sunn®

Sunn Professional Line

SPL 2212, 2216
stereo mixing consoles

operators manual

SUNN MUSICAL EQUIP. CO. AMBURN INDUSTRIAL PARK TUALATIN,OREGON 97062
A HARTZELL CORPORATION COMPANY

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Section 3 - MIXER FUNCTIONS

SECTION 1

INTRODUCTION

The SUNN SPL 2212 and 2216 are high performance mixers designed for sound reinforcement. They use quiet, high-speed, operational amplifiers for all signal processing; offer both balanced and unbalanced inputs and outputs; give enough control flexibility for sound reinforcement and recording sessions; and have multipoint overload sensing and user-adjustable low-frequency cutoff controls, assuring the best possible sound for every performance.

The SPL 2216 has 16 channels while the SPL 2212 has 12 input channels; in every other way the two mixers are identical. Each channel has individual gain, EQ, Panning, and Fader controls, with a separate Cue Switch providing a quick performance check on each channel. The master mixer section has faders and variable low-pass cutoffs for the Sub 1, Sub 2, and Monitor outputs, with the Main fader derived from the two Sub outputs. There are additional outputs for Effects, AUX, and headphones, with additional inputs for the Effects and AUX returns and direct patch inputs for the mixer busses.

This manual is divided into three sections; an Introduction, Operating Instructions, and Mixer Functions. You will probably want to go to Section 2 and read about the Live PA Setup and the Operating Hints first; this will quickly "get you on board" the SPL 2216/2212 mixer. When you use the mixer the first few times, keep the Mixer Function section nearby; when in doubt, just refer to the picture and the test to find out what each control does. To check the signal path, refer to the block diagram at the front of this section; this shows all of the major circuits of the SPL 2212/2216 mixer.

SPECIFICATIONS FOR SPL 2212 AND SPL 2216

(All specifications refer to SPL 2212 and SPL 2216 unless noted)

NOISE

All specifications are maximums. All are "A" weighted and referenced to 0 dBV = 1 vrms. Conditions are stated by the measurement.

Microphone Pre-amp equivalent input noise

Source resistance = 150 ohms	– 122 dBV

Master section output noise
Channel faders down. All others at maximum

Submasters	– 78 dBV
Main	– 70 dBV
Monitor	– 90 dBV

Noise under Actual Operating Conditions

All channel GAIN controls at – 10dB, equalization and PAN controls at center, faders at maximum.
Submaster and main faders at – 10dB

	SPL 2212	SPL 2216
Submasters	– 65 dBV	– 63 dBV
Main	– 70 dBV	– 68 dBV

Signal to Noise Ratio

Referenced to maximum output of 10 vrms. Measured at main output.

SPL 2212	SPL 2216
+ 90 dB	+ 88 dB

DISTORTION

All distortion measurements are maximums measured from 20Hz to 20KHz at the maximum output voltage and load conditions specified as maximum output levels below.

	THD	IMD
Channel Send	.02%	.01%
Any other unbalanced output	.04%	.03%
Any Balanced output	.07%	.03%

MAXIMUM OUTPUT LEVELS

Channel send, effects and auxiliary outputs	7 vrms into 2K ohm
Any other unbalanced output	8 vrms into 2K ohm
Any balanced output	10 vrms into 600 ohms + 22 dBm

MAXIMUM INPUT LEVELS

Microphone Input	.8 vrms
Line Input	10 vrms
Auxiliary or Effects Input	8 vrms
Direct Patch Input	10 vrms

SLEW RATE

600 ohm load on balanced outputs, 2K ohm on unbalanced.

Channel Send	12 volts per microsecond
Any other unbalanced output	6 volts per microsecond
Any balanced output	12 volts per microsecond

FREQUENCY RESPONSE

From any input to any output	20Hz to 50KHz + 0 – 3dB

SUNN MUSICAL EQUIPMENT COMPANY'S LIMITED WARRANTY

SUNN Musical Equipment Company warrants new products to be free from defective materials and workmanship for one year from date of purchase to the original owner when purchased from an AUTHORIZED SUNN DEALER according to the following conditions.

The purchaser is responsible for completing and mailing to SUNN, within 15 days of purchase, the warranty application enclosed with each product. Upon receipt of the warranty application, SUNN will issue a warranty validation sticker that must be affixed to the product. Where a warranty validation area has not been provided on a few SUNN products, the validation sticker is to be affixed to your original proof of purchase and presented at the time of warranty service. PROOF OF PURCHASE ON UNREGISTERED EQUIPMENT IS NOT SUFFICIENT FOR RECEIVING IN-WARRANTY SERVICE. In the event you do not receive your validation sticker within 60 days of mailing, you are to notify SUNN Musical Equipment Company in writing immediately. The purchaser has the sole responsibility of completing and mailing the warranty application.

Light bulbs and meters carry a 90 day warranty from date of purchase.

SUNN products that have been subject to accident, alterations, abuse, rental, or defacing of the serial number are not covered by this warranty. Loudspeakers and drivers misuse due to overpowering or improper installation resulting in torn, burned or charred components will not be covered by this warranty.

The normal wear and tear of appearance items such as handles, corners, casters, and knobs are not covered under this warranty.

If your SUNN product requires service during the warranty period, SUNN will repair or replace, at its option, defective materials provided you have identified yourself as the owner of the validated product to any SUNN authorized service center or contact SUNN for service assistance. Transportation charges to and from an authorized service center of factory for SUNN products and components to effect repairs shall be the responsibility of the owner. In the event a product is to be returned to SUNN for repairs, a written return authorization from SUNN must be obtained prior to shipping.

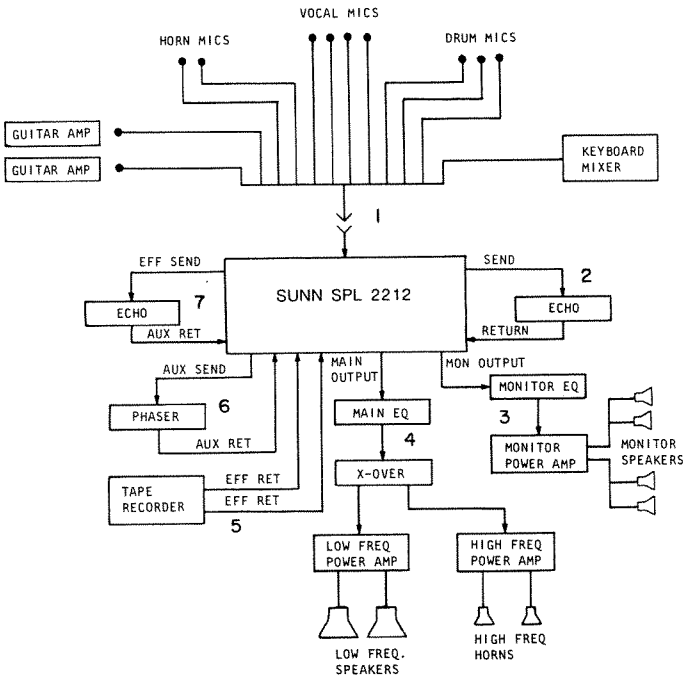
Sunn is not liable for any incidental or consequential damages resulting from any defect or failure of this instrument other than the repair of SUNN product subject to the terms of this warranty. This warranty gives you specific legal rights and you may also have other rights which vary from state to state. This warranty is expressly in lieu of all other agreements and warranties, expressed or implied except as may be otherwise required by law.

Thank you for choosing SUNN!

