

SEP-800 SPECTRAL ENERGY PROCESSOR

INSTALLATION AND OPERATION MANUAL



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SEP-800

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FM4 & AM4 SYSTEM INFORMATION

System information is located in the appendix preceding the parts list.

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1.1 INTRODUCTION

Circuit Research Labs has created a new concept in stereophonic multiband dynamic range controllers that will give you precise dynamic control and equalization of your "ON AIR" or other selected program material. This manual describes the installation and operation of this unit which we have named the Spectral Energy Processor, model SEP-800.

The SEP-800 incorporates exclusive CRL patented gain reduction elements in addition to voltage controlled output VCA's which provide absolute gain/phase tracking of the stereophonic output signals during equalizing adjustments.

This unit also has several new and "unique" control features which gives the unit more flexibility and power than has ever been possible with another multiband audio processor unit. These features include the compress/limit and the multi/wide band controls. Special "Bass Boost" high pass filters help improve bass clarity and punch while at the same time removing sub-sonic program contents. More is explained about these features later in this manual and time should be dedicated to understand these important product features.

Designed with STEREO in mind, the SEP-800 has unique patent pending control circuits which maintain absolute stereo imaging without the annoying side effects of conventional stereo "strapping" techniques used by other manufacturers. Conventional stereo "strapping" can cause opposite channel gain intermodulations which reduces the overall stereo loudness of other processors as compared to SEP-800. These control circuits enable the SEP-800 to achieve greater stereo loudness without sounding as processed. You will find out this difference when placing this unit on the air.

1.3 PREVENTIVE MAINTENANCE

A minimum amount of preventive maintenance is required to insure optimum performance of this processor unit. If you do not have a regular preventive maintenance schedule in existence, Circuit Research Labs suggests the following check list be performed on a periodic basis such as once a month or at least quarterly.

1. Check to insure that the input and output cables are secured tightly to their respective terminals and are not frayed (FRAYED SHIELD WIRES CAN SHORT OUT INPUT AND OUTPUT TERMINALS AND CAUSE INTERMITTENT FAILURES).
2. Check to insure that all knobs, switches, and indicators are secure and in good working condition. If they become physically loose, tighten them as this could also cause intermittent operating results.
3. Check to insure that there is not an excessive build up of dirt or dust on or around the unit. While this may not immediately affect the unit, long term exposure may.
4. NOTE: Keep all liquids away from the unit. Accidental spillage can result in serious damage to the unit will void the warranty.

1.4 FACTORY SERVICE & REPAIR

In the event this unit must be returned to the factory for repair, IN or OUT of warranty, Circuit Research Labs requires that a RETURN AUTHORIZATION (RA) NUMBER be obtained from the CUSTOMER SERVICE department. Call CRL prior to shipment at 602-438-0888 for this number or the equipment will be returned to you undelivered. In order to insure prompt service, the following information must also be included with the returned unit:

1. The Return Authorization Number CLEARLY MARKED ON THE OUTSIDE of the shipping container.
2. Description of Trouble - While we take pride in our repair department's ability, they have not graduated Mind Reading yet. Descriptions should include A) the symptom description, B) the unit control settings when the trouble was detected and C) the CRL system usage, AM/FM & mono/stereo.
3. Approximate date of purchase and the serial number of the unit - This will aid in the determination of billing for warranty or out of warranty repairs.

All repairs must be shipped PRE-PAID via United Parcel Service to:

CIRCUIT RESEARCH LABS Inc.
2522 WEST GENEVA DRIVE
TEMPE, ARIZONA, 85282
ATT: CUSTOMER SERVICE

1.5 SPECIFICATIONS

SEP-800

TYPICAL SPECIFICATIONS

Operating Temperature Range: 0 to 50 degrees C.

Nominal Power Requirements: 20 watts 110 to 125 VAC.

Weight: 71bs 2oz. (3.2Kg)

Input Sensitivity: -30dbm to +20dbm, ref-G/R threshold

Input Impedence: 600 balanced, 10K ohms unbalanced,
Active Transformerless

Output Impedence: Less than 200 ohms, balanced or
unbalanced Transformerless

Maximum Output: +18dbm into 600 ohms @ 400Hz

Frequency Response: 50Hz to 15KHz; +.1 to -.6

Total Harmonic Distortion: .25% in Operate
.06% in Proof

Separation: 65db, 50Hz to 5KHz in Operate
50db, 5KHz to 10KHz

75db, 50Hz to 5KHz in Proof
65db, 5KHz to 10KHz

S+N/N: 65db in Operate
75db in Proof

Gain Reduction Type: 4 band VCR alignment free design
followed by 4 output control VCA's

Gain Reduction Range: 30 db maximum

Crossover Frequencies: 200Hz, 1KHz, 5KHz with 6db/octave
filters.

