

LSM-10



Line Selector & Monitor

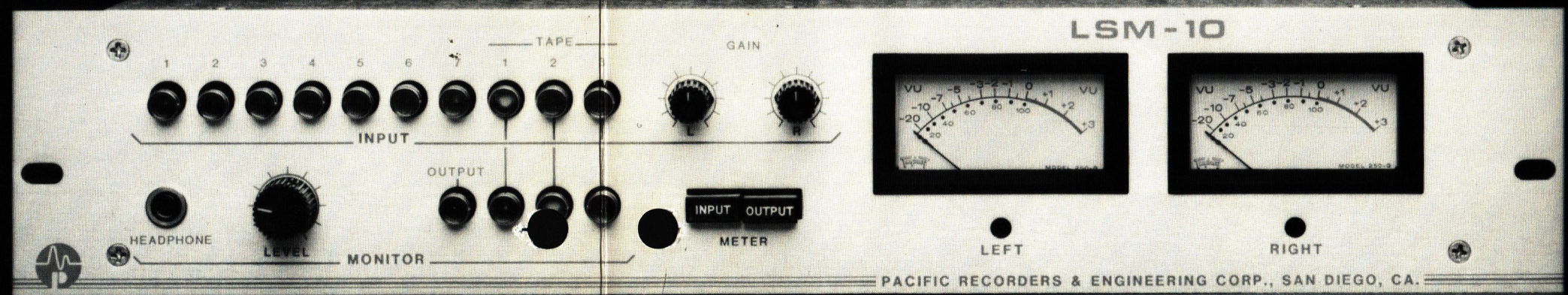
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Technical Manual



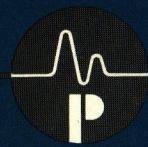
PACIFIC RECORDERS & ENGINEERING CORPORATION

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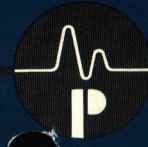
LSM-10

LINE SELECTOR MODULE



PACIFIC RECORDERS & ENGINEERING CORPORATION
2070 Las Palmas Drive - Carlsbad, CA 92008 - 619-438-3911 - Telex: 181777

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THE LSM-10 LINE SELECTOR MODULE

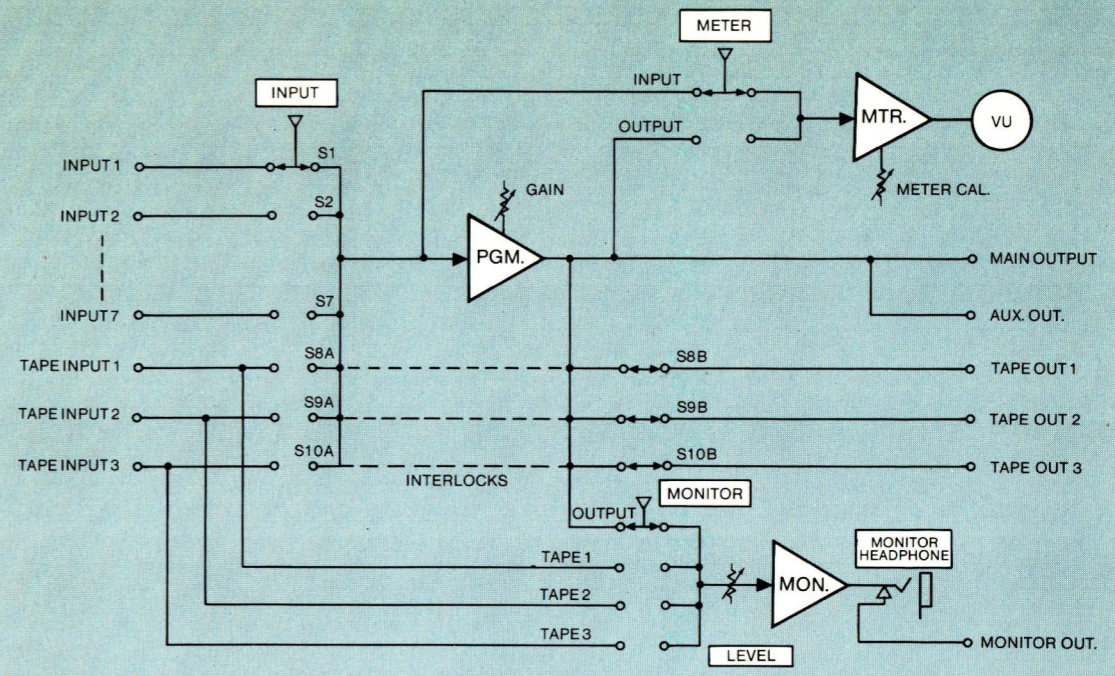
FEATURES: ■ 10 SELECTABLE STEREO INPUTS ■ MAIN AND AUXILIARY OUTPUTS PLUS 3 RECORDING OUTPUTS ■ STEREO GAIN RANGE CONTROLS ■ SELECTABLE INPUT/OUTPUT METERING ■ SELECTABLE MONITORING OF MAIN OUTPUT AND 3 TAPE RETURNS ■ INDEPENDENT MONITOR WITH LEVEL CONTROL ■ RECORD/PLAYBACK FEEDBACK LOCKOUT

The LSM-10 Line Selector Module allows production, newsroom and recording personnel to select any of 10 line-level signal sources (including three tape machines) for monitoring, metering and recording. This stereo unit is based upon a program amplifier preceded by a source-selector switch, to which monitoring and metering circuitry has been added. The program amplifier output is routed to a series of connectors on the rear of the unit: a main output, an auxiliary output and a set of outputs to three tape recorders. The source-selector switch is configured so that when a tape machine is selected as the source, the output line to that tape recorder is interrupted, preventing the possibility of feedback. The program amplifier has a front-panel gain-trim control.

The monitoring amplifier, with headphone-driving capability, allows monitoring of the output of any of the three tape machines or of the program amplifier, all independent of the source-selector switch. The monitoring amplifier gain is adjustable with a front-panel level control. Its output appears at the front-panel head-phone jack which is normalled-through to a rear-panel connector, for possible application to an external power amplifier.