SECTION 2

OPERATING INSTRUCTIONS

LIVE PA SETUP



The sound system is set up for a mono mix. The MAIN output is used to drive the PA sound system. The submaster busses are used to develop two separate submixes, with SUB 1 used for a vocal mix and SUB 2 used for a musical instrument mix. All channels used for vocals have their PAN controls set to the SUB 1 position. All channels used for instruments (guitar, horns, keyboards, drums) have their PAN controls set to the SUB 2 position. The EFFECTS SEND will be used to add an effect to the vocal mix and the AUX SEND will be used to add an effect to the instrument mix. The MAIN OUTPUT is the sum of all input signals.

1. CHANNEL INPUTS

Connect all low impedance microphones to the MIC INPUTS. High impedance microphones and line level input signals are placed into the LINE inputs. If the mixer is 25 feet or more from the stage, low impedance microphones with balanced line outputs should be the only microphones used. This helps to eliminate noise from external sources from getting into the sound system through the microphone cables. The use of a snake is recommended when the mixing board is operated away from the stage.

2. CHANNEL EFFECT PATCHING

The channels are designed to allow direct access to each channel for signal processing. Patch from the channel SEND output to the accessory unit, for example, an echo unit. The return signal from the echo unit is patched back into the channel RETURN jack. Only the channel with the echo unit will be affected by the echo unit.

3. MONITOR SYSTEM

The MONITOR system provides the performers with a separate mix which allows monitoring of their performance. In the example, the MONITOR system consists of the mixer, a graphic equalizer, power amp, and monitor speakers. The channel MONITOR controls are adjusted for the desired signal level sent from the channels to the monitor buss. The MONITOR FADER control is used to adjust the desired operating level. A graphic equalizer, although not a necessity, is recommended to prevent acoustical feedback.

4. MAIN PA SOUND SYSTEM

The MAIN PA function in a sound system is to produce the sound mix created for the audience. In this example, besides the mixer, there is a graphic equalizer, electronic crossover, two power amplifiers and high and low frequency speakers. The channel fader controls are used to adjust the signal level from the channels sent to the submaster busses. The two submaster faders adjust the balance between the vocal mix and instrument mix sent to the MAIN buss. The MAIN FADER control adjusts the overall level of the main sound system.

5. TAPE RECORDER INPUT PATCHING USING THE EFF RET

The EFF RET jacks 1 & 2 provide direct input access to the MAIN buss. In many performances a band will play program music from a tape recorder through the MAIN PA sound system during their breaks. The EFF RET jacks in this example are used for input signals from a tape recorder. Use the EFFECTS RETURN controls and tape output level controls to adjust for desired sound level.

6. ACCESSORY PATCHING USING THE AUX SEND & AUX RETURN

The AUX SEND provides a separate output mix which is ideal for driving external accessory units. In this example, a phaser unit is used to add a phaser effect to the instrument mix. Patch from the AUX SEND jack to the input of the phaser unit. The AUX SEND control is used to set the proper input signal level to the phaser. The return signal from the phaser is patched back into the mixer at one of the two AUX RET input jacks 1 or 2. The AUX RET control adjusts the input signal level from the phaser unit mixed with the instrument signal present in the instrument submaster channel. The AUX PAN control is set to the submaster buss used for the instrument mix (SUB 2).

7. ACCESSORY PATCHING USING THE EFFECT SEND & AUX RETURN

The EFF SEND jack provides an output signal from the EFF/REV buss which can be used to drive external accessory units. The EFF/REV buss delivers the signals from the EFF/REV controls to the internal reverb pan and also the EFF send amp. In the example, only the channels used for the vocal mix are being sent to the EFF SEND jack. The EFF SEND output is patched to the echo input. Adjust the desired input siganl level to the echo unit with the EFFECTS SEND control. The return signal from the echo unit is patched into an AUX RET jack. The return signal is placed in an AUX RET jack instead of an EFF RET jack for two reasons. The first is that both EFF RET jacks are being used for tape inputs and secondly, placing the signal into the AUX RET jack allows the signal to be panned to the submaster channel used for the vocal mix. The AUX PAN control associated with the AUX RET jack used for the echo return is placed in the SUB 1 position. The AUX RETURN control is used to adjust the amount of echo signal to be mixed with the signal already present in the vocal submaster.

RECORDING SESSION

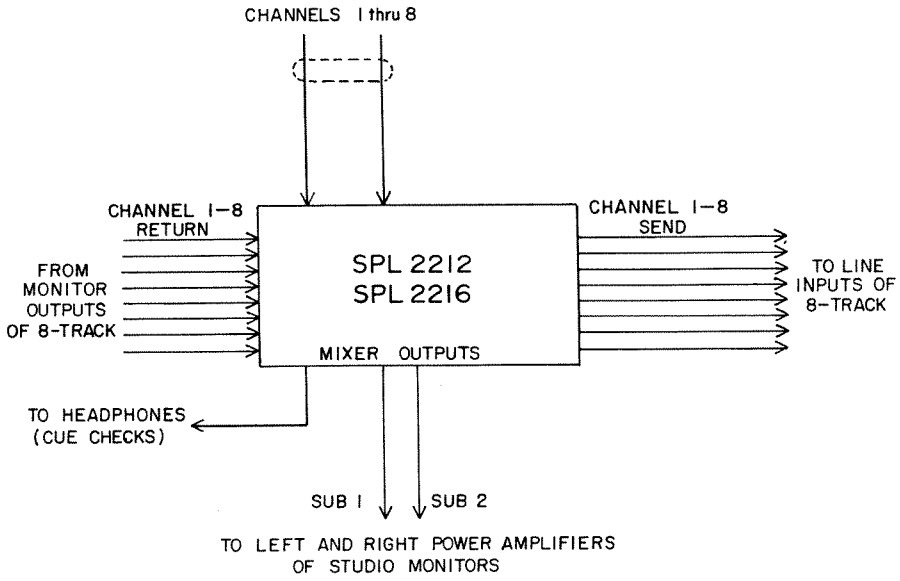
The SPL 2216/2212 can also serve as a recording console for multitrack tape machines during session mixes and mixdowns. Here is a suggested system setup using an 8-track machine.

Session Mix

Connect up to 8 microphones to the individual channel inputs. Since the individual tracks should be "dry" (without EQ or reverb), connect the 8-track to the channel SEND jacks - this precedes the EQ and Fader sections. Connect the Monitor outputs of the 8-track to the channel RETURN jacks. Connect the stereo amp for the studio monitor speakers to the SUB 1 and SUB 2 outputs.

