



SR109 Professional Mixer

OPERATION AND SERVICE MANUAL

**Manufactured by
SHURE BROTHERS INC.
222 Hartrey Avenue
Evanston, Illinois 60204 U.S.A.**

WARNING

To reduce the risk of fire or electric shock, do not expose this appliance to rain or extreme moisture.

SR109 Professional Mixer

SPECIFICATIONS

Equipment Type	All silicon transistor mixer/pre-amplifier	Signal to Noise (20 Hz-20 kHz)	Typically 83 dB at maximum output with one channel Volume Control and MASTER Volume Control set at 8 (approximately 58 dB gain)
Number of Input Channels	8	Input Attenuation	0, 15 dB (switch-selected)
Power Output	+19 dBm (program line level)	Input Clipping Level at 1 kHz:	
Voltage Gain *		MIC Input	100 mV (ATTENUATOR out; Ch. Volume at 2)
Program	87 $\pm$ 3 dB MIC input to LINE LEVEL out		4.5 mV (ATTENUATOR out; Ch. Volume at 12)
	37 $\pm$ 3 dB LINE input to LINE LEVEL out		0.56V (ATTENUATOR in; Ch. Volume at 2)
	37 $\pm$ 3 dB MIC input to MIC LEVEL out		25 mV (ATTENUATOR in; Ch. Volume at 12)
Headphones	69 $\pm$ 3 dB MIC input to PHONES out	LINE Input	33V (ATTENUATOR out; Ch. Volume at 2)
Link	54.5 $\pm$ 3 dB MIC input to LINK OUTPUT (with 600-ohm termination)		1.35V (ATTENUATOR out; Ch. Volume at 12)
	27 $\pm$ 2 dB LINK INPUT to LINE LEVEL output		90V (ATTENUATOR in; Ch. Volume at 2)
Accessory	59 $\pm$ 3 dB MIC input to ACCESSORY output (via pins 1-8/INPUTS)		8.0V (ATTENUATOR in; Ch. Volume at 12)
	54.5 $\pm$ 3 dB MIC input to ACCESSORY output (via pin 9/PROGRAM) (terminated with 600 ohms)	Input Common Mode Rejection	100 dB at 100 Hz
Frequency Response	$\pm$ 3 dB, 20 Hz-20 kHz (150-ohm source; 600-ohm load)	Low-Frequency Equalization	$\pm$ 13 dB at 100 Hz with respect to 0 (flat) setting
Input Sensitivity	0.1 mV max. for +4 dBm program output	High-Frequency Equalization	$\pm$ 12 dB at 10 kHz with respect to 0 (flat) setting
Distortion	THD less than 1% at +12 dBm, 30 Hz-20 kHz; IM distortion less than 1% at +12 dBm	Tone Oscillator	1 kHz; less than 1% distortion; variable level
Noise (300 Hz-20 kHz)	-128 dBV (equivalent input noise at full gain)	Input Impedance at 1 kHz:	
	-72.8 dBm output noise (MASTER Volume Control down)	Microphone	2.1 kilohms balanced (for use with 25- to 600-ohm microphones)
	-38.8 dBm output noise (MASTER and one channel Volume Control up)	Line (channels 7 and 8)	66 kilohms balanced bridging
Hum and Noise (20 Hz-20 kHz)	-125 dBV (equivalent input hum and noise at full gain)	Link Input	35 kilohms unbalanced
	-61.8 dBm output noise (MASTER Volume Control down)	Output Impedance:	
	-34.8 dBm output noise (MASTER and one channel Volume Control up)	Program	Balanced line level: 120 ohms actual (for use with 25- to 600-ohm inputs)
			Microphone level: 0.5 ohms actual (for use with 25- to 600-ohm inputs)

* Measurement conditions: MIC input through 150 ohms, LINE input through 33 kilohms, LINK INPUT through 600 ohms; PROGRAM LINE LEVEL terminated in 600 ohms, PROGRAM MIC LEVEL terminated in 150 ohms, PHONES terminated in 8 ohms; MASTER Volume, Channel Volume and PHONES Controls full up; all other controls and switches 0 or out.

SR109 Professional Mixer

SPECIFICATIONS

Headphones	3.5 ohms actual (for use with 4- to 16-ohm headphones)	Phase Switch	Output polarity-reversing switch (0°, 180°) (reverses phase of all program outputs)
Link	600 ohms (actual)	30 Vdc Bus	Pin 10 on ACCESSORY OUTPUT connector is regulated +30 ±3.5 Vdc supply; pin 11 is ground (earth). May be used to power accessories up to 50 mA.
Accessory	Unbalanced aux level: 33 ohms actual (for use with 4K or higher loads)	Operating Voltage	90-132 Vac, 50/60 Hz (SR109) 90-132, 180-250 Vac, 50/60 Hz (SR109-2E)
Limiter		Power Consumption	20 watts max. (Mixer only). 500 watts max. (SWITCHED AC receptacle) (SR109 only)
Threshold		Temperature Range:	
(adjustable)	Typically -20 to +20 dBm (at LINE LEVEL output)	Operating	-7° to 54°C (20° to 130°F)
Range	Approximately 30 dB	Storage	-29° to 71°C (-20° to 160°F)
Link Jack System	External signal conditioning output/input; high-level auxiliary amplifier and tape recorder signal output; multiple Mixer connection (common mix); remote master volume control	Dimensions	133 mm H × 483 mm W × 232 mm D (See Page 4.) (5¼ in. × 19 in. × 9⅛ in.)
VU Meter Calibration	0, +4, +8 dBm, switch-selectable (0.775, 1.23, 1.95 Vrms) at 1 kHz to 600-ohm load. [VU RANGE Switch in 0 position provides 0 VU reading of 0 dBm (0.775 Vrms) to 600-ohm load]	Installation	Equipped for standard 19 in. (483 mm) rack mounting; 5¼ in. (133 mm) height; may be operated in accessory A105A Carrying Case or in custom control center.
Phasing (polarity)	Pin 3 of INPUT connectors in phase with pin 9 of ACCESSORY OUTPUT, tips of LINK OUTPUT and PROGRAM LINE LEVEL OUTPUTS, and pin 3 of PROGRAM LINE LEVEL and MIC LEVEL OUTPUTS (PHASE Switch in 0° position). Pins 1-8 of ACCESSORY OUTPUT out of phase with the above.	Weight	7.7 kg (17 lb)
		Finish	Matte black, with beige write-on trim strip
		Certifications	Listed by Underwriters' Laboratories, Inc.; listed by Canadian Standards Association as certified (SR109 only)

SR109 Professional Mixer

TABLE OF CONTENTS

Section	Page	Section	Page
SPECIFICATIONS	ii, iii	SERVICE INSTRUCTIONS	
DESCRIPTION	1	Mixer Service	14
OPERATING INSTRUCTIONS		Replacement Parts	14
Functional Identification	3	Fuse Replacement	14
General Operating Instructions	3	Knob Replacement	14
Mounting and Ventilation	4	Service Access	14
Power Supply	5	Lamp Replacement	14
Functional Circuit Description	6	Board Removal	15
Input Channels	6	Limiter Internal Adjustment	16
Monitor Mixer System	6	Overload Indicator Check	16
Program Mix Amplifier	7	VU Meter Removal	16
Link Jacks	7	VU Meter Calibration	16
Program Output	7	Parts Removal	17
VU Meter Circuit	7	Transistor and Diode Removal	17
Limiter	8	Active Component Checking	17
Tone Oscillator	8	Service Illustrations	18
Basic Operating Hints	8	Optional Accessories	18
SPECIAL OPERATING INSTRUCTIONS		REPLACEMENT PARTS LIST	19
High-Impedance Microphones	9	NOTES TO CIRCUIT DIAGRAM	
Musical Instruments	9	General	29
Tape Recording	9	Troubleshooting	29
Record Playback	10	Ac Voltage Measurements	29
Tape Playback	11	Dc Voltage Measurements	30
Additional Mixer Inputs	11	Resistance Measurements	30
Additional Mixer Inputs (Two SR109s)	12	CONDENSED OPERATING INSTRUCTIONS	35
Redundant Mixer Set-up (Two SR109s)	12	ARCHITECTS' AND ENGINEERS' SPECIFICATIONS	35
Stereo Operation	12	GUARANTEE	35
Remote Volume Control	13	SHIPPING INSTRUCTIONS	35
Telephone Line Surge Protection	14		

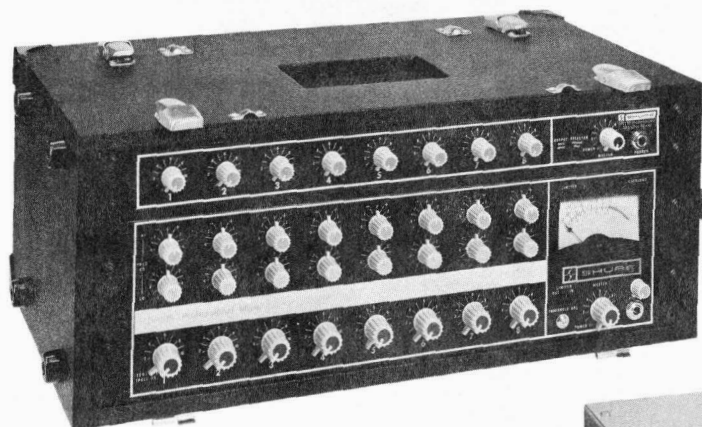
SR109 Professional Mixer

LIST OF ILLUSTRATIONS

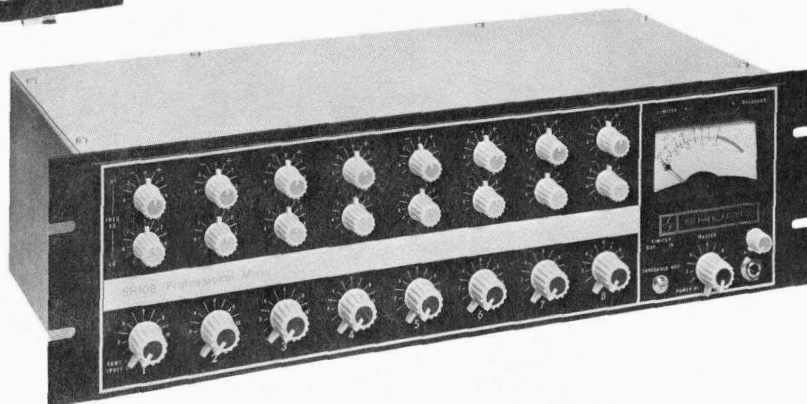
Figure	Page	Figure	Page
1 SR109 Professional Mixer Front Panel	2	13 Redundant Mixers	13
2 SR109 Professional Mixer Rear Panel	2	14 Stereo Tape Recording	13
3 Overall Dimensions	5	15 Remote Volume Control	13
4 Block Diagram	5	16 Printed Circuit Board and Parts Location	16
5 SR110 Monitor Mixer Applications	7	17 Opto-Isolator Test	17
6 Tone Oscillator Applications	8	18 Board 1: Preamplifier	24
7 Preamplifier-Mixer Connections	9	19 Board 2: Channel Equalizer	25
8 Tape Recording	10	20 Board 3: Main Board	26
9 Record Playback	10	21 Board 9: Power Supply	27
10 Tape Playback	11	22 Board 0: Program Mute	27
11 Additional Mixer Inputs	11	23 Lead Codes	29
12 Additional Inputs: Two SR109s	12	24 SR109-2E Power Supply Circuit Diagram	30
		25 SR109 Professional Mixer Circuit Diagram	32-33

SR109 Professional Mixer

DESCRIPTION



(Shown with SR110
Monitor Mixer
in A105A Carrying Case)



The Shure Model SR109 Professional Mixer is a solid-state, eight-channel microphone mixer-preamplifier that enables the operator to mix as many as eight microphones with individual control over input attenuation, volume and high- and low-frequency equalization. The Mixer has three outputs: a program output, an accessory output and a headphone output. In addition, channels 7 and 8 contain switch-selectable inputs for use with either low-impedance microphones or line level sources. A master volume control regulates program output.

The program output has both a 600-ohm, balanced line level output and a low-impedance, balanced, microphone output. The headphone output is an 8-ohm balanced output with separate volume control. A pair of link jacks facilitate connection to an additional mixer, or external equipment such as compressors, limiters or equalizers.

The SR109 rear panel contains provisions for connection to one or more Shure SR110 Professional Monitor Mixers. The SR110 is a self-contained, eight-channel, line level mixer designed to provide a separate stage monitor mix that follows the program mix levels. In addition, it may be used in multi-track recording as a submaster mix panel or mixdown panel.

The SR109 contains a peak-responding, adjustable output limiter with an in-out switch and an indicator lamp that flashes when the limiter is operating. The front panel also contains an overload indicator lamp that signals when

the output is clipping in the non-limiting mode.

The Mixer contains a VU meter and a meter sensitivity switch to adjust sensitivity to indicate program output level. A built-in 1 kHz tone oscillator facilitates synchronization of all meters in a system. A front-panel trim strip provides space for pencilled notations.

The regulated power supply is designed to operate over a wide range of ac line voltages, permitting the use of extremely long ac extension cables without performance degradation. Accessory equipment drawing up to 500 watts may be connected to the rear-panel switched ac receptacle (SR109 only).

The solid-state components in the SR109 Professional Mixer are protected against damage as a possible result of open-circuit or short-circuit conditions on the inputs or outputs. All components are conservatively rated and are operated well within their respective ratings to assure long life and trouble-free performance.

The Mixer is supplied with rack-mounting screws and spare fuses.

The Mixer is Underwriters' Laboratories, Inc., listed, and is listed by the Canadian Standards Association as certified (SR109 only).

The following are designed for use with the SR109 Professional Mixer:

SR110 Professional Monitor Mixer
A105A Carrying Case

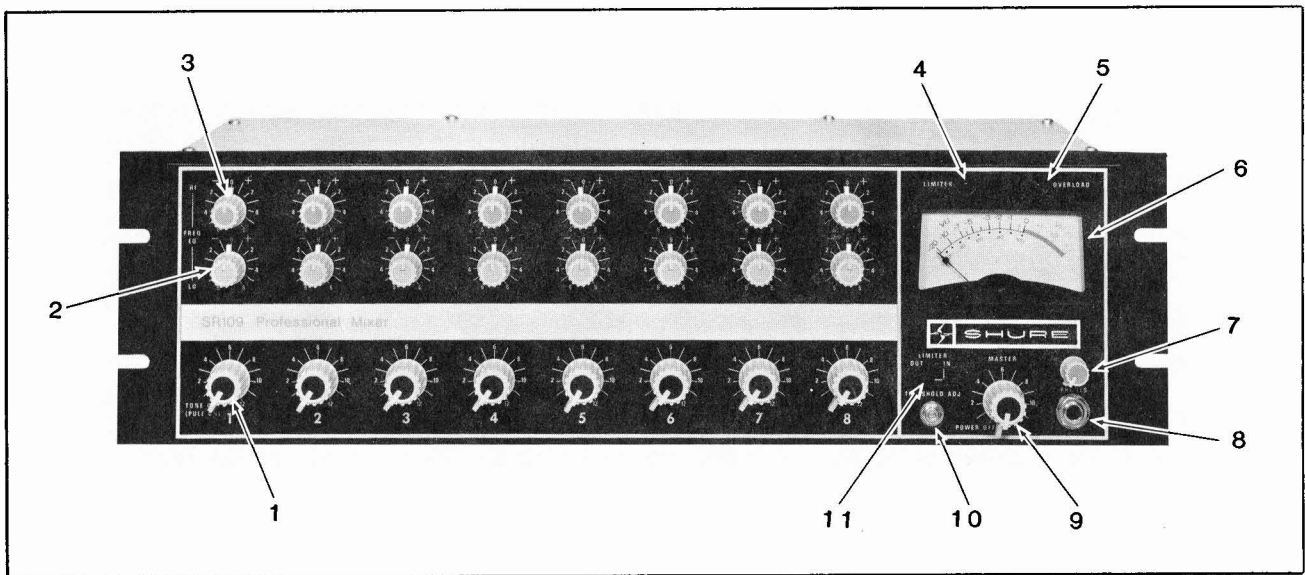


FIGURE 1. SR109 PROFESSIONAL MIXER FRONT PANEL

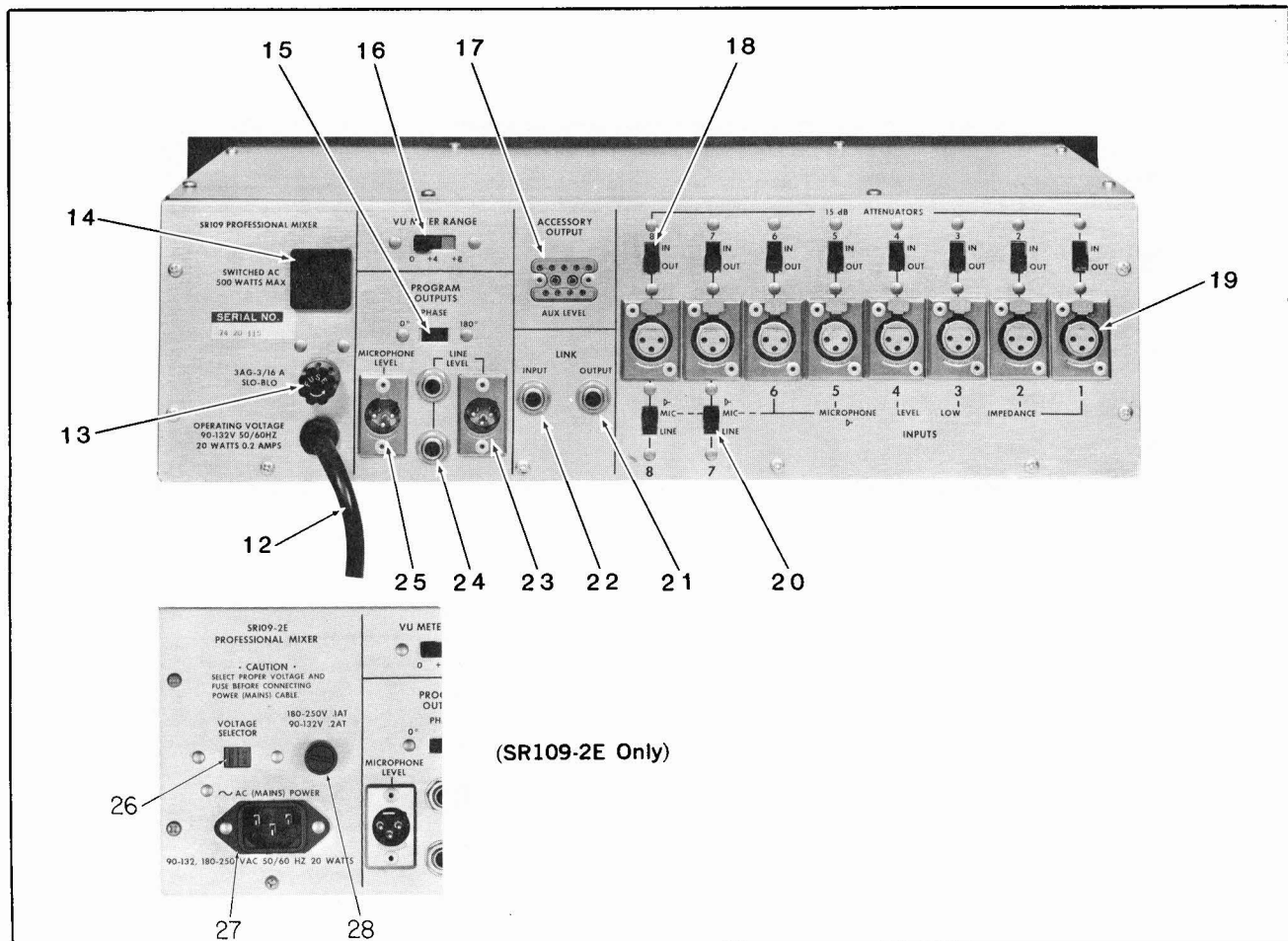


FIGURE 2. SR109 PROFESSIONAL MIXER REAR PANEL

SR109 Professional Mixer

OPERATING INSTRUCTIONS

FUNCTIONAL IDENTIFICATION (Refer to Figures 1 and 2, Page 2.)