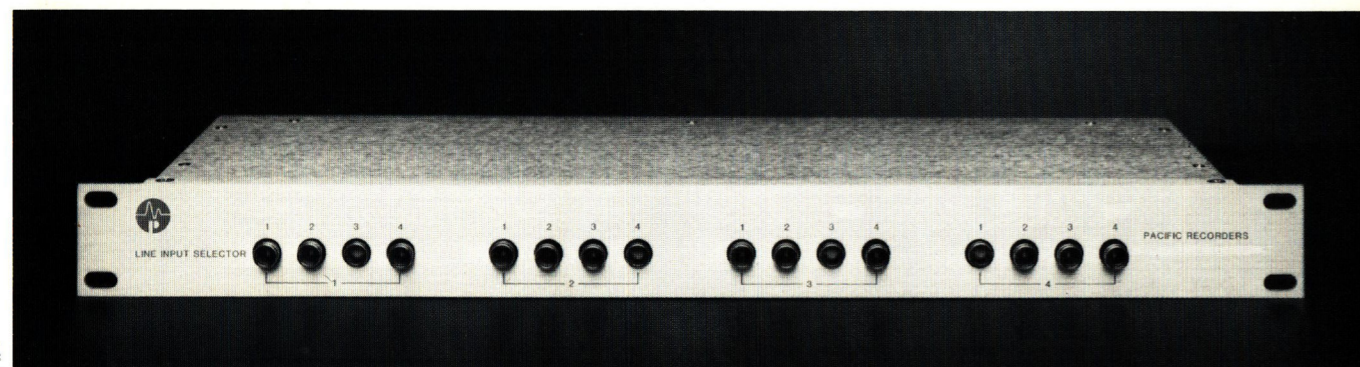
The VU meters are driven by buffer amplifiers and are front-panel switchable to allow level measurement of either the selected source or the program amplifier output.

LSM-10 Functional Block Diagram



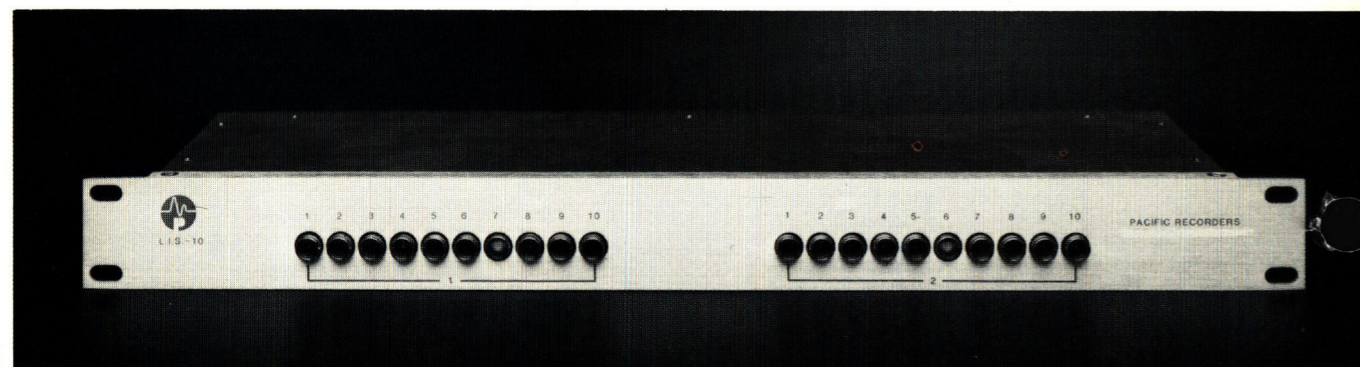
- NOTES:**
1. Left Channel only is shown.
 2. PANEL Control
 3. Power supply not shown
 4. When a Tape Input is chosen, the corresponding Tape Output Line is opened

LS-4 and LS-10 LINE SWITCHERS



LS-4

Also available are two passive switching systems. The LS-4 is a set of four 4-input by 1-output stereo switches. The inputs are all isolated; a total of sixteen inputs can be accommodated. The LS-10 is a pair of 10-input by 1-output stereo switches. The inputs are connected in parallel on the LS-10.



LS-10

LSM-10 TECHNICAL SPECIFICATIONS

Nominal Input Signal Levels: +4 to +8 dBu; see notes

Gain Adjustment & Range: -2 to +24 dB

Source Impedance: 600 ohms or less, balanced or unbalanced

Input Impedance: Program amplifier: 50K ohms line-to-line, balanced, instrumentation input amplifiers
Monitor Amplifier: as above
Metering Amplifier: 60K ohms

Common-mode Rejection: Program Amplifier: better than 50 dB, 20 Hz to 20 kHz (60 dB typical)
Monitor Amplifier: better than 40 dB, 20 Hz to 20 kHz (55 dB typical)

Output Level: Program Amplifier: +8 dBu nominal; clip point is +29 dBm into 600 ohm load
Monitor Amplifier: +8 dBu nominal; clip point is +21 dBm into 600-ohm load

Output Source Impedance: Program Amplifier: Less than 100 ohms, balanced, floating, transformer-coupled
Monitor Amplifier: Less than 40 ohms unbalanced

Output Load Impedance: 600 ohms or greater

Frequency Response: +0, -0.6 dB, 20 Hz to 20 kHz

Signal to Noise Ratio: Better than 90 dB with +8 dBu test tone, 20 Hz to 30 kHz bandwidth

Harmonic Distortion: Program Amplifier: better than 0.01% at +29 dBm into 600 ohm load, 1 kHz; better than 0.03% at +29 dBm into 600 ohm load, 50 Hz to 20 kHz;
Monitor Amplifier: less than 0.01% at +21 dBm into 600 ohm load, 20 Hz to 20 kHz

Intermodulation Distortion: Less than 0.005%, +8 to +29 dBm into 600 ohm load, SMPTE (60/7000 Hz)

Crosstalk: Better than 85 dB, 20 Hz to 20 kHz

Power Requirements: 120 VAC, 50/60 Hz, 10 watts

Size: 19" wide, 3.5" high, 10" deep

Weight: 10 pounds; 20 pounds domestic shipping

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Notes:

1. These specifications are subject to change without prior notice.
2. 0 dBu corresponds to an amplitude of 0.775 V RMS regardless of impedance. It is the same as 0 dBm if the impedance of the circuit under discussion is 600 ohms. It may be considered 0 dBm (enabling convenient measurement with meters calibrated for a 600 ohm circuit) if the circuit impedance is simply disregarded.
3. The program amplifier and metering amplifiers in the LSM-10 have adjustable gain, enabling operations on either +4 dBu or +8 dBu systems.

LSM-10

Line Selector & Monitor



Pacific Recorders & Engineering Corporation
2070 Las Palmas Drive
Carlsbad, California 92008

June 1983

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1. INTRODUCTION

The LSM-10 Line Selector Module allows production, newsroom and recording personnel to select any of 10 line-level signal sources (including three tape machines) for monitoring, metering and recording. This stereo unit is based upon a program amplifier preceded by a source-selector switch, to which monitoring and metering circuitry has been added. The program amplifier output is routed to a series of connectors on the rear of the unit: a main output, an auxiliary output and a set of outputs to three tape recorders. The source-selector switch is configured so that when a tape machine is selected as the source, the output line to that tape recorder is interrupted, preventing the possibility of feedback. The program amplifier has a front-panel gain-trim control.

