SPP-800

Stereo Preparation Processor

Audio Processing of the '80's

CIRCUIT RESEARCH LABS, INC.

3204 S. Fair Lane • Tempe, Arizona 85282

(602) 894-0077

438 0888

CIRCUIT RESEARCH LABS, INC.

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PROOF OF PERFORMANCE: For _____ By P. Esch Date 9/2/81

FM2 System SPP800 #8107605, SMP800 #8108812

MODE OF OPERATION: Proof @ calibrate point @ 1Khz.

CAL. PT.= threshold of rear cal. led or front "peak" led.

S/N: L ch. -60 db
R ch. -62

THD:	100hz	1Khz	10Khz	
L ch.	.14	.07	.12	%
R ch.	.14	.09	.22	

Measured response -22db below limit threshold using 75us de-emphasis for SMC 600A or SMP 800 only.

RESPONSE:	50hz	100hz	400hz	1Khz	5Khz	7.5Khz	10Khz	15Khz
R ch.	-.5	-.2	0	0/REF	+.8	+.5	0	-.7
L ch.	-.2	0	0	0/REF	+1.0	+.6	0	-.6

==========

In OPERATE the unit or system is checked with the following controls set:

APP 400 / SPP 800		SEP 400A		PMC 400 / SMP 800	
G/R	-6	DEP PROCESS	____	G/R	-6
EQ	FLAT	DEP DENSITY	____	AUTO/STANDARD	STD.
GATE	OFF	GATE REAR	____	CLIP LEVEL	+2
OPERATION	M1	L	____	LO PHASE CORRECT	____
OUTPUT REAR	-6db	M1	____	HI PHASE CORRECT	____
		M2	____	EQ	____
		H	____	ASSYMMETRY DAY	____
		PEP PROCESS	____	ASSYMMETRY NIGHT	____
		PEP DENSITY	____	EQ CONTROL REAR	____
				LO CUT-FLAT SW. REAR	____

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APP 300A
PROCESS ____
OUTPUT ____
GATE CONTROL REAR ____

CC 300
Process ____
Clip + ____
Clip - ____
R/C Sw. ____

SMC 600A
PROCESS ____
DENSITY ____
STANDARD-AUTO REAR ____

PHC 300A
PROCESS ____
DENSITY ____
LO PHASE CORRECT ____
HI PHASE CORRECT ____
OUTPUT ____
EQ ____
ASSYMETRY ____
AUTO-STANDARD REAR ____
EQ FREQ. REAR ____
LO CUT-FLAT REAR ____

All input and output controls are set according to calibration procedures.

==========

MODE OF OPERATION: Operate ? calibrate point @ 1Khz.
CAL. PT.= threshold of rear cal. led or front "peak" led.

S/N: L ch. -56 db
R ch. -53

THD:

	100hz	1Khz	10Khz
L ch.	.14	.15	.32 %
R ch.	.19	.17	.30

Response:

☐ Measured -5db below limit threshold.

☒ Measured -22db below limit using 75us de-emphasis.

	50hz	100hz	400hz	1Khz	5Khz	7.5Khz	10Khz	15Khz
L	0	0	0	C/REF	+.5	+.5	+.3	-2.0
R	0	0	0	C/REF	0	0	0	-2.0

Power supply @ 400hz in operate @ operate cal. pt.

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FOR STEREO UNITS AND SYSTEMS:

Crosstalk is measured @ gain reduction threshold. While measuring both channels for equal levels, disconnect left ch. and ground the left ch. input. Measure left-ch. output for any residual audio over and above S/N ratio figure for left ch. Ideally below readings should equal S/N figures.

100hz	400hz	1Khz	10Khz	15Khz
-45	-55	-56	-48	-49 db

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Introduction

1.1:1

Competitive stations as well as recording studios, etc., may demand more control of their audio signal. CRL has created the SPP-800 for these demanding applications. The SPP-800 is a true multichannel audio processor. This device processes the audio thru two parallel gain control bands. These two gain control stages are separated by gentle 6db per octave slopes and utilize Operational Transconductance Amplifiers as the gain control elements. These OTA gain controllers are controlled by CRL's proprietary analog computer modules that select, based on average level and transient content, the proper amounts of AGC control as well as transient expansion of the dynamics. In other words the SPP-800 can actually increase the dynamics of the transients while placing the overall level under automatic gain control. These two parallel bands can then provide very large amounts of dynamic equalization if set to do so by front panel controls. This dynamic equalization is achieved without the squash, pump, and suck of other multiband designs and in fact can provide a more dynamic range than was perceived in the original material. The SPP-800 allows the signals from the two AGC bands to then be mixed together via algebraic addition thru a ratiometric control pot. This allows you to control the output of each band by plus or minus 6db. The AGC action is gain freezable at the users discretion. CRL's stereo strapping circuitry is very unique due to it's ability to prevent dynamics from intermodulating between channels while allowing long term AGC action to have control between channels.

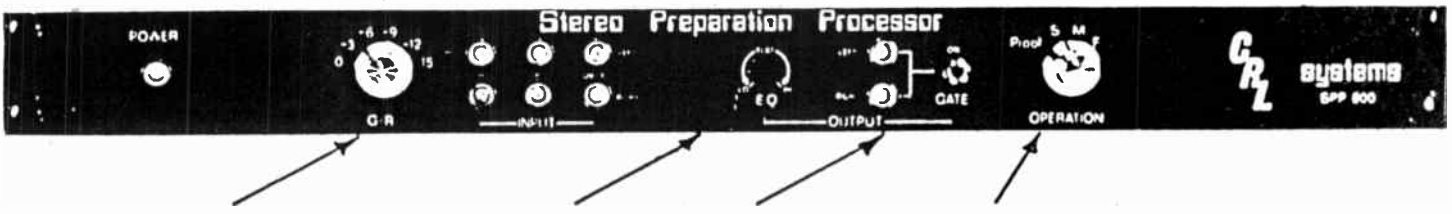
SET-UP

Initial Switch Positions

2.1:1

Front and back panel controls will now be set for the starter/calibrate procedure.

Set controls as shown by the following:

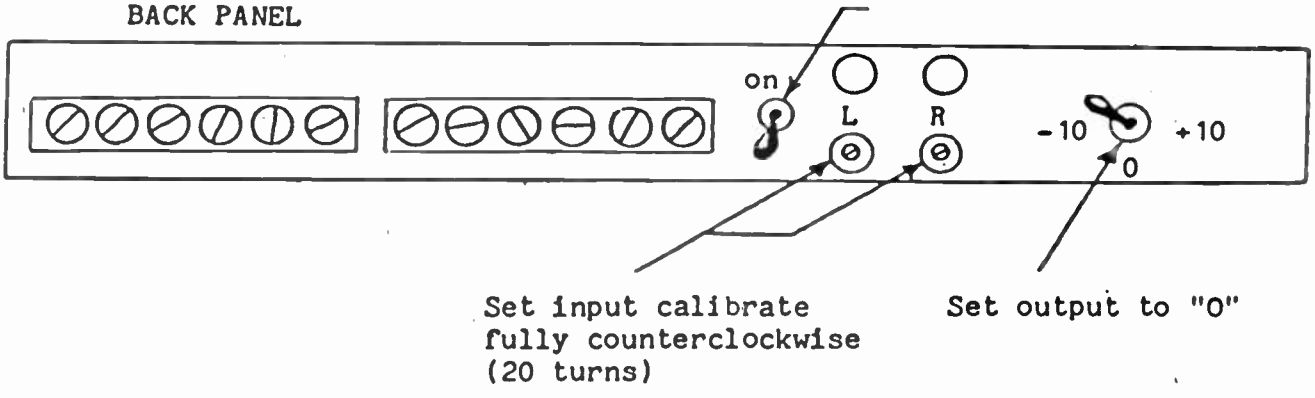


Set G/R to -6

Set EQ. to flat (12:00)

Set GATE to "on"

Set OPERATION to "M" (medium)



Note: The pink noise generator supplies a signal that may be used to calibrate other CRL processors etc. Also note that for most applications, direct hookup, STL, or Telco would require a zero setting of the output control. However, some stations due to technical layout may wish to use the -10 or +10 output setting. Please be sure you don't overdrive your STL or Telco equipment with the +10 setting.

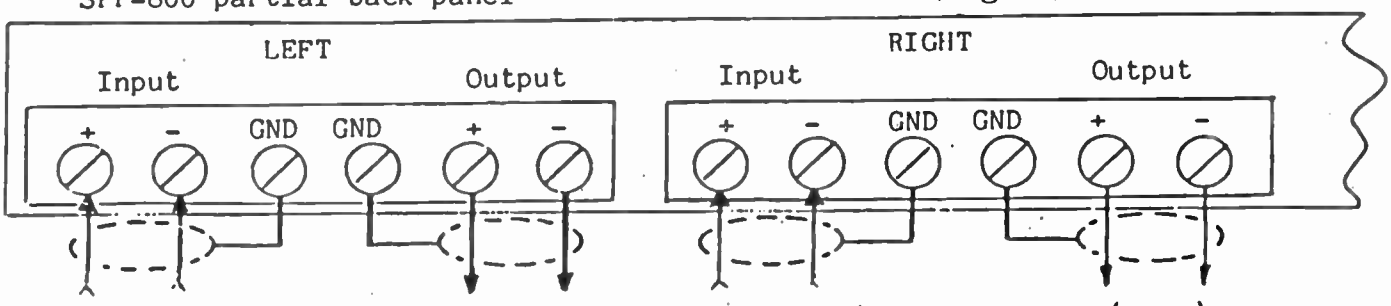
SET-UP

Interconnections

2.2:1

The SPP-800 can be wired for balanced operation (fig. 1) or unbalanced operation (fig. 2). Determine if your system is balanced or unbalanced and use the appropriate diagram. Note that the left channel instructions apply to the right channel also.