NOTE: All front panel controls are numbered for reference only.

1. Individual Channel Volume Controls (Eight) — Control volume and input clipping level of each channel separately. Channel 1 contains TONE OSCillator push-pull Switch — Pulling switch outward turns oscillator on, and rotating control adjusts level of 1 kHz tone generated internally for set-up purposes.
2. Individual Channel FREQUENCY EQUALizer-LOW Rotary Controls (Eight) — Adjust low-frequency signal equalization for each channel.
3. Individual Channel FREQUENCY EQUALization-HIGH Rotary Controls (Eight) — Adjust high-frequency signal equalization for each channel.
4. LIMITER Indicator Lamp — Indicates limiting action when LIMITER Switch (11) is turned on (IN).
5. OVERLOAD Indicator Lamp — Indicates Mixer overload condition (output clipping) when LIMITER Switch (11) is turned off (OUT).
6. True VU Meter — Indicates volume level of program output. (Meets all current standards for VU Meters.)
7. PHONES Rotary Control — Controls volume level to PHONES Jack (8).
8. PHONES Output Jack — Provides for connection of stereo or monophonic headphones for monitoring.
9. MASTER Volume Rotary Control and POWER Switch — Adjusts level of total program output, and applies ac power to power supply and SWITCHED AC Receptacle.
10. THRESHOLD ADJUSTment Screwdriver-Adjustable Control — Sets threshold level of limiter function.
11. LIMITER IN-OUT Slide Switch — Turns program output limiter on and off.
12. AC Grounded Line Cord — Connects ac power source to Mixer power supply (SR109 only).
13. 3AG-3/16A SLO-BLO AC Fuse — Protects Mixer ac input line against overload (SR109 only).
14. SWITCHED AC Grounded Receptacle — Provides up to 500 watts of unfused switched ac power to accessory equipment (SR109 only).
15. PROGRAM OUTPUTS/PHASE Slide Switch — Reverses phase (polarity) of LINE LEVEL and MICROPHONE LEVEL program outputs with respect to inputs.
16. VU METER RANGE Slide Switch — Selects VU meter (6) sensitivity for three ranges of program level indication in dBm.
17. ACCESSORY OUTPUT/AUX LEVEL 11-Pin Connector — Provides output connection to Shure SR110 Monitor Mixer.
18. 15 dB ATTENUATORS/IN-OUT Slide Switches (Eight) — Provide choice of input signal attenuation for each channel.
19. INPUTS/MICROPHONE LEVEL LOW IMPEDANCE Three-Pin Jacks (Eight) — Provide for balanced connection of low-impedance sources to channels 1

- through 8 inputs, or line level sources to channels 7 and 8.
20. MIC/LINE Slide Switches (Two) — Select low-impedance (MIC) or line level (LINE) input connections for channels 7 and 8.
21. LINK OUTPUT Phone Jack — Provides output connection to external equipment or common mix bus to combine two or more Mixers.
22. LINK INPUT Phone Jack — Provides input connection from external equipment (compressor, limiter, equalizer, etc.).
23. PROGRAM OUTPUTS/LINE LEVEL Three-Pin Connector — Provides balanced output connection to power amplifier.
24. PROGRAM OUTPUTS/LINE LEVEL Phone Jacks (Two) — Provide balanced or unbalanced output connection to power amplifier.
25. PROGRAM OUTPUTS/MICROPHONE LEVEL Three-Pin Connector — provides low-impedance microphone-level program output.
26. VOLTAGE SELECTOR Slide Switch — Selects operating voltage range of 90 to 132 or 180 to 250 Vac, 50/60 Hz (SR109-2E only).
27. AC (MAINS) POWER 3-Pin Connector — Connects ac line cord to Mixer power supply (SR109-2E only).
28. 180-250V 0.1AT/90-132V 0.2AT SLO-BLO AC Fuse — Protects Mixer ac input line against overload (SR109-2E only).

GENERAL OPERATING INSTRUCTIONS

WARNING

Voltages in this equipment are hazardous to life. Make all input and output connections before ac power is connected. Refer servicing to qualified service personnel.

1. Using hardware provided, install Mixer securely in standard 19 in. (483 mm) rack or optional A105A Carrying Case prior to making electrical connections.
2. Set front-panel switches to off or OUT and all controls to 0. Set rear-panel PHASE Switch (15) to 0°.
3. Connect desired PROGRAM OUTPUT/LINE LEVEL Connector (23, 24) to power amplifier input connecting cable. (NOTE: Shure SR105 Power Amplifiers are supplied with audio connecting cables.) If Mixer output is to be fed to another mixer or tape recorder microphone input, use PROGRAM OUTPUT/MICROPHONE LEVEL Connector (25). If desired, connect monophonic or stereo headphones to front-panel PHONES Jack (8). Connect speakers to power amplifier.
4. Connect one or more low-impedance microphones to rear-panel INPUTS/MICROPHONE LEVEL LOW IMPEDANCE Connectors (19). Any high-quality dynamic,

ribbon or condenser low-impedance microphone may be used. Connect line level sources to channel 7 or 8 connectors only. If line level inputs are used, set corresponding MIC/LINE Switch (20) to LINE.

5. If external signal-processing equipment such as an equalizer, compressor or limiter is to be used, connect Mixer LINK OUTPUT Connector (21) to external equipment input and LINK INPUT Connector (22) to external equipment output. (See *Link Jacks*, Page 7, for detailed information.) If a Shure SR110 Monitor Mixer is to be used with the SR109, connect multi-pin plug of SR110 to ACCESSORY OUTPUT Connector (17) of SR109.

6. SR109: Connect ac line cord (12) to grounded 90- to 132-volt, 50/60 Hz ac source. Line cord is a 2.4m (8 ft), 3-conductor cord with 3-pin grounding plug. If extension cords are required, use high-quality, rubber-jacketed cable with 18 gauge (0.8 mm²) or heavier wire.

SR109-2E: Obtain suitable 3-pin male ac connector and attach to line cord: brown lead to "hot" or "live" terminal, blue lead to neutral terminal, and green/yellow lead to ground or earth terminal. (Connector should be installed by qualified service personnel.) Select proper operating voltage (90-132V or 180-250V) using VOLTAGE SELECTOR Switch (26). Note that switch positions are marked 115 and 220 volts. Make certain proper fuse is installed in fuseholder (28): 0.1AT with switch set to 220, or 0.2AT with switch set to 115. Insert female end of line cord into chassis power connector (27) and connect male plug to 3-wire grounded ac power receptacle providing proper operating voltage.

7. Turn on front-panel MASTER Volume Control/POWER Switch (9) and allow one to two minutes warmup time. This warmup time allows the supply voltages to stabilize and capacitors to charge to provide optimum performance. Set 15 dB ATTENUATOR Switch (18) initially to OUT for normal PA use, to IN for "hard" rock music. For LINE INPUT sources (channels 7 and 8), set MIC/LINE switch (20) to LINE.
8. Set Master Volume Control (9) to 6. Set VU METER RANGE Switch (16) to 0 for PA or telephone line use (when using a Western Electric 30B Voice Coupler), +4 for recording, or +8 for broadcast use. Have someone sing or talk into microphone and raise channel Volume Control (1) to achieve desired sound level. If meter reads low at proper sound level, reduce power amplifier volume level and increase channel volume level. For single microphone set-up, if meter indicates excessively high level ("pinning" or "pegging" needle), decrease MASTER Volume Control to obtain good meter reading and increase power amplifier volume level or input sensitivity to obtain proper sound level. In multiple microphone set-up, it may be necessary to decrease MASTER Volume Control in order to maintain channel Volume Control setting. Ideally, set the channel Volume Controls as high as possible (consistent with an adequate mixing range), and increase the MASTER Volume Control to obtain a 0 VU Meter reading. Then increase the power amplifier level control to the desired level. Using the 15 dB ATTENUATORS (18) may aid in maintaining this setting if the channel Volume Control is consistently set low.

9. Set HI and LO FREQ EQ Controls (3, 2) for channel in use. Vertical position (0) indicates "flat" frequency response. Clockwise (+) settings increase high-frequency (treble) or low-frequency (bass) level and counterclockwise (—) settings decrease the high- or low-frequency level.

10. With LIMITER Switch (11) in OUT position, OVERLOAD Indicator Lamp (5) will flash when Mixer output clipping level is exceeded. If limiting is desired, adjust limiter as follows: Operate Mixer with program material and adjust the channel and MASTER Volume Controls (1, 9) for desired sound level. With small screwdriver, turn THRESHOLD ADJ Control (10) full counterclockwise. Set LIMITER IN/OUT Switch to IN. Slowly increase (clockwise) THRESHOLD ADJ Control until LIMITER Lamp (4) flashes intermittently, indicating limiting action on program peaks. A continuous glow indicates an undesirable excess of limiting: MASTER and/or channel Volume Controls should be reduced. Increasing channel or MASTER Volume Controls will not increase mixer output above the level just set. Should higher or lower maximum output level be desired, increase or decrease THRESHOLD ADJUSTMENT. (An alternate set-up procedure uses the TONE OSCillator to produce a maximum desired VU level. The THRESHOLD ADJUSTMENT is slowly increased (clockwise) until the VU Meter reading just set is reduced by 1 dB. Note that with this set-up, the program material level displayed on the VU Meter will be lower because of the difference between peak and average levels. However, limiting action will take place at the same peak level. This effect will be more evident on speech than on music.)

11. Monitor output is available at front-panel PHONES Jack (8). Adjust PHONES Control (7) for comfortable listening level.

12. NOTE: During temporary shutdown (break, intermission), do not turn off Mixer power. It is designed to operate continuously, and optimum performance is maintained after internal voltages are allowed to stabilize. Also, do not turn down all microphones. Leave the master or announcer's microphone on so that if the Mixer is left unattended, announcements may be made, and the operator will be alerted that the next performance is about to begin.

MOUNTING AND VENTILATION

The Shure SR109 Professional Mixer may be operated in a standard 19 in. (483 mm) audio equipment rack (see Figure 3, Page 5), or in a Shure A105A Carrying Case. Four rack-mounting screws are provided with the Mixer.

The Shure A105A Carrying Case has a 7 in. (178 mm) rack-mounting space. When the SR109 is mounted in this case, an additional rack-mounted unit such as the SR110 Monitor Mixer may be mounted in the remaining 1¾ in. (44.4 mm) space.

In rack-mounted installations, consider rear-panel access before installation is made. Although most installations will not require frequent access, it should be remembered that input and output changes, and some switch movements, will necessitate rear-panel access.

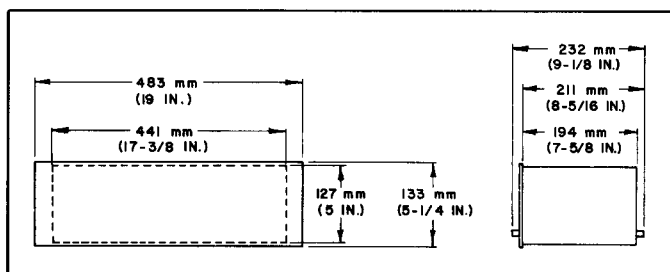


FIGURE 3. OVERALL DIMENSIONS

POWER SUPPLY

SR109: The Mixer regulated power supply is designed to operate from 90 to 132 volts ac, 50/60 Hz without adjustments, allowing the Mixer to meet all specifications over this wide range of ac input voltages. A three-conductor, grounded line cord (12) supplies ac power to the Mixer through the front-panel POWER Switch (9). The Mixer consumes 20 watts maximum (0.2 amperes) and the ac line input is protected by a 3/16-ampere slow-blow fuse (13) and a wired-in 3/10-ampere slow-blow fuse in series.

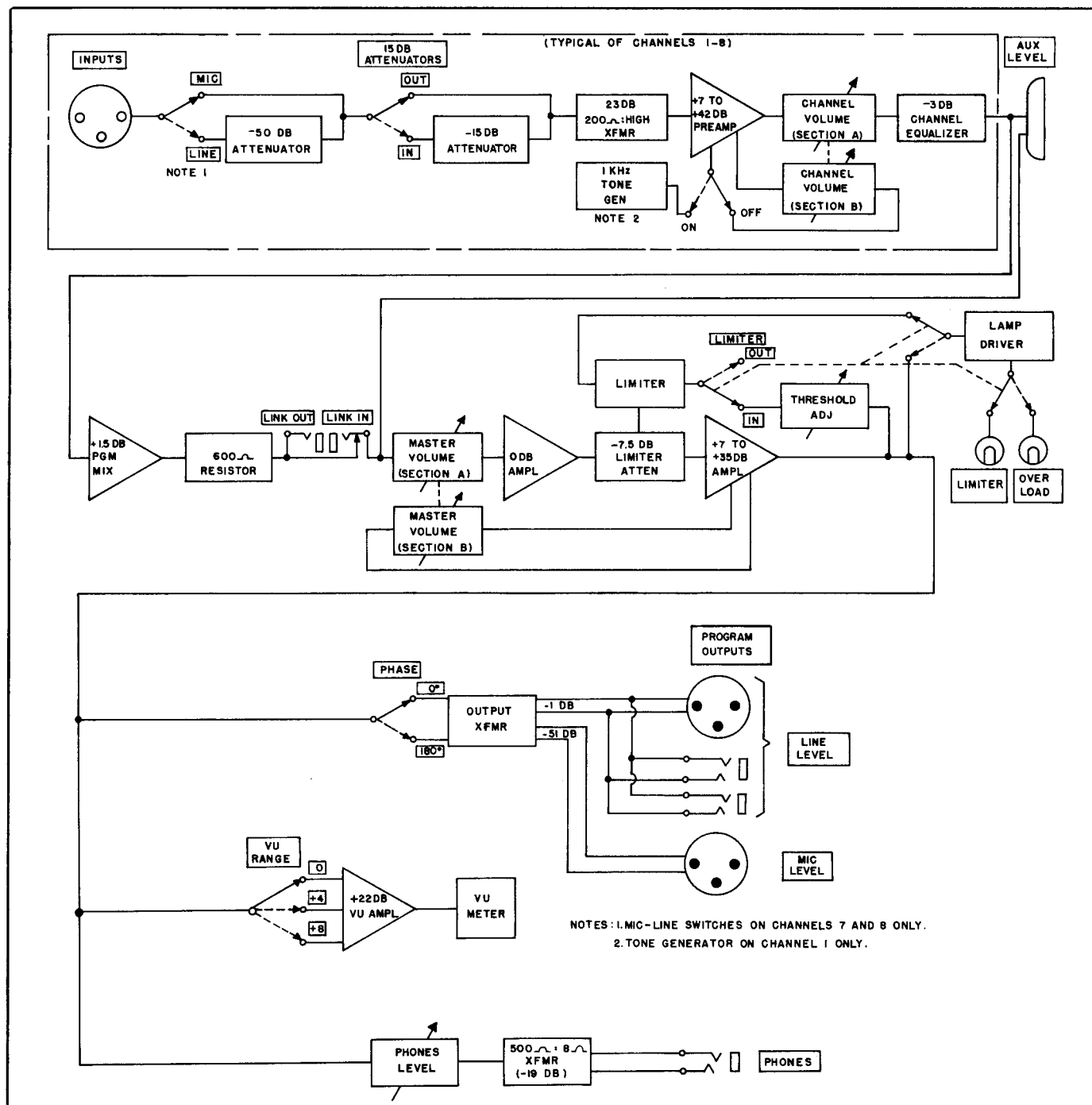


FIGURE 4. SR109 BLOCK DIAGRAM

CAUTION

These fuses should not be replaced with any other size or type of fuse.

Accessory equipment may be connected to the rear-panel SWITCHED AC Receptacle (14). The accessory equipment may consume up to 500 watts maximum, which provides for use with high-power amplifiers such as the Shure SR105. Note that the receptacle is switched but not fused; all accessory equipment used with the Mixer should contain its own fuse.

SR109-2E: The SR109-2E regulated power supply is designed to operate from either 90 to 132 volts ac or 180 to 250 volts ac, 50/60 Hz, as selected by the rear-panel VOLTAGE SELECTOR Switch (26). A three-conductor, grounded line cord supplies ac power to the Mixer through the front-panel POWER ON-OFF Switch (9). The SR109-2E line cord does not have a connector on the power source end of the cord. Obtain a suitable three-pin male ac connector and install it on the line cord: brown to "hot" or "live" terminal, blue lead to neutral terminal, and green/yellow lead to ground or earth terminal. (Connector should be installed by qualified service personnel.) The ac line is protected by a 0.1-ampere Slo-Blo fuse (for 180- to 250-volt operation) or a 0.2-ampere Slo-Blo fuse (for 90- to 132-volt operation). A wired-in 3/10-ampere fuse also protects the ac line.

FUNCTIONAL CIRCUIT DESCRIPTION

(See Figure 4, Page 5)

Each three-pin professional audio input MICROPHONE LEVEL Connector (19) feeds its own low-impedance balanced Input Transformer, which provides gain of 23 dB. Channels 7 and 8 also contain MIC/LINE Switches (20) which switch in a 50 dB bridging line-to-microphone level Attenuator to accept line-level inputs. The Input Transformers (and, on channels 7 and 8, the MIC/LINE Switch) are fed to 15 dB ATTENUATOR Switches (18) and then to the Preamplifier, which provides +7 to +42 dB gain. The amount of voltage gain provided by the Preamplifier (7 to 42 dB) is controlled by the Channel Volume Control (1), providing an increase in input clipping level as gain is reduced. The Preamplifier circuits contain the individual Channel Volume Controls and feed the individual Channel Equalizer (HI and LO FREQ EQ) Controls (3,2) which decrease the signal approximately 3 dB when set to the 0, or "flat," setting.

The Equalizer outputs are fed to the Program Mix Amplifier and the ACCESSORY OUTPUT Connector (17) for interconnection with SR110 Monitor Mixers. The Program Mix Amplifier feeds through a 560-ohm resistor to the LINK jacks (21, 22). When accessory equipment is not connected to the LINK jacks, the jacks are bypassed and the program signal is fed to the MASTER Volume Control (9) and back to the ACCESSORY OUTPUT Connector.

The output of the MASTER Volume Control, after feeding a 0 dB gain Amplifier, is sent to a Limiter Attenuator circuit. The attenuated signal feeds a limiter, which is connected to a Lamp Driver (for driving the LIMITER and OVERLOAD lamps) and a Limiter THRESHOLD ADJ Control (10) for setting the threshold of Limiter operation. Note that when the LIMITER Switch (11) is turned off (OUT), the LIMITER Lamp (4) will *not* light, but the OVERLOAD Lamp (5) *will* flash whenever the output clipping level is exceeded. The Limiter Attenuator also feeds a +7 to +35 dB output Amplifier, also controlled by the MASTER Volume Control.