Output EQ Range: -12db to +6db

Attack & Release Times: Program dependent in user selected
ranges of Slow, Medium, or Fast

Product specifications are subject to changes without notice
because of technology updates and product improvements by Circuit
Research Labs, Inc.

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2.1 INITIAL SET-UP

Before operating the SEP-800 Spectral Energy Processor, front and rear panel controls should be set as indicated in Section 2.2 below and one of the calibration procedures should be performed.

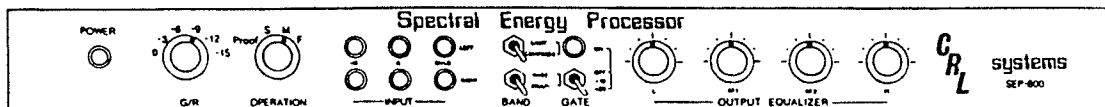


FIGURE 2-1 FRONT PANEL CONTROL LOCATIONS

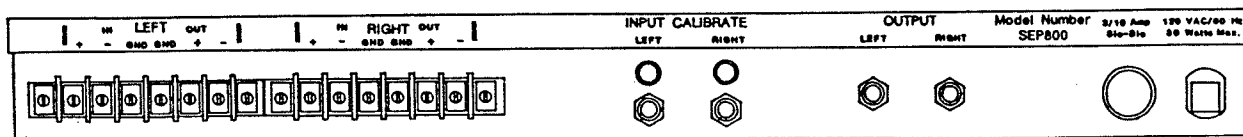


FIGURE 2-2 REAR PANEL CONTROL LOCATIONS

2.2 INITIAL CONTROL POSITIONS

SETTINGS

CONTROL	POSITION
G/R Control	Set to -6
OPERATION Control	Set to M
LIMIT/COMPRESS Switch	Compress
WIDE/MULTI Switch	Multi
GATE Switch	Set to -20 position
OUTPUT EQUALIZER Controls	Set to vertical or 12 o'clock
INPUT CALIBRATE Controls (rear) (screwdriver adjustment)	factory set for +0 dbm
OUTPUT Controls (rear)	factory set for +0 dbm

2.3 INTERCONNECTIONS

This unit may be wired for either balanced or unbalanced operation. Most broadcast equipment, however, is designed for balanced operation. Connect according to the appropriate diagram in Figure 2-3 below. Typically, two conductor shielded cable such as Belden #8451 is used which has red and black twisted pair inside a braided external shield. Connect the red "high" side signal leads to the plus (+) input/output terminals and the black "low" side signal leads to the minus (-) input/output terminals. THE CABLE SHIELD SHOULD BE GROUNDED AT BOTH ENDS for proper balancing with ACTIVE input and output circuits such as is used in this unit.

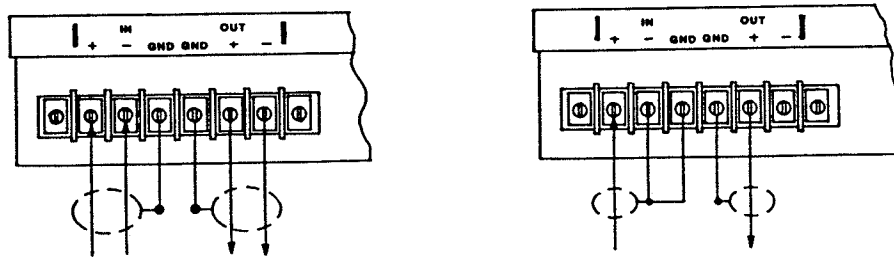


FIGURE 2-3 BALANCED AND UNBALANCED CONNECTIONS

NOTE: When using unbalanced INPUT connections, the shields are connected to the ground terminals and the minus (-) terminals are connected to the grounds by jumper wires as shown. However, when using unbalanced OUTPUTS, the shields must be connected to the ground terminals, but THE MINUS (-) OUTPUT TERMINALS MUST BE LEFT UNCONNECTED. This unit does not use transformers and grounding the minus (-) OUTPUT terminals will short the outputs of IC amplifiers.