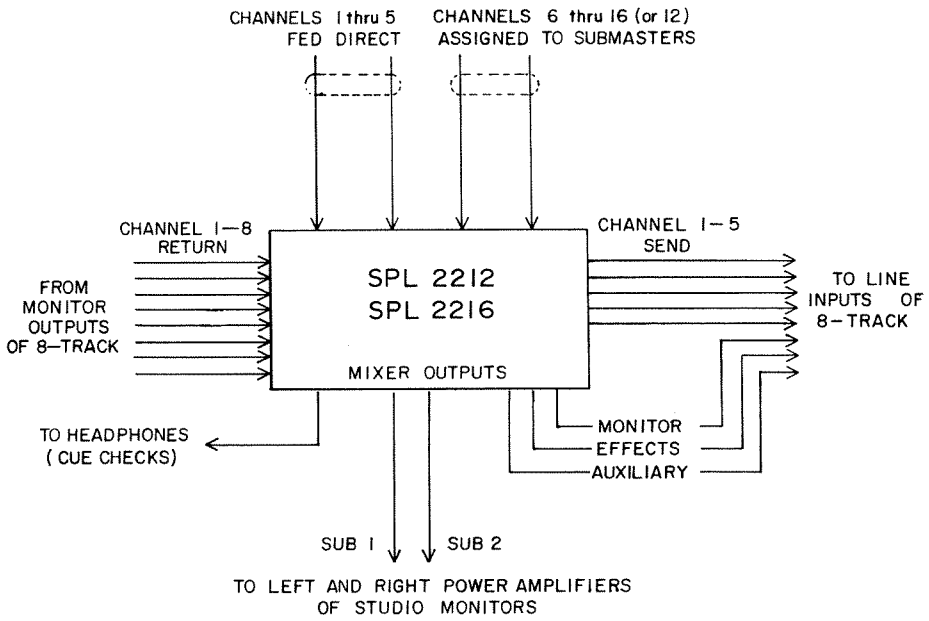
Session Mix - Continued

The channel GAIN controls affect the levels going on the tape; use these controls to set optimum levels on the tape machine's VU meters. All other controls, such as the channel EQ, PAN, and FADERS, affect only the signal RETURN'ed from the tape machine. Be sure to note the settings you use for later reference during mixdown.



Submasters: If you re-jumper the AUX and EFF/REV to be PRE-EQ and PRE-FADER circuits you can dedicate three busses as submasters, allowing use of all 16 or 12 inputs. This setup connects 5 channel SENDS to the 8-track, using the AUX, Effects, and MONITOR outputs to drive the other three tape channels. The levels going into the submaster busses are set by the channel AUX, EFF/REV, and MONITOR controls; the levels going onto the tape are set by the AUX SEND, Effects SEND, and MONITOR FADER controls in the Master Mixer section of the board.

(To change internal jumpers, refer to "Resetting Internal Jumpers" in this section. Be sure to indicate to other users that the machine has been re-jumpered - or change the jumpers back to the original factory settings when you finish up.



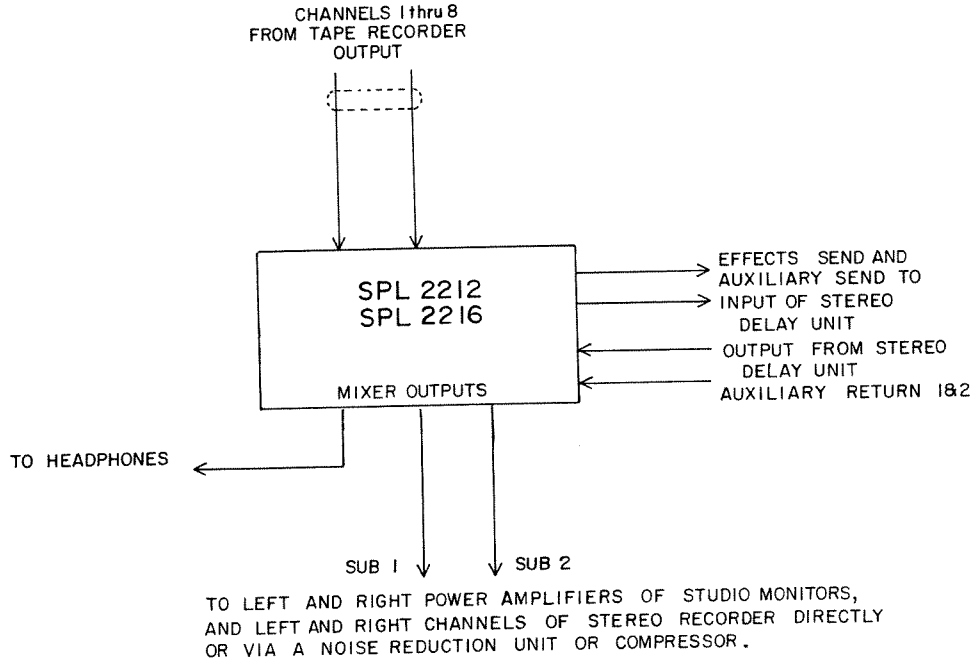
STEREO MIXDOWN

In a stereo mixdown the dry signals pre-recorded onto a multi-track tape recorder are fed back into the mixing console, processed (add EQ, and desired effects) and sent to a stereo tape recorder. Connect the 8 tape outputs to the channel LINE inputs; connect the stereo master machine to the SUB 1 and SUB 2 outputs. All channel and Master Mixer controls operate normally. Assign the stereo image with the PAN controls - and use a little discretion here; stereo sounds most natural if the images are smoothly distributed left-to-right, with vocals centered.

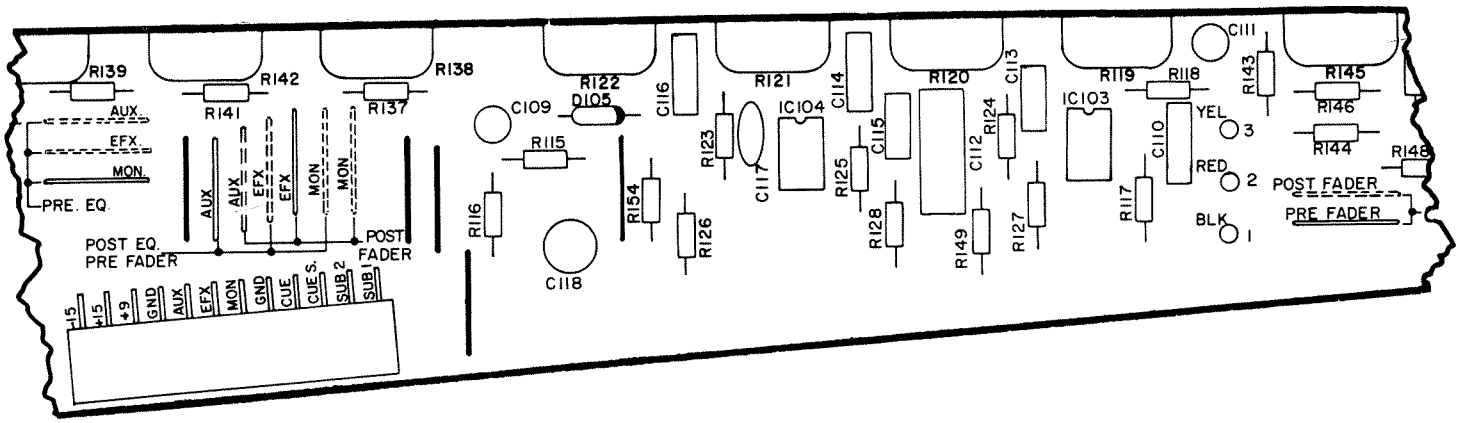
You may prefer the spacious sound of a stereo reverb device such as a stereo digital delay unit. Connect the inputs of the external reverb device to the EFFECTS and AUX outputs of the 2216/2212; connect the outputs of the reverb device to the AUX 1 return and the AUX 2 return. Set the AUX 1 PAN control to SUB 1 and the AUX 2 PAN control to SUB 2; use the AUX 1 and 2 RETURN controls to adjust the level of reverb fed back into stereo busses SUB 1 and 2.

STEREO MIXDOWN - Continued

It may be desired when using the AUX and Effect sends in a stereo mixdown to assign the AUX and EFF/REV channel controls to Post-EQ and Post-Fader. This is done by placement of internal jumpers on the channel boards, refer to Resetting Internal Jumpers in this section.