The monitoring amplifier, with headphone-driving capability, allows monitoring of the output of any of the three tape machines or of the program amplifier, all independent of the source-selector switch. The monitoring amplifier level is adjustable with a front-panel level control. Its output appears at the front-panel head-phone jack which is normalled-through to a rear-panel connector, for possible application to an external power amplifier.

The VU meters are driven by buffer amplifiers and are front-panel switchable to allow level measurement of either the selected source or the program amplifier output.

2. SPECIFICATIONS

Nominal Input Signal Level	+4 to +8 dBu; see notes
Gain Adjustment Range	-2 to +24 dB
Source Impedance	600 ohms or less, balanced or unbalanced
Input Impedance	Program amplifier: 50K ohms line-to-line, balanced, instrumentation input amplifiers Monitor amplifier: as above Metering amplifier: 60K ohms
Common-mode Rejection	Program amplifier: better than 50 dB, 20 Hz to 20 kHz (60 dB typical); Monitor amplifier: better than 40 dB, 20 Hz to 20 kHz (55 dB typical)
Output Level	Program amplifier: +8 dBu nominal; clip point is +29 dBm into 600 ohm load; Monitor amplifier: +8 dBu nominal; clip point is +21 dBm into 600 ohm load
Output Source Impedance	Program amplifier: Less than 100 ohms, balanced, floating, transformer-coupled Monitor amplifier: Less than 40 ohms, unbalanced
Output Load Impedance	600 ohms or greater
Frequency Response	+0, -0.6 dB, 20 Hz to 20 kHz
Signal to Noise Ratio	Better than 90 dB with +8 dBu test tone, 20 Hz to 30 kHz bandwidth
Harmonic Distortion	Program amplifier: better than 0.005% at +29 dBm into 600 ohm load, 1 kHz; better than 0.05% at +29 dBm into 600 ohm load, 50 Hz to 20 kHz; Monitor amplifier: Less than 0.006% at +21 dBm into 600 ohm load, 20 Hz to 20 kHz
Intermodulation Distortion	Less than 0.005%, +8 to +29 dBm into 600 ohm load, SMPTE (60/7000 Hz)

Power Requirements	120 VAC, 50/60 Hz, 10 watts
Size	19" wide, 1.75" high, 10" deep
Weight	10 pounds; 20 pounds domestic shipping

Notes:

1. These specifications are subject to change without prior notice.
2. 0 dB_u corresponds to an amplitude of 0.775 V RMS regardless of impedance. It is the same as 0 dB_m if the impedance of the circuit under discussion is 600 ohms. It may be considered 0 dB_m (enabling convenient measurement with meters calibrated for a 600 ohm circuit) if the circuit impedance is simply disregarded.
3. The program amplifier and metering amplifiers in the LSM-10 have adjustable gain, enabling operation on either +4 dB_u or +8 dB_u systems.

3. WARRANTY

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

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

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

D) This warranty is void for equipment which has been subject to abuse, improper installation, improper application, 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 the environmental conditions specified by Seller.

E) 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; and seller shall not be liable or responsible for any business loss or interruption, or any other consequential damages of any nature whatsoever, resulting from any equipment failure or breach of this warranty.

4. INSTALLATION

4.1 Unpacking

The LSM-10 should be carefully unpacked and inspected for any shipping damage. Keep all packing material in case a claim is to be made against the carrier for damages. Should the inspection reveal any damage, immediately file a claim with the carrier.

Remove the top cover and check that the various plug-in components are seated and that no components have been shocked out of place in shipping. The top cover should then be re-installed. If it is considered likely that the VU meters will be re-calibrated, then the cover can be left off temporarily. There are no other adjustments which might be made.

4.2 Location

The LSM-10 occupies two rack-units of height (3.5") and should be installed in a rack or between rails which have been grounded, if that option exists. The unit should be located at the operator's position in the recording or production facility. The VU meters should be clearly visible and the source-selector switch should be conveniently close.

4.3 Input Connections

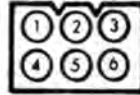
The input signals applied to the LSM-10 should be applied from a source of 600 ohms or less. The level should be about +8 dBu, although somewhat lower levels are useable. The circuitry presented to the source will be a set of instrumentation amplifiers; the program amplifier presents a line-to-line load of 50K ohms; the monitor amplifier, when it is monitoring the input, presents an additional load of 50K ohms, and the metering amplifier, when switched to measure the input, presents an additional load of 60K ohms. These figures can all be considered bridging (no-load) to a source of 600 ohms or less.

All connections to and from the unit should be made with two-conductor shielded cable.

All of the input connectors have the following format:

Pin: Name:

1 Left Shield
2 Left (Low)
3 Left (High)



4 Right Shield
5 Right (Low)
6 Right (High)

View of Molex™ connector as
seen from outside of equipment

4.4 Output Connections

The output signal from the program amplifier in the LSM-10 will normally be at +8 dBu. The internal impedance seen looking back into the program amplifier is about 100 ohms; the load should be 600 ohms or higher. The program amplifier output is transformer-coupled and floating.

The output signal from the monitor amplifier is continuously adjustable in level up to a maximum of +21 dBm into a 600 ohm load. The internal impedance seen looking back into the monitor amplifier is about 40 ohms; the load should be 600 ohms or higher. The monitor amplifier output is unbalanced and appears at the front-panel headphone jack. Should this jack be unused, then that output signal is normalled through to the monitor output connector on the rear of the unit, for application to an external power amplifier and loudspeaker(s).

Both of the XLR-type output connectors have the following format:

Pin: Name:

1 Shield
2 Low
3 High

All of the Molex™ output connectors have the following format:

Pin: Name:

1 Left Shield
2 Left (Low)
3 Left (High)

4 Right Shield
5 Right (Low)
6 Right (High)

4.5 Power Connections

The unit requires approximately 10 watts of power at 120 VAC, 50 or 60 Hz, from a power connector which has an integral ground lead.

The "third pin" on the power connector should be left intact. For safety reasons, this pin is connected to the chassis of the LSM-10 directly. Do not sever this pin, do not sever the green wire in the power cord at either end and do not use an adaptor to enable the three-prong connector to plug into an older-style two-prong outlet.

4.6 Meter Zero

Prior to actually applying power, check the VU meter mechanical zero adjustments. If necessary, zero the meters with the aid of a small screwdriver.

5. OPERATION

5.1 Introduction

The LSM-10 was designed to enable the selection, monitoring and measurement of a set of signal sources in an environment such as a newsroom or production or recording facility. One of these signal sources is chosen and is routed to a program amplifier.

The output of that program amplifier is routed to a pair of output connectors as well as to the inputs of as many as three tape recorders.

The monitoring system can select either the output of the program amplifier or the playback output of one of three tape machines. The monitoring switch operates independently of the source-selector switch. The monitoring amplifier is designed to drive headphones or an external power amplifier.