It is possible to use unbalanced in and balanced out or vice versa without degrading performance.

2.4 INPUT/OUTPUT CALIBRATIONS

When the SEP-800 is received from CRL as a part of a system, all units have been properly calibrated for direct interconnection between units. This means that only system input and output adjustments should be required unless other equipment or phone lines separate the units. If the latter is encountered or purchase of the SEP-800 has been separate, proceed to the following procedure which meets your needs.

CRL SYSTEM'S PINK NOISE CALIBRATION

When received as part of a CRL SYSTEM, this is the recommended calibration procedure. If dual locations are necessary, or you wish to check the CRL system calibration, use the following procedure.

CRL SYSTEM'S PINK NOISE CALIBRATION (Cont.)

1. Set the G/R and OPERATION controls of the SPP-800 to the desired operating levels or -6 and "M" respectively. Switch on the rear panel internal pink noise generator.
2. If you have NOT done so, set the controls of the SEP-800 to the positions as previously described in the Section 2.2, INITIAL CONTROL POSITIONS.
3. The input calibration LEDs on the rear panel of the SEP-800 should frequently flash but not be on constantly with pink noise input. With normal program material, the rear panel LEDs should only flash on program peaks between 10% and 20% of the time.
4. If the input calibration LEDs are constantly on, are not flashing at all, or are not flashing EQUALLY, re-adjust the appropriate input control until both channels equally indicate the desired results described in step 3. If the input controls do not seem to have enough range and the front panel -15 indicators are flashing, refer to Section 3.5, Input Sensitivity Jumpers to correct for LOW INPUT levels.
5. Adjust the output level controls of the SEP-800 until the level indicators of the following unit are indicating normal input level for that unit.
6. Switch off the SPP-800's pink noise generator and proceed to the FINAL ADJUSTMENTS explanation at the end of this Section.

NORMAL PROGRAM MATERIAL CALIBRATION

The SEP-800 unit can be operated with or without the CRL SPP-800 AGC unit ahead of it. Use the following procedure for calibrating the SEP-800 for stand alone operation, for connecting the SEP-800 to non-CRL AGCs, and as an alternative to the CRL SYSTEM pink noise method. When used alone, the SEP-800 unit's capability becomes restricted because it MUST BE USED IN THE WIDE BAND mode in order to provide acceptable AGC and COMPRESSION action. This means that its dynamic equalization ability is cancelled. If an SPP-800 is used before this unit, the pink noise method described above should be used for a more accurate calibration.

1. This procedure uses normal program material as the audio source. The console should be set for the station's "normal" maximum peak VU meter indication on program peaks. Connect the left and right channel outputs of the audio console, or program lines or preceeding AGC unit to the left and right SEP-800 inputs. OBSERVE CORRECT (+) AND (-) WIRING POLARITY, If this is NOT DONE, THE MONO SIGNAL WILL BE CANCELLED.

NORMAL PROGRAM MATERIAL CALIBRATION (Cont.)

2. If you have NOT done so, set the controls of the SEP-800 to the positions as described in the Section 2.2, INITIAL CONTROL POSITIONS.

NOTE: IF NO AGC IS USED IN FRONT of the unit, SET the G/R control to -12.

3. The best alignment balance can ONLY be obtained by using a mono source to insure the same signal to both channel inputs of the SEP-800. The input calibration LEDs can then be adjusted to flash equally on program peaks which will indicate proper balancing of input levels.
4. When the source is program material, the rear panel input LEDs should flash about 10% to 20% of the time. On the front panel, the green LEDs (-15) will be on most of the time.
5. If the input calibration LEDs are constantly on, are not flashing at all, or are not flashing EQUALLY, re-adjust the appropriate input control until both channels equally indicate the desired results described in step 4. If the input controls do not seem to have enough range and the front panel -15 indicators are flashing, refer to Section 3.5, Input Sensitivity Jumpers to correct for LOW INPUT levels.
6. Adjust the output level controls of the SEP-800 until the level indicators of the following unit are indicating normal input level for that unit.

2.5 FINAL ADJUSTMENTS

After completing one of the previous adjustment procedures, special attention should be given to achieving the final desired sound. Since the SEP-800 unit is typically used with other equipment in front and/or following it, consideration MUST be given to the settings of all equipment in the audio path in a systems approach.