The signal then goes through a 0°-180° PHASE Switch (15), and into the Program Output Transformer. The Transformer feeds three LINE LEVEL Output Connectors (23, 24) and a MIC LEVEL Output Connector (25), which is at 50 dB below line level. The +7 to +35 dB output Amplifier also feeds the VU METER RANGE Switch (16), which goes to a +22 dB Meter Amplifier and then to the VU Meter (6), and a PHONES Level Control (7), Headphones Transformer and PHONES Output Jack (8).

The Mixer also contains a 1 kHz Tone Generator for use in set-up and check-out. The Generator is activated and controlled by the channel 1 Volume Control/TONE OSC Switch (1), and the Control output is fed to the Preamplifier.

A detailed description of the Mixer circuits and controls and their uses is provided in the following paragraphs of this section.

INPUT CHANNELS

Eight professional, three-pin, audio MICROPHONE LEVEL Input Connectors (19) are provided on the rear panel of the Mixer. The Mixer is designed to operate with high-quality, low-impedance dynamic, ribbon or condenser microphones. Each low impedance microphone input is connected to a low-impedance, balanced-input transformer through a 15 dB input ATTENUATOR (18). Two MIC/LINE Slide Switches (20) are provided for channels 7 and 8. These switches allow the user to select between either low-impedance MICROPHONE or LINE LEVEL inputs. If additional line level inputs are required, Shure A15LA Line Input Adapters may be used in each microphone level input.

The 15 dB ATTENUATOR (18) two-position switch provides input attenuations of 0 or 15 dB. This switch allows the user to compensate for the differences in levels due to different sources, such as close talking or distant microphone placement, and to compensate for high output levels from condenser microphones.

The Channel Volume Control (1) is a dual control: one section, in a feedback circuit, sets the gain of the preamplifier; the second section is a preamplifier output attenuator. This circuit configuration increases the preamplifier input clipping level as the Volume Control is reduced to lower settings. Ideally, the control should operate in the middle range, between 4 and 9. This can often be accomplished by proper 15 dB ATTENUATOR Switch (18) setting.

The output of the Channel Volume Control (1) feeds the equalizer circuit. Individual HI and LO FREQ EQ controls (3, 2) allow the user to shape the sound of each input channel without affecting the other channels of the Mixer. The HI FREQ controls provide up to 13 dB of boost or cut at 10 kHz with a 1 kHz hinge point. The LO FREQ controls provide up to 13 dB of boost or cut at 100 Hz with a 1 kHz hinge point. Control settings with plus (+) markings indicate boost, and minus (—) markings denote cut. A 0 setting provides a normal or "flat" frequency response.

The output of the equalizer feeds the ACCESSORY OUTPUT/AUX LEVEL Connector (17) and the Program Mix Amplifier.

MONITOR MIXER SYSTEM

The rear-panel ACCESSORY OUTPUT/AUX LEVEL Connector (17) of the SR109 provides for interconnection to one or more Shure SR110 Professional Monitor Mixers. The output of each individual channel after all channel controls (volume, equalization and attenuation) appears

on this connector as do the LINK INPUT total mix signal and the power supply connections. The SR110 is a self-contained, eight-channel, line level mixer designed for use with the SR109 or similar equipment. The SR110 can provide a separate stage monitor "mix" that follows the program "mix" levels coming from the eight channels of the SR109. In addition, it may be used in multi-track recording as a submaster mix panel or as a "mixdown" panel.

The SR110 provides eight high-impedance, unbalanced, line level inputs to its mixing circuitry, one high-impedance, unbalanced, line level input to its Output Selector Switch for monitoring the program mix, and one line level, 600-ohm, balanced output. Individual channel and master volume controls are provided, as is a switch to choose between monitoring the channels in use (Mixed Inputs) and the total program mix (Program Input). The Mixed Inputs position takes the signal from each channel frequency equalization circuit, and the Program Input position obtains the mixed signal at the LINK INPUT Jack (22).

The SR110 has parallel accessory input/output male and female connectors. These connectors permit the connection of addition tandem or "stacked" SR110s. A typical application is shown in Figure 5, Page 7.

PROGRAM MIX AMPLIFIER

The program mix amplifier is an active mixing amplifier in which gain remains constant independent of the individual channel volume control settings. The output of the program mix amplifier is connected through a 560-ohm mixing resistor to the LINK Jacks (21, 22).

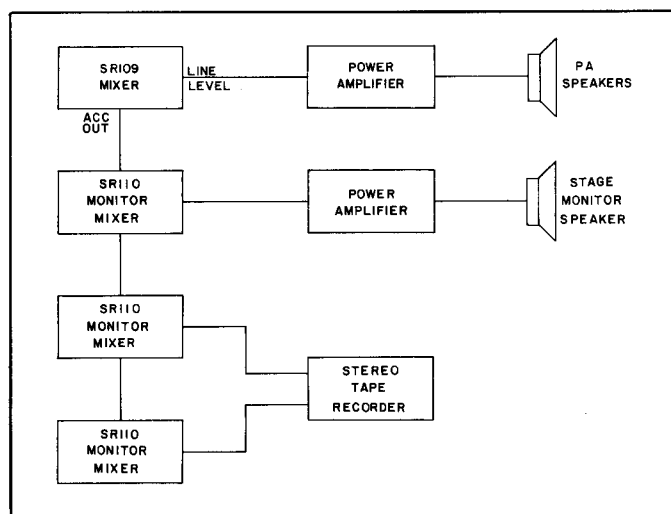


FIGURE 5. SR110 MONITOR MIXER APPLICATIONS

LINK JACKS

The LINK Jacks (21,22) on the rear panel of the Mixer enable the user to interconnect more Mixers for additional inputs or add external equipment, such as equalizers, compressors, or limiters. When connecting two or more SR109 Professional Mixers together to provide many channel inputs, connect the LINK OUTPUT Jacks (21) of all the units together. It should be noted that the LINK OUTPUT Jack is actually a two-way jack; the impedance at this point is actually 600 ohms, and any number of units may be tied together at this point. The LINK INPUT Jack

(22) is an input-only jack and has switching contacts that disconnect the LINK OUTPUT signal from the MASTER Volume Control (9). Note that the SR109 and the Shure SR101 Audio Console may be interconnected in the same manner.

If an equalizer, limiter or compressor is connected to the Mixer, the LINK OUTPUT Jack (21) is connected to the input of the external unit and the output of the external unit is connected to the LINK INPUT Jack (22).

The signals at the LINK Jacks are typically at a level 10 dB below line level. These jacks will accommodate signal levels in the range between -30 to $+10$ dBm. The LINK INPUT impedance is greater than 20 kilohms and may be considered a bridging impedance. The output of the LINK Jacks feeds the MASTER Volume Control (9) which is a two-section control similar to those used in the individual channels. The LINK INPUT Jack is connected to the ACCESSORY OUTPUT/AUX LEVEL Connector (17).

PROGRAM OUTPUT

The signal from the LINK Jacks (22, 21) drives the program output amplifier. The gain of this amplifier is controlled by one-half of the MASTER Volume Control (9) (the other half is an input attenuator for the output amplifier). In addition to the limiter circuitry, the program output amplifier also contains the front-panel OVERLOAD Indicator Lamp (5). This indicator will flash when the output clipping level is exceeded, and *only* when the LIMITER Switch (11) is in the OUT position. The output of the program amplifier is sent to the PHASE Switch (15) mounted on the rear panel of the Mixer. This switch allows the user to change the phase of the program output, which may be helpful in eliminating or reducing low-frequency acoustic feedback. Generally, this switch is adjusted to the position which either gives the most gain before feedback or, if both positions give the same gain before feedback, use the position that produces the highest pitch feedback. The program signal, after leaving the PHASE Switch, is routed to the output transformer which provides both LINE LEVEL and MICROPHONE LEVEL outputs. The LINE LEVEL output is connected to one professional three-pin, male, audio output connector (23) and two three-circuit phone jacks (24). The MICROPHONE LEVEL output is a low-impedance, balanced output, 50 dB below the LINE LEVEL output, and is connected to a professional three-pin, male, audio output connector (25).

Note that all of the program outputs are balanced with respect to ground. If a two-circuit type phone plug is used to connect the mixer line level output to an amplifier or tape recorder, the line outputs will automatically become unbalanced. If the three-pin unbalanced output is used and a phone jack output is *also* to be used, obtain a stereo phone plug and connect the tip and ring of the plug only. (The sleeve is a shield and would cause a ground loop.)

If it becomes necessary to use the MICROPHONE LEVEL Output Connector (25) to feed a high-impedance microphone input, use a line matching transformer such as one of the Shure A95 Series at the high-impedance microphone input.

The output of the program output amplifier is also fed to the VU Meter (6) circuit.

VU METER CIRCUIT

To allow a wide range of signals to be handled by the VU Meter (6), a VU Meter amplifier is provided. The output of the program amplifier is fed to the VU METER RANGE Switch (16) which in turn feeds the VU Meter amplifier and the Meter. The VU METER RANGE Switch provides a

choice of 0, +4 or +8 dBm output levels for the VU Meter. The 0 setting is usually used for PA applications, +4 is the standard for recording use, and +8 is preferred for use by broadcasters. The calibration of the VU METER RANGE Switch is internally adjusted at the factory for 0 VU across a 600-ohm load on the program output in the +4 dBm switch position. The VU Meter amplifier provides the proper impedance and signal level for correct VU Meter ballistics and calibration. This amplifier also isolates the Meter from the program output and eliminates the distortion normally caused by the nonlinearities of VU meters.

LIMITER

The program output amplifier also contains a peak-responding, rapid-acting, limiter circuit. When the LIMITER Switch (11) is turned on (IN), and the THRESHOLD ADJ Control (10) is properly adjusted, the LIMITER Indicator Lamp (4) will flash whenever the limit threshold is exceeded and the limiter is functioning. The dynamic range of the limiter is approximately 30 dB.

Set the limiter THRESHOLD ADJ Control (10) as follows. Operate the Mixer with program material, and adjust the individual channel and MASTER Volume Controls (1, 9) for the desired level. With a small screwdriver, turn the THRESHOLD ADJ Control full counterclockwise. Set the LIMITER IN-OUT Switch (11) to IN. Slowly increase (turn clockwise) the THRESHOLD ADJ Control until the LIMITER Indicator Lamp (4) flashes, indicating limiting action on program peaks. Note that increasing the channel or MASTER Volume Controls will not increase the mixed output above the level just set. Should a higher or lower maximum output level be desired, increase or decrease the THRESHOLD ADJ Control.

An alternate method of limiter threshold adjustment is to turn on the TONE OSCillator (1) to produce a maximum reference level on the VU Meter (6). Adjust the THRESHOLD ADJ Control (10) clockwise until the VU Meter reading just set is reduced by 1 dB. The program material displayed on the VU Meter will be lower because of the difference between peak and average levels, but limiting action will take place at the same peak level. This effect will be more evident on speech than music.

TONE OSCILLATOR

The Mixer contains a built-in 1 kHz tone oscillator for set-up and check-out purposes. The TONE OSC Control and On-Off Switch (1) injects the 1 kHz tone into the channel 1 preamplifier. The tone is processed through the program channel in the same manner as microphone or line input signals.

The tone oscillator may be used as follows: With the VU METER RANGE Switch (16) set to +4, increase the MASTER Volume Control (9) and TONE OSC Control (1) until a 0 VU reading is obtained on the VU Meter. A tone reference level has now been established. The Mixer LINE LEVEL Output (23, 24) is now +4 dBm (1.23 volts across a 600-ohm load) and the MICROPHONE LEVEL Output (25) is approximately 4 millivolts. These reference signals may be used to set up power amplifiers, tape recorders, or other equipment connected to these outputs (Figure 6A, Page 8). By adjusting the input level (or volume) controls on the associated equipment, all meters in the audio system can be made to "track." This allows the Mixer operator to observe only the Mixer VU Meter.

The tone oscillator may also be used to provide a check of cables and equipment connected to the link output. With the LINK OUTPUT Jack (21) connected to the input

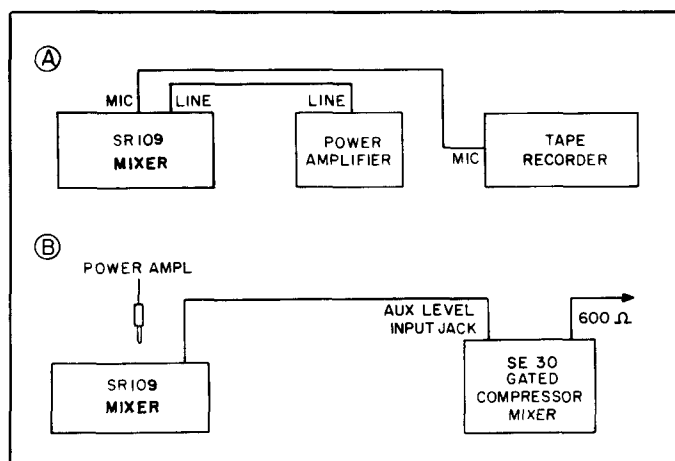


FIGURE 6. TONE OSCILLATOR APPLICATIONS

of external equipment, such as a Shure SE30 Gated Compressor/Mixer which in turn feeds a broadcast line, disconnect the Mixer output, either at the back of the Mixer, power amplifier or speakers (Figure 6B, Page 8). Set the MASTER Volume Control (9) to 6 or the normal operating position, and increase the TONE OSC Control (1) for a 0 VU reading on the VU Meter (6). Set the MASTER Volume Control to 0. Under this set-up condition, the external equipment may now be calibrated or checked out without affecting the Mixer output. After calibrating the external equipment, turn off the tone oscillator, and return the MASTER to the previous setting. Reconnect the power amplifier or speakers.

BASIC OPERATING HINTS

Should any difficulty be encountered in Mixer operation, the problem may often be traced to some simple source such as an error in interconnection. The following is offered as a basic guide to problems of this sort.

- Symptom:** Mixer is "dead" (no output, VU METER lamps out)
- Check:**
1. Check that ac power source is "live" and that Mixer is plugged in.
 2. Check that POWER OFF Switch (9) is on.
 3. Check to see that rear-panel SLO-BLO Fuse (13, 28) is good.
- Symptom:** Mixer is "dead" (no output, VU Meter lamps lit)
- Check:**
1. Check that cable from PROGRAM OUTPUT/LINE LEVEL Connector (23) has not accidentally been connected to PROGRAM OUTPUT/MICROPHONE LEVEL Connector (25).
 2. Check that PHASE Switch (15) is not between positions.
 3. If external equipment is connected to LINK Jacks (21, 22), disconnect external equipment to determine whether fault is in external equipment.
- Symptom:** One channel is "dead" (other channels operating properly)
- Check:**
1. Check for defective input cable or source.
 2. Check that MIC/LINE Switch (20) (channels 7 and 8 only) is not between positions or in the wrong position.

SR109 Professional Mixer

SPECIAL OPERATING INSTRUCTIONS

The previous section described normal interconnection and operation of the SR109 Professional Mixer; this section provides information on special set-ups to more fully utilize the capabilities of the Mixer.

HIGH-IMPEDANCE MICROPHONES

High-impedance dynamic, ribbon or condenser microphones (crystal or ceramic microphones are not recommended) can be used with one of the low-impedance MICROPHONE LEVEL Input Jacks (19), providing a line matching transformer (Shure A95 Series) is used. NOTE: The 15 dB ATTENUATOR Switch may be used to compensate for the very high output produced by some condenser microphones.

The high-impedance cable should be limited to 6m (20 ft). If a long cable length is required, use up to 3m (10 ft) of high-impedance, single-conductor, shielded cable (Belden #8401, #8410, or #8411) between the microphone and line matching transformer, and add as much low-impedance, two-conductor, shielded cable (Belden #8412 or #8422) as necessary between the transformer and Mixer input jack. These precautions will help avoid high-frequency signal loss and reduce the possibility of hum and noise.

MUSICAL INSTRUMENTS

Musical instruments, acoustical (non-electrified), acoustical-electrical, or electrified, may be amplified through the Mixer. For acoustical instruments, place a microphone close to the instrument strings, sounding board, or mouth. Adjust equalization and volume controls as necessary.

For acoustical-electrified instruments such as classic or folk guitars with pickups and preamplifier outputs, or pianos with pickups and preamplifier outputs, either place the microphone as described above, or connect the pickup to a line matching transformer as described under *High-Impedance Microphones* (Page 9). Adjust the 15 dB ATTENUATOR Switch (8) for the channel in use to provide the desired sound level with the channel Volume Control (1) set at about mid-scale.

To use a preamplifier auxiliary output (instrument or tape recorder preamplifier, or hi-fi amplifier tape monitor output jack, or headphone jack; not the speaker jacks — amplifier damage may result) with the Mixer, connect the preamplifier auxiliary output to a LINE LEVEL input (chan-

nel 7 or 8 jack with MIC/LINE Switch in LINE position). If the source is unbalanced, connect the cable shield to pin 1 and the hot conductor to pin 3 of the input jack. As an alternate connection, connect the preamplifier auxiliary output through up to 3m (10 ft) of cable to the high-impedance side of a line matching transformer (Shure A95 Series) as shown in Figure 7, Page 9. Connect the low-impedance side of the transformer through a low-impedance microphone cable (up to 300m—1000 ft) to a Mixer MICROPHONE LEVEL Input Jack (19). Adjust Mixer equalization controls for optimum sound. Adjust the Mixer 15 dB ATTENUATOR Switch (18) for the channel in use to provide the desired sound level with the channel Volume Control (1) set at about mid-scale.

Fully electrified instruments may also be amplified using a microphone in front of the instrument speaker, or the instrument output (*not* the speaker jack; amplifier damage may result) may be fed directly to an input jack as described above. It is important to note that the tonal quality of fully electrified instruments is primarily formed by the instrument amplifier and speaker; an external microphone picking up the instrument speaker output may very well provide a more desirable sound than that obtained by direct connections.

The cable length restrictions applying to high-impedance microphones also apply to most musical instruments (see *High-Impedance Microphones*, Page 9).

TAPE RECORDING

The Mixer output may be recorded on a tape recorder from either the LINE LEVEL Output (23, 24), MICROPHONE LEVEL Output (25) or LINK OUTPUT (21) Jacks. The Mixer Program Outputs are *after* the MASTER Volume Control (9) and LIMITER Switch (11); the LINK OUTPUT Jack is *before* these features. In planning a tape recorder connection, the operator should decide whether he wants the tape level to follow the MASTER Control and LIMITER.