The metering system can measure either the actual level of the selected signal or the level of the program amplifier output. (The program amplifier has a front-panel gain-trim adjustment which allows as much as 25 dB of gain to be added to the input signal.)

5.2 Non-Tape Inputs

The LSM-10 accommodates a total of ten inputs; three of these are set aside specifically (but not exclusively) for tape-recorder application and are handled internally in a manner slightly different from the remaining (non-tape) inputs.

The non-tape inputs, which might be, for example, from a network feed, a two-way radio receiver, or some other remote source, are selected by the INPUT switch.* Whichever source is selected drives the program amplifier. Should the signal be lower than normal line level, its amplitude can be increased by using the front-panel GAIN control. The selected signal will appear simultaneously at the main and the auxiliary output connectors and at each of the tape output connectors.

The level of the chosen input signal can be measured by operating the METER switch to INPUT; the level of the signal after going through the program amplifier can be measured by operating the METER switch to OUTPUT.

* - In this manual, front-panel controls are indicated in CAPITALS

The non-tape signals are best monitored by operating the MONITOR switch to OUTPUT.

5.3 Tape Inputs

Three of the ten input sources are reserved primarily for the use of tape recorders. These may be reel-to-reel, cassette or cartridge types. The tape sources are handled in a manner similar to the other sources with these exceptions:

1. When a specific tape machine is selected as the source, the output drive from the program amplifier to that tape machine's recording input is interrupted. This is done to prevent feedback.
2. The monitor system can be switched to monitor a tape machine's output directly, prior to the input source-selector switch. This allows the operator to compare tape input with tape output.

Which tape input is selected is determined by the INPUT switch. The selected source drives the program amplifier. Should its level be low, it can be increased by operating the GAIN control. The selected signal will appear simultaneously at the main output connector and at the auxiliary output connector. In addition, it will appear at the inputs to the other two tape machines, useful for dubbing.

The tape signals can be monitored by operating the MONITOR switch to OUTPUT or they can be monitored by operating that switch to the appropriate TAPE (1, 2 or 3) position. The TAPE positions can be used to monitor a specific tape machine at any time, even though it is not selected as the signal source, because the monitoring connections are ahead of the source-selector switch.

The level of the chosen tape signal can be measured by operating the METER switch to INPUT; the level of the signal after going through the program amplifier can be measured by operating the METER switch to OUTPUT.

5.4 Monitoring

The monitoring system in the LSM-10 is intended to drive either a pair of headphones, 600 ohms or greater, or an external power amplifier. The volume of the monitor signal is continuously adjustable using the LEVEL control up to a maximum level of +21 dBm into a 600 ohm load. Headphones may be plugged into the front-panel MONITOR HEADPHONE connector on the LSM-10. When they are not plugged into this connector, the monitor signal is routed to the rear-panel monitor output connector.

The monitoring system will most commonly be used to monitor the output of the LSM-10, by operating the MONITOR switch to OUTPUT. However, a tape may be played and monitored by operating the MONITOR switch to the appropriate TAPE position. In this manner, a tape can be cued up or confirmed as being the proper tape prior to using it as a program source.

5.5 Metering

The metering system in the LSM-10 includes buffer amplifiers so that the meter rectifiers do not add distortion to the audio signals. The meters can be switched by using the METER switch to read either the chosen input signal level or the output of the program amplifier.

6. TECHNICAL DESCRIPTION

In the following discussions, it may be helpful to refer to the Block Diagram (Figure 1) and the schematic drawings of the Program Amplifier (Figure 2), the Monitor Amplifier (Figure 3), and the Metering Amplifier and Power Supply (Figure 4). The input source switching is shown in Figure 5 and the monitor and meter switching are shown in Figure 6.

6.1 Program Amplifier

The program amplifier is of a dual configuration for stereo. Only the left channel will be discussed, and the component designations given are for that channel. The designations of components for the right channel are the same except that they are numbered starting at 101 rather than at 1.

The source as selected by the INPUT selector switch is applied to the input differential amplifier using both halves of U1. R1 and R5, with C2 and C3, provide RF bypassing. C1 and C4 remove any DC component which may be present on the input line. R3 and R4 provide signal attenuation balanced to ground. The input amplifier has its gain set by feedback resistors R7 and R15 operating in conjunction with the series string of R8, R9 (the gain-trim pot) and R10.

The output of this first stage is applied to a subtractor using amplifier U2. Gain and common-mode rejection are determined by the ratios of resistor pairs R11 / R12 and R14 / R20. Q1 and Q2 provide current amplification for U2. The remaining components around this stage are for biasing, temperature stabilization and transient protection. The output of this stage is applied to the primary of output transformer T1. This quad-filar transformer has three of its windings connected in series-aiding to provide a voltage stepup. The transformer is wired to both the main and the auxiliary output connectors.

6.2 Monitor Amplifier

The monitor amplifier is a dual type for stereo. Only the left channel will be discussed.

The signal to be monitored, as selected by the MONITOR selector switch, is applied to an input differential amplifier using both halves of U3. R21 and R25, with C19 and C20, provide RF bypassing. C18 and C21 remove any DC component from the applied signal. This stage has its gain set by feedback resistors R27 and R33, with the series string of R28 and R29.

The output of this first stage is applied to a subtractor using U4. Gain and common-mode rejection are determined by R30 / R31 and R34 / R35. The output of U4 is applied to the monitor volume control.

The signal set by the volume control is applied to the output amplifier using U5 and associated components. As with the program amplifier, Q3 and Q4 provide current amplification and the remaining components provide biasing, stabilization and transient protection. The output of this stage is applied via C42 to the headphone jack. This jack is normalled-through to the rear-panel monitor output connector.