SPP-800 partial back panel (fig. 1)



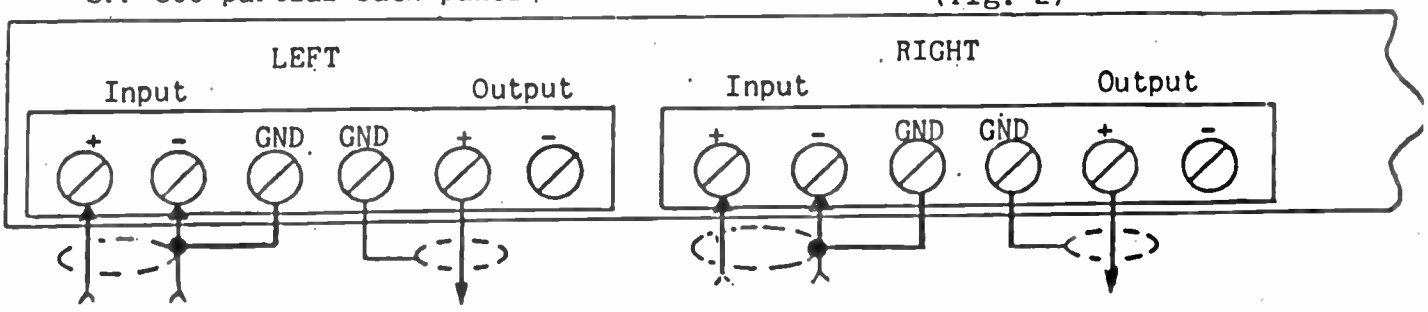
Balanced audio input from console, or other audio source at 0VU. *

Balanced audio output to Telco, STL, recording equipment, etc.

(Same)

(same)

SPP-800 partial back panel (fig. 2)



Unbalanced audio input from console, or other audio source at 0VU. *

Unbalanced audio output to Telco, STL, recording equipment, etc. **

(same)

(same)

* Make sure both ends of your audio cable sheild are grounded.

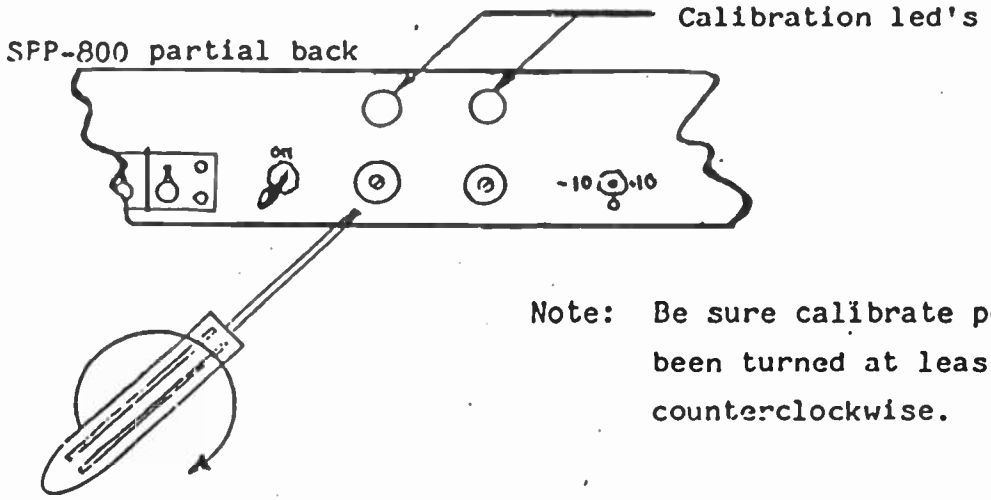
** Important! For unbalanced operation the (-) output terminal should not be grounded since this is an amplifier output and is not transformer coupled.

Set-Up
Calibration

2.3:1

Set audio console or other program source for 0VU output. Apply power to the SPP-800 at this point.

With a 0 VU signal the SPP-800 can be calibrated. Note that the signal used to calibrate the SPP-800 should be your typical program format. Using a small flat bladed screw driver begin to rotate the left channel calibrate pot clockwise as shown:



Note: Be sure calibrate pots have been turned at least 20 times counterclockwise.

Continue the clockwise rotation until the calibrate LED flashes on program peaks approximately 10-20% of the time. Repeat the same procedure for the right channel. If you have problems adjusting the calibrate pots for proper operation then the input amplifiers may not be set for the proper amount of gain. The next section will show you how how to reset the gain range of the SPP-800 internally. Set the output switch to 0(zero) to feed any further devices with a 0VU signal. Note that some STL or telco links may require a +10 drive, if this is case then set the output switch to +10

SET UP

Calibration Difficulties

2.4:1

If your SPP-800 input control attenuators seem to have not enough gain or too much gain you may need to adjust the settings of the internal mini dip switches.

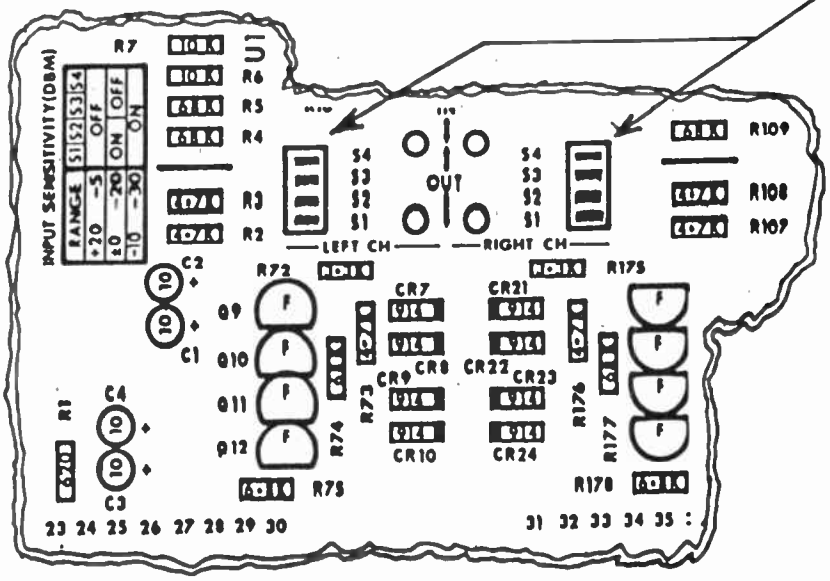
Normally from the factory the SPP-800 comes with a stock S1-4 setting that allow the input attenuators to work properly from 0 (zero)dbm thru -20 dbm. If your actual level into the SPP-800 is lower than -20dbm you will need to increase the gain of the SPP-800. If your SPP-800 seems to have to much level then you will need to lower the gain of the unit.

To make a gain modification simply remove the top cover of the SPP-800 and locate the internal mini dip switches. This switch has 4 SPST slides mounted on it and should be adjusted as follows.

STOCK SETTING- GAIN RANGE 0dbm--20dbm:
Switches number S1 & S2 are "ON" or "CLOSED". Switches number S3 & S4 are "OFF" or "OPEN".

MORE SENSITIVITY- GAIN RANGE -10dbm- -30dbm:
Switches number S1, S2, S3, S4 are "ON or "CLOSED"

LESS SENSITIVITY- GAIN RANGE -5dbm- +20 dbm
Switches S1, S2, S3, S4 are "OFF" or "OPEN"



OPERATION

Controls

3.1:1

At this point your SPP-800 should be driving whatever load you have need for at the proper level (output control -10,0,+10). We are now ready to discuss the function of the front panel controls.

OPERATION Switch : 3.1:2

When this switch is in proof the input amplifiers are connected to the output amplifiers. When the operation switch is at the "S" setting the processor is behaving like a slow AGC or "gain rider". When set to "M" the processor has a medium release time and when set to "F" has a fast release time. You might think of this switch controlling the operation speed of the AGC circuits. When the speed of operation is increased the RMS energy of the signal increases without any increase in peak amplitude. This increase in RMS energy is perceived by the ear as an increase in loudness. Note, however, that an increase in speed of operation also results in less of the original musical dynamics being present. The sophistication of the SPP-800 minimizes this drawback by making it very difficult for the ear to notice anything but an increase in loudness. For most applications the "M" setting should be optimum.

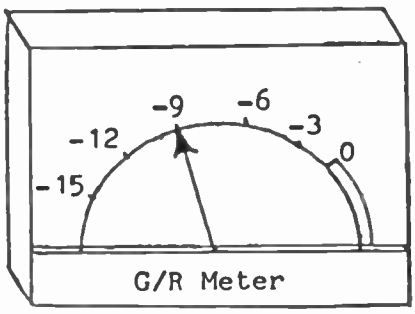
G/R Switch: 3.1:3

The G/R Switch controls the range over which gain reduction will take place. The function of this control may be best understood by the pictorial on the following page.

Operation

Controls

G/R Switch: 3.2:1



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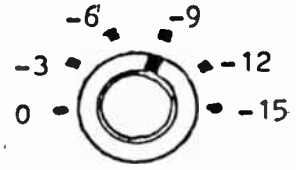


G/R Switch

The above illustration should make the function of the G/R switch obvious. This switch controls medium-slow AGC circuits in the SPP-800 and when set to -9 programs the AGC to do 9db of gain reduction. In other words, input source material may vary as much as 9db below 0VU but the output of the SPP-800 will be held at 0 VU. Also note that AGC action is automatic above 0 VU independant of the G/R switch setting. Input source may rise as much as 25db above 0 VU but the output will still be held at 0 VU. In effect this circuit gain rides the average level and tends to make up for "jock errors". Since average and peak levels are being controlled there is a loudness increase when turning the G/R switch clockwise toward -15. The largest loudness increases will be seen when switching from 0 to -3 and from -3 to -6. As you continue further clockwise the loudness increase is much less than the increase from the preceeding step. Since a loudness increase results in some loss of dynamic integrity the setting of this switch is of a subjective nature. We do however, recommend as low a setting as possible to achieve your goal. Please notice that very large amounts of control is possible without the ear noticing any unpleasant side effects.