RESETTING INTERNAL JUMPERS



RESETTING INTERNAL JUMPERS - Continued

The component diagram on the previous page shows the locations of the jumpers on the individual channel cards. The solid lines represent the factory-wired standard locations; the dotted lines represent new locations that can be selected.

The jumpers for the AUX, EFF/REV, and MON busses can be placed in one of three locations.

A) PRE-EQ, PRE-FADER
B) POST-EQ, PRE-FADER
C) POST-EQ, POST-FADER

The jumper for the CUE buss can be placed in one of two locations:

A) PRE-FADER
B) POST-FADER

When you change jumpers, you will want to make some kind of record of the changes before someone else operates the mixer.

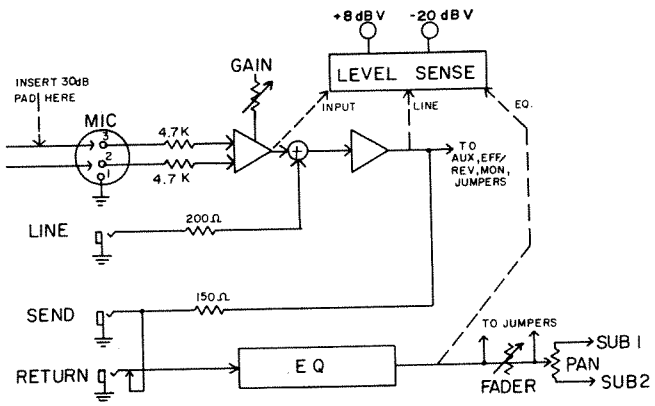
All costs for changing the jumpers will be paid by the owner. SUNN is not responsible for damage caused by improper modifications.

SUNN recommends the changing of the jumpers to be performed at the nearest qualified SUNN dealer or service center.

OPERATING HINTS

Overload:

The SPL 2216/2212 has a level sensing circuit that monitors three stages of amplification: The microphone pre-amp, the line-amp, and the EQ circuitry (see figure below).



OPERATING HINTS - Continued

The green -20 dBV LED indicates normal operating level, but the red +8 dBV LED indicates that overload is imminent or actually occurring, resulting in hard clipping in the op-amps.

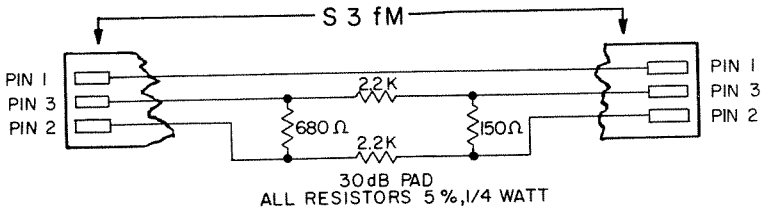
1) Switch on the CUE to check on sound quality as you make adjustments.

2) Reduce the GAIN control. This cuts the gain of the line amp, the most likely overload point. If the red LED is still on...

3) Turn the EQ controls back to the zero position. If the red LED refuses to go away, that means...

4) The microphone preamp is overloading. Pull the GAIN down to -55, and add a 30 dB pad in series with the mike input. It's not a bad idea to carry several of these pads around with you.

5) A 30 dB pad can be made by using a switchcraft connector Part #S3FM with the resistor network shown below.



30dB PAD
ALL RESISTORS 5%,1/4 WATT

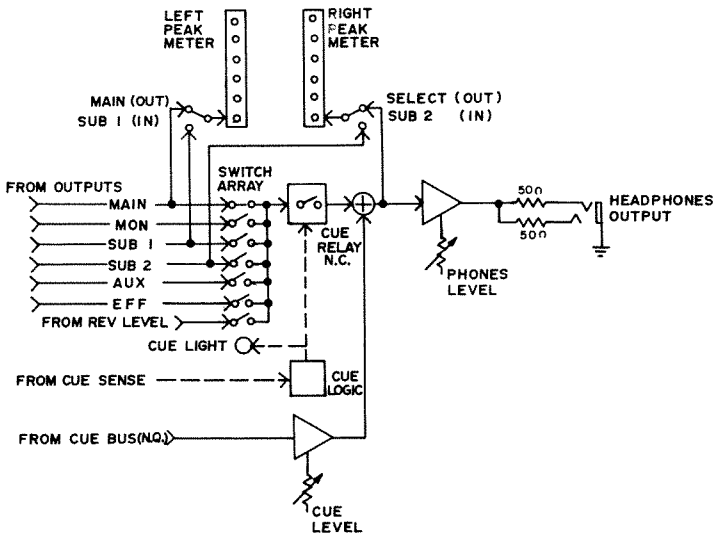
CUE SYSTEM

The CUE switch on each channel automatically overrides all other signals fed to the headphones (and the right Peak Meter, if switched out to SELECT). Since both channel and output faders are bypassed, don't be surprised if there is a sudden change in level; reach for the CUE LEVEL under the HEADPHONE/METER switch array.

CUE SYSTEM - Continued

You can press as many CUE switches as you want; the outputs of all CUE'ed channels will sum together. As you press more CUE switches, the level will gradually increase; turn down on the CUE LEVEL to compensate.

The CUE light is a reminder that a CUE switch is on, meaning that you are NOT listening to a finished mix, but only a CUE'ed channel.



HEADPHONE/METER SWITCHING

The HEADPHONE/METER switch array selects the mixer output that is fed to the headphones (and the right Peak Meter, if switched out to SELECT). You can listen to all of the main mixer outputs; MAIN, MONITOR, SUB 1 or SUB 2; the secondary outputs, AUX and EFFECTS; and the output of the REVERB circuit before it is panned into the SUB 1 and SUB 2 busses.

Pressing any CUE button will override this switch and feed the CUE'ed channels directly into the headphone amp. The CUE light will come on as a reminder of CUE status.

There are two buttons under the Peak Meters; when both are pushed in, they connect the Peak Meters to the SUB 1 and SUB 2 outputs. This is useful when the mixer is used for stereo recordings.

HEADPHONE/METER SWITCHING - Continued

When the mixer is used for live PA, both buttons are usually switched out. This connects the left Peak Meter to the MAIN output, so it indicates the signal level being fed to the main PA speakers. The right Peak Meter is connected to the switch array or the CUE system, so it may be used to examine any particular segment of the overall mix.

LOW FREQUENCY CUTOFF

These controls reject subsonic noise from the MONITOR, SUB 1 and SUB 2 outputs. Since the MAIN output is derived directly from the SUB 1 and 2 outputs, there is no need for a control on the MAIN output.

Subsonic noise and rumble not only strain the monitor and main power amplifiers, but they generate large amounts of IM distortion in the PA speakers, particularly if they are horn-loaded or bass-reflex types. Both types of speakers are unloaded at low frequencies and are capable of handling only a few watts below the bass rolloff. If the woofers are fed too much subsonic power for too long, the spider and surrounds will weaken, leading to rubbing voice coils and sudden failure.

These controls should be set to match to bass rolloffs of the monitor and main speakers. Set the MONITOR control between 75 and 100 Hz; set the SUB 1 and SUB 2 controls between 45 and 60 Hz. If you are making a stereo recording, be SURE to set both SUB 1 and SUB 2 controls to 20 Hz; there are some consumer systems that go below 30 Hz.

REVERB DRIVE LEVELS

The reverb system works best if the signal peaks are compressed; you can do this by setting the EFF/REV channel controls to a level which causes the green REVERB LEVEL LED to flash.