6.3 Metering Amplifier

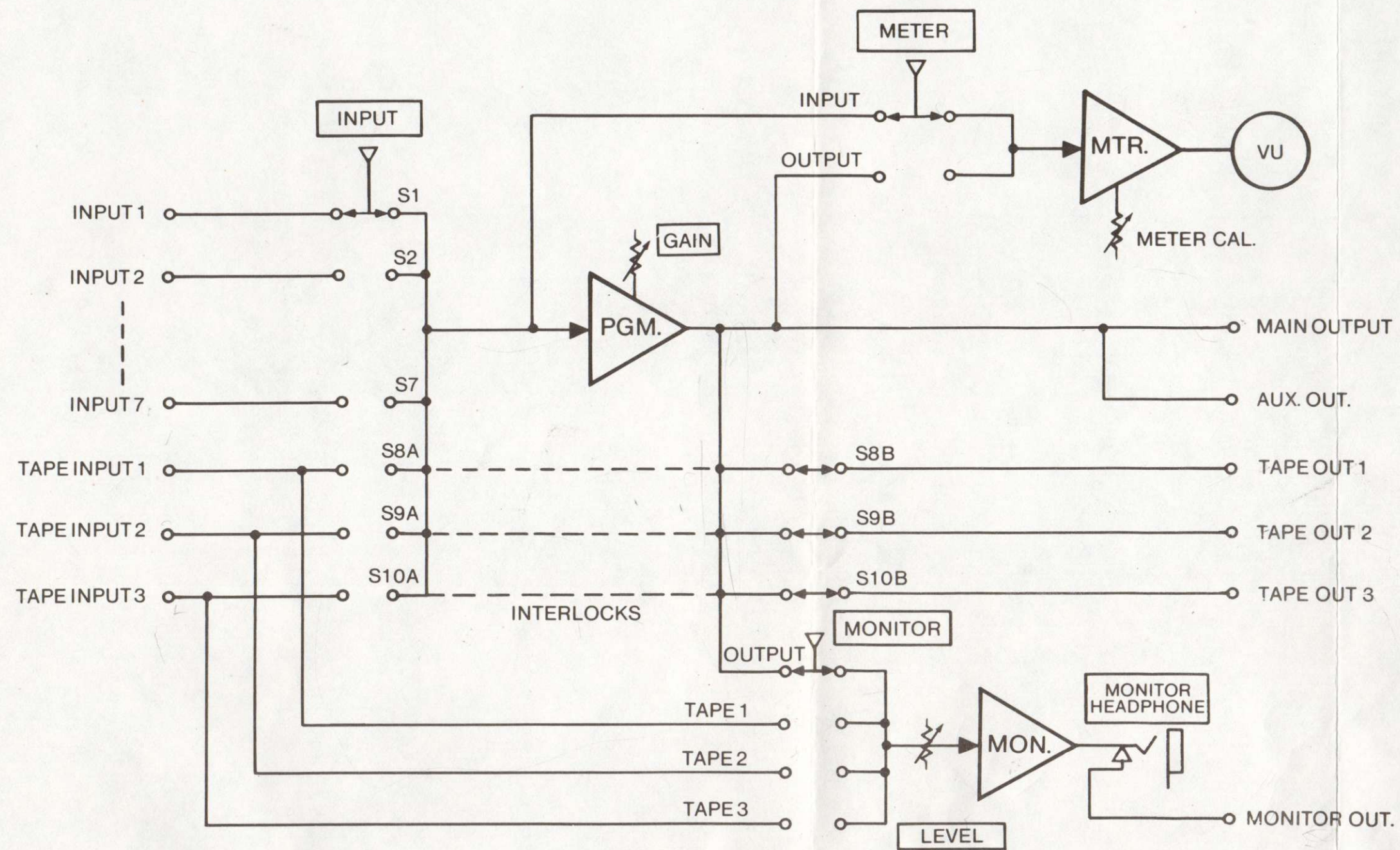
The metering amplifier is a dual circuit for stereo. Only the left channel will be discussed.

R47 and R48, with C43 and C44, provide RF bypassing. Any residual DC signals are removed by C45 and C46, with R50 and R51. The amplifier has its gain set by feedback resistors R52 and R55, operating with the R54 and R53 (the meter calibration control). The amplifier output is coupled to the VU meter by C52 and C53. The amplifier has a very low output impedance; the source as seen by the VU meter is resistor R53. Diodes DS1 and DS2 provide overload protection to the meter.

6.4 Power Supply

The LSM-10 can be operated from either 120 or from 240 VAC, at either 50 or 60 Hz. Operation from 120 VAC is accomplished by connecting the power transformer primaries in parallel, while operation from 240 VAC is accomplished by connecting the primaries in series. Refer to Figure 4 for the connections.

The transformer output is rectified by full-wave rectifier BR1 and is used to charge primary filter capacitors C54 and C58. The voltages on these capacitors are regulated to +15 volts by U7 and to -15 volts by U8. The remaining components around these regulators are for overload and failure protection and transient response improvement.



NOTES:

1. Left Channel only is shown.
2. PANEL Control
3. Power supply not shown
4. When a Tape Input is chosen, the corresponding Tape Output Line is opened