OPERATION

Controls

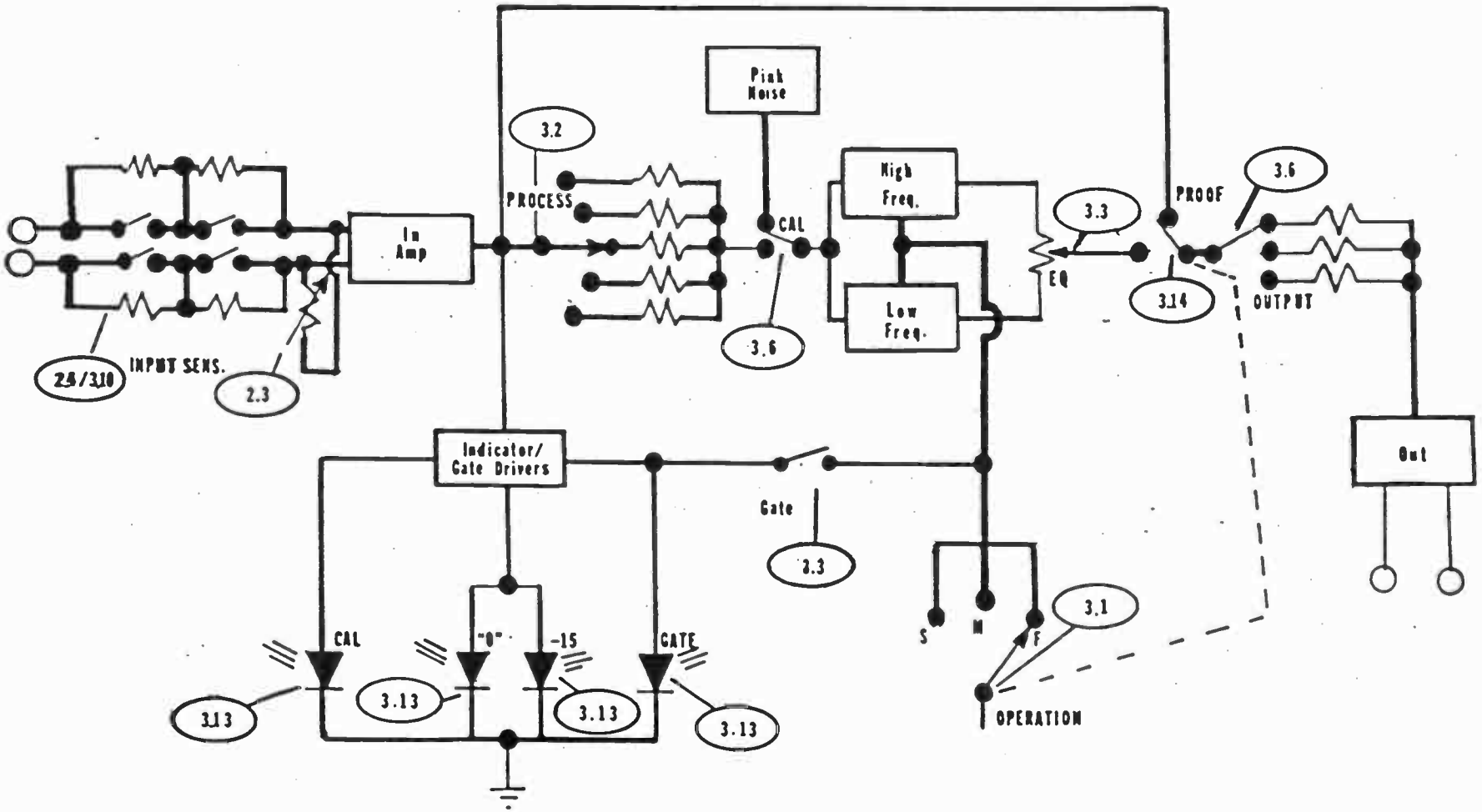
EQ. Pot: 3.3:1

This control should be adjusted using a small flat bladed screwdriver. Audio, after passing thru the harmonic phase rotation network to produce a symetrical audio waveform, is split into high and low bands. Each of these two bands is under AGC and the recombination of these bands is controlled by the EQ. Pot. Rotating the pot clockwise (towards HI) adds high frequencies while subtracting low frequencies. Rotating the pot counterclockwise (towards LO) subtracts high frequencies while adding low frequencies. The gain of each band may be controlled by plus or minus 6db.

GATE Switch:3.3:2

When this switch is on all gain control circuits operate normally until the input drops from -20db to -22db. When this drop occurs all gain control circuits freeze. This means that whatever the gain was when the -20 to -22db threshold is crossed remains the same. This prevents the AGC circuits from treating low level signals such as noise as intelligence to be brought up in level (gain controlled). The gate lamp should be seen to light whenever there is a program pause. In most all applications we can think of this switch should be on.

3.4:1
Section 3.5 of this manual shows a block diagram of where the controls of the SPP-800, APP-400 are located. This block diagram is not intended for troubleshooting but rather to aquaint you with the signal flow position the external controls have.



SPP CONTROL LOCATIONS

OPERATION
Controls

The following is a description of the back panel controls of the SPP-800:

Two (2) INPUT Calibrate Pots: 3.6:1

These 20 turn pots control the amount of input signal reaching the input amplifiers and are used to calibrate the SPP-800 to a 0VU signal (typical program source).

OUTPUT Switch: 3.6:2

This switch controls the output level of the SPP-800. The three possible output levels are 0, -10, and +10 dbm. Care should be taken not to overdrive equipment with the +10dbm setting. Some STL and Telco links may take a +10 setting.

PINK NOISE GENERATOR: 3.6:3

This switch controls a digital white noise generator that is demphasized -3db per octave as frequency increases.. When the processor is in normal use this switch should be off. This signal may be used to calibrate other CRL audio processing equipment such as the SEP-400, SMP-800, or the CC-300. Note that the front panel EQ. control should be in the flat position (12:00) since the EQ. control could effect some re-equalization of the -3db per octave pink noise generator. Note also that this is not a precision noise generator.

3.7:1

When the pink noise generator is being used to calibrate the input levels of the SEP-400, SEP-400A, SMC-600A, or the SMP-800 simply set the pink noise generator switch to the on position and adjust the input level of the unit to be calibrated to the point where the CAL light (PEAK light on the SMC-600) just begins to flicker. All that is necessary is that you find this threshold point and you will be close enough. Set this unit for an average control setting or the settings specified the processor's instruction manual. With the unit set to an average control setting (front panel controls half way thru their range) or to the settings specified the next unit after this one may be calibrated. If the following unit is either an SMC-600 or an SMP-800 adjust the input drive to this unit to the point where the CAL or PEAK lights just come on (PEAK for the SMC-600, CAL for the SMP-800). Note that for AM installations the PMC-300 or PMC-400 may be calibrated in the same manner. At this point regardless of what type of CRL system you have, a pink noise signal should now be ready to go to your transmitter or stereo generator. Set your peak limiter (PMC-300, PMC-400, SMC-600, SMP-800) to the maximum process/clipping setting and set your levels into your transmitter/stereo generator. Note, if you are setting up an older AM transmitter you may wish to use less than full process to avoid damage to your transmitter or antenna system. The signal from the pink noise generator contains low frequency pulse information suitable for setting low frequency tilt correction. If you are a stereo station the signal from the SPP-800 pink noise generator is MONO and is VERY good for setting L-R null and balancing the controls on the processing system.

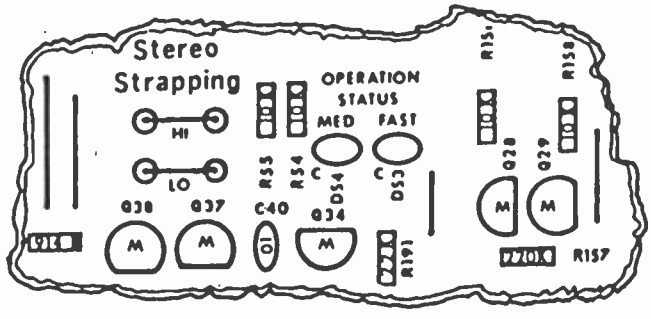
OPERATION

Internal Options

In the SPP-800 two operation options are built in to the circuit board layout, phase processing and stereo strapping.

STEREO STRAPPING: 3.8:1

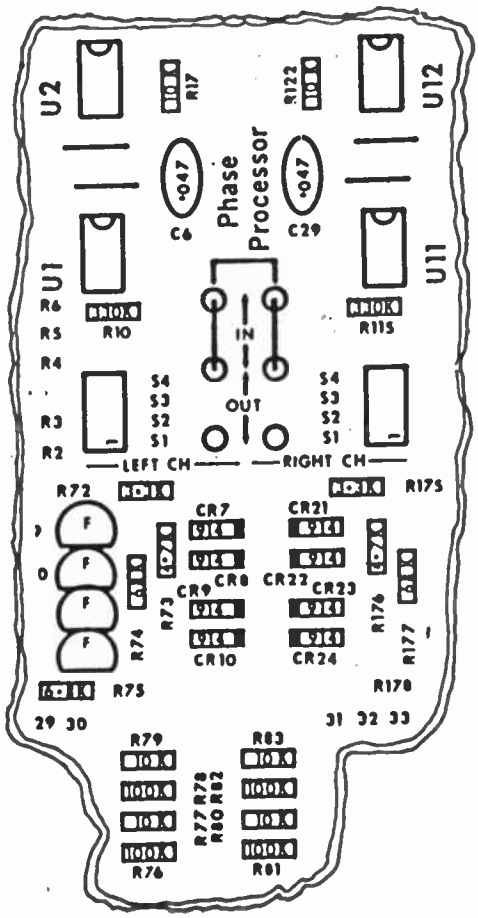
As the SPP-800 comes from the factory the left and right channel AGC circuitry is strapped together. In other words, the overall gain of the right channel is controlled by the left channel program material and the gain of the left channel is controlled by the program on the right channel. This insures that the center image of the stereo program does not shift due to processing.
Both the LOW band the HIGH band of the left and right channels are strapped together to track. If you wish to unstrap the gain control circuitry you may do so by removing the strapping jumpers shown below.