ALWAYS make certain that when things don't sound quite right coming out of the unit that it is not because things aren't sounding quit right coming INTO it as well. Many hours of adjusting audio processing equipment have been spent trying to adjust "out" something which was coming into it all the time.

In normal operating conditions, the SEP-800 will not cause any typical audible distortions such as THD, IM, and etc. If these sounds are perceived, it will usually be caused by miss-alignment of following limiting/clipping devices in the system or other amplifiers somewhere else being over driven.

2.6 SOUND SETTING GUIDE

SUGGESTED CONTROL SETTINGS

Format	G/R	OPERATION	LIM/COMP
Rock			
heavy 1	-12	M	L
heavy 2	-9	F	C
heavy 3	-9	F	L
medium 1	-9	M	C
medium 2	-6	F	C
medium 3	-6	F	L
soft 1	-9	S	C
soft 2	-6	M	C
soft 3	-6	S	L
Beautiful Music			
heavy	-9	M	C
medium	-6	S	C
soft	-3	S	C
Country			
heavy	-9	M	C
medium	-6	M	C
soft	-3	S	C
Talk			
heavy	-12	M	L
medium	-9	M	L
soft	-6	S	L
Classical			
heavy	-9	S	C
medium	-6	S	C
soft	-3	S	C
MOR/Easy Listening			
heavy	-9	M	C
medium	-6	M	C
soft	-6	S	C

NOTE: The MULTI/WIDE switch may be set as desired for dynamic equalization ON or OFF.

CAUTION: These settings are only suggested if the SEP-800 is being used with an SPP-800 ahead of it. If the SEP-800 is being used with no input AGC, ADD 3 to 6 db to the G/R levels and use ONLY the WIDE BAND mode.

3.1 GENERAL

This section describes the operating details of each of the controls of the stereo SEP-800, Spectral Energy Processor. After reading this section it is strongly recommended to read the following section 4. THEORY OF OPERATION as it will help give a better overall understanding to the control function descriptions.

3.2 FRONT PANEL CONTROLS (See Figure 2.1)

G/R CONTROL

The amount of gain reduction produced in the four audio bands is controlled by this switch. The desired level of processing can be adjusted in 3 db steps from 0 to -15db. This is a precision step attenuator switch which controls the total input level to the following four gain reduction bands. As the switch is rotated clockwise, there is an increase in loudness at the unit outputs because of increased processing action. Output loudness increases will be the greatest when changing between lower process levels as compared to changing between higher levels.

NOTE: To obtain maximum loudness use lower settings of the G/R Control (-3 or -6) and faster settings of the OPERATION switch. For the maximum dynamic equalization effects use higher settings of the G/R Control and slower settings of the OPERATION switch.

OPERATION CONTROL

This switch controls the program dependent attack and release time ranges of all four gain reduction bands and also activates the "bypass" or proof position. The three active settings of this switch, S, M, F produce three different actions on the audio signal.

- "S" In this position, the four bands operate primarily as dynamic equalizers and extremely transparent AGC's which maintain consistent equalization and average levels despite variations in program material.
- "M" With this setting, the four bands resemble more aggressive type compression devices and cause moderate loudness increases by compressing and reducing the dynamic range.
- "F" With this maximum setting, the most radical gain reduction action occurs and resembles rapid compression type devices. The dynamic range is greatly reduced, but the loudness increase is maximum.

PROOF. In this position, the AGC circuits are removed to allow frequency response and distortion measurements. It is also useful as an A-B'ing of the unit's processing effects.

3.2 FRONT PANEL CONTROLS (Cont.)

LIMIT/COMPRESS BAND SWITCH

This is a NEW AND EXCLUSIVE feature of Circuit Research Labs and allows the stereo SEP-800 Spectral Energy Processor to actually be TWO audio processors in ONE package. While also affecting dynamic attack and release characteristics of the unit, this control also affects the PEAK to AVERAGE control of the unit as well.

In the COMPRESS position, the SEP-800 is very similar in action to the earlier CRL SEP-400 mono multiband audio processor design which produces substantial increases in the RMS and loudness of program material while having little effect on the TRANSIENT and "apparent dynamics" of program content. This position allows substantial levels of audio processing of program signals without "SOUNDING" processed and is the recommended position by CRL.