To use a LINE LEVEL Output Jack (23, 24) feeding a high-impedance auxiliary tape recorder input, connect a cable from one LINE LEVEL Jack to the tape recorder input (see Figure 8, Page 10). If the LINE LEVEL Output is being used and a two-circuit phone jack is used to connect the Mixer to the tape recorder, this will unbalance the LINE

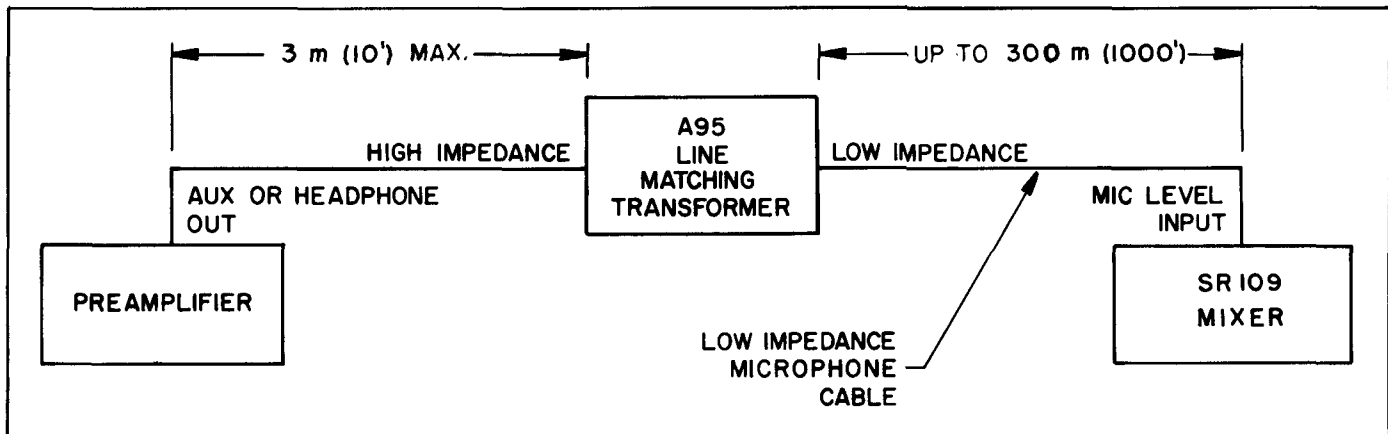


FIGURE 7. PREAMPLIFIER-MIXER CONNECTIONS

LEVEL Output (refer to *Program Output*, Page 7).

If the MICROPHONE LEVEL Output Jack (25) is to be used, connect a cable from it to the tape recorder low-impedance microphone input. If the microphone input on the tape recorder is designed to be used with high-impedance microphones (greater than 1000 ohms), insert a line matching transformer (Shure A95 Series with proper connectors) between the MICROPHONE LEVEL Output Jack and the tape recorder input (refer to *Program Output*, Page 7).

To use the LINK OUTPUT Jack (21), use a two-circuit phone plug on the cable to the tape recorder auxiliary or line input. The input impedance of the tape recorder should be 600 ohms minimum.

The output impedance of the LINK OUTPUT Jack (21) is low; this provides for unlimited cable length between the Mixer output and tape recorder input. Low-capacitance, single-conductor, shielded cable (Belden #8401, #8410, or #8411) is recommended to reduce the possibility of hum and noise pickup.

For operation with a stereo tape recorder, refer to *Stereo Operation*, Page 12.

RECORD PLAYBACK

To play records through the Mixer using a turntable or record changer with a stereo magnetic cartridge and no preamplifier, the most expedient method is to join the left and right channel leads from the turntable in a "Y" adapter and connect the joined output through an A95 Series Line Matching Transformer to a MICROPHONE LEVEL Input Connector (19) on the Mixer (see Figure 9A, Page 10). Note that the total lead length between the turntable and the A95 should not exceed 1.5m (5 ft). To approximate the RIAA equalization curve, set the Mixer FREQ EQ-LO Control (2) to +4, the FREQ EQ-HI Control (3) to -6, and the 15 dB ATTENUATOR Switch (18) to 0 for the channel being used. Adjust the channel Volume Control (1) as necessary.

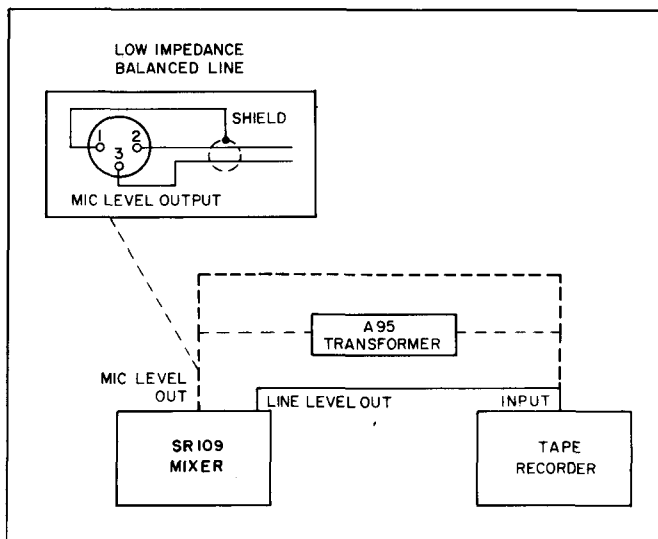


FIGURE 8. TAPE RECORDING

A better method of performing this interconnection involves the use of a phono preamplifier such as the Shure M64 Stereo Preamplifier (see Figure 9B, Page 10). In this set-up, RIAA equalization will be achieved at the preamplifier, before the signal enters the Mixer. In this manner, the Mixer equalization controls may be used to optimize the room sound, rather than compensating for the input signal. The joined turntable leads enter the channel 1 input of the preamplifier, and the output is taken from the channel 1 low level output and fed to a MICROPHONE LEVEL Input Jack (19) of the Mixer. Set the Mixer 15 dB ATTENUATOR Switch (18) to 0 with this set-up.

Note also that this set-up removes the cable restriction between turntable and Mixer described above; although

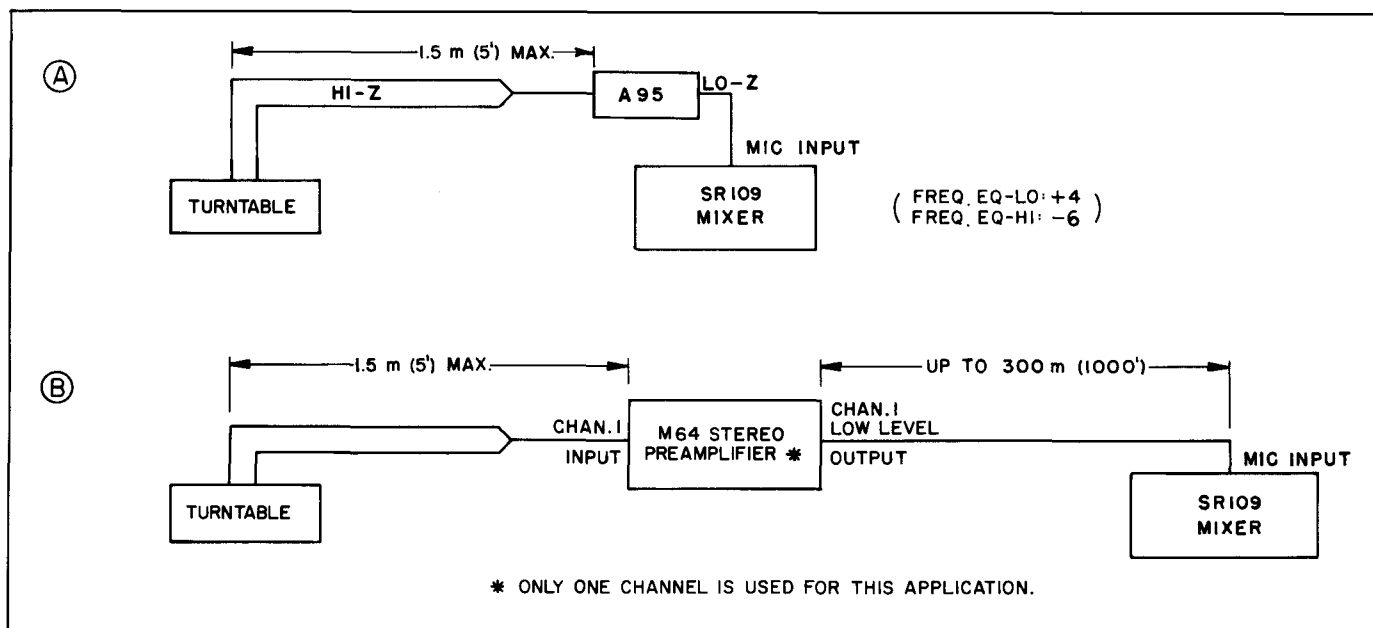


FIGURE 9. RECORD PLAYBACK

a maximum of 1.5m (5 ft) between turntable and preamplifier is mandatory, the cable length between the preamplifier and Mixer is virtually unlimited.

TAPE PLAYBACK

To play tape-recorded material through the Mixer, connect a cable from the tape recorder auxiliary or line level output to the channel 7 or 8 LINE LEVEL Input Jack (19). For unbalanced tape recorder outputs, connect a single-conductor, shielded cable as shown in Figure 10, Page 11. Connect the tape recorder output cable shield to pin 1 and the "hot" conductor to pin 3 of the SR109 LINE LEVEL Input Jack.

Set the rear-panel MIC/LINE Switch (20) on channel 7 or 8 (whichever is being used) to LINE. Set the 15 dB ATTENUATOR Switch (18) to 0, and the channel Volume Control (1) as required.

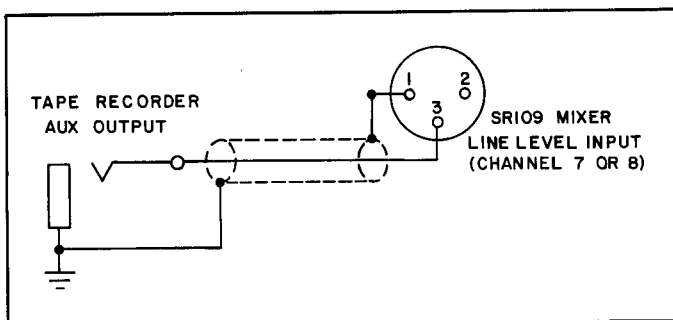


FIGURE 10. TAPE PLAYBACK

ADDITIONAL MIXER INPUTS

Additional microphone or other source inputs may be obtained using a high gain, low noise, microphone mixer such as the Shure M68FC. When connected to a MICROPHONE LEVEL Input Jack (19), the M68FC and SR109 will provide a total of 11 inputs (see Figure 11A, Page 11). (Note that adding a mixer at an Input Jack converts that channel to a submaster control; the total number of inputs will thus be the mixer total plus the SR109 total—8—minus 1 for the submaster.)

A common practice when adding a mixer in this manner is to connect similar-use microphones (for instance, all drum, string or horn microphones) to a single mixer which is fed into the SR109. The SR109 individual channel Volume Control (1) then controls an entire section, facilitating adjustment of that section during a performance. With this set-up, set the channel 15 dB ATTENUATOR Switch (18) to 0 and adjust the mixer channel volume controls in the mid-to-high range. Adjust the mixer master volume control as required to keep the SR109 channel volume control in the desirable middle range.

The M68FC mixer has a switch-selectable low- or high-impedance microphone output. When using an M68FC-type mixer into an SR109 MICROPHONE LEVEL Input Jack (19), set the mixer MIC OUT switch to low impedance, and make necessary adjustments as described above. It is sometimes desirable to use the auxiliary output from the mixer into the SR109 channel 7 (or 8) LINE INPUT (19). (Refer to *Tape Playback*, Page 11, for a description of this set-up.)

To use this set-up with an M68FC mixer, connect a cable between the mixer auxiliary output (phono pin jack) and the SR109 LINE INPUT Jack (19) on channel 7 (or 8) (Fig-

ure 11B, Page 11). Set the SR109 15 dB ATTENUATOR Switch (18) to 0 and the MIC/LINE switch to LINE. To use this set-up with other mixers, essentially the same procedure is followed. The Shure M67 mixer, for instance, may be connected to the SR109 LINE INPUT Jack through the mixer line out connector (binding posts) or headphone output (phone jack) (Figure 11C, Page 11).

If a mixer is to be used with the SR109 but it is desirable to maintain as many SR109 channels as possible, the mixer *can* be connected to the LINK OUTPUT Jack (21) (Figure 11D, Page 11). However, this requires sacrificing the channel equalization functions for the sources entering through the mixer. The only SR109 control functions operating on the mixer sources in this set-up are the MASTER Volume Control (9), LIMITER Switch (11) and rear-panel PHASE Switch (15). In addition, any mixer used in this set-up requires a 2.2-kilohm resistor in series with the mixer output to provide an attenuator bridging connection; the resulting signal level will be down -10 dB (see Figure 11E, Page 11). The M67 Mixer headphone jack has suitable built-in resistors and may be connected directly to the SR109 LINK OUTPUT Jack. Only mixers with 600-ohm line outputs may be used in the configuration. Note that the Shure M68FC mixer cannot be used this way.

The mixer-to-link out jack connection can also be used with several mixers. Each mixer output must contain its

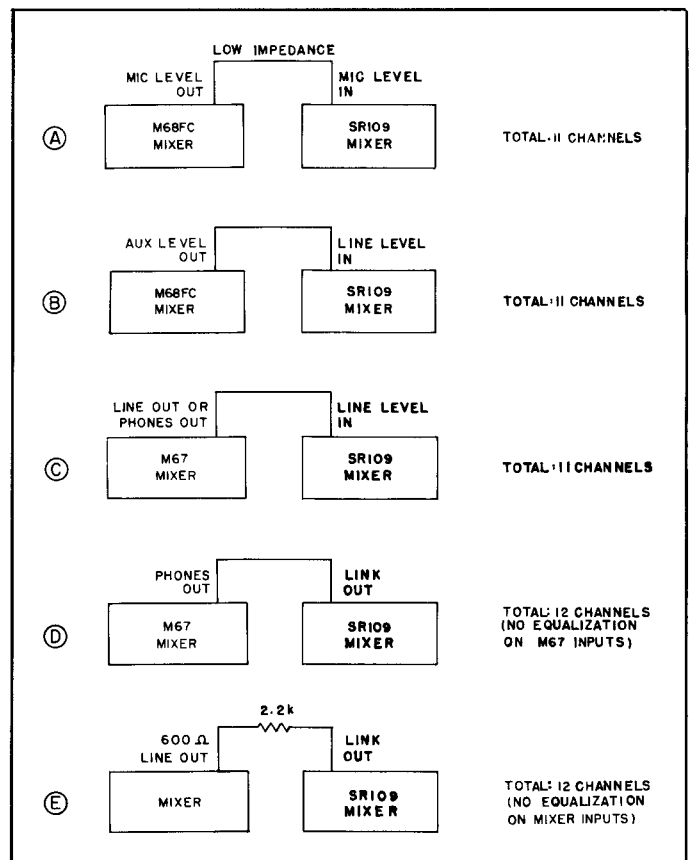


FIGURE 11. ADDITIONAL MIXER INPUTS

own 2.2-kilohm resistor prior to being joined in a "Y" adapter.

Any number of M67 mixers may be interconnected by connecting their headphone jacks in parallel. The paralleled headphone output is then connected to an SR109 LINE LEVEL Input Connector (19). The MIC/LINE Switch (20) should be set to LINE and the 15 dB ATTENUATOR Switch (18) set at 0 as an initial position and adjusted in balance with the M67 meter reading and the channel 7 (or 8) Mixer Volume Control setting (1). In this set-up the M67 VU meter switch should be set to +4, the master volume to 3, and the individual volume controls to 7 or 8.

ADDITIONAL MIXER INPUTS (TWO SR109s)

A total of 16 microphone inputs can be obtained using two Mixers in a COMMON MIX mode. Connect a cable to the "slave" Mixer LINK OUTPUT Jack (21) and to the "master" Mixer LINK OUTPUT Jack (Figure 12A, Page 12). Note that the LINK OUTPUT Jack is both an input and output jack. This interconnection provides a two-way path between the two Mixers. In this set-up, both Mixers contain the total program mix. Each Mixer MASTER Volume Control (9) is independent, and may be used to control two separate program outputs.

A different set-up that uses the slave Mixer as a submaster is made by connecting the slave Mixer LINK OUTPUT Jack (21) to the master Mixer channel 7 (or 8) LINE INPUT Jack (19) and the slave LINK INPUT Jack (22) to the master LINK OUTPUT Jack (21) (refer to Figure 12B, Page 12). This set-up is helpful when an orchestra (or band) is mixed on the slave Mixer. The channel 7 (or 8) Volume Control on the master Mixer provides a single control (submaster) to mix the total orchestra sound with the vocals. The result is that the two MASTER Volume Controls (9) provide two independent outputs, each with the total program mix and each with separate limiting adjustments.

Note that the above set-ups are also applicable to an

SR109 and a Shure SR101 Audio Console. The console may be used as master or slave.

REDUNDANT MIXER SET-UP (TWO SR109s)

Two Mixers can be connected in parallel such that certain types of failure in one will not cause the loss of channels connected to that Mixer; in a failure in the output of one Mixer, the channel inputs of both units will be routed through the operative Mixer. This type of system is termed "redundant," that is, the reliability of the system is enhanced through parallel functioning devices.

Connect a cable between the LINK OUTPUT Jacks (21) of each Mixer. Construct a resistor network as shown in Figure 13, Page 13, and insert it between the LINE LEVEL Output Jacks (23) on both Mixers and the balanced bridging input of the power amplifier. The resistor network matches the output of the two Mixers to the balanced line to the power amplifier.

A method of *total* redundancy using two Mixers is to parallel-connect ("Y") all inputs using Switchcraft 391Q13, 391Q53 or equivalent adapters. The second (redundant) Mixer may be kept on with all Volume Controls (1, 9) down, and the required controls brought up to the desired level only upon failure of one channel. The same output attenuator network as described above is required.

STEREO OPERATION

Stereo operation, for PA or tape recording purposes, may be accomplished in several ways. The most common are described in the following paragraphs.