PHASE PROCESSING: 3.8:2

A two stage All pass filter is located at the input side of the AGC processing path. This input filter does not affect amplitude response. This filter does however intentially shift the phase response of the system based on frequency content. This effect

is created to produce symmetrical waveforms. These symmetrical waveforms allow cleaner processing of the voices. This Phase Processing can be eliminated if desired by removing the jumpers from the "IN" position, as it comes from the factory, and then placing them across the "OUT" position as shown below.
NOTE: The Phase Processor does not degrade Mono signal content.



MINI DIP CHANGES: 3.10:1

If your SPP-800 input control attenuators seem to have not enough gain or too much gain you may need to adjust the settings of the internal mini dip switches.

Normally from the factory the SPP-800 comes with a stock S1-4 setting that allow the input attenuators to work properly from 0 (zero)dtm thru -20 dbm. If your actual level into the SPP-800 is lower than -20dbm you will need to increase the gain of the SPP-800. If your SPP-800 seems to have to much level then you will need to lower the gain of the unit.

To make a gain modification simply remove the top cover of the SPP-800 and locate the internal mini dip switches. This switch has 4 SPST slides mounted on it and should be adjusted as follows.

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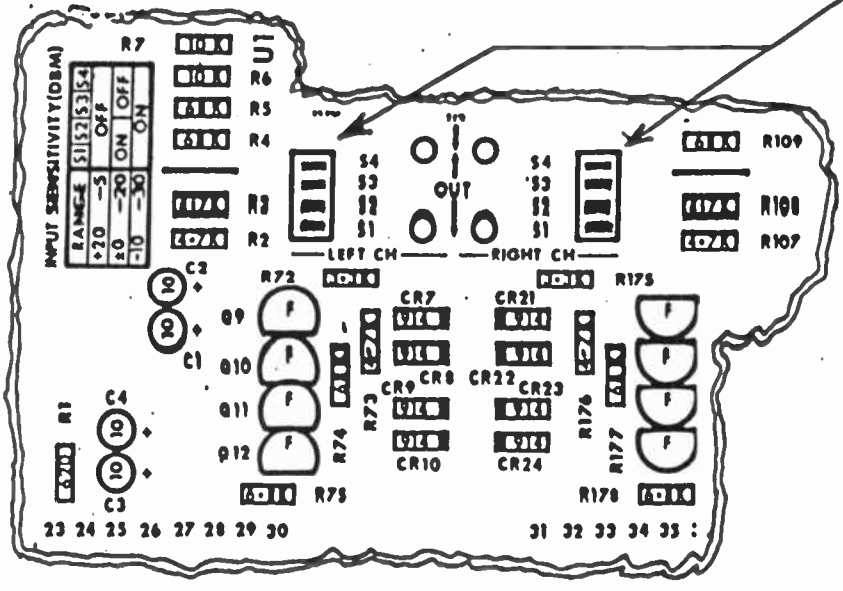
MORE SENSITIVITY- GAIN RANGE -10dbm- -30dbm:
Switches number S1, S2, S3, S4 are "ON or "CLOSED"

LESS SENSITIVITY- GAIN RANGE -5dbm- +20 dbm
Switches S1, S2, S3, S4 are "OFF" or "OPEN"



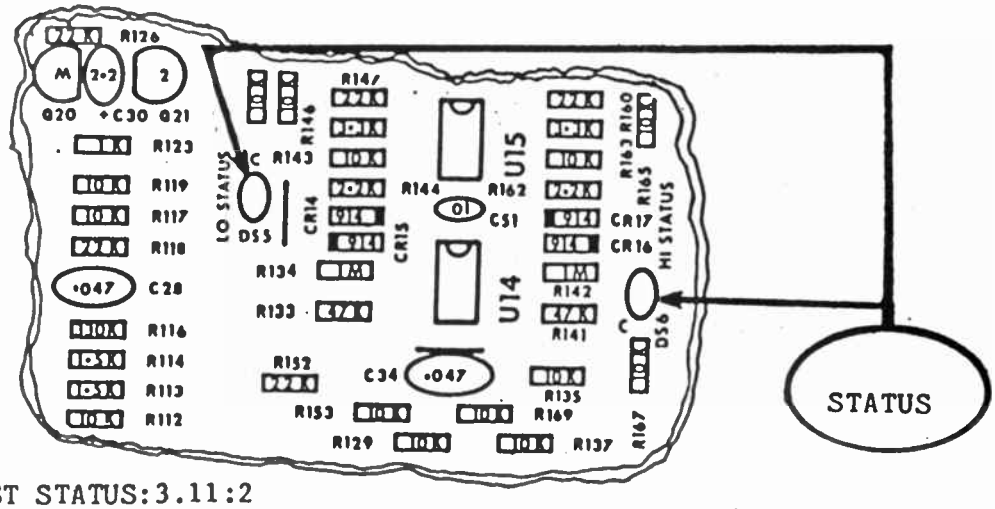
OPERATION

Status Indicators

In the APP-400 there are three seperate sets of status indicators. These indicators are used primarily in trouble shooting the unit.

HI/LO STATUS: 3.11:1

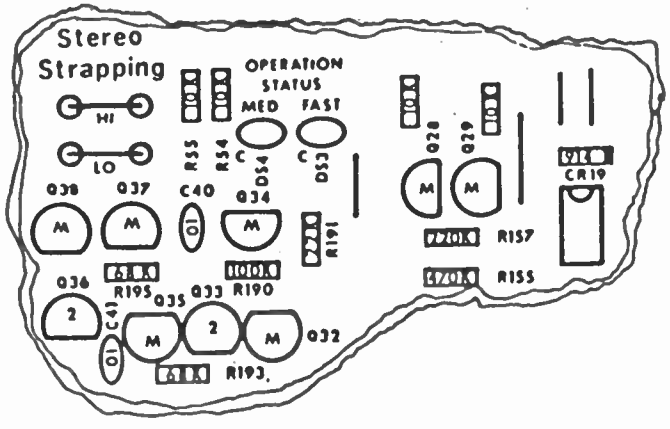
These HI/LO LEDS's are connected to there respective High frequency and Low frequency processing bands and indicate the status of the control current feeding the OTA. Under proper operating conditions these LED's should be fully lit. If the control circuitry should fail these indicators will either dim or go out completely. Under program input these lights may dim slightly in some units, this is completely normal.



MED/FAST STATUS:3.11:2

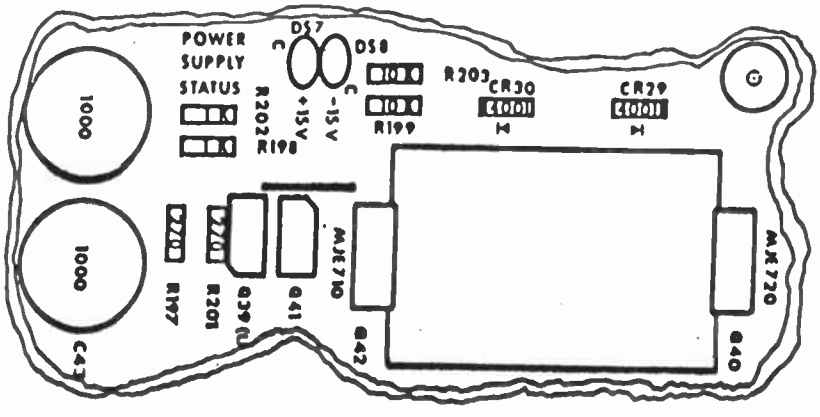
There are two LED's in the APP-400 that are labled OPERATION STATUS MED FAST. These two indicators show the condition of the control voltage coming from the front panel OPERATION switch. If neither of the LED's are lit then the OPERATION switch is set to either S (SLOW) or PROOF. If the MED LED is lit then the OPERATION switch is set to M (MEDIUM).

MED FAST. These two indicators show the condition of the control voltage coming from the front panel OPERATION switch. If neither of the LED's are lit then the OPERATION switch is set to either S (SLOW) or PROOF. If the MED LED is lit then the OPERATION switch is set to M (MEDIUM). If the OPERATION switch is set to F (FAST) then only the FAST LED will be lit. If you observe a condition that does not follow these rules then there may be a problem with the OPERATION swicth, wiring harness or the solid state switches.



POWER SUPPLY STATUS: 3.12:1

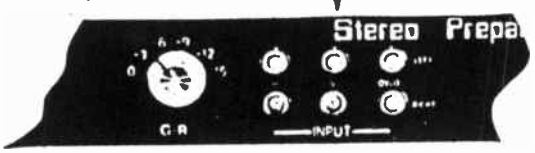
DS 7 and DS 8 LED's are power supply voltage monitors. Should either the POSITIVE or the NEGATIVE supply fail the corresponding status indicator will go out or dim.



OPERATION

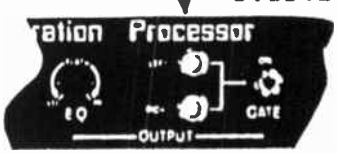
External Status Indicators

Front Panel INPUT Lamps: 3.13:1



These input lamps indicate the status of gain reduction. The threshold at which gain reduction occurs is indicated by the 0 lamp (middle). When the SPP-800 is calibrated to 0VU the 0 lamp will be lighting on program peaks and shows gain reduction on those signal peaks above 0 VU. The -15 lamp indicates the presence of audio -15db below 0VU assuming the 0 lamp has been calibrated for 0VU. Note that the 0 lamp is the same lamp (electrically) as the cal lamp on the back panel. The OVLD (overload) lamp should never come on during normal operation. The OVLD lamp lights when signal rises 12db above 0VU. Note that the left and right rows correspond to the left and right channels.

