other input stereo channel, to each input, and to every console channel.

12.03 Nominal input level is .78V RMS. With the input trim pots wide open (fully CW) a .78V RMS input signal will cause 0 VU reading on the set-up meter. Sources with output levels of approximately .78V RMS, and containing their own output attenuators, should be connected to inputs with the trim pots fully CW and adjusted at the source to give 0 db reading on the set-up meter.

Sources with outputs higher than .78V RMS and no individual output gain adjust should be connected to a console input and the console input trim pot adjusted CCW to provide 0 db on the set-up meter.

12.04 For sources with outputs lower than .78V RMS, the gain of the card can be increased by 20 db by cutting the 4 gain straps for that individual card. Refer to illustration 12A, at the end of this section, for the location of these straps on the foil side of each plug-in input card. This increases

sensitivity for all three inputs connected to that channel. Follow the same procedure outlined above for adjusting individual input levels. The nominal input sensitivity of the input card with the gain strap cut is .078V RMS.

12.05 Mic Level Input Calibration

Mic level signals must first be brought through a mic pre-amp for amplification to line level (consult the "Installation" section for more information).

12.06 When connecting mics to inputs with normal gain (gain straps in place), connect the test meter as described above and set the channel input gain trims for minimum attenuation (fully CW). Then adjust the corresponding mic pre-amp attenuator for 0 VU reading on the set-up meter.

12.07 When connecting mics to input channels with increased gain (gain straps out) the mic pre-amp output should first be established at approximately .78V RMS. Input trim pots should then be adjusted for 0 VU on the set-up meter.

12.08 If the mic pre-amp output is to be "looped through" external processing equipment, adjust the mic pre-amp input attenuator for the proper input level for that piece of equipment.

12.09 Output Level Adjustment

To preserve console headroom, an output level of +8 dbm into 600 ohms, or 2V RMS is suggested. To calibrate the output level, connect the set-up meter to the Program or Audition, left, right or mono output. Using a properly pre-calibrated input with the front panel slide attenuator set to the -15 db mark, adjust the line amp plug in card trim pots to

set 0 VU on the test meter. While this adjustment is being made, make sure that the output is terminated into the load it will be feeding, as output loading will effect the level. If a level other than +8 dbm is desired, adjust trim pots to that level.

12.10 LED Meter Calibration

Each console meter has three adjustments, which should be made using a tone generator after all other console level adjustments have been completed. Refer to illustration 12B, at the end of this section, for the location of all of the variable meter controls on the rear of each meter.

12.11 To set meter sensitivity, connect the internal tone generator (or other sine wave source) to a console left and right input with channel attenuator set at the -15 db mark. Use a calibrated meter to determine that the line outputs are at the desired level. Set the meter response mode switch for VU.

Adjust the left and right sensitivity controls to light the last yellow LED, for 0 VU reading.

12.12 To set the peak flasher, first determine what level above 0 db you want the flasher to indicate. This will depend on overall system headroom, and/or processing. However, between 10 db and 14 db is generally practical. Increase the tone level by this amount, as indicated on the external meter monitoring output level. The bar graph meter should "peg".

Set the peak indicator threshold control to just light the peak indicator LED on the back of the meter. This LED is provided because unlike the peak lamp on the front of the meter, it has no holding function - enabling more accurate calibration.