The REVERB LEVEL pot controls the amount of reverb blended INTO the SUB 1 and SUB 2 busses; it does NOT regulate the amount of signal driving the reverb circuit. Use the EFF/REV channel controls instead. (With factory standard jumpers, the channel Faders also control the reverb drive level; if you want to change this, refer to "Resetting Internal Jumpers" in this section).

STEREO/MONO OPERATION

The SPL 2216/2212 is intended primarily for mono PA systems; a mono PA will usually give the best sound for most listening locations. It also greatly simplifies the set-up and balancing. For mono PA, the MAIN OUTPUT drives the PA amplifiers. SUB 1 and SUB 2 can be used for separate sub-mixing (such as vocals and instruments) with the channel PAN controls assigning the inputs to either or both of the sub-groups. Since the MAIN output is derived from the SUB 1 and SUB 2 outputs, you can use the SUB Faders to adjust sub-group balance and the MAIN Fader to adjust overall PA level.

STEREO/MONO OPERATION - Continued

If the location is suitable for a stereo PA, use SUB 1 and SUB 2 to drive the left and right PA amplifier systems. The SUB Faders will directly control the left and right PA levels. The MAIN output may be used as a mono backfill. Use the channel PAN controls to assign left/right locations for the individual inputs - it's usually desirable to have the planned locations correspond to the actual locations of the performers.

CANCEL NOISE WITH BALANCED LINES

It is possible to be fooled during set-up by an apparently quiet system; however, when the SCR-controlled house lights come on and all the amplifiers are switched on, buzzes and hash will appear. It takes balanced lines to reject the strong EMI fields found in a working environment, although unbalanced lines may be used when the runs are very short (less than 6 feet).

Use balanced two-conductor shielded cable for all long runs. If balanced cable is connected to an unbalanced amplifier or microphone, use a 600 ohm line matching transformer close to the unbalanced device. This ensures maximum common-mode noise rejection for the entire system.

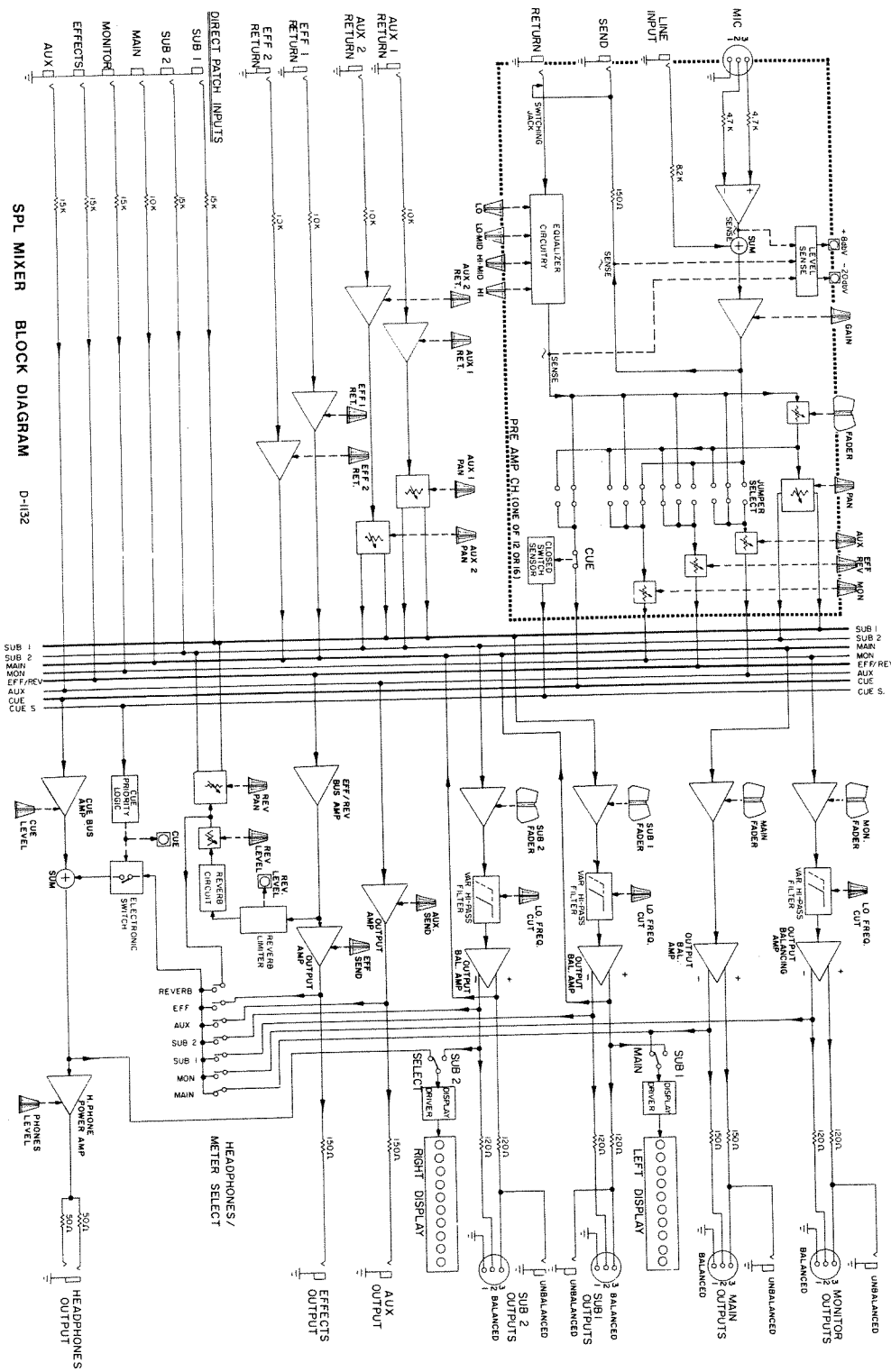
If you have no choice and must use unbalanced cables, keep the lengths as short as possible and well away from AC power mains, lighting cables, and speaker wires. This isn't a bad idea for balanced lines as well, since the balanced system will be just that much quieter.

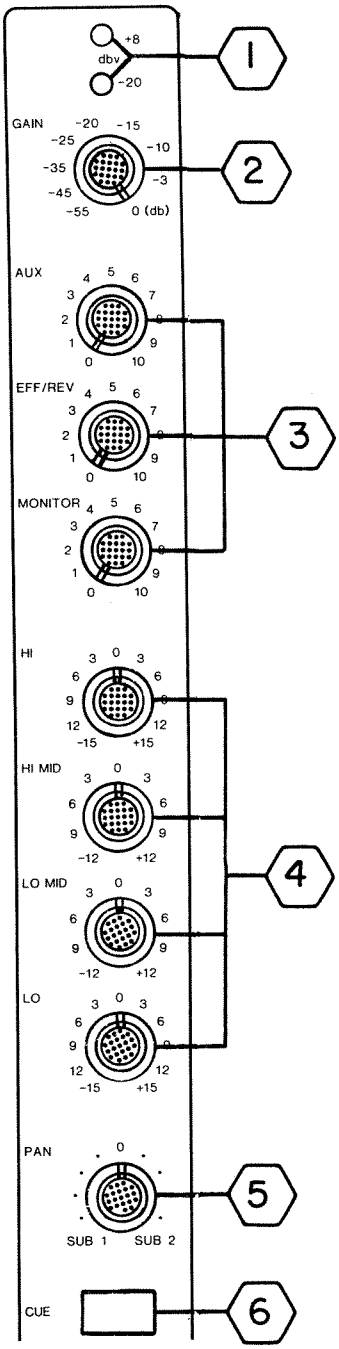
On the back of the SPL 2216/2212, the balanced lines connect to the three-pin Cannon-XLR jacks. The unbalanced lines connect to the 1/4" phone jacks.