FIG 1
LSM-10 FUNCTIONAL
BLOCK DIAGRAM

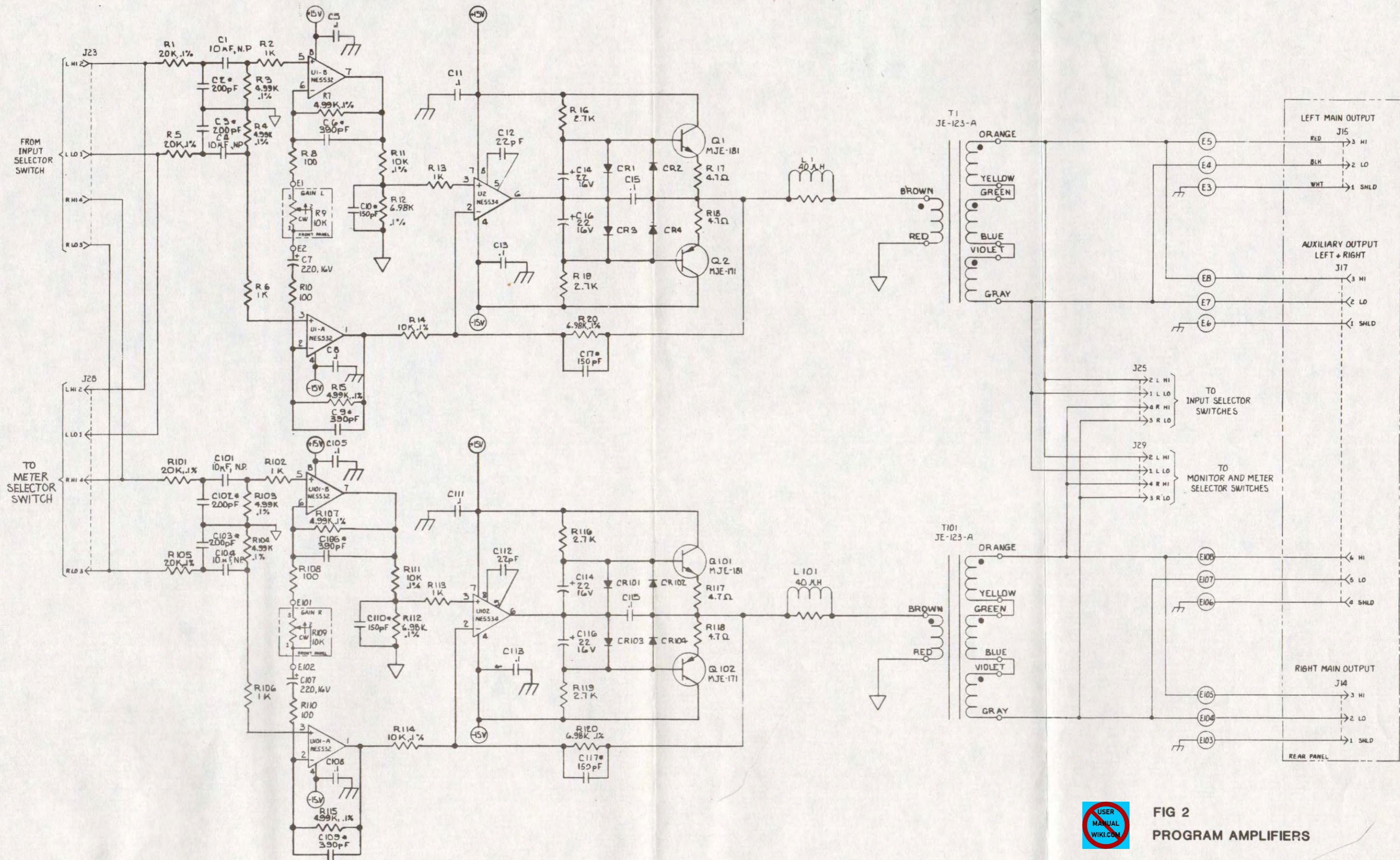
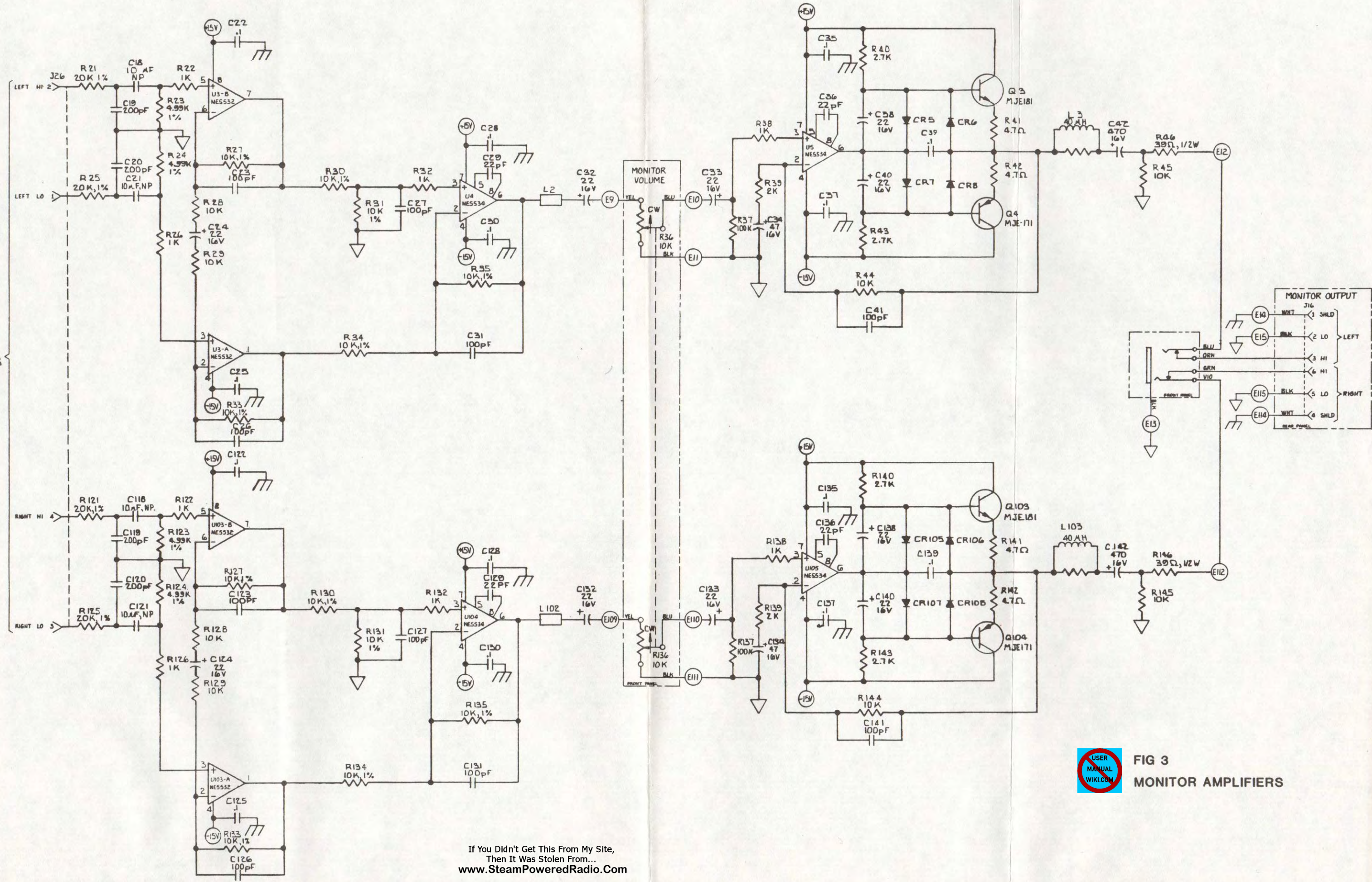


FIG 2
PROGRAM AMPLIFIERS

3. * = MATCHED PAIR CAPACITORS.
 2. CR1-B, 101-108 ARE 1N914
 1. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE 1/4W, 5%
 ALL CAPACITATORS ARE MEASURED IN MICROFARADS.
 — NOTES —