FRONT PANEL GATE LIGHTS: 3.13:2



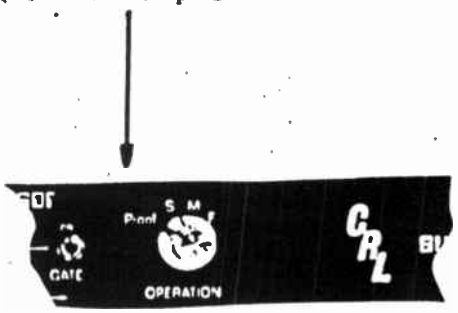
These lights indicate the amount of gating activity that is occuring in the agc of the SPP-800. These lights will not light light if the GATE switch is turned off. With the GATE switch turned on these LED's will light every time the unit goes to a linear amplifier mode of operation(gated(and will remain on until the unit begins to AGC again.

PROOF MEASURMENTS

Defeating Gain control

3.14:1

In some applications (mainly broadcast) it is sometimes necessary to make measurements of frequency response and distortion thru the automatic gain control apparatus with the automatic control defeated. Thus leaving the AGC a normal linear amplifier. To do so simply Switch the front panel OPERATION switch to PROOF position.



SMP-800

Stereo Modulation Processor

Patent Pending

CRL CIRCUIT RESEARCH LABS, INC.

3204 S. Fair Lane - Tempe, Arizona 85281 - (602) 894-0077

WARRANTY

Circuit Research Labs, Incorporated warrants its products to be free of defects in materials and/or workmanship. This warranty shall extend for a period of one (1) year from the date the product was originally shipped.

Circuit Research Labs' warranty does not apply to products that have been damaged due to and/or subjected to improper handling by shipping companies, negligence, accidents, improper use, or alterations not authorized by Circuit Research Labs, Incorporated.

THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED AND IN NO EVENT SHALL CIRCUIT RESEARCH LABS, INCORPORATED BE LIABLE FOR ANY ANTICIPATED PROFITS, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF TIME OR OTHER LOSSES INCURRED BY THE BUYER/CUSTOMER IN CONNECTION WITH THE PURCHASE, OPERATION OR USE OF THE PRODUCT.

CHAPTER I

SMP-800

STEREO MODULATION PROCESSOR

1.0 INTRODUCTION

Circuit Research Labs has created the SMP-800 Stereo Modulation Processor to maintain a constant modulation level of your stereo signal. A complete all in one processor, the SMP-800 has been designed to either stand alone or be coupled with CRL's more flexible and powerful SPP-800. This unique new concept in modulation processors contains features never before perfected for the audio industry and meets the high standards of performance and reliability CRL demands of its products.

The SMP-800's AGC circuits utilize a highly sophisticated program dependent process control circuit (patent pending) which requires no internal alignment. The high performance multiband IM reducing limiter/clipping networks and a new design (patent pending) 15KHz low pass clipping filters provides unequalled modulation processing of your program material.

The front panel controls will extend the versatility of the SMP-800 by allowing you to control the signal power contained in the constant modulation limits. System alignment has been simplified to two external adjustments on the rear panel and two on the front which creates a unit that will give you extended trouble free operation.

Circuit Research Labs has combined simplicity of operation with sophisticated circuit design making the SMP-800 a highly flexible and reliable stereo modulation system. The sophistication of the SMP-800 will become obvious to you as you install, calibrate and begin to process your station's program format on the air.

1.1 PREVENTIVE MAINTENANCE

A minimum amount of preventive maintenance is required to insure optimum performance of the SMP-800 processor. If you do not have a regular preventive maintenance schedule in existance Circuit Research Labs suggests the following check list be performed once a week.

1. Check to insure that the input and output cables are secured tightly to their respective terminals and are not frayed.
2. Check to insure that all knobs, switches and indicators are secure.
3. Check to insure that there is not a build up of dirt or dust on or around the SMP-800.

NOTE

It is recommended that no liquids such as coffee, water etc. be placed on the SMP-800. Accidental spillage could result in serious damage to the unit.

1.2 RETURN FOR REPAIR POLICY

In the event that the SMP-800 must be returned to the factory for in warranty and/or out of warranty repair, Circuit Research Labs requires that a Return Authorization (RA) Number be attached to the unit. In order to insure prompt service and a quick turn around time for equipment repair, Circuit Research Labs requires that the following information be included when the unit is returned to the factory:

1. Return Authorization Number affixed to the outside of shipping container.

NOTE

The RA Number is obtained by calling or writing Circuit Research Labs, Incorporated.

2. Description of trouble - This will help the Repair Department in diagnosing the trouble faster. This description should include what mode of operation the unit was in when the trouble was detected and the system configuration being used.
3. Serial Number of the unit and approximate date of purchase - This will aid in the determination of billing for warranty or out of warranty repair.

Circuit Research Labs requests that all units being shipped back to the

factory be shipped via United Parcel Service (UPS) to:

Circuit Research Labs, Inc.
3204 South Fair Lane
Tempe, Arizona 85282
Attn: Repair Department

CHAPTER II

INSTALLATION

2.0 INITIAL SET UP

2.1 SYSTEM LOCATION

2.1.1 General (Figure 2-1)

The SMP-800 must be in the same physical location as your stereo generator. There should be no STL or Telco link between the stereo generator and the SMP-800.

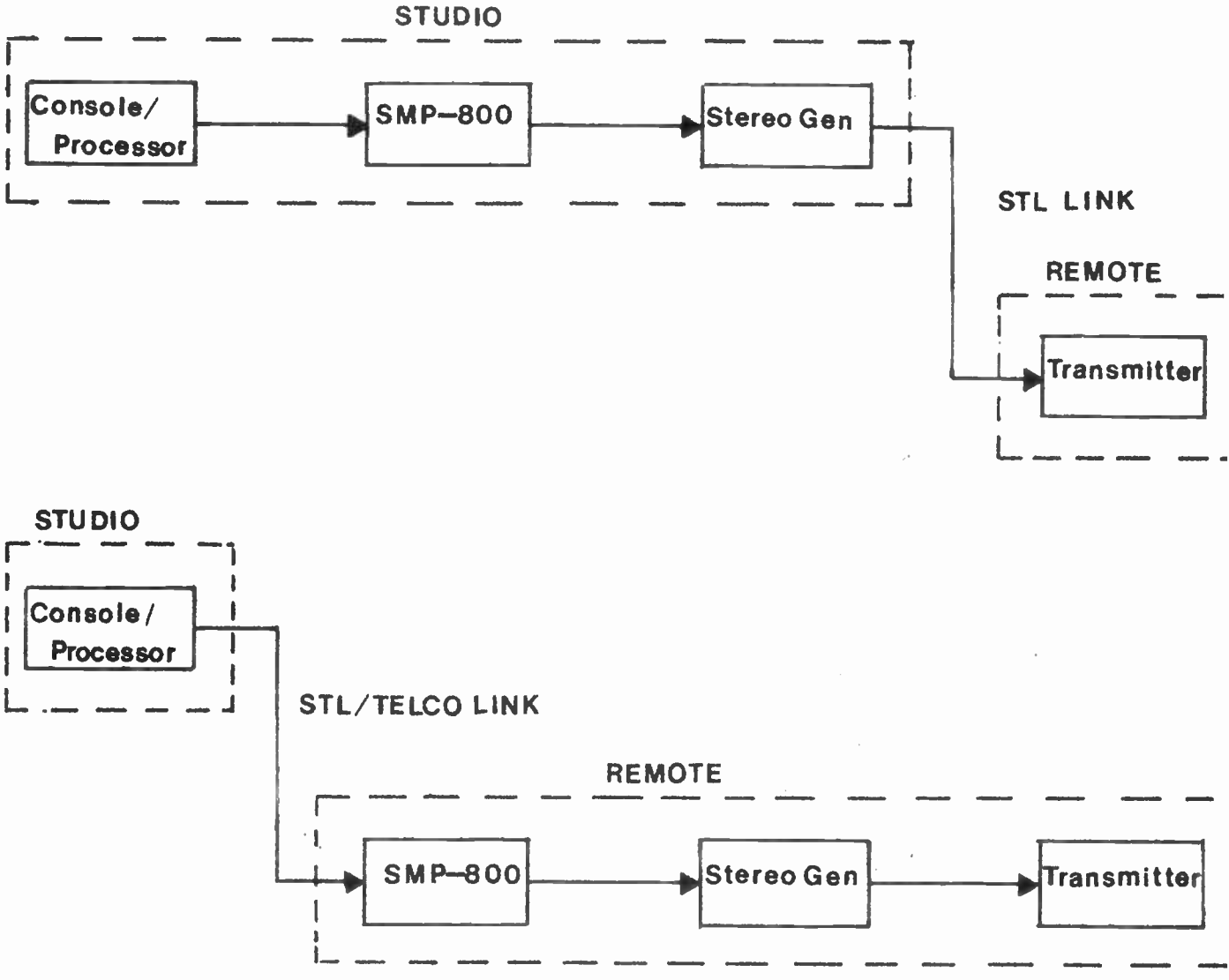


FIGURE 2-1 SMP-800 LOCATION DIAGRAM

2.2 INITIAL SWITCH POSITION

2.2.1 General

Before operating the SMP-800 Stereo Modulation Processor, the front and rear panel controls must be set so the starter/calibrate procedure can be completed.

2.2.2 Front Panel Controls (Figure 2-2)

Table 2.1 shall define the position of the front panel controls of the SMP-800.