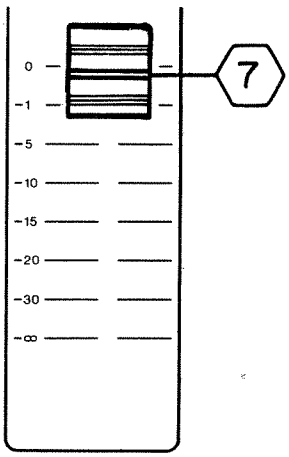
TALKBACK

A talkback feature allows the stage and mixing boards operator to communicate through the stage monitor system. Connect the stage and mixer microphones to an unused channel; this becomes the talkback channel. Use both MIKE and LINE inputs for two mikes, (using a three-pin to phone jack adaptor if necessary). Assign the output of the talkback channel with the MONITOR control, keeping the EFF/REV, AUX and Channel Fader all the way down. To listen to the stage microphone, switch the talkback channel cue switch "IN" and listen through the mixer headphones.

SECTION 3


SPL MIXER BLOCK DIAGRAM D-1132
DIRECT PATCH INPUTS
SUB 1
SUB 2
MAIN
MONITOR
EFFECTS
AUX
EFF 1 RETURN
EFF 2 RETURN
AUX 1 RETURN
AUX 2 RETURN
RETURN
SEND
LINE INPUT
MIC
PRE AMP CH 1 ONE OF 12 OR 16
EQUALIZER CIRCUITRY
GAIN
FADER
PAN
CUE
HEADPHONES/ METER SELECT
LEFT DISPLAY
RIGHT DISPLAY
MAIN OUTPUTS
SUB 1 OUTPUTS
SUB 2 OUTPUTS
MONITOR OUTPUTS
EFFECTS OUTPUT
AUX OUTPUT
HEADPHONES OUTPUT





CHANNEL CONTROLS

1. LED INDICATORS

The two LED's are used along with the GAIN control to achieve the proper operating level in the preamp. The green LED will light at a signal level of -20 dBV or greater, and the red LED will light at a signal level of +8 dBV. There is a 10 dB of headroom left when the red LED is lit.

2. GAIN

The GAIN control adjusts the channel gain over a range of 55 dB. The MIC input gain is adjustable from 0 to 55 dB. The LINE input gain is adjustable from -20 to 35 dB. The GAIN control when used with the LED indicators allows the channel to accept any signal source and achieve the maximum signal to noise ratio. The GAIN control should be adjusted so that when the channel is operating the green LED is on continuously and the red LED flashes during loud signal peaks. If a balanced line level input signal is placed in the MIC INPUT, and the GAIN control will not prevent the red LED from being on continuously, the input signal is probably greater than .8 VRMS. If so, the signal should be reduced at the source by turning down the level or by inserting a signal attenuation pad between the signal source and the MIC INPUT.

3. AUX, EFF/REV, MONITOR

These controls adjust the signal level sent to their respective busses from the channels. These busses provide separate signals which can be used for monitor mixing and sends to external accessory units for signal processing. The AUX control is factory wired to be post-EQ, pre-fader, the EFF/REV control is post-EQ, post-fader, and the MONITOR control is pre-EQ, pre-fader. All three controls can be set pre or post EQ and pre or post fader by the placement of jumper wires on the preamp circuit board. See Section 2 for further details.

REVERB SETTING

The EFF/REV control is used to adjust the signal sent from the channel to the EFF/REV buss where it is used as an EFFECTS SEND and as an input signal to the internal reverb pan. The EFF/REV controls should be adjusted so that during operation the REVERB LEVEL LED indicator, located in the master mixer section, flashes.

4. PREAMP EQ

These four controls are used to adjust the channel equalization.

The HI EQ is a high pass shelving filter with a cutoff frequency of 8 Khz. It has a control range of 15 dB cut or boost.

The HI MID EQ is a bandpass filter with a center frequency of 2 Khz. It has a control range of 12 dB cut or boost.

The LO MID EQ is a bandpass filter with a center frequency of 500 hz. It has a control range of 12 dB cut or boost.

The LO EQ is a low pass shelving filter with a cutoff frequency of 125 hz. It has a control range of 15 dB cut or boost.

5. PAN

This control allows the signal from the channel to be assigned to either or both submaster busses, SUB 1 and SUB 2. In the (0) position the preamp signal will be sent equally to both submaster busses. When rotating the PAN control clockwise more signal will be sent to SUB 2 and less signal to SUB 1. When the control is rotated fully clockwise all the signal is sent to SUB 2. Rotating the PAN control counter clockwise provides the opposite result with the signal going to SUB 1.

6. CUE SWITCH

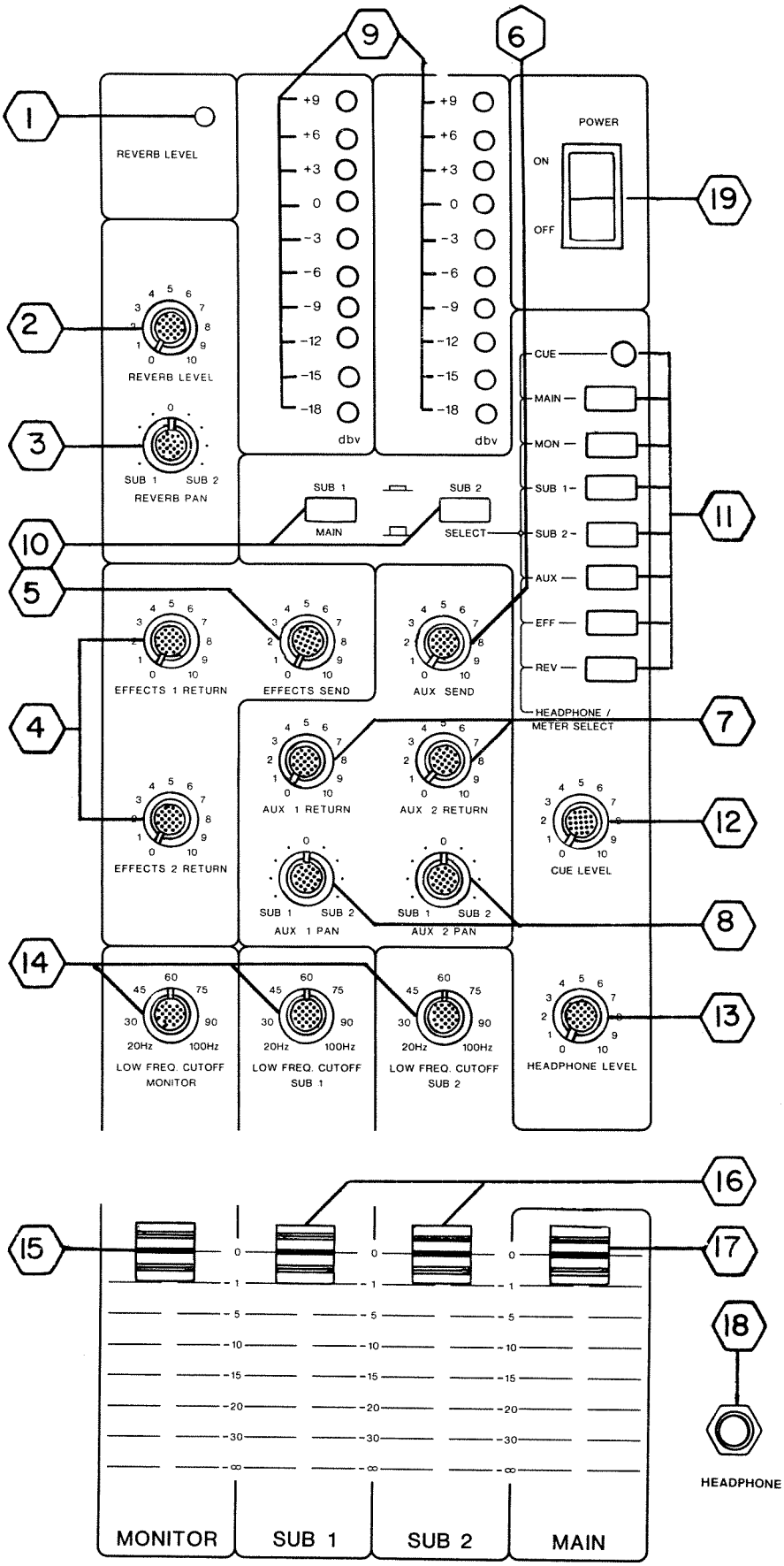
These switches allow any of the channels to be monitored via a set of headphones plugged into the headphone jack. To monitor a single channel or group of channels, press the CUE switch on the desired channel(s). The CUE'ed channel will appear on the HEADPHONE output. To release a channel from the headphone, press the channel CUE switch again.