A convenient method of stereo recording is to record the vocals on one tape channel and the instruments on the other. For this set-up, connect either the Mixer MICROPHONE LEVEL (25) or LINE LEVEL (24) Output Jack to one channel input of a stereo tape recorder (refer to *Tape Recording*, Page 9). Connect a microphone to the remain-

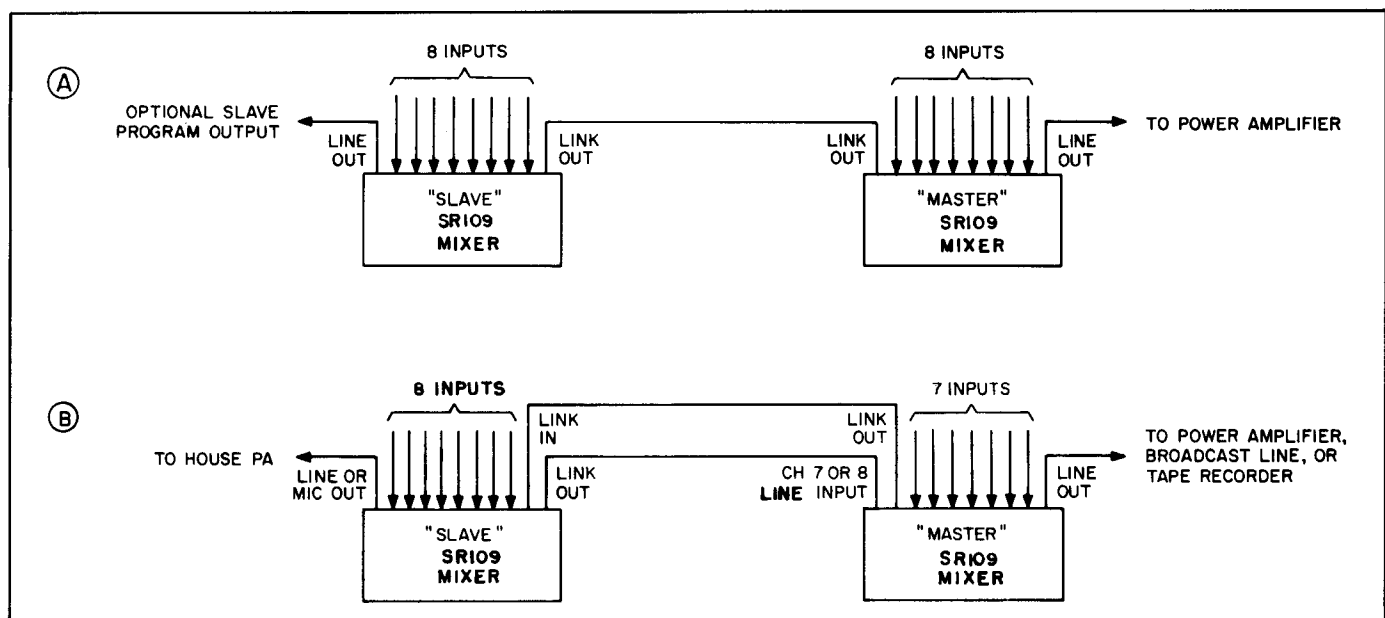


FIGURE 12. ADDITIONAL INPUTS: TWO SR109s

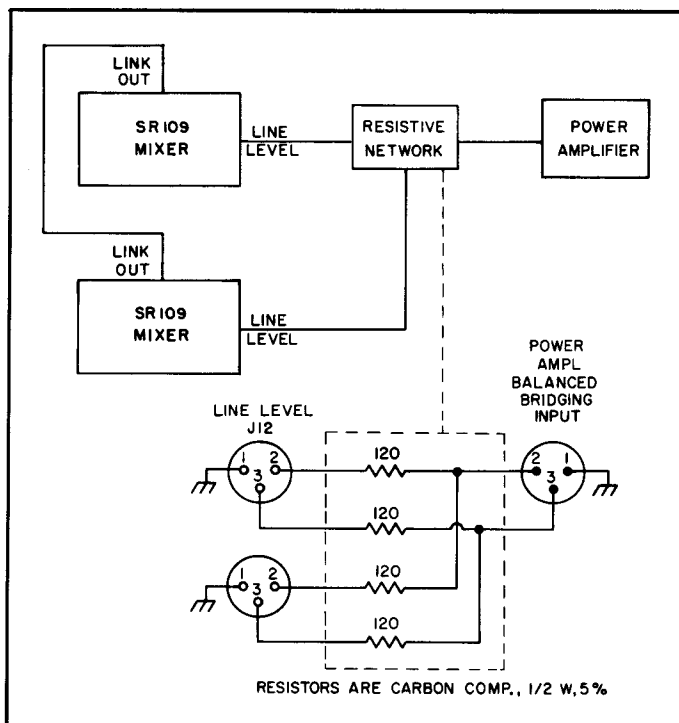


FIGURE 13. REDUNDANT MIXERS

ing tape channel input; an omnidirectional unit suspended from the ceiling will pick up the full acoustic output of the instruments.

An ideal method of recording the SR109 output in stereo is to use two SR110 Professional Monitor Mixers. This method allows the SR109 output to be used for the PA system. Connect the SR110s as shown in Figure 14, Page 13, with the output of one SR110 feeding the left input of the tape recorder and the other SR110 feeding the right.

Note that the controls of the SR110s permit spatial positioning ("panning" from left to right) and also allow different level settings to be used on the recording as opposed to the PA level. Spatial channel assignment or positioning is accomplished as follows: If the SR109 channel 1 input is to be recorded on the left tape channel, set the left SR110 channel 1 volume control for the proper level and leave the right SR110 channel 1 volume control at 0. If the second tape input is to be recorded "centered" (both left and right), adjust *both* SR110 channel 2 volume controls to the same setting. Note that these two controls combine the functions of record level and panning or positioning.

SR109 instrumental channels that are set at a low level for PA use with respect to vocal channels should be set higher on the SR110s to provide a proper recording balance. Once the SR110 levels are set, the SR109 provides the "mix" for both PA and tape recording.

An expansion of the above method may be used to record 4-channel (quadriphonic) sound. In this method, four SR110s are connected to the four tape recorder inputs, and adjustments are made as described above.

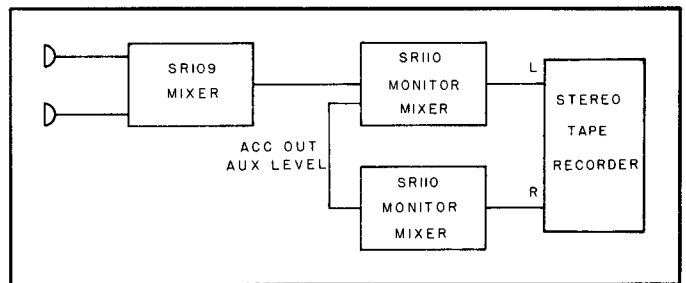


FIGURE 14. STEREO TAPE RECORDING

REMOTE VOLUME CONTROL

A remote volume control may be constructed for adjusting the output level at a considerable distance from the Mixer. For remote control up to 15m (50 ft), obtain a linear-taper potentiometer with knob (any value from 1000 to 2500 ohms), a standard phone plug, and a length of single-conductor, shielded microphone cable (such as Belden #8401, #8410, or #8411). Connect the potentiometer and plug as shown in Figure 15A, Page 13, and connect the phone plug to the Mixer LINK OUTPUT Jack (21).

If hum or noise is encountered with the above set-up, it may be necessary to provide a two-wire control. Using the same potentiometer, obtain two standard phone plugs and twice the desired length of single-conductor, shielded microphone cable. Connect the potentiometer and plugs

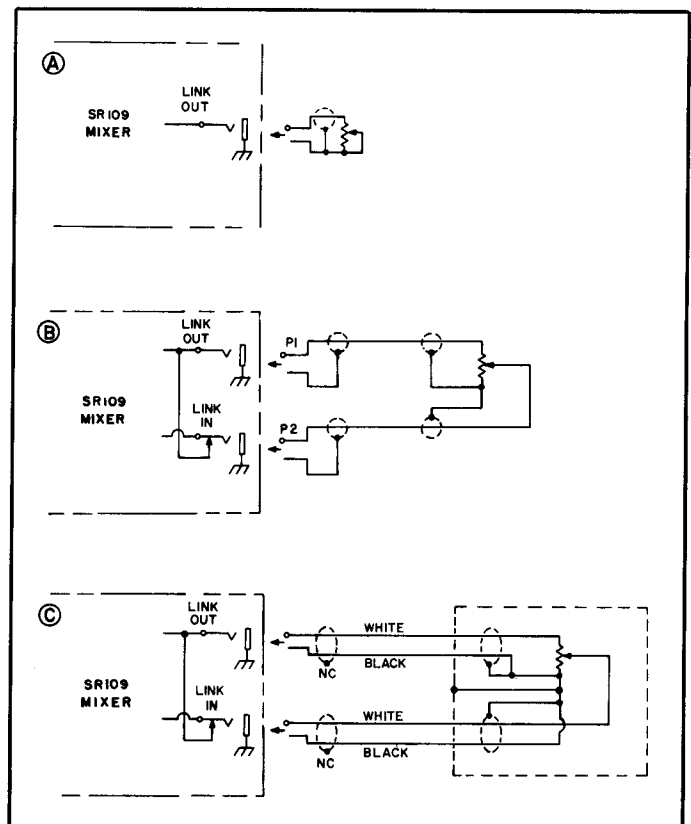


FIGURE 15. REMOTE VOLUME CONTROL

as shown in Figure 15B, Page 13, and plug the control assembly into the LINK OUTPUT (21) and LINK INPUT (22) Jacks.

For distances over 15m (50 ft) or for permanent installations where hum or noise may be encountered, use low-capacitance, two-conductor, shielded cable (Belden #8412 or #8422). Connect as shown in Figure 15C, Page 13, and use a metal box to contain the potentiometer. The cable shield must be connected to the metal box containing the potentiometer, to the common conductor (black), and not to the sleeve connections of the

phone plugs. **IMPORTANT:** To avoid hum caused by a ground loop, *do not ground* the metal box to any metal such as electrical conduit, water pipes, heating ducts, or structural steel.

TELEPHONE LINE SURGE PROTECTION

When using the Mixer to feed a telephone line that may be subject to lightning-induced voltage surges, the following part should be installed across the telephone line to provide additional protection for output circuit components: Thyrector, General Electric Part No. 6RS20SP1B1.

SR109 Professional Mixer

SERVICE INSTRUCTIONS

MIXER SERVICE (SEE GUARANTEE, Page 35.)

The SR109 Professional Mixer uses components of the highest quality, operating well within their respective ratings to assure long life.

WARNING

Voltages in this equipment are hazardous to life. Make all input and output connections before ac power is connected. Refer servicing to qualified service personnel.

REPLACEMENT PARTS

Parts that are readily available through local electronics parts distributors are not shown on the accompanying Parts List. Their values are shown on the Circuit Diagram (Figure 25, Pages 32-33). Commercial parts not readily available and unique parts are shown on the Parts List and may be ordered directly from the factory.

The commercial alternates shown on the Parts List are not necessarily equivalents, but may be used in the event that direct factory replacements are not immediately available. To maintain the highest possible performance and reliability, Shure factory replacement parts should be used. When ordering replacement parts, specify the Shure Replacement Kit Number (RKC), description, product model number, and serial number.

FUSE REPLACEMENT

To replace line fuse F1 (with no apparent problems in the Mixer), disconnect the line cord from the ac source and remove the rear-panel fuseholder cap. Replace the defective fuse *only* with a 3AG-3/16A Slo-Blo fuse (SR109 only; SR109-2E contains a 0.1A Slo-Blo fuse for 180- to 250-volt operation, or a 0.2A Slo-Blo fuse for 90- to 132-volt operation).

CAUTION

If trouble symptoms — overheating, erratic operation, etc. — were apparent before the fuse blew, or if the replacement fuse blows, a qualified serviceman should troubleshoot the Mixer carefully to find the source of the trouble. Do not continue to replace fuses until the trouble has been corrected.

The Mixer also contains a wired-in fuse in series with rear-panel line fuse F1 (F2, 3/10A, Slo-Blo). If replacement becomes necessary, replace only with an identical fuse.

KNOB REPLACEMENT

All front-panel control knobs are pull-off types and are interchangeable with others of the same function. When ordering replacement knobs, be sure to order the proper color-coded type for the desired control.

SERVICE ACCESS

To open the Mixer for servicing, remove the eight Phillips head screws securing the top cover and remove the top cover. Rear-panel-mounted parts and the preamplifier assembly may be reached by removing the eight Phillips head screws securing the rear panel, and carefully moving the rear panel assembly out and downward. Front-panel-mounted parts may be reached by removing the two screws at the top of the cover channels and the four screws at the bottom of the chassis, and carefully moving the front panel assembly out and downward.

LAMP REPLACEMENT

To replace either of the two #47 lamps (PL1, PL2) illuminating the VU Meter (M1), carefully raise the metal clip assembly holding the lamp to be replaced upward and off the Power Supply printed circuit board bracket. Lift the lamp socket upward, taking care not to crimp or break any associated wiring. Replace the defective lamp and carefully return the lamp assembly to its original position.

To replace either of the two light-emitting diodes (LED's) (D1, D2) mounted on the front panel, remove the outer insulating tubing and mounting ring from the rear of the LED. Press against the front-panel portion of the LED envelope to force it out the back through the mounting clip.

Unsolder *both* LED gray leads from the Power Supply assembly. Remove the Power Supply assembly and VU Meter (see *VU Meter Removal*, Page 16). Unsolder the LED orange lead from the LIMITER OUT-IN Switch (S12) or THRESHOLD ADJ Control (R10) (depending on which is to be replaced). Insert the replacement LED in the front panel and place the mounting ring and insulating tubing over the leads. Solder the orange lead in place, loosely coiling the two LED orange leads together. Replace the VU Meter and Power Supply assembly. Loosely coil the two LED gray leads together and re-solder them to the Power Supply ground terminal.

The above is the recommended procedure for LED replacement. In an emergency, the LED wires may be spliced and insulated (with tape or tubing) without removing the VU Meter or Power Supply.

BOARD REMOVAL

The various printed circuit boards are mounted in different manners. The following paragraphs describe the best method of removing these boards after wires and cable assemblies have been removed. **IMPORTANT:** When disconnecting push-on terminals or soldered board connections, make sure each wire is identified for proper reconnection. This may be done by affixing a piece of masking tape marked with the connection or terminal letter to each wire.

Wire colors are given in the following table.

CAUTION

Similar wire colors are used in different circuits; make sure proper re-connections can be made. Take care not to bend or break the push-on terminals. Remove or replace terminals by grasping the terminal itself; do not pull on the associated wire.

Preamplifier Board			
Letter	Wire Color	Letter	Wire Color
G/Ch. 1	Brown	G/Ch. 6	Blue
G/Ch. 2	White/Red	G/Ch. 7	Gray
G/Ch. 3	Orange	G/Ch. 8	White
G/Ch. 4	Yellow	H,J	Red
G/Ch. 5	Green	L,K	Black

Equalizer Boards			
A	Red	C,D/Ch. 4	Yellow
B	Black	C,D/Ch. 5	Green
C,D/Ch. 1	Brown	C,D/Ch. 6	Blue
C,D/Ch. 2	White/Red	C,D/Ch. 7	Gray
C,D/Ch. 3	Orange	C,D/Ch. 8	White

Main Board			
A	White	K	Blue
B	Gray	L	White/Purple
C	Blue	M	Gray
D	Green	N	White/Green
E	Yellow	Q	Yellow/Red
F	Orange	R	Yellow
G	White/Red	S	Purple
H	Brown	T	Orange
J	Black	V	Green

Main Board (Cont'd.)			
W	Black	AC	White/Red
X	White	AD	Green
Y	Red	AE	Brown
Z	White/Green	AF	Black
AA	Black	AG	Red
AB	White	AH	Black

Power Supply Board			
B	Red (5)	H	Red
D	Blue	J	Yellow
E	Green	K	Black
F	Yellow	L	Gray
G	Black (7)		

Program Mute Board			
A	Black	D	White
B	Green/White	E	Green
C	Red		

NOTE: Production variations may result in wire colors differing from those in the table.

Refer to Figure 16, Page 16, for the location of each board. The function of each board assembly is defined in the table below.

Board No.	Function	Component Numbering
1	Preamplifier Board	100's
2	Equalizer Boards (8)	200's
3	Main Board	300's
9	Power Supply Board	900's
0	Program Mute Board	90's

When removing front-panel control retaining nuts with a 1/2" nutdriver or wrench, be careful not to damage the black plastic surface.

Remove boards from nylon fasteners by squeezing the upper protruding tab on the circuit board side inward and sliding the board outward and off the fastener. The fasteners may be removed from the support bracket by squeezing both tabs securing the fastener to the bracket and pushing the fastener through the bracket hole. **NOTE:** When replacing nylon fasteners, be sure the protruding tab on the circuit board side is oriented towards the top of the chassis. Failure to do so will make future board removal difficult.

Preamplifier (Board 1): Remove the board from the seven nylon fasteners (see procedure above) securing the board to the vertical bracket, disconnect the eight color-coded channel output leads, and lift the board up for service access.

Channel Equalizer (Board 2): Each of these eight boards may be removed by removing the two front-panel equalizer control knobs and retaining nuts associated with that channel. The Channel Equalizer Boards are identical and may be interchanged without modification.

Main Board (Board 3): Remove the board from the six nylon fasteners (see procedure above) securing the board to the vertical bracket, remove the 41 push-on leads, and lift the board upward.

Power Supply (Board 9): Remove the four screws securing the board and lift straight up.

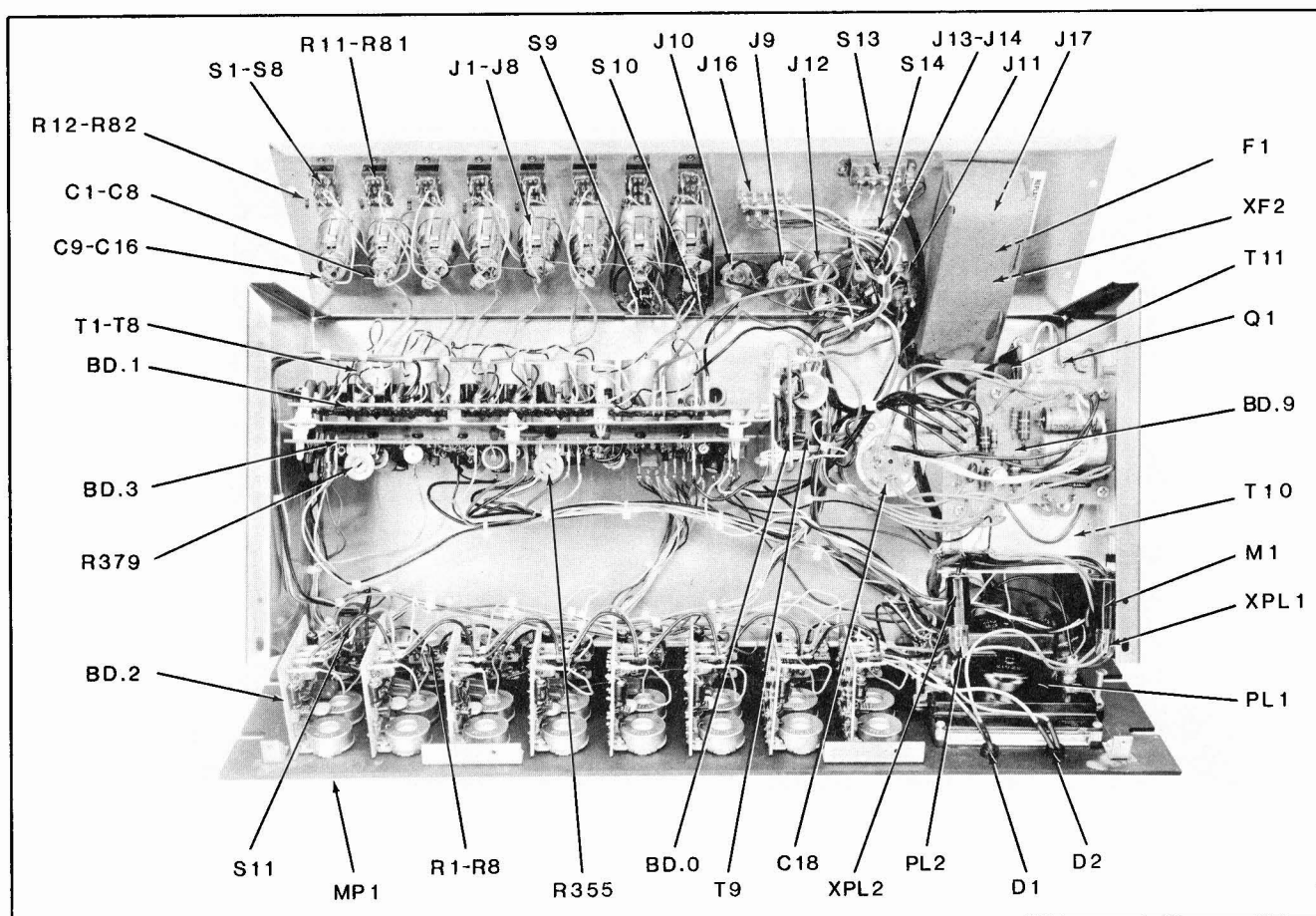


FIGURE 16. PRINTED CIRCUIT BOARD AND PARTS LOCATION

Program Mute (Board 0): Remove the board from the four nylon fasteners securing the board to the vertical bracket and lift upward.