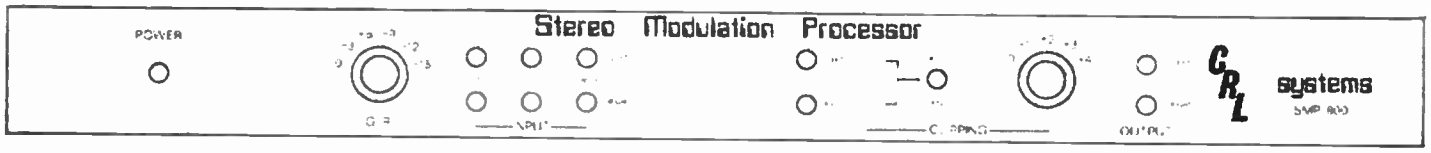


FIGURE 2-2 FRONT PANEL CONTROLS

TABLE 2.1 FRONT PANEL CONTROL POSITIONS

Control	Position
G/R Switch	Set to the -6 position
Auto/Std Switch	Set to the STD position
Clipping Control Switch	Set to the +2 position
Transmitter Modulation Pots (Labled Output)	Rotate each pot counter-clockwise at least 20 times

2.2.3 Rear Panel Controls (Figure 2-3)

Table 2.2 shall define the position of the rear panel controls of the SMP-800.

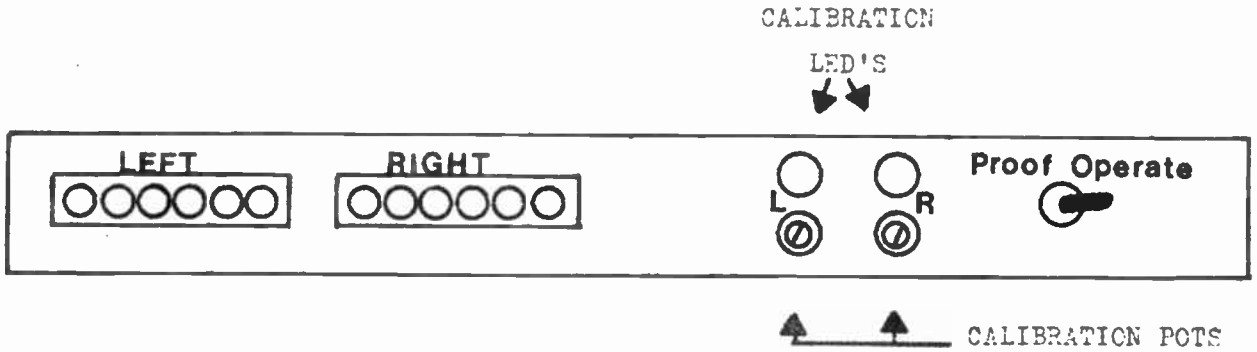


FIGURE 2-3 REAR PANEL CONTROLS

TABLE 2.2 REAR PANEL CONTROL POSITIONS

Control	Position
Calibrate Pots	Rotate each pot counter-clockwise at least 20 times.
PROOF/Operate Switch	Set to the Operate position.

2.3 INTERCONNECTIONS

2.3.1 General

The SMP-800 may be wired for either balanced or unbalanced operation. Paragraphs 2.3.2 and 2.3.3 shall define the connection procedure required for the balanced or unbalanced mode of operation respectively. The following connection procedures shall be for the left channel only but will also apply for the right channel. Determine if your system is balanced or unbalanced and proceed with the applicable set of instructions.

2.3.2 Balanced Operation (Figure 2-4)

The following procedure shall define the interconnections that are required for the SMP-800 to operate in the balanced mode of operation.

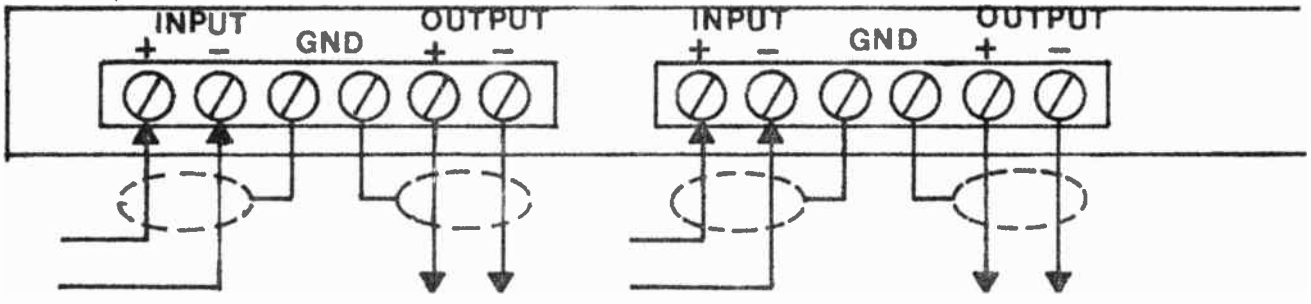


FIGURE 2-4 BALANCED OPERATION INTERCONNECTION

NOTE

All interconnect cables should be shielded for best operation.

1. Connect the balanced audio OUTPUT cable from the console or other audio source to the terminals labeled INPUT on the SMP-800.
2. Connect the balanced audio INPUT cable from the Telco, STL or recording equipment to the terminal labeled OUTPUT on the SMP-800.
3. Connect the shield of the cable connected to the SMP-800 INPUT to the Ground (GND) terminal closest to the INPUT terminals.
4. Connect the shield of the cable connected to the SMP-800 OUTPUT terminal to the Ground (GND) terminal closest to the OUTPUT terminal.

NOTE

It is imperative that both ends of the interconnect cables' shield be connected to Ground.

2.3.3 Unbalanced Operation (Figure 2-5)

The following procedure shall define the interconnections that are required for the SMP-800 to operate in the unbalanced mode of operation.

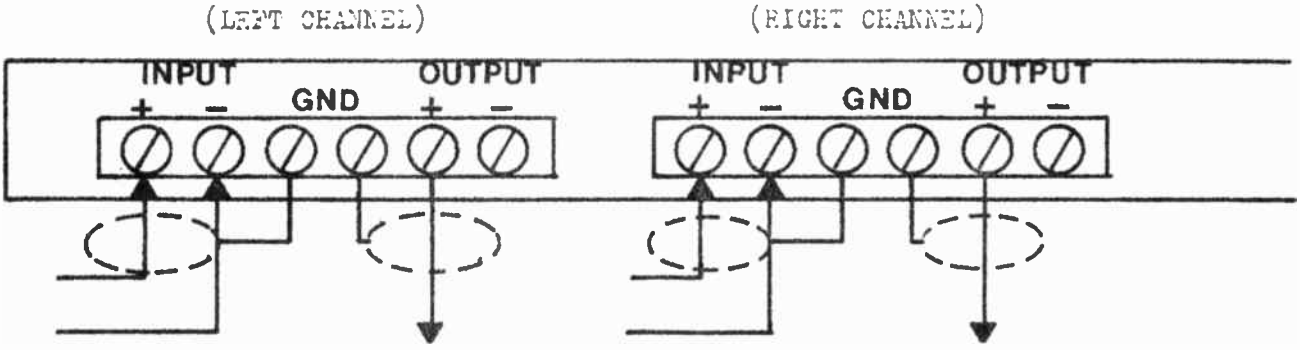


FIGURE 2-5 UNBALANCED OPERATION INTERCONNECTION

NOTE

All interconnect cables should be shielded for best operation.

1. Connect the unbalanced audio OUTPUT cable from the console or other audio source to the plus (+) INPUT terminal on the SMP-800.
2. Using a short section of wire, connect the minus (-) INPUT terminal of the SMP-800 to the Ground (GND) terminal closest to the INPUT terminal.
3. Connect the shield of the cable connected to the SMP-800 INPUT to the Ground (GND) terminal closest to the INPUT terminals.
4. Connect the shield of the cable connected to the SMP-800 OUTPUT to the Ground (GND) terminal closest to the OUTPUT terminals.
5. Connect the signal lead cable to the SMP-800 plus (+) OUTPUT terminal.

NOTE

For unbalanced operation the minus (-) OUTPUT terminal must not be grounded. This output is directly coupled to the output of an amplifier and is not transformer coupled.

2.4 STEREO GENERATOR SET UP

2.4.1 General

The SMP-800 contains two 15KHz high performance low pass filters. These filters are dynamically 60db down at 19KHz and have pre-emphasis

curve generation at 25, 50 or 75 microseconds. Connecting the SMP-800 to a standard stereo generator will in affect, connect two 15KHz low pass filters and two pre-emphasis curves in series creating serious program quality degradation. To eliminate this problem it will be necessary to remove the 15KHz low pass filter and pre-emphasis curve from your stereo generator.

It may also be necessary to remove the high pass filter in some stereo generators as well. The high pass filter roll off may cause low frequency tilt which can reduce modulation. Refer to Paragraph 2.4.2 for the method used to determine if the high pass filter in your stereo generator must be removed.

2.4.2 Stereo Generator Modification Determination

To determine if the stereo generator you are using must have its high pass filter removed, perform the following test:

1. Connect an audio generator to one channel of the stereo generator and measure the composite output through the frequency range of 20 to 1KHz.
2. If the output level deviates less than 1db the high pass filter will not have to be removed.
3. If the output level deviates more than 1db the high pass filter must be removed.

2.4.3 Stereo Generator Modification

The following shall define the procedures required to eliminate the low pass filter in some commonly used stereo generators.

MOSELY SCG -9

1. To remove the pre-emphasis curve, short C6 and C18.
2. Unplug audio low pass filter modules in both left and right channels.
3. Jumper terminal A to terminal B for both left and right channels.

HARRIS MS-15

1. Switch the DTR filters off.
2. Change J1 and J2 in the stereo analog module to the flat position.

NOTE

For best results also remove C4 and C26 from the stereo analog module.

ORBAN 8000-A

1. Unbalanced audio will be run to the Optimod by connecting the CRL system's (+) outputs to the RCA Test Jacks on the rear of the Optimod 8000-A.
2. Jumper the chassis and circuit Ground together on the Optimod 8000-A.

NOTE

Be sure the Ground shield is connected on both sides of the cable.