The CUE switch comes factory wired post-EQ, pre-Fader, and can be changed to post-EQ, post-Fader. See Section 2 for further details.

7. CHANNEL FADER

The channel Fader controls adjust the signal level from the preamp channels sent to the submaster busses. These controls are accurately marked in dB for easy reference in comparing channel settings. It is recommended to use the Faders near the top of their range, leaving enough room for the channel to be boosted.

MASTER MIXER CONTROLS



MASTER MIXER CONTROLS

1. REVERB LEVEL INDICATOR

The REVERB LEVEL indicator, a green LED, is used in conjunction with the preamp EFF/REV controls to adjust for proper signal level sent to the internal reverb pan. The flashing of the LED indicates adequate drive for the reverb system.

2. REVERB LEVEL

The REVERB LEVEL control adjusts the amount or reverb signal from the reverb system that is added to SUB 1 and SUB 2.

3. REVERB PAN

The REVERB PAN control assigns the reverb signal to the submaster busses. Rotating the pan control clockwise will send more reverb signal to SUB 2 and less to SUB 1 until the control is rotated fully clockwise where all the reverb signal is sent to SUB 2. Rotating the PAN control counter clockwise will have the opposite result with the signal going to SUB 1.

4. EFFECTS RETURN 1 & 2

The EFFECTS RETURN controls adjust the signal level from the EFF RET jacks 1 and 2 that is added to the MAIN buss.

5. EFFECTS SEND

The EFFECTS SEND control adjusts the gain of the EFFECTS buss amp and controls the amount of EFFECTS signal sent to the EFF SEND jack.

6. AUX SEND

The AUX SEND control adjusts the gain of the AUX buss amp and controls the amount of AUX signal sent to the AUX SEND jack.

7. AUX RETURN 1 & 2

The AUX RETURN controls adjust the signal level from the AUX RETURN jacks that is added to SUB 1 and SUB 2.

8. AUX PAN 1 & 2

The AUX PAN controls allow the input signal from the AUX RETURN jacks to be panned between the submaster busses. Turning the PAN controls clockwise assigns the signals to the SUB 2 buss. Turning the PAN controls counter clockwise assigns the signals to the SUB 1 buss.

9. PEAK METERS

The two PEAK METERS accurately display the peak signal level present at all critical outputs in the SUNN SPL 2216 and SUNN SPL 2212 mixers. These outputs include the MAIN, MONITOR, SUB 1, SUB 2, AUX and EFF. The REVERB and CUE busses although not output busses can also be displayed. The left PEAK METER displays the signal level of either the MAIN or SUB 1 outputs depending upon the position of the METER SELECT switch located just below the left LED ARRAY. The right PEAK METER will display the SUB 2 output or any output whose corresponding switch located in the HEADPHONE/ METER SELECT column has been depressed.

Listed below are the nine different dBV levels and the output voltages corresponding to their levels.

+9 dBV = 2.8 VRMS	0 dBV = 1.0 VRMS	-9 dBV = .35 VRMS
+6 dBV = 1.9 VRMS	-3 dBV = .7 VRMS	-12 dBV = .25 VRMS
+3 dBV = 1.4 VRMS	-6 dBV = .50 VRMS	-15 dBV = .17 VRMS

The lighting of the +9 dBV LED indicates that there is 9 dB of headroom left in the output being monitored before clipping will occur.

10. METER SELECT SWITCHES

The two switches located under the left and right PEAK METERS are used to select which output will be displayed in the PEAK METERS. The switch under the left PEAK METER, when placed in the MAIN position (up), assigns the MAIN output buss to the PEAK METER.

In the SUB 1 position (depressed), the PEAK METER displays the SUB 1 output when placed in the SELECT position. The switch located under the right PEAK METER displays the output selected by the HEADPHONE/METER SELECT switch array. When the switch is placed in the SUB 2 position (depressed) the PEAK METER displays the SUB 2 output.

11. HEADPHONE/METER SELECT SWITCH ARRAY

This switch array allows complete monitoring of all critical outputs. One of seven different outputs may be monitored, both visually with the right PEAK METER when the right LED display switch is placed in the SELECT position and audibly via a set of headphones. The CUE buss has priority in the SUNN SPL series mixers. This means that whenever any preamp CUE switch is depressed, the preamp signal is present at the headphone output and the HEADPHONE/METER SELECT SWITCH array is overridden. A red LED at the top of the switch array lights whenever a CUE switch is depressed to remind the operator that the CUE system is operating.

12. CUE LEVEL

This control adjusts the signal level sent to the headphone output when monitoring the CUE buss. As more or less preamp channels are monitored through a pair of headphones, adjust this control for the desired signal level.

13. HEADPHONE LEVEL

This control adjusts the signal sent to the headphone output when monitoring any of the output busses whose corresponding HEADPHONE/METER select switch has been depressed.

14. LOW FREQ CUTOFF, SUB 1, 2 and MONITOR

These controls allow the low frequency cutoff of both submaster busses and the monitor buss to be varied over a frequency range of 20 hz to 100 hz. These controls should be adjusted to the highest cutoff frequency possible without causing any degradation to the signal. This helps to remove low frequency stage noises and rumble which reduce system headroom and cause IM distortion in the speaker.

15. MONITOR FADER

This slide control, accurately scaled in dB for easy reference, adjusts the output signal level from the MONITOR buss amp to the MONITOR OUTPUT jacks.

16. SUB 1 and 2 FADERS

The two submaster slide controls, accurately scaled in dB for easy reference, adjust the output signal level from the submaster buss amps to the SUB OUTPUTS 1 and 2.

17. MAIN FADER

This slide control, accurately scaled in dB for easy reference, adjusts the output signal level from the MAIN buss amp to the MAIN OUTPUT jacks.