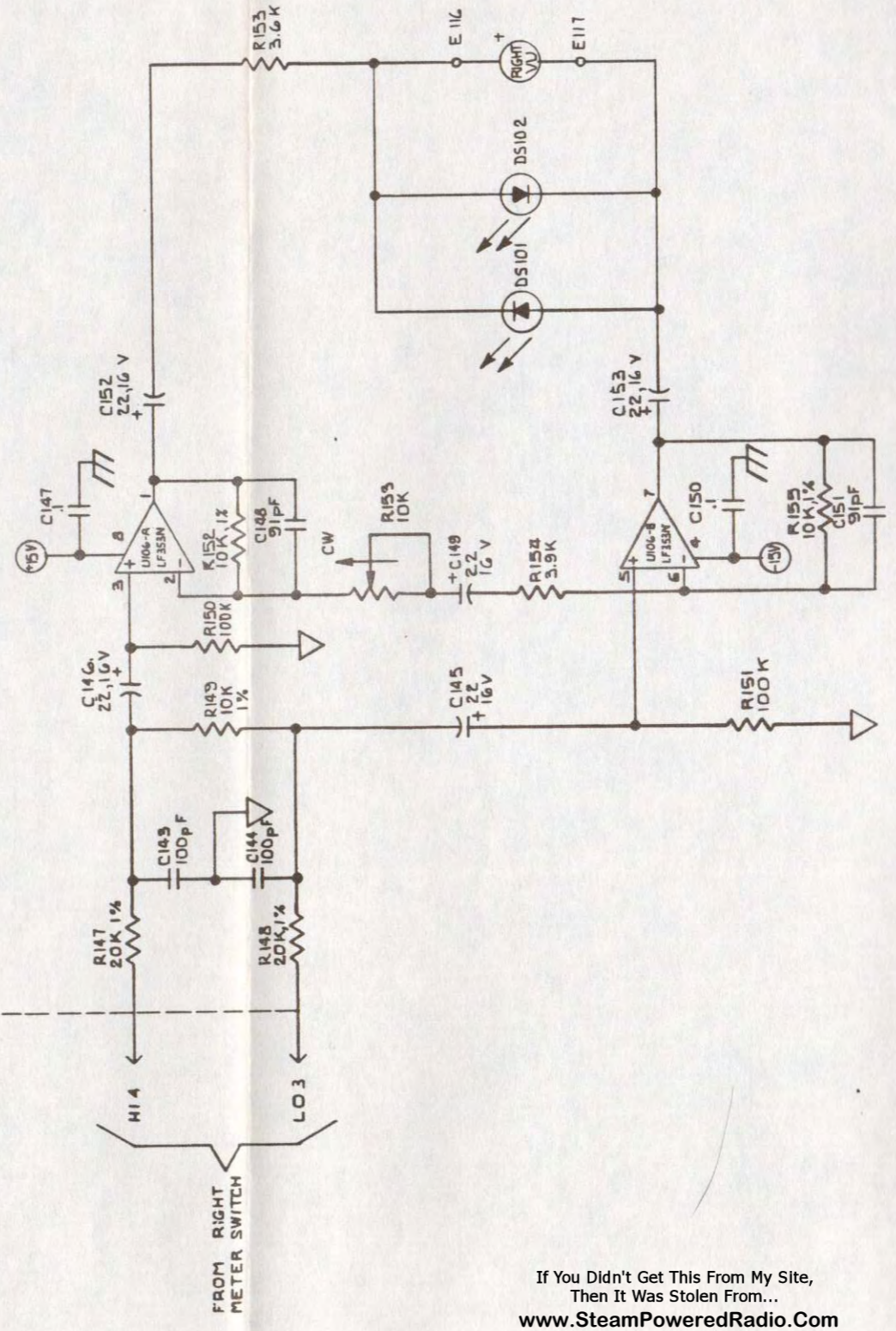
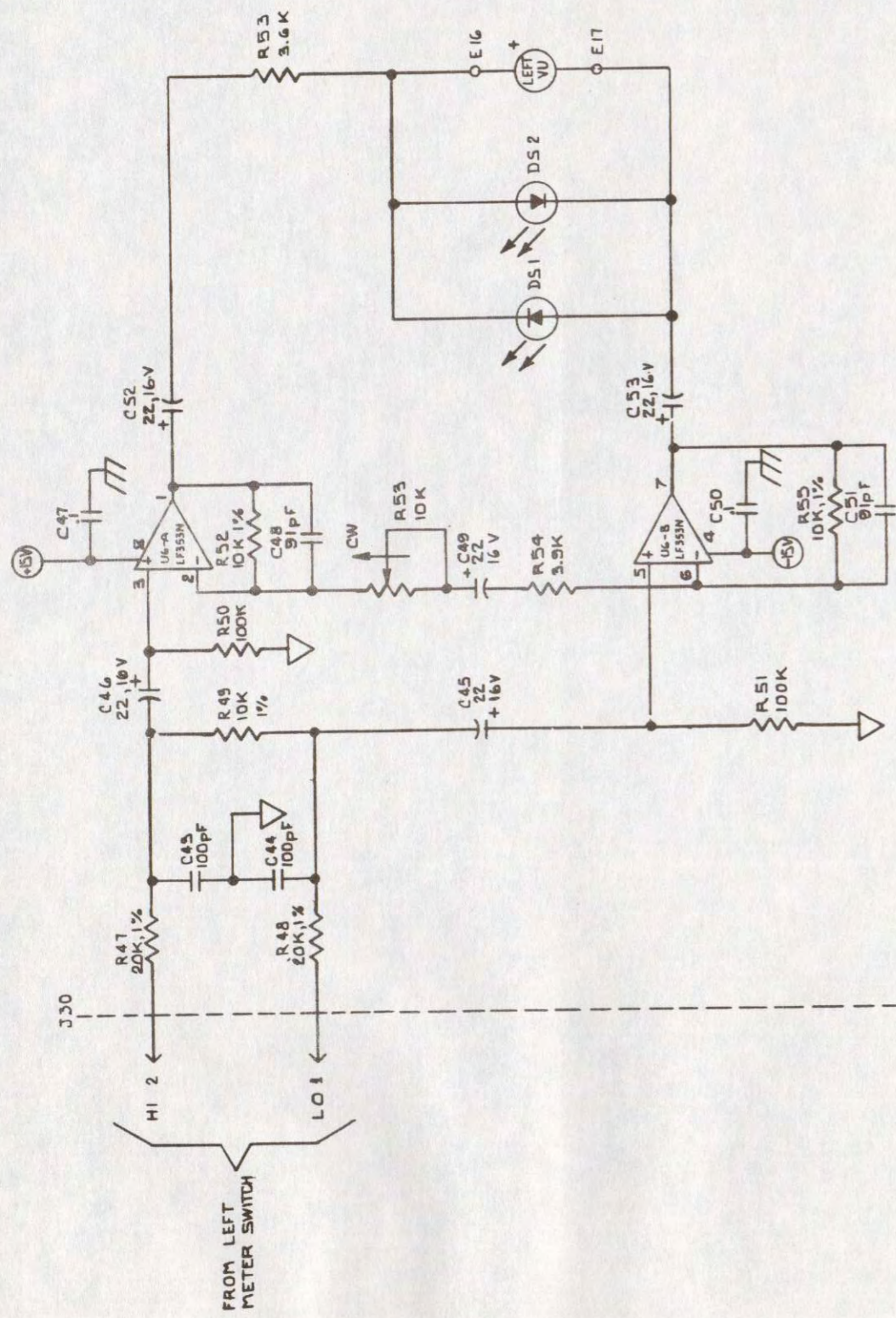
FROM
MONITOR
SELECTOR
SWITCH



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Then It Was Stolen From...
www.SteamPoweredRadio.Com