3. Set test/normal switch to the test position on the rear panel.

CAUTION

Do not short (-) terminals on CRL to Ground. These terminals must be unconnected.

4. The 15KHz Optimod filters have been bypassed at the test jacks. CRL's 15KHz filters will take their place.

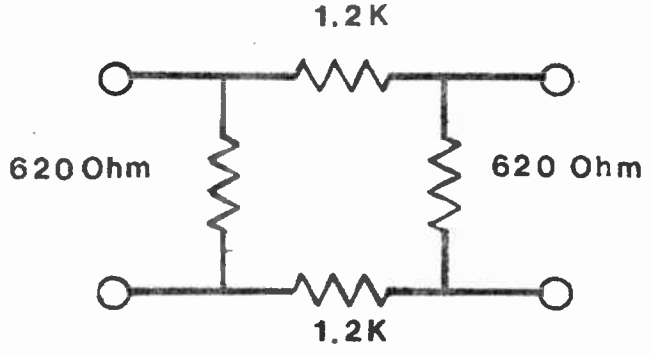
COLLINS 310-Z-1

1. Unsolder the 15KHz low pass filter modules (three terminals).
2. Remove the modules from the stereo generator board.
3. Jumper "IN" to "OUT".
4. Remove pre-emphasis network left and right (FL1 and FL3).
5. Remove the high pass filter (FL2 and FL4).
6. Replace FL1 and FL3 with a 20db pad.

NOTE

The 20db pad, shown below, will provide about 20db of attenuation and should be used to prevent overloading.

7. Jumper "IN" to "OUT" on FL2 and FL4.



2.4.4 Stereo Generator Check List

To insure that all procedures have been completed, the following check list has been provided for your convenience.

1. Jumper out and/or remove your stereo generator's 15KHz low pass filters.
2. Jumper out and/or remove your stereo generator's pre-emphasis network.
3. Determine if your stereo generator has high pass filters and if so whether or not it needs to be jumpered out and/or removed.

2.5 CALIBRATION

2.5.1 General

Once the front and rear panel controls have been set and the low pass filters in your stereo generator are removed, the SMP-800 may be calibrated. Paragraph 2.5.2 shall define the dynamic calibration procedure and Paragraph 2.5.3 shall define the tone calibration procedure. Both procedures are just as accurate but by using the tone calibration procedure better balance will be produced than when using the dynamic calibration procedure. Determine which procedure fits your requirements and proceed with the applicable paragraph.

2.5.2 Dynamic Calibration Procedure

1. Adjust the input source for a 0VU reference level.

NOTE

The signal used to calibrate the SMP-800 should be your typical program format.

2. Apply power (115VAC) to the SMP-800.
3. Locate the left and right channel calibration pots and Light Emitting Diodes (LED's) on the rear panel of the SMP-800. (Refer to Figure 2-2)
4. Rotate the left channel control pots, clockwise, until the left channel calibration LED flashes on program peaks approximately 10-20% of the time.
5. Repeat Step 4 for the right channel calibration.

2.5.3 Tone Calibration Procedure

1. Apply a +3VU (as indicated by console VU meter), 1KHz sine wave to the SMP-800.
2. Apply power (115VAC) to the SMP-800.

3. Locate the left and right calibration pots and Light Emitting Diodes (LED's) on the rear panel of the SMP-800. (Refer to Figure 2-2)

4. Rotate the left channel control pot, clockwise, until the left channel calibration LED just lights.

5. Repeat Step 4 for the right channel calibration.

2.6 TRANSMITTER MODULATION ADJUSTMENT

2.6.1 General

To insure optimum performance of the SMP-800 both the left and right channel modulation level must be adjusted. Paragraph 2.6.2 and 2.6.3 will describe the mono and stereo adjustment procedures respectively.

NOTE

Insure that the input cable leads are connected to the same polarity (+ to +, - to -), throughout the system. Reversal of leads will result in phasing errors.

2.6.2 Mono Adjustment Procedure

The following procedure will define the mono transmitter modulation adjustment.

1. Rotate the left channel output pot, clockwise, until the total modulation monitor reads 100%.

2. Adjust the stereo modulation monitor to read L-R modulation.

3. Rotate the right channel output pot, clockwise, until the stereo modulation meter reaches its null position.

NOTE

When the stereo modulation meter reaches its null level the left and right channels are at the same level. The null level will be reached at between 30 and 40db as shown on the stereo modulation meter.

4. Recheck the modulation monitor to insure that it has not exceeded 100%. If the modulation monitor is still at 100% the calibration procedure is completed. If the reading exceeds 100% proceed to Step 5.

5. Reduce the left channel until the modulation monitor reads 100%.

6. Adjust the stereo modulation monitor to read L-R modulation.

7. Adjust the right channel output pot until the stereo modulation meter reaches its null position.

2.6.3 Stereo Adjustment Procedure

The following procedure will define the stereo transmitter modulation adjustment.

1. Remove the right channel input interconnect cable.
2. Rotate the left channel output pot, clockwise, until the modulation monitor reads 100%.
3. Remove the input cable from the left channel and connect it to the right channel.
4. Rotate the right channel output pot, clockwise, until the modulation monitor reads 100%.
5. Connect the left and right interconnect cables in their proper locations.
6. Check the total modulation monitor to insure that the total modulation does not exceed 100%.

NOTE

If the total modulation exceeds 100% reduce the levels of the left and right channels to below 100%.

CHAPTER III

OPERATION

3.0 GENERAL

The SMP-800 is now ready for operation. The unit has been calibrated to OVU and the output should be driving your modified stereo generator. The left and right channel outputs are equal in amplitude and both ends of the interconnect shields are grounded. We can now describe the function of the front and rear panel controls. The recommended control configuration for the SMP-800 is shown in Table 3.1.

TABLE 3.1 RECOMMENDED CONTROL CONFIGURATION

Control	Location	Position
PROOF/Operate Switch	Rear Panel	Operate
G/R Switch	Front Panel	-6
Clipping Switch	Front Panel	+2

NOTE

Table 3.1 defines a good setting for a Country or Easy Listening format if the SMP-800 is being used alone. If the SMP-800 is not being used alone, a lower setting may be required.

3.1 FRONT PANEL CONTROLS

3.1.1 Gain/Reduction Switch (Figure 3-1)

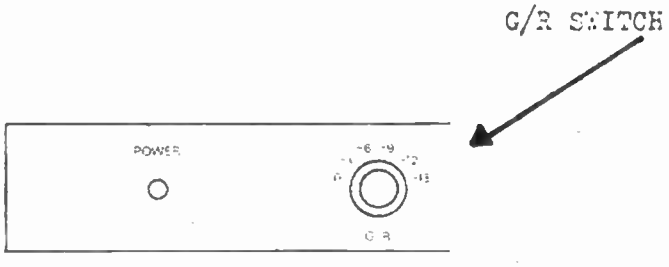


FIGURE 3-1 GAIN REDUCTION SWITCH LOCATION

The gain reduction switch controls the range over which gain reduction will take place in the SMP-800. When the G/R switch is set

in the -9 position, the medium-slow AGC circuit will hold the SMP-800 output constant if the input source material drops 9db below OVU as referenced from the audio source. If the input source material drops 10db or more, the output will drop no more than the difference between the G/R switch setting and the input source level. For example, the G/R switch is set at -9, and the input level drops 11db below OVU. The total drop in signal level at the output will be 2db below the OVU setting. Signals may rise as much as 25db above OVU and not be affected by the G/R switch setting.

NOTE

AGC action is automatic above OVU.

In effect, this circuit gain rides the average signal level and tends to make up for "Jock Errors". Since the average and peak signal levels are being controlled by the SMP-800 you will detect a loudness increase when turning the G/R switch clockwise (towards -15). The greatest increase in loudness will be realized when the G/R switch is switched from 0 to -3 and from -3 to -6. By continuing to turn the switch towards the -15 position, there will be no additional increase in loudness.

Since there is a loss of long term dynamic integrity with higher switch settings, the position of this switch is of a subjective nature. CRL recommends that the G/R switch setting be set in as low a position as possible to achieve your goal.

NOTE

A large amount of control is possible in the SMP-800 without the ear detecting any unpleasant side effects.

3.1.2 Auto/Standard Switch (Figure 3-2)

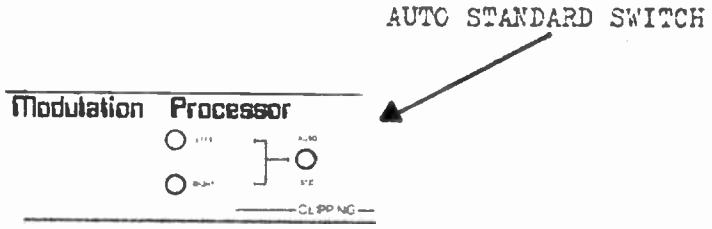


FIGURE 3-2 AUTO STANDARD SWITCH LOCATION

The auto/standard switch will change the overall clipping that will take place in the SMP-800.

By placing this switch in the standard mode, the clipping level that is acting upon the program material is determined by the clipping control setting. In the standard mode, loudness will be increased but there may be a decrease in the quality of the processed signal.

By placing the switch in the auto mode the processor will look for sustained tonal qualities in the program material and when found, will clip them less than when in the standard mode. For voice only programming it is suggested that the switch be placed in the auto mode, since distortion in a voice signal is more noticeable than in a music signal.