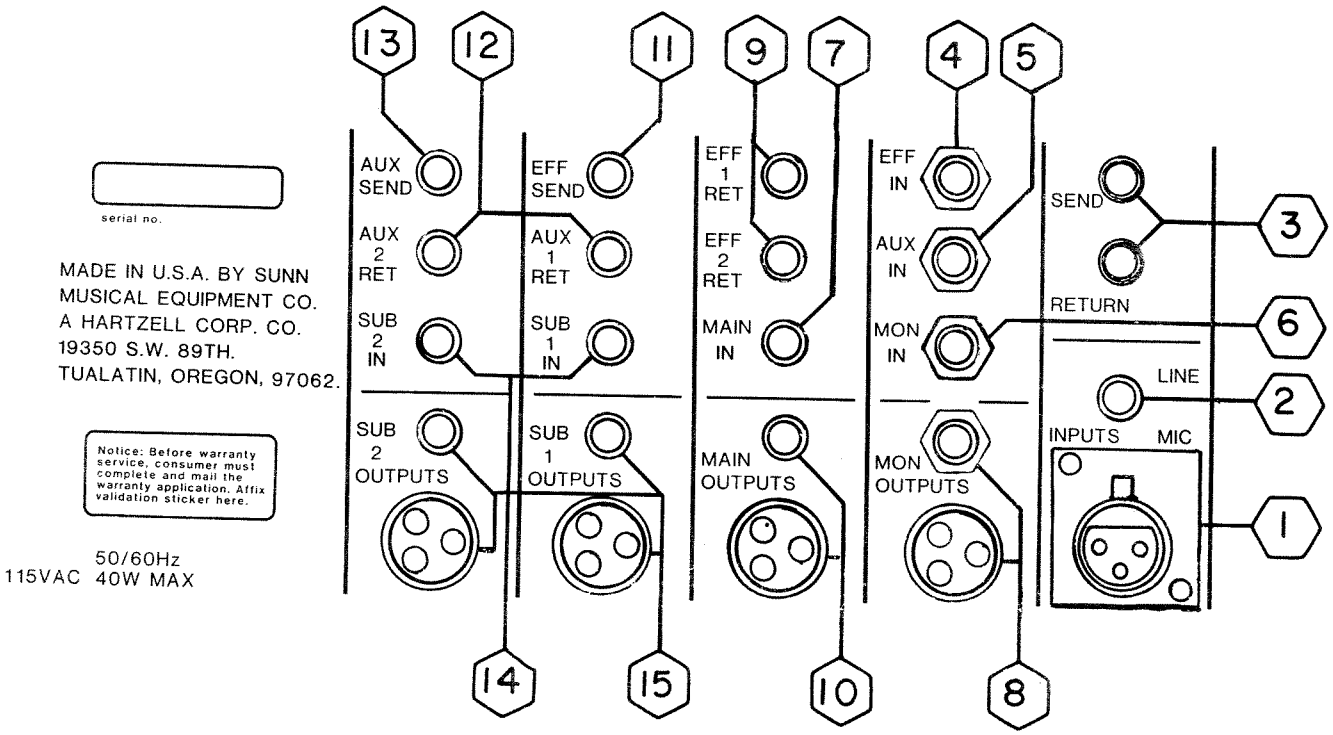
18. HEADPHONE JACK

This jack is used to connect a pair of stereo headphones to the mixing console.

19. POWER SWITCH

This switch turns the mixer ON and OFF. Always switch the mixer ON before the power amps, and always switch it OFF after the power amps.

INPUT & OUTPUT CONNECTORS



CHANNEL CONNECTORS

1. MIC INPUTS

The MIC inputs are a three pin audio connector (XLR-Cannon type) designed for low level balanced input signal from low impedance microphones. The maximum input signal level at the MIC input should not exceed .8 VRMS or signal clipping will occur, indicated by continuous lighting of the +8 dB LED indicators.

2. LINE INPUTS

These inputs are standard 1/4" phone jacks designed to accept signals from high impedance microphones and line level signals from units such as keyboard mixers, synthesizers, and tape recorders. A minimum input signal level of 80 mVRMS at the LINE INPUT is required to achieve a +8 dBV signal in the preamp channel. The maximum input signal level that should be placed into the LINE INPUT is 10 VRMS.

CHANNEL CONNECTORS - Continued

3. SEND & RETURN

These jacks provide access to each individual preamp channel which allows the insertion of an external accessory unit for signal processing. The access point for these jacks is located in the preamp in a post-GAIN control and pre-EQ position (only the GAIN control will have an effect upon the signal at the SEND jack). The SEND jack is connected to the preamp channel so that it can be used without affecting the signal in the preamp channel. When the RETURN jack is used, the signal path in the preamp will be interrupted at the access point. Only the signal from the RETURN jack will be sent to the preamp EQ and those mixer busses which are post-EQ.

MASTER MIXER CONNECTORS

4. EFF IN

This input allows a line level input signal to be patched directly into the EFFECTS buss preceding the EFFECTS SEND control. This input is useful when patching the EFFECTS OUT from another mixer into the SUNN SPL mixer.

5. AUX IN

This input allows a line level input signal to be patched into the AUX buss preceding the AUX SEND control. This input is useful when patching the AUX output from another mixer into the AUX buss in the SUNN SPL mixer.

6. MON IN

This input allows a line level input signal to be patched into a MONITOR buss preceding the MONITOR FADER control. This input is useful when patching the MONITOR out from another mixer into the MONITOR buss in the SUNN SPL mixers.

7. MAIN IN

This input allows a line level input signal to be patched into the MAIN buss preceding the MAIN FADER control. This input is useful when patching the MAIN out from another mixer into the MAIN buss in the SUNN SPL mixers.

8. MONITOR OUTPUTS

These outputs deliver a line level output signal from the MONITOR buss. The MONITOR buss is used to generate a separate mix for the stage monitor speakers. The three pin audio connector is used for a balanced output signal and the phone jack provides an unbalanced output signal.

9. EFF/RET 1 and 2

These input jacks accept line level input signals from external sources and mix them into the MAIN buss. These external sources can be the returns from effects units, tape recorders, or signals from other mixers.

10. MAIN OUTPUTS

These output jacks deliver a line level output signal from the MAIN buss. The MAIN buss is used to generate the main PA mix in a mono sound system, or in a stereo system it can be used for a mono back fill or a tape recorder input. The three pin audio connector is used for balanced line operation and the phone jack is used for unbalanced line operation.

11. EFF SEND

This output will deliver a line level signal from the EFF/REV buss. The output signal from the EFF SEND is usually sent to an external effects unit.

12. AUX RET 1 and 2

These two inputs allow line level input signals to be mixed into the submaster busses from external sources. These external sources can be returns from effect units, tape recorders, and other mixers.

13. AUX SEND

This output will deliver a line level output signal from the AUX buss. This output signal can be used to drive external accessory units or it can be used as a separate post-EQ monitor mix.

14. SUB IN 1 and 2

These input jacks allow line level signals to be mixed into the submaster busses 1 and 2 pre-master FADER controls.

15. SUB OUTPUTS 1 and 2

These output jacks will deliver line level output signal from the two submaster busses, SUB 1 and SUB 2. The submaster outputs, in a stereo system, provided the output signals used to drive the main PA system. They can also be used to drive external accessory units or as a stereo output for recording. The three pin audio connectors are used for balanced line operation, the phone jacks are for unbalanced line operation. These jacks can be used simultaneously if desired. This allows a stereo recording to be made from the unbalanced submaster outputs, while the balanced outputs are being used to drive the PA.