In the LIMIT position, the SEP-800 is similar in action to those of many other manufactured multiband processors which depend on substantial peak control action occurring in their Gain Reduction stages. While this setting does not "SOUND AS OPEN" as the CRL COMPRESS position, it does allow a "MORE CONSISTENT LOUDNESS" capability and can achieve greater levels of "ON-AIR" loudness without resorting to the same amounts of post peak clipping.

WIDE/MULTI BAND SWITCH

The WIDE/MULTI control switch is another NEW AND EXCLUSIVE feature of Circuit Research Labs and allows the stereo SEP-800 Spectral Energy Processor to "TURN ON AND OFF" its normal multiband dynamic equalizing action.

In the MULTI band mode, the SEP-800 performs as a conventional multiband gain control processor. The audio is split into separate frequency bands and each band undergoes independent gain control action. This causes automatic re-equalization of the audio spectrum when the bands are re-combined at the output after separate gain controlling. Automatic or dynamic equalization has been found very desirable for most applications but not for stand alone AGC/COMPRESSION applications.

In the WIDE band mode, the SEP-800 processing characteristics are STILL MULTIBAND, except that widely varying input levels can now be controlled by just one unit without audible "tonal balance" changes in the output because of the "typical" multiband dynamic equalization effect.

GATE SWITCH

This control may be set in three positions; OFF, -10, or -20. When the input level drops below the threshold this setting, all gain control circuits are "frozen" at their previous gain (or attenuation) levels. If the switch is set for -10, signals that

GATE SWITCH (Cont.)

fall below that level will be passed through without AGC amplification. This means that no background noise is brought up during pauses in program material. For example, if a newsmen is using a teletype background that is more than -10db or -20db down in level (depending on choice of setting), the teletype will not be increased in loudness during pauses. The "GATE" LED on the front panel will go on whenever the gain is frozen by this circuit.

OUTPUT EQUALIZER CONTROLS (L, M1, M2, H.)

These controls adjust the levels of the stereo outputs of the four gain control channels. They control individual band output levels from -12db to +6db from their 12 o'clock positions. Precision tracking of the stereo audio bands is achieved through the use of stereo VCA's which control the actual audio levels. The stereo VCA's are in turn controlled by a single control voltages which are operated by the front panel controls.

With these controls, you can easily tailor the sound of the station for your particular format and operate them much as a simple audio equalizer would. The four bands are logarithmically equal in audio frequency spectrum size in order to match the way our ears perceive sound. The four bands use 6db per octave filters to insure "peak" and "hole" free band recombination and control the ranges as follows:

OUTPUT EQUALIZER CONTROL RANGES

"L" Covers the band from 20 to 200 Hz.

"M1" Covers the band from 200 to 1000 Hz.

"M2" Covers the band from 1000 to 5000 Hz.

"H" Covers the band from 5kHz to 15 kHz.

Notice that there are small markings at numerous positions about the perimeters of these controls. These are used to "log" down different types of equalizer settings which may be then be re-created later.

NOTE: If all controls are advanced beyond 12 o'clock and their settings are equal, NO equalization has been accomplished, only the total output drive level of the unit has been achieved. In these cases, it is recommended that ALL equalizer controls be returned to their 12 o'clock positions and the units rear panel OUTPUT controls be re-adjusted instead.

3.3 REAR PANEL CONTROLS

INPUT CONTROLS

These controls are twenty turn potentiometers which must be adjusted with a SMALL blade screwdriver such as the CRL screwdriver provided with the equipment. These controls are factory set to +0 dbm on pink noise input in order to match the output levels of a preceeding Circuit Research Labs, Inc. Stereo Preparation Processor AGC, model SPP-800.

OUTPUT CONTROLS

These controls are same type as the input controls. They are factory set for +0 dbm output on pink noise input and when the front panel control settings are at the prescribed values listed in Section 2.2, INITIAL CONTROL POSITIONS. Their range of adjustment is from OFF to greater than +18 dbm, depending on the other control settings.

3.4 INDICATORS

1. The -15 indicators light whenever the input levels are -15db or less below the input calibration level. With normal operating conditions they will be "ON" most of the time, going off only during program pauses.
2. The "0" indicators light whenever input levels reach the pre-calibrated input threshold levels. When program peaks reach these levels, the DB amount selected by the G/R switch equals the actual amount of gain reduction occurring at that time.
3. The OVLD indicators light whenever input levels exceed the recommended maximum input levels into the unit. These levels have been chosen to indicate excessive amounts which may be causing audible degradations of current process level settings but not necessarily any audible distortions.
4. The GATE indicator will light whenever the gain is frozen in the AGC circuits. This action may be defeated by turning off the associated panel switch. The -10 setting restricts processing action to the "top 10db" of the audio dynamic range while the -20 setting restricts it the the "top 20db".