LIMITER INTERNAL ADJUSTMENT

To adjust the limiter function following replacement of circuit components, set the MASTER Volume Control (R9) to full clockwise. With the LIMITER Switch (S12) in the OUT position, turn on the TONE OSCillator (R1) (with all other microphone inputs full counterclockwise) and adjust channel 1 Volume Control to produce a VU Meter (M1) reading of 0 VU with the VU RANGE Switch (S13) set to +4. This provides +4 dBm (+1.8 dBV) at the LINE LEVEL Output Connector (J1). Set the LIMITER Switch to IN and adjust the THRESHOLD ADJ Control (R10) to reduce the output by 1 dB on the VU Meter (to +0.8 dBV). Adjust the internal LED potentiometer (R379) so that the LIMITER Indicator Lamp (D1) just begins to light.

OVERLOAD INDICATOR CHECK

Set up as for *Limiter Internal Adjustment* and set the LIMITER Switch (S12) to OUT. Connect headphones to the PHONES Jack, listen to the tone with a 600-ohm LINE OUTPUT load, and increase the channel 1 volume. The OVERLOAD Lamp (D2) should light 2 dB before distortion can be heard on the headphones.

VU METER REMOVAL

If the VU Meter (M1) requires replacement, remove it as follows. Remove the top cover. Remove the two screws at the top of the cover channels and the four screws at the bottom of the chassis, and move the front panel out and downward. Remove the hex nuts, wire leads and washers from both meter terminals. Loosen the 1-inch screws in the meter retaining brackets at either side of the meter until the brackets slip off the screws in the sides of the meter. Carefully pass the meter assembly *out through the front panel*. To replace the meter, reverse the above steps, taking care to engage the slots in the meter retaining brackets with the screws in the sides of the meter. Tighten the 1-inch screws as necessary to retain the meter against the front panel. Reattach the meter leads, and close and secure the front panel. Replace the top cover.

CAUTION

Do not overtighten screws so as to deform meter retaining brackets.

VU METER CALIBRATION

With the Mixer turned off, the front-panel VU Meter (M1) should read 0 on the lower of the two meter scales. If it does not, adjust the screw below the meter face to obtain the correct reading.

To calibrate the meter, set the VU RANGE Switch (S13)

to +4 and connect a 600-ohm load and an ac voltmeter across the LINE LEVEL OUTPUT (J12-J14). Turn on the Mixer and adjust the TONE OSC Control (R1) and the MASTER Volume Control (R9) until a reading of +4 dBm (1.228V across 600 ohms) is obtained on the voltmeter. Adjust potentiometer R355 (VU Calibrate) on the Main Board until the VU Meter reads 0 on the upper of the two scales.

Note that the VU Calibrate potentiometer range allows the VU Meter to be adjusted to 0 for any output between 0 dBm and +8 dBm.

PARTS REMOVAL

Access to certain parts in the Mixer is not always apparent due to the large number of parts and assemblies, and the requirements for their placement. The following information is given to help locate and gain access to these parts (see Figure 16, Page 16).

Parts mounted on the rear panel may be replaced by removing the eight screws securing the rear panel to the chassis and moving the rear panel out and downward.

Parts mounted on the front panel may be replaced by removing the two screws at the top of the cover channels and the four screws at the bottom of the chassis, and moving the front panel out and downward.

To remove transformers T1-T8, remove the five screws at the bottom of the chassis holding the three-board bracket assembly to the chassis. Carefully lift the entire assembly upward, and remove the nut and washer securing the desired transformer.

Front panel controls located below the VU Meter (M1) (LIMITER Switch S12, THRESHOLD ADJ Control R10, MASTER Volume Control R9, PHONES Level Control R14 and PHONES Jack J15) may be reached by lowering the front panel as described above.

Headphones transformer T10 may be reached by first removing the Power Supply board and bracket as described under *Board Removal*.

To gain access to channel Volume Control potentiometers R1-R8, lower the front panel.

TRANSISTOR AND DIODE REMOVAL

Most transistors and all diodes used in the Mixer are mechanically supported by their leads. When replacing these devices, proper lead configurations must be followed. Minimum soldering heat (preferably with a low-wattage soldering iron) should be used to avoid damage to the device. Be sure to place heat-shrinkable tubing or "spaghetti" on leads where the original device contained such tubing. Transistor lead codes are included in the *Notes to Circuit Diagram* (Figure 23, Page 29). **IMPORTANT:** Be sure to replace ferrite bead rings on those transistor leads where they were removed.

ACTIVE COMPONENT CHECKING

Defective transistors and diodes may be located by use of a standard ohmmeter such as a Simpson 260. Polarity of the ohmmeter must be verified before these checks are made.

With a known diode orientation, measure the diode resistance in the forward and reverse directions. The lowest meter reading will establish the probe at the cathode end (schematic symbol arrow points to cathode) as the "minus" probe while the other probe will be "plus." Some ohmmeters are not polarized in this manner with relation to "volts plus probe" and "volts minus probe." With the

ohmmeter "plus" probe on the anode end of a diode, and the "minus" probe on the cathode end, the ohmmeter should read approximately 2000 ohms or less. With the meter probes reversed, a reading of about 10,000 ohms or more should be obtained. If either of these conditions is not met, the diode should be replaced.

To check transistors, the ohmmeter should be set to the 100- or 1,000-ohm scale. Transistors and diodes must be removed from the circuit before testing. If all conditions in the following table are met, the transistor may be considered free of any major defect; if any of the following conditions are not met, the transistor should be replaced. See *Notes to Circuit Diagram*, Figure 23, Page 29, for transistor lead codes.

OHMMETER CONNECTIONS		OHMMETER READING	
"Plus" Lead	"Minus" Lead	NPN Transistor	PNP Transistor
Collector	Emitter	High	High
Emitter	Collector	High	High
Collector	Base	High	Low
Emitter	Base	*	Low
Base	Collector	Low	High
Base	Emitter	Low	*

*Not a significant measurement.

To check LEDs (OVERLOAD or LIMITER), disconnect the orange LED lead and connect a 1-, 1.5-, or 2.2-kilohm resistor between the +30 Vdc supply and the orange LED lead (gray lead is still grounded). The LED should light with power applied. Replace any LED that does not light. **NOTE:** Do not check LEDs with an ohmmeter; the ohmmeter may damage the LED or give erroneous readings.

To check the opto-isolator (U1) on Board 3, obtain a high-impedance ohmmeter (VOM or VTVM), a 1½V battery and a 100-ohm resistor. Disconnect the leads to U1 and check as follows.

1. Connect the ohmmeter across the light-dependent resistor side of U1. Resistance reading should be greater than 10 megohms.
2. With ohmmeter connected as above, connect battery and resistor as shown in Figure 17, Page 17. (**IMPORTANT:** Connect only as shown to avoid damage to the LED.) The resistance reading should drop to less than 1000 ohms. Replace U1 if these conditions are not met.

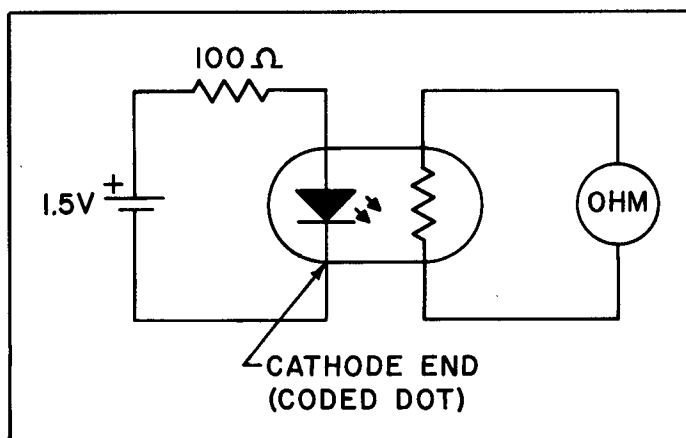


FIGURE 17. OPTO-ISOLATOR TEST

SERVICE ILLUSTRATIONS

Immediately following the parts list on the pages that follow are parts location drawings (Figures 18 to 22, Pages 24-27), and an overall Circuit Diagram (Figures 24 and 25, Pages 30 and 32-33). Once a board has been located through the parts location photo (Figure 16, Page 16), the components on that board may be located from the corresponding parts location drawing. Foil circuit paths are shown as shaded areas on the drawings. The overall Circuit Diagram (Figures 24 and 25, Pages 30 and 32-33) shows all board circuits and chassis-mounted parts.

OPTIONAL ACCESSORIES

The following optional companion unit and accessory are designed for use with the Shure SR109 Professional Mixer:

SR110 Professional Monitor Mixer
A105A Carrying Case

The SR109 and an SR110 Monitor Mixer will conveniently mount in a single A105A case.

SR109 Professional Mixer

REPLACEMENT PARTS LIST

NOTE: The commercial alternates shown in the following lists are not necessarily equivalent parts, but are electrically and mechanically similar, and may be used if direct factory replacements are not immediately available. To maintain highest possible performance and reliability, Shure Factory Replacement Parts should be used. To insure low noise figure, order transistors from Shure Brothers Inc.

Reference Designation	Replacement Kit No. *	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
CHASSIS-MOUNTED PARTS AND ASSEMBLIES					
Bd. 1	—	—	90A2129	Printed Circuit-Assembly, Preamplifier	None
Bd. 2	—	—	90A2247	Printed Circuit Assembly, Channel Equalizer, with HI and LO controls	None
Bd. 3	—	—	90A2117	Printed Circuit Assembly, Main Board	None
Bd. 9	—	—	90A2251	Printed Circuit Assembly, Power Supply	None
Bd. 0	—	—	90B2254	Printed Circuit Assembly, Program Mute	None
C18	—	—	86A641	Capacitor, Dual Electrolytic, 1000 μF, 70V	None
D1-D2	—	—	90B1989	Diode Assembly, Light-Emitting	Monsanto MV5023
F1	—	—	80B159	Fuse, Ac, 3AG-3/16A, 125V, Slo-Blo (SR109)	Littelfuse 313.187 Bussman MDL3/16
F1	—	—	80C258 80D258	0.1A for 220V operation, 0.2A for 115V operation, Fuse, Ac, Slo-Blo, 250V (SR109-2E)	Littelfuse 21300 Series
F2	—	—	80A267	Fuse, Ac, Pigtail, 3/10A, Slo-Blo	Littelfuse 315.300
J1-J8	—	—	95B246	Connector, Female, 3-pin Audio, MICROPHONE LEVEL Input	Switchcraft D3F
J9	RKC87	1	95C446	Connector, Phone Jack, 2-Conductor, Single Closed Circuit, LINK INPUT	Switchcraft 12A
J10	RKC68	1	95B446	Connector, Phone Jack, 2-Conductor, Open Circuit, LINK OUTPUT	Switchcraft 11
J11-J12	—	—	95B247	Connector, Male, 3-Pin Audio, MIC LEVEL and LINE LEVEL Output	Switchcraft D3M
J13-J14	—	—	95D446	Connector, Phone Jack, 3-Conductor, Open Circuit, LINE LEVEL Output	Switchcraft 12B
J15	—	—	95D658	Connector, Phone Jack, 3-Conductor, Open Circuit, PHONES	Switchcraft 112B
J16	—	—	95A655	Connector, Female, 11-pin, MONITOR OUTPUT	Amphenol 126-805
J17	—	—	95B552	Connector, Female, SWITCHED AC, 500 WATTS MAX. (SR109 only)	None

* Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST FOR SR109 PROFESSIONAL MIXER

Reference Designation	Replacement Kit No. *	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
J18	—	—	95A689	Connector, 3-Pin, AC (MAINS) POWER (SR109-2E only)	None
L2-L4	—	—	80A250	Ferrite Bead Ring	Stackpole 57-0181; Ferronics 21-031J
M1	—	—	95A615	Meter Assembly, VU	API Instruments 361-2, A-Scale
MP1	—	—	90D2085	Knob Assembly, Orange, HI FREQ EQ	None
MP2	—	—	90C2085	Knob Assembly, Red, LO FREQ EQ	None
MP3	—	—	90B2119	Knob Assembly, Grey, PHONES	None
MP4	—	—	90A1786	Knob Assembly, Black, Individual Channel and MASTER Volume	None
MP5	—	—	39A384	Nameplate, Write-on	None
MP6	—	—	39A345	Nameplate, Shure	None
PL1-PL2	RKC7	4	95A466	Lamp, Indicator, 6.3V	GE 47
Q1	RKC55	1	86A338	Transistor, Silicon, NPN	RCA 2N3441
R1	—	—	46A051	Potentiometer, Modified Log, Tandem, 50k, with TONE OSC Switch, Channel 1 Volume	None
R2-R8	—	—	46A052	Potentiometer, Tandem, 50k, Channels 2-8 Volume	None
R9	—	—	46A050	Potentiometer, Tandem, 50k, with On-Off Switch, MASTER Volume (SR109)	None
R9	—	—	46A074	Potentiometer, Tandem, 50k, with On-Off Switch, MASTER Volume (SR109-2E)	None
R10	—	—	46A048	Potentiometer, Screwdriver Adjust, 50k, THRESHOLD ADJ	None
R14	—	—	46A049	Potentiometer, Linear, 2k, PHONES	None
S1-S10	—	—	55A119	Switch, Slide, DPDT, 15 dB ATTENUATOR and MIC/LINE	None
S11	—	—	—	Part of R1	
S12	—	—	55A120	Switch, Slide, TPDT, LIMITER	None
S13	—	—	55B62	Switch, Slide, DPTT, VU RANGE	None
S14	—	—	55C119	Switch, Slide, DPDT, PHASE	None
S15	—	—	—	Part of R9	
S16	—	—	55A116	Switch, Slide, DPDT, VOLTAGE SELECTOR (SR109-2E only)	None
T1-T8	—	—	90J2150	Transformer and Shield Assembly, Mic Input	None
T9	—	—	51A235	Transformer, Line Level Output	None

* Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST FOR SR109 PROFESSIONAL MIXER

Reference Designation	Replacement Kit No. *	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
T10	—	—	51D228	Transformer, Headphone Output	None
T11	—	—	51A262	Transformer, Ac Power (SR109)	None
T11	—	—	51A265	Transformer, Ac Power (SR109-2E)	None
W1	—	—	95A632	Line Cord, Ac, Grounded, 2.7m (9 ft) (SR109)	Belden 17408
W1	—	—	90A1888	Line Cord, Ac, Grounded, 9-Foot, Single Connector (SR109-2E)	None
XF1	—	—	95A429	Fuseholder, Miniature, Panel-Mounting (SR109)	Littelfuse 342014
XF1	—	—	95A604	Fuseholder, Miniature, Panel-Mounting (SR109-2E)	None
XPL1-XPL2	—	—	95A657	Lampholder and Bracket Assembly	None

PREAMPLIFIER (BOARD 1)

C110, C120, C130, C140, C150, C160, C170, C180, C190, C191	—	—	50KB104	Capacitor, Film, 0.1 μ F, 100V	Sprague 225P10491; CDE DMF-1P1-10
C111, C121, C131, C141, C151, C161, C171, C181	—	—	86B629	Capacitor, Electrolytic, 22 μ F, 35V	Sprague 502D-226G050CE10; Mallory MTV-25CB35
C113, C123, C133, C143, C153, C163, C173, C183	—	—	86A630	Capacitor, Electrolytic, 4.7 or 5 μ F, 35V	Sprague 30D-TE1303; CDE NLW-5-50
C192, C193	—	—	86J628	Capacitor, Electrolytic, 50 μ F, 35V	Sprague 30D-TE1307; CDE NLW-50-50
C194	—	—	86L628	Capacitor, Electrolytic, 250 μ F, 40V	None
D100	RKC50	2	86A410	Silicon Rectifier, 100V, 1/2 A	Motorola 1N4002
L110, L120, L130, L140, L150, L160, L170, L180	—	—	80A253	Ferrite Bead Ring	Stackpole 57-0180; Ferronics 21-030J
Q110, Q120, Q130, Q140, Q150, Q160, Q170, Q180	—	—	86A350	Transistor, Silicon, Low Power, NPN	Motorola 2N5210
Q111, Q121, Q131, Q141, Q151, Q161, Q171, Q181	—	—	86A348	Transistor, Silicon, Low Power, PNP	Motorola or Fairchild 2N5087
Q112, Q122, Q132, Q142, Q152, Q162, Q172, Q182	RKC9	4	86A349	Transistor, Silicon, NPN	Motorola 2N5088; TI 2N3711

* Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST FOR SR109 PROFESSIONAL MIXER

Reference Designation	Replacement Kit No. *	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
EQUALIZER (BOARD 2)					
C200, C201, C205, C208	—	—	86A630	Capacitor, Electrolytic, 4.7 or 5 μ F, 35V	Sprague 30D-TE1303; CDE NLW-5-50
Q200, Q201, Q202	RKC9	4	86A349	Transistor, Silicon, NPN	Motorola 2N5088; TI 2N3711
R204, R208	—	—	46A034	Potentiometer, 50k, HI and LO FREQ EQ	None
MAIN BOARD (BOARD 3)					
C300-C302, C316-C317, C322, C326-C329, C332, C334-C335	—	—	86A630	Capacitor, Electrolytic, 4.7 or 5 μ F, 35V	Sprague 30D-TE1303; CDE NLW-5-50
C303, C321	—	—	86B629	Capacitor, Electrolytic, 22 μ F, 35V	Sprague 502D-226G050CE10; Mallory MTV-25CD35
C304	—	—	86J628	Capacitor, Electrolytic, 50 μ F, 35V	Sprague 30D-TE1307; CDE NLW-50-50
C306, C323, C330, C333	—	—	86L628	Capacitor, Electrolytic, 250 μ F, 40V	None
C310	—	—	86F630	Capacitor, Electrolytic, 1 μ F, 25V	Sprague 30D-TE1200; CDE NLW-1-25
C311, C336	—	—	50KB104	Capacitor, Electrolytic, .1 μ F, 100V	Sprague 225P10491; CDE DMF-1P1-10
C318	—	—	86B636	Capacitor, Electrolytic, 4 μ F, 25V	None
C324, C331	—	—	86N628	Capacitor, Electrolytic, 100 μ F, 25V	Sprague 30D-TE1211; Mallory MTA-100F35; CDE NLW-100-25
C325	—	—	86A629	Capacitor, Electrolytic, 47 μ F, 16V	Sprague 503D-476G016; Mallory MTV-35CB25
D300-D304, D307-D308	RKC79	1	86A403	Silicon Rectifier, 50V, 1/2A	Motorola 1N4001
D305, D309-D312, D314	—	—	86A415	Diode, Silicon, Computer, 75V	TI or GE 1N4148
D313	RKC22	1	86A408	Silicon Zener Diode, 22V, 5%	Motorola 1N4748A
L1	—	—	80A250	Ferrite Bead Ring	Stackpole 57-0180; Ferronics 21-031J
Q300, Q304, Q309	—	—	86A350	Transistor, Silicon, NPN	Motorola 2N5210
Q301, Q303, Q310, Q312, Q316, Q318, Q319, Q321	RKC66	1	86A335	Transistor, Silicon, PNP	TI TIS93

* Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

REPLACEMENT PARTS LIST FOR SR109 PROFESSIONAL MIXER

Reference Designation	Replacement Kit No. *	Replacement Kit Consists Of:			Commercial Alternate
		Qty.	Part No.	Description	
Q302, Q311, Q315	RKC65	1	86A334	Transistor, Silicon, NPN	TI TIS92
Q305	—	—	86A348	Transistor, Silicon, Low Power, PNP	Motorola or Fairchild 2N5087
Q306	—	—	86A329	Transistor, Silicon, N-Channel, Field Effect	Motorola 2N5458
Q307-Q308, Q313, Q317, Q320	RKC9	4	86A349	Transistor, Silicon, NPN	Motorola 2N5088; TI 2N3711
Q314	RKC12	1	86A336	Transistor, Silicon, NPN	TI TIS97
R355	—	—	46F033	Potentiometer, 10k, VU Cal	None
R379	—	—	46D033	Potentiometer, 100k, LIMITER Lamp Cal	None
U1	—	—	86A901	Optical Isolator, LED Photoconductor	None

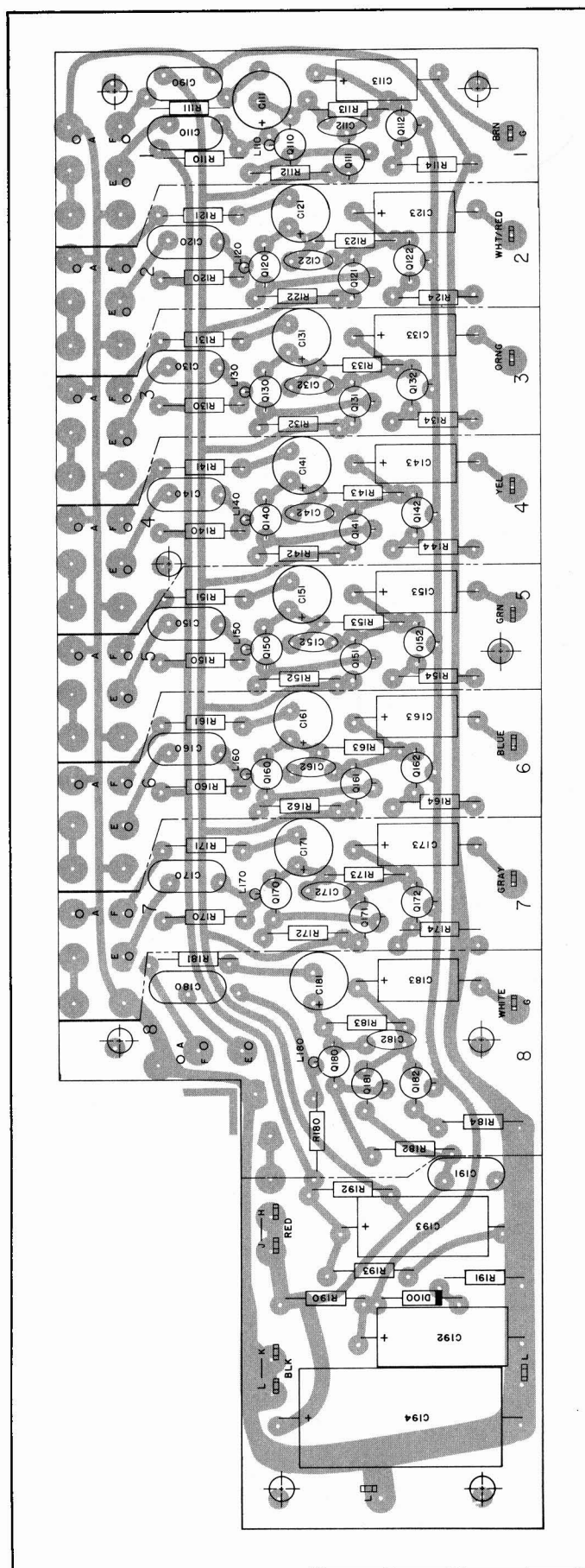
POWER SUPPLY (BOARD 9)

C900	—	—	86P628	Capacitor, Electrolytic, 250 μ F, 60V	None
C901	—	—	86L628	Capacitor, Electrolytic, 250 μ F, 40V	CDE BR250-50
C902	—	—	50KB104	Capacitor, Film, .1 μ F, 100V	Sprague 225P10491; CDE DMF-1P1-10
D900-D903	RKC50	2	86A410	Silicon Rectifier, 100V, 1/2A	Motorola 1N4002
D904	—	—	86A416	Silicon Zener Diode, 32V, 5%	Motorola 1N4752B
Q900	—	—	86A344	Transistor, Silicon, Power, NPN	RCA 40347
R906	—	—	45CB208C	Resistor, Fixed, 2.0 ohms, 1W, 5%	None

PROGRAM MUTE (BOARD 0)

C90	—	—	50KC104	Capacitor, Film, .1 μ F, 100V	Sprague 225P10491; CDE DMF-1P1-10
C91	—	—	86A632	Capacitor, Electrolytic, 1000 μ F, 25V	Sprague TVA-1211
D90-D92	RKC21	4	86A404	Silicon Rectifier, 100V, 1/2A	Motorola 1N4002
Q90	RKC9	4	86A349	Transistor, Silicon, NPN	Motorola 2N5088; TI 2N3711
Q91	RKC12	1	86A336	Transistor, Silicon, NPN	TI TIS97
RLY90	—	—	55A93	Relay, Reed, SPST, 24 Vdc	None

* Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.



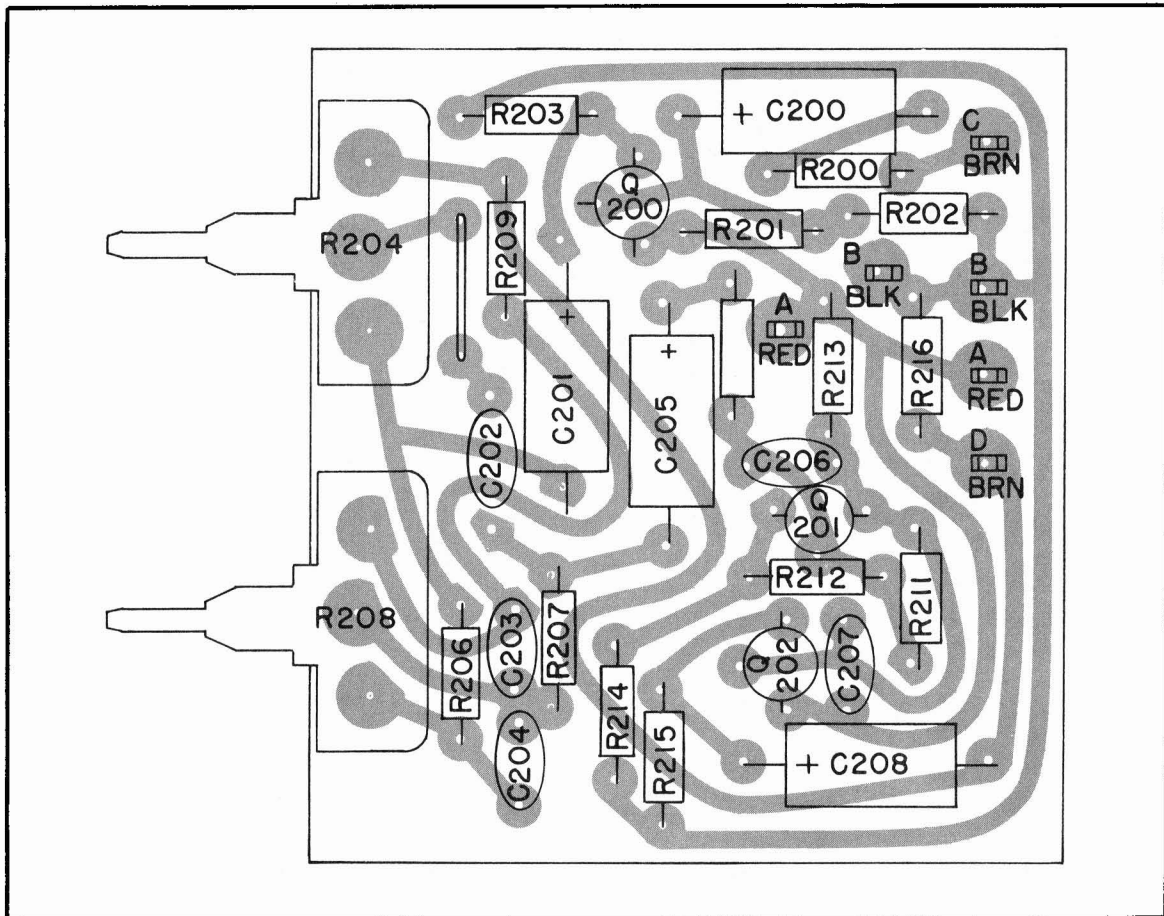


FIGURE 19. BOARD 2: CHANNEL EQUALIZER

2247-2/2246-3/587-4

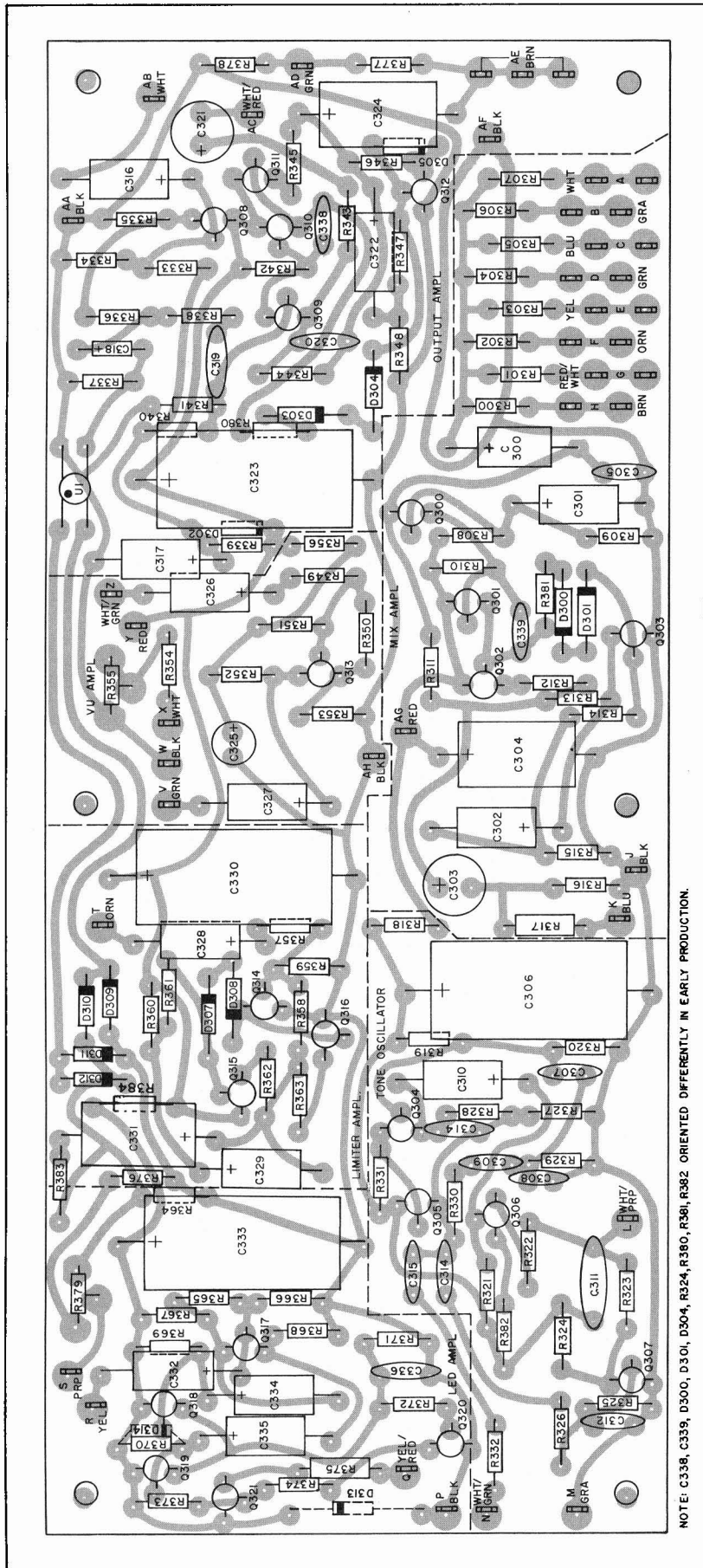


FIGURE 20. BOARD 3: MAIN BOARD

2117-8/627-5

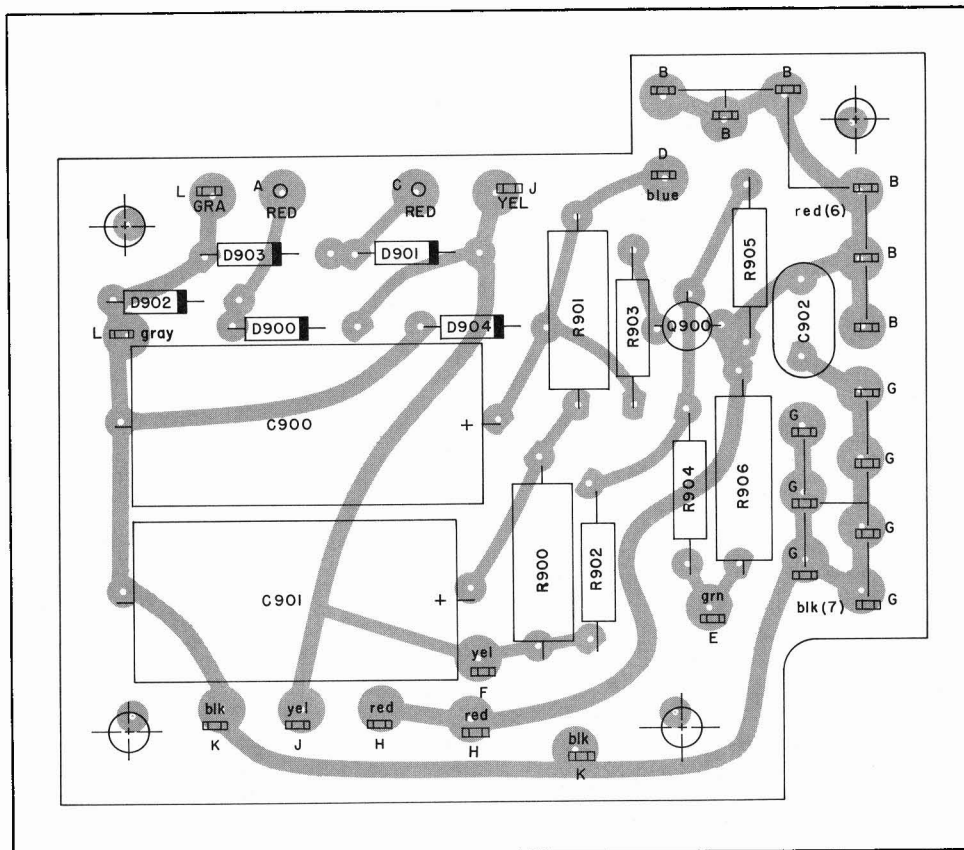


FIGURE 21. BOARD 9: POWER SUPPLY 2210-9/2251-3/591-4

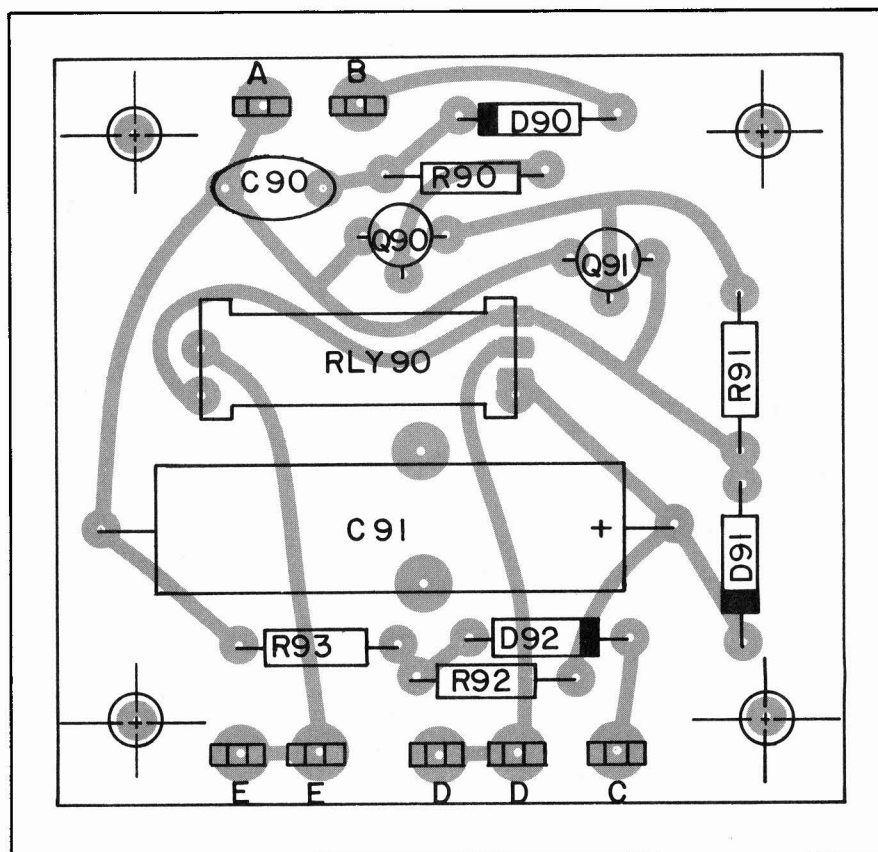


FIGURE 22. BOARD 0: PROGRAM MUTE 2254-3/592-3

SR109 Professional Mixer

NOTES TO CIRCUIT DIAGRAM

GENERAL

Shure part numbers are not shown in the Parts List accompanying the Circuit Diagram (Figures 24 and 25, Pages 30 and 32-33) if parts are readily available through local electronics parts suppliers. In these instances, the Circuit Diagram shows only the reference designation and value of the standard parts.

All capacitor values are shown in microfarads unless otherwise designated. All non-electrolytic capacitors are 100 working volts dc or more unless otherwise specified. Electrolytic capacitors are shown in microfarads x volts.

All resistor values are shown in ohms ($k = 1000$). Resistors are 10% tolerance unless otherwise specified. Resistors are 1/4-watt unless otherwise specified.

Transistor lead codes are shown in Figure 23. Acceptable replacements are as shown in the Parts List.

The following ground symbols denote:

Chassis Ground 
Circuit Ground 
Printed Circuit Board Ground 

TROUBLESHOOTING

A general troubleshooting process is as follows: If the Mixer is completely "dead," check the ac power source,

fuses, and power supply output (30V between pins B and G, Board 9). If the indicator lamps are on but the output is distorted, low or not present, apply an input signal as described under *Ac Voltage Measurements* below, and determine that the input and output voltage to each board assembly is correct. If an incorrect ac voltage is found at any board output, perform *Dc Voltage Measurements* on that board as described below to isolate the problem area.

AC VOLTAGE MEASUREMENTS

The numbers within rectangular symbols  on the circuit diagram denote the ac voltages at that point under the following test conditions:

1. Voltages measured with respect to chassis unless otherwise indicated.
2. Line voltage: 120V, 50/60 Hz (SR109)
120V or 240V, 50/60 Hz (SR109-2E)
3. Test signal of 1 mV, 1 kHz applied between pins 2 and 3 of connector J1.
4. Ac voltage measurements may vary $\pm 20\%$ from values shown.
5. Measurements made with ac VTVM of 1 megohm or greater input impedance.
6. 600-ohm load across LINE LEVEL Output Connector J12 (pins 2 and 3).