FIG 3
MONITOR AMPLIFIERS



If You Didn't Get This From My Site,
Then It Was Stolen From...
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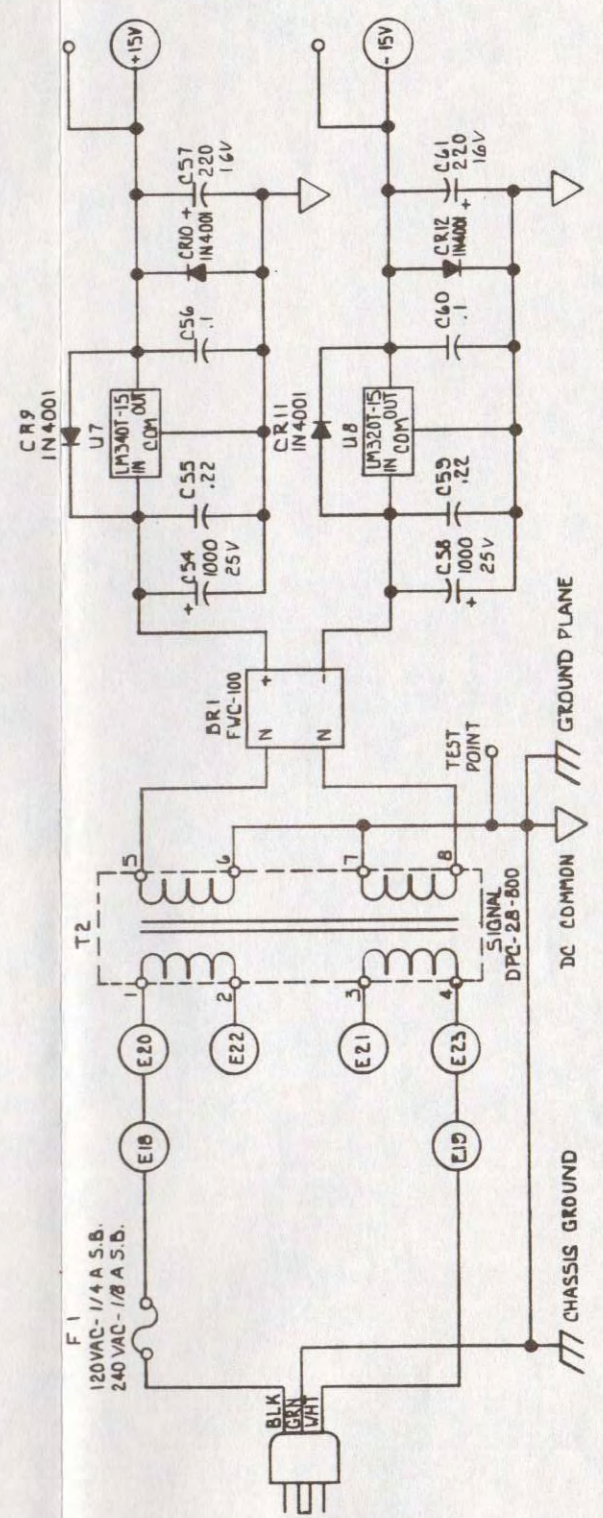
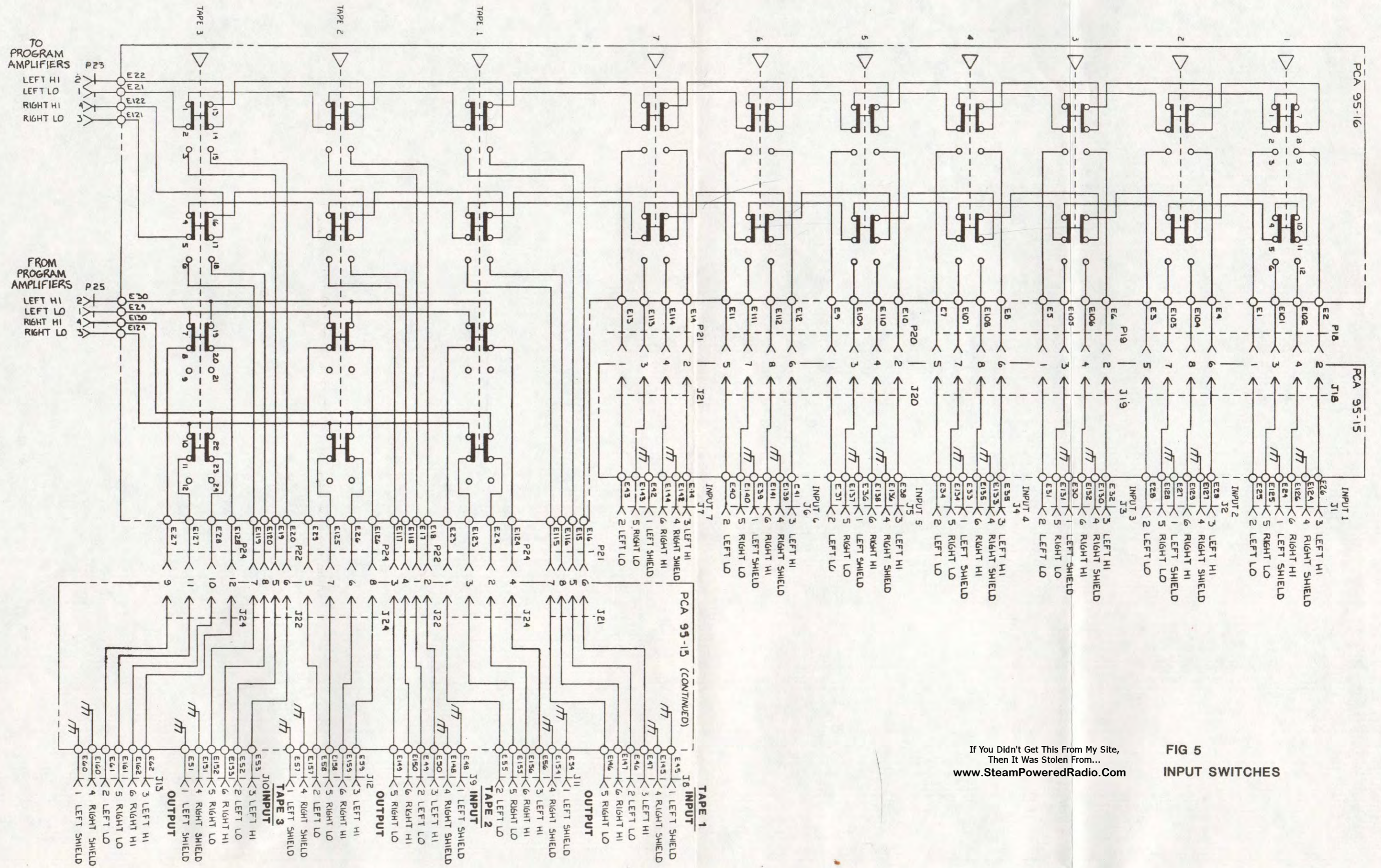


FIG 4
METER AMPLIFIER,
POWER SUPPLY



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FIG 5
INPUT SWITCHES