3.5 INTERNAL CONTROL JUMPERS

INPUT SENSITIVITY JUMPERS

If the input calibration LEDs do not light after fifteen clockwise turns of the control, the audio input signal to the unit is too low for the current setting of the internal input sensitivity ranges. To change the input sensitivity of the unit, change the settings of the internal jumpers located on the circuit board according to the following table.

INPUT SENSITIVITY JUMPERS (Cont.)

NOTE: The units are normally shipped with internal range settings for "M" or medium sensitivity which is from -15 to +5 dbm.

ATTENUATOR SWITCH POSITIONS

GAIN RANGE	JUMPER SETTINGS
Low Sensitivity (+0 to +15dbm)	"L"
Medium Sensitivity (-15 to +5 dbm)	"M"
High Sensitivity (-30 to -10dbm)	"H"

STEREO/MONO JUMPER

Included internally on the circuit board of this unit is a stereo/mono jumper which is normally shipped for stereo operation. This jumper is clearly labeled as STEREO/MONO and can be used to connect the left and right channel processing circuits together to provide "mono" operation of the stereo unit or to temporarily facilitate "stereo" operation of a transmission system from a left channel only mono input source. This feature is useful in eliminating the necessity of building external splitter pads for connecting both inputs to a common output.

BASS BOOST JUMPERS

The BASS BOOST Jumpers are normally shipped in the "IN" position which activates the "Bass Boost" high pass filter and can be easily changed to the "OUT" position to defeat these input filters. These filters are designed to significantly remove frequencies below 50 Hertz while "sonically" sounding as if the bass has been mildly enhanced the lower bass frequencies.

The low frequency cut-off is designed to maximize the transmitted and received high fidelity stereo signal. Several limiting factors affecting the transmitting and receiving system were considered in design of this high pass filter.

Major power supply limitations of many AM transmitters still exists when transmitting SUBSONIC signals and many FM exciters do not appreciate this frequency spectrum as well.

Significant research has also shown medium and small speaker enclosures can often exhibit sub-resonant intermodulations of the rest of the audio spectrum when these bass signals are present. This causes a MECHANICAL LOSS of loudness of the speaker system and can make the overall audio sound "masked" in quality and clarity.

4.1 SIMPLIFIED THEORY OF OPERATION (See Block Diagram, A-1)

The left and right audio signals enter the SEP-800 through the (+) and (-) audio input terminals located on the rear panel. At the rear of the chassis, the audio lines are then R.F. bypassed to chassis ground by Pi type LC low pass input filters located in the R.F. shield compartment.

The audio signals are next sent to input attenuation networks of the differential input amplifiers. The audio levels to these balanced amplifiers are adjusted by the rear panel INPUT CALIBRATE potentiometers in order to set the left and right reference levels into the unit.

After the INPUT CALIBRATE potentiometers, the overall unit input sensitivities are adjusted by attenuation networks set by jumpers to one of three ranges. These ranges are High (-10 to -30 dbm), Medium (+5 to -15 dbm), and Low (+5 to 0 dbm).

Next, the input signals enter the G/R process switch. This switch is configured in 3db steps and is used as precision step attenuators to adjust the audio drive levels into the later G/R stages. The attenuation steps cause corresponding amounts of gain reduction or compression according to the G/R switch settings.

Following the G/R process switch, the left and right audio enters the specially designed "BASS BOOST" high pass filters which also act as buffer amplifiers for the following frequency splitting filters.

The frequency splitting filters used in each channel split the audio into four separate bands which have been selected to give the optimum performance in processing capacity.

These filters break the audio spectrum into the musical bass bands controlled by the front panel "L" control, the vocal resonance bands controlled by the front panel "M1" control, the vocal presence bands controlled by the "M2" control and finally the musical high bands controlled by the "H" control.

The four stereo bands contain the audible frequency range from 50Hz to 15KHz and separate the L and M1 bands at 200Hz, the M1 and M2 bands at 1KHz, and the M2 and H bands at 5KHz. These separation points are 3db down from the ZERO attenuation levels of the filter networks.

Next, the left and right channel dynamic ranges are gain reduced or compressed