3.1.3 Clipping Control Switch (Figure 3-3)

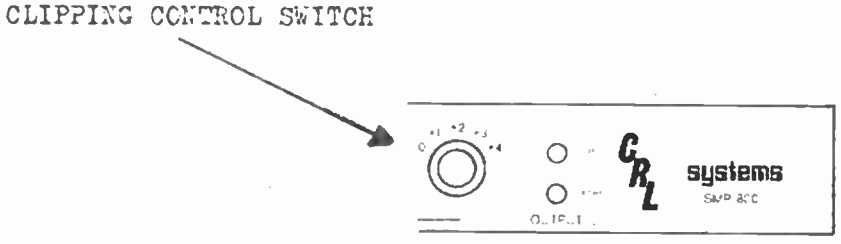


FIGURE 3-3 CLIPPING CONTROL SWITCH LOCATION

The clipping control switch will determine the amount of loudness that can be generated in the SMP-800. This loudness is created by the amount of clipping that is done to the signal waveform. This five

position switch clips 0, +1, +2, +3 or +4db off the signal depending upon the switch setting. By placing the switch in the +2 position for example, the processor will clip +2db off the signal waveform. As the switch is rotated clockwise, towards the +4db position, the loudness of the signal will increase. This increase is realized because more signal energy is packed into a smaller space (modulation limits). The largest increase in loudness will be noticed when the switch is changed from 0 to +1db and +1 to +2db. As you proceed clockwise from +2 to +4db the loudness will not increase as much as it did when switching from 0 to +1db. By increasing the clipping level you may introduce a loss in dynamic integrity of the signal which will cause possible distortion. Therefore, it is recommended that as low a setting of this switch be used to achieve your goal.

3.2 REAR PANEL CONTROLS

3.2.1 Input Calibrate Pots (Figure 3-4)

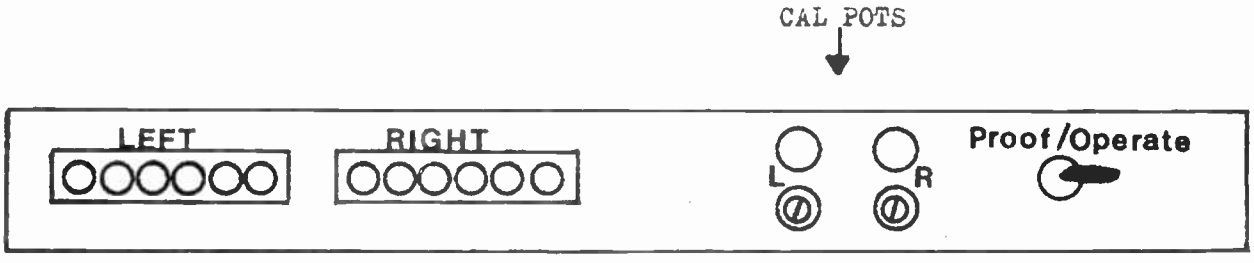


FIGURE 3-4 INPUT CALIBRATION POTS LOCATION

The left and right channel input calibration pots are used to control the amount of input signal that will reach the input amplifiers of the SMP-800. The optimum amount of input signal that should reach the input amplifiers is OVU as indicated on your control console or automation system.

3.2.2 PROOF/Operate Switch (Figure 3-5)

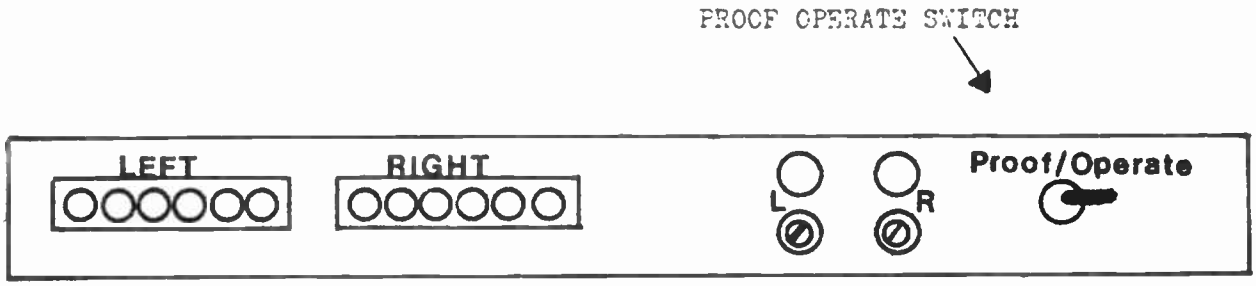


FIGURE 3-5 PROOF OPERATE SWITCH LOCATION

The SMP-800's PROOF/Operate switch will defeat all system audio processing. To bypass all audio processing place the PROOF/Operate switch in the PROOF position.

3.3 STATUS INDICATORS

3.3.1 General

Two sets of status indicators have been included on the front panel of the SMP-800 to give the operator a constant update on system operation. These indicators are, the input level indicator, and clipping status. Both indications will be defined in Paragraphs 3.3.2 and 3.3.3 respectively.

3.3.2 Input Level Indicators (Figure 3-6)

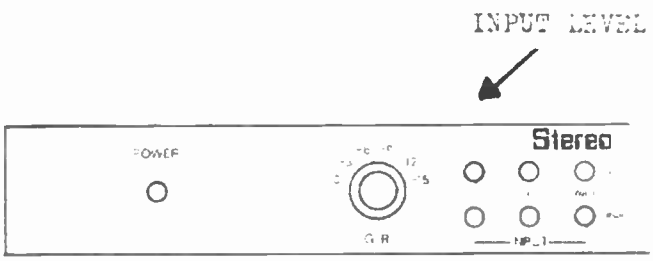


FIGURE 3-6 INPUT LEVEL INDICATORS

The input level indicators will light and remain lit when the pre-determined input levels of the program material are reached.

Table 3.2 will define the levels at which each lamp will light when the input signal is calibrated to the OVU reference level as indicated on your audio console or automation system.

TABLE 3.2 INDICATOR LAMPS' ILLUMINATION LEVELS

Lamp	Illumination Level
-15	-15db below the OVU calibration reference level.
0	Signals that exceed the OVU calibration reference level
OVLD	Signals that are 12db above the OVU calibration reference level

NOTE

The top row of lamps indicate the left channel and the bottom row of lamps indicate the right channel on the SMP-800.

3.3.3 Clipping Indicators (Figure 3-7)

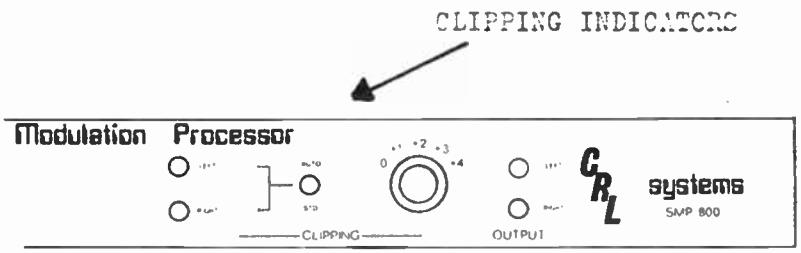


FIGURE 3-7 CLIPPING INDICATOR LOCATION

The left and right channel clipping indicators will indicate the average amount of clipping taking place in both channels of the SMP-800.

NOTE

These lamps will tend to light when clipping of mid-frequencies is taking place.

It is recommended that these lamps not be used as an absolute

CIRCUIT RESEARCH LABS, INC.
3204 S. Fair Lane - Tempe, Arizona 85281 - (602) 894-0077

PROOF OF PERFORMANCE: For _____ By P. Eich Date 10/9/81

SMP 800 # 8109801

MODE OF OPERATION: Proof @ calibrate point @ 1Khz.

CAL. PT.= threshold of rear cal. led or front "peak" led.

S/N: L ch. -75 db
R ch. -75

THD:	100hz	1Khz	10Khz
L ch.	.01	.01	.1 %
R ch.	.07	.04	.12

Measured response -22db below limit threshold using 75us de-emphasis for SMC 600A or SMP 800 only.

RESPONSE:	50hz	100hz	400hz	1Khz	5Khz	7.5Khz	10Khz	15Khz
R ch.	0	0	0	0/Ref	+.9	+.9	+.5	-.3
L ch.	-.3	-.1	0	0/Ref	+.6	+.5	+.2	-.5

==========

In OPERATE the unit or system is checked with the following controls set:

APP 400
SPP 800

G/R	
EQ	
GATE	
OPERATION	
OUTPUT REAR	

SEP 400A

DEP PROCESS	
DEP DENSITY	
GATE REAR	
L	
M1	
M2	
H	
PEP PROCESS	
PEP DENSITY	

PMC 400
SMP 800

G/R	-9
AUTO/STANDARD	STD
CLIP LEVEL	+2
LO PHASE CORRECT	
HI PHASE CORRECT	
EQ	
ASSYMMETRY DAY	
ASSYMMETRY NIGHT	
EQ CONTROL REAR	
LO CUT-FLAT SW. REAR	

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APP 300A		SMC 600A		PMC 300A	
PROCESS	____	PROCESS	____	PROCESS	____
OUTPUT	____	DENSITY	____	DENSITY	____
GATE CONTROL REAR	____	STANDARD-AUTO REAR	____	LO PHASE CORRECT	____
				HI PHASE CORRECT	____
CC 300				OUTPUT	____
Process	____			EQ	____
Clip +	____			ASSYMETRY	____
Clip -	____			AUTO-STANDARD REAR	____
R/C Sw.	____			EQ FREQ. REAR	____
				LO CUT-FLAT REAR	____

All input and output controls are set according to calibration procedures.

==========

MODE OF OPERATION: Operate ? calibrate point @ 1Khz.

CAL. PT.= threshold of rear cal. led or front "peak" led.

S/N: L ch. -70 db
R ch. -70

THD:

	100hz	1Khz	10Khz
L ch.	.18	.16	.23
R ch.	.19	.14	.29

%

Response:

☐ Measured -5db below limit threshold.

☒ Measured -22db below limit using 75us de-emphasis.

	50hz	100hz	400hz	1Khz	5Khz	7.5Khz	10Khz	15Khz
L	-.5	-.4	0	0/Ref	0	0	0	-2.0
R	-.4	0	0	0/Ref	+.3	+.5	+1.0	-2.0

Power supply @ 400hz in operate @ operate cal. pt.