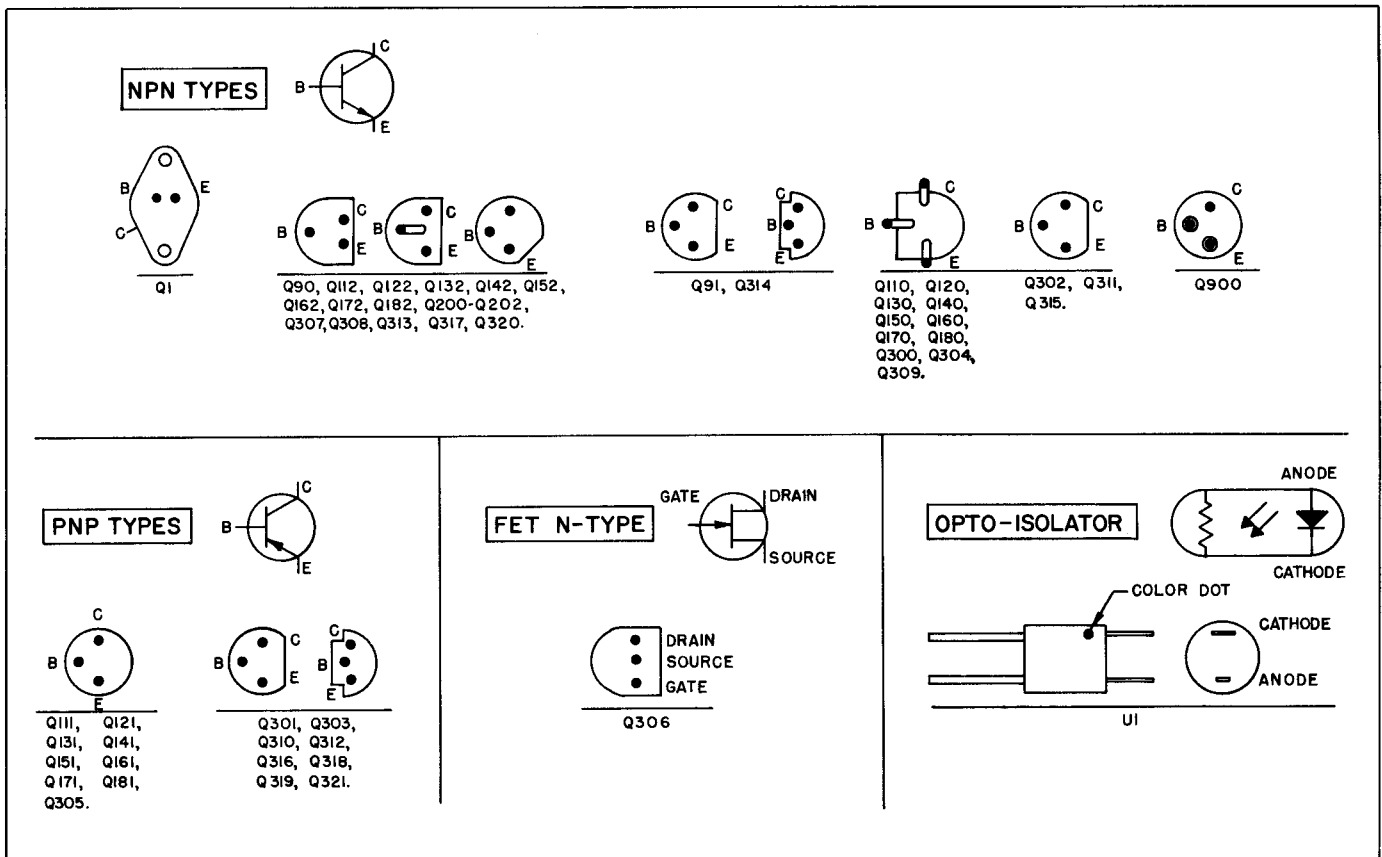


FIGURE 23. LEAD CODES

7. All Equalization Controls in 0 (flat) setting.
8. All Volume Controls set to maximum (12).
9. Tone oscillator circuit measurements on Main Board (Bd. 3) made with TONE OSC Switch on (out).
10. LIMITER Switch in IN position.

4. Dc voltage measurements may vary $\pm 20\%$ from values shown.
5. Measurements made with VTVM of 11 megohms or greater input impedance.
6. Tone oscillator circuit measurements on Main Board (Bd. 3) made with TONE OSC Switch on.

DC VOLTAGE MEASUREMENTS

The numbers within elliptical symbols $\circ$ on the circuit diagram denote the dc voltages at that point under the following conditions:

1. Voltages measured with respect to chassis unless otherwise indicated.
2. Line voltage: 120V, 50/60 Hz (SR109)
120V or 240V, 50/60 Hz (SR109-2E)
3. No input signal applied.

RESISTANCE MEASUREMENTS

With the ac line cord disconnected from the ac source and the POWER OFF Switch in the OFF position, the following ohmmeter measurements may be made:

1. Transformers may be checked for continuity of each winding.
2. To test transistors and diodes, see Page 17.
3. To check LEDs, see Page 17.
4. To check opto-isolator, see Page 17.

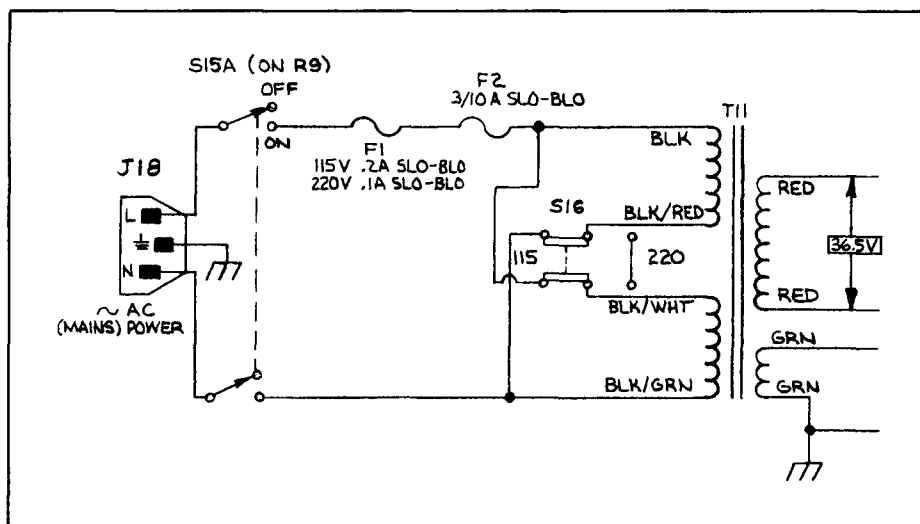
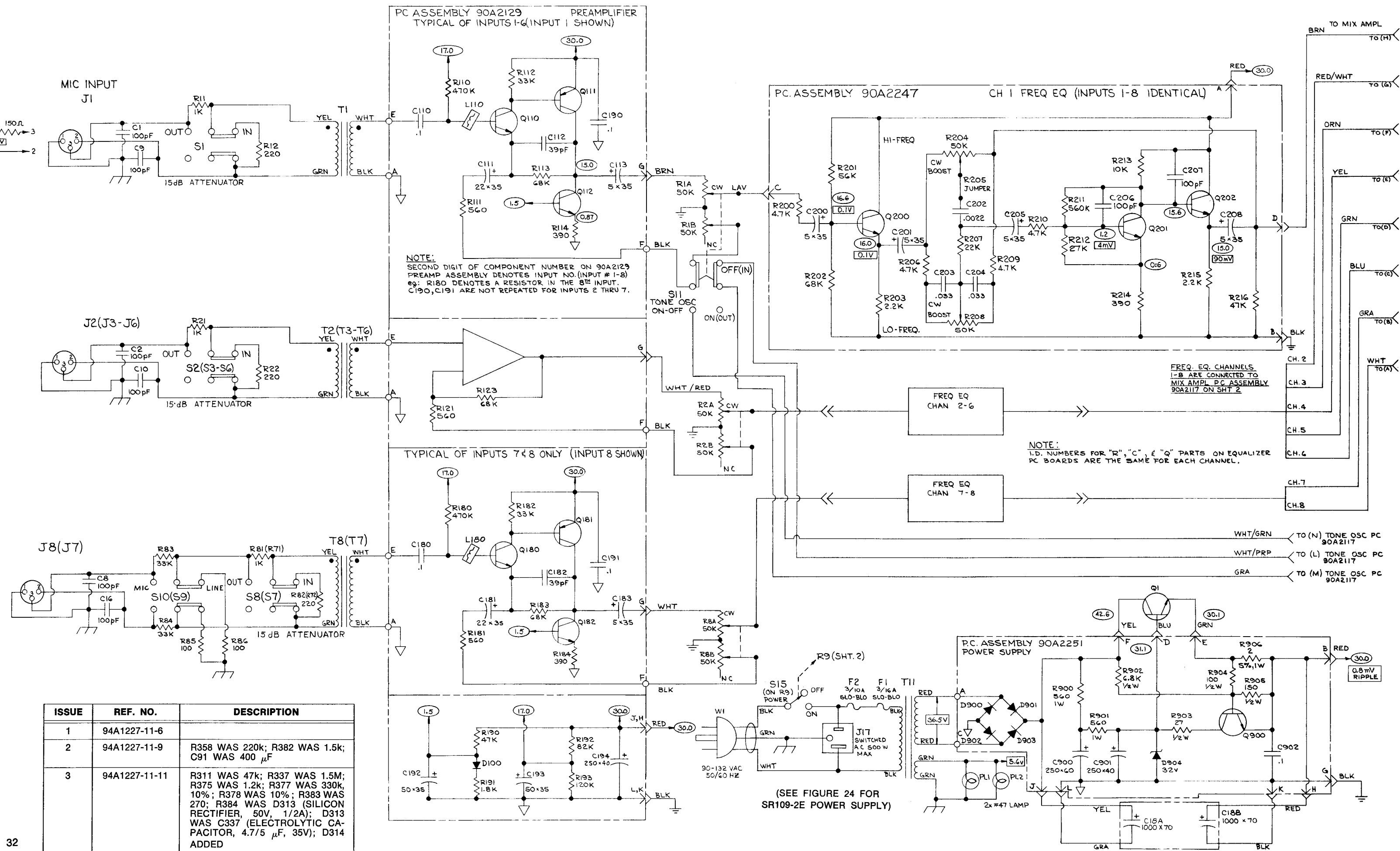


FIGURE 24. SR109-2E POWER SUPPLY CIRCUIT DIAGRAM

B1227-11-1



J16
ACCESSORY OUTPUT

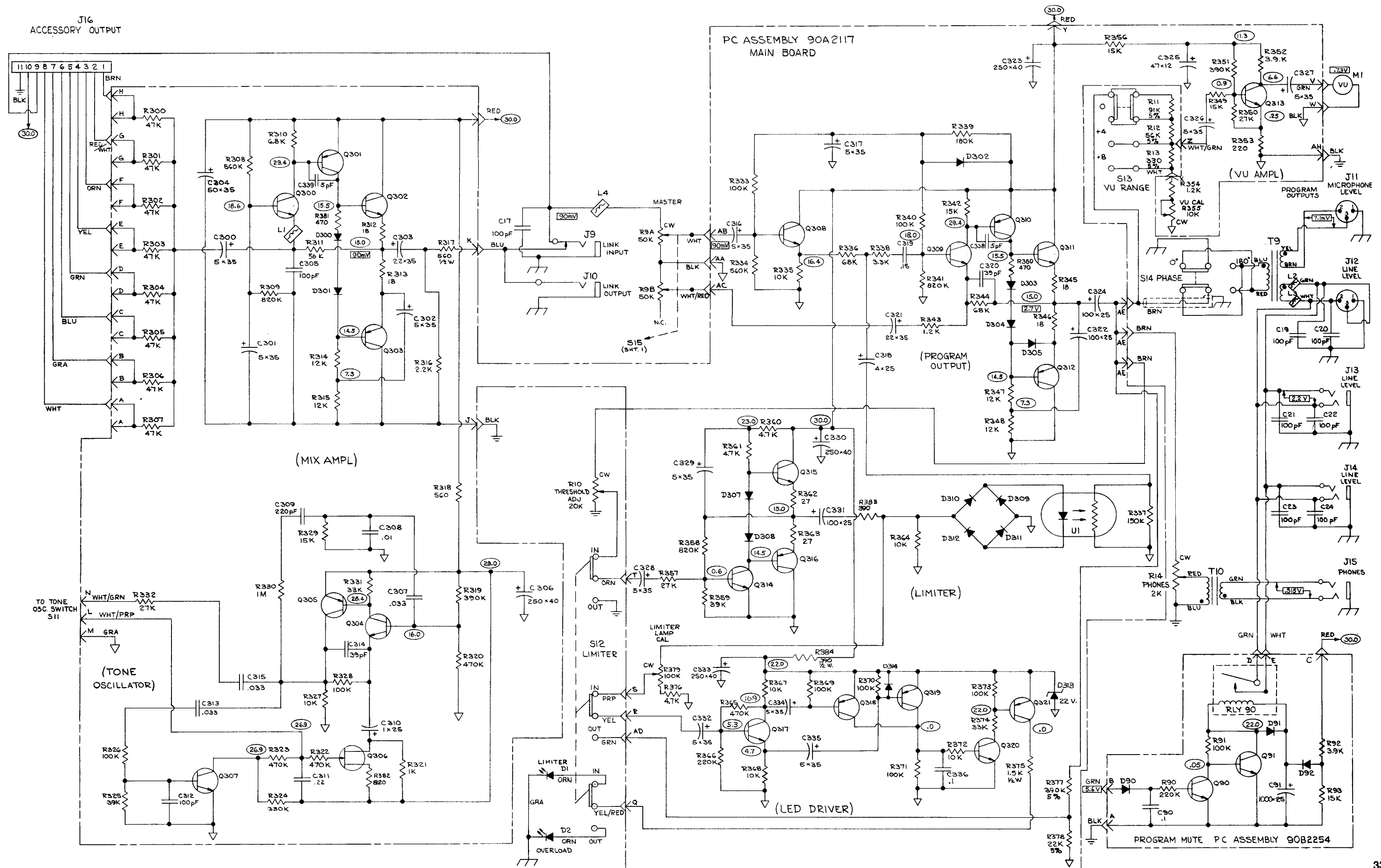


FIGURE 25. SR109 PROFESSIONAL MIXER CIRCUIT DIAGRAM

SR109 Professional Mixer

CONDENSED OPERATING INSTRUCTIONS

1. Set all switches and controls to OFF or 0.
2. Connect PROGRAM OUTPUT (LINE or MICROPHONE LEVEL) to power amplifier, broadcast line feed, etc. Connect speakers to power amplifier. Connect headphones to PHONES Jack.
3. Connect sources (microphones, tape recorders, etc.) to INPUT Connectors. Set Channel 7 or 8 MIC/LINE Switches as necessary.
4. Connect external signal-processing equipment (compressor, equalizer, etc.) to LINK Jacks. (To connect two Mixers, connect LINK OUT Jacks together.)
5. Connect ac line to ac source.
6. Turn on POWER Switch and allow one to two minutes warmup time.
7. Set 15 dB ATTENUATOR Switches to preliminary position for type of material to be used (0 for speech or instrumental music, —15 for "hard" rock music).
8. Set VU METER RANGE Switch for present application: 0 for PA, +4 for recording, or +8 for broadcast.
9. Set MASTER Volume Control to 6. With source input, raise Channel Volume Control for desired sound level. Readjust ATTENUATOR Switch if necessary.
10. Adjust HI and LO FREQUENCY Equalization Controls as necessary.
11. Turn on LIMITER and adjust THRESHOLD ADJ Control if desired.

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS*

The Mixer shall be a self-contained 90- to 132-volt, 50 to 60 Hz, line-operated, all-silicon transistor mixing amplifier with preamplifiers and controls to mix eight independent low-impedance microphone input signals.

Each input channel in the Mixer shall have independent HIGH-FREQUENCY and LOW-FREQUENCY controls, two-position zero to 15 dB ATTENUATOR Switch and rotary-motion level control. The 7th and 8th input channels shall each have an additional input switch to select the desired input level (MIC or LINE).

The PROGRAM OUTPUT circuit shall have a 600-ohm balanced line level output rated at +12 dBm at less than 1% distortion with a minimum clipping level of +19 dBm and a low-impedance, balanced, microphone-level output at a level 50 dB below the LINE LEVEL output. A PHASE switch shall be provided to reverse the phase of both the LINE and MICROPHONE LEVEL outputs.

The program channel shall have a rotary motion MASTER LEVEL control, and a 76.2 mm (3 in.) illuminated VU meter with a 0, +4, +8 dBm VU METER RANGE Switch.

A pair of LINK Jacks shall be provided in the program circuit to allow connection to external equipment such as a compressor, limiter, equalizer, additional mixer or console, etc.

The Mixer shall have a PHONES level control and a transformer-coupled headphone (PHONES) output.

The Mixer shall have a voltage gain of 87 ± 3 dB and a maximum microphone input sensitivity of 0.1 millivolts for a +4 dBm program output.

The microphone input clipping level, with a zero attenuator setting, shall be 4.5 millivolts minimum with the level control at maximum and shall increase to 100 millivolts minimum with the level control near minimum.

The Mixer shall contain a peak-responding adjustable output limiter with an in-out switch and an indicator lamp that flashes when the limiter threshold is exceeded. An overload lamp, which operates only when the limiter is not activated, shall indicate when the output clipping level of the Mixer is exceeded.

An 11-pin accessory monitor output connector shall provide for connection to one or more Shure SR110 Professional Monitor Mixers to provide separate monitor mixes for stage monitoring (foldback), multi-channel tape recording, or stereo broadcasting.

The Mixer shall be enclosed in a metal housing designed for rack-mounting in a standard 19-inch (483 mm) audio equipment rack, or mounting in an accessory vinyl-covered wood portable case.

The Mixer dimensions shall be 133 mm (5¼ in.) in height, 483 mm (19 in.) in width, and 232 mm (9⅛ in.) in depth. The weight shall be not more than 7.7 kg (17 lb).

The Mixer shall have a built-in tone oscillator and a level control built into the channel 1 program circuit. A POWER on/off switch shall also be located on the front panel. A switched ac receptacle rated for 500 watts maximum load shall be provided.

The MICROPHONE INPUT connectors shall be three-pin female professional audio type. The LINK Jacks, and two PROGRAM LINE LEVEL OUTPUT Jacks shall be ¼-inch phone jacks. One PROGRAM LINE LEVEL OUTPUT connector and the MIC LEVEL OUTPUT connector shall be three-pin male professional audio type. The headphone (PHONES) connector shall be a three-circuit ¼-inch phone jack to be used with either mono or stereo phones with an impedance of 4 ohms or higher.

Any Mixer not meeting all of the above specifications shall be deemed unacceptable under this specification. The Mixer shall be a Shure Model SR109.

* All specifications apply to SR109-2E except: operating voltage is 90-132 or 180-250 volts; no switched AC receptacle is provided.

GUARANTEE

This Shure product is guaranteed in normal use to be free from electrical and mechanical defects for a period of one year from date of purchase. Please retain proof of purchase date. This guarantee includes all parts and labor. This guarantee is in lieu of any and all other guarantees or warranties, express or implied, and there shall be no recovery for any consequential or incidental damages.

SHIPPING INSTRUCTIONS

Carefully repack the unit and return it prepaid to:

Shure Brothers Incorporated
Attention: Service Department
1501 West Shure Drive
Arlington Heights, Illinois 60004

If outside the United States, return the unit to your dealer or Authorized Shure Service Center for repair. The unit will be returned to you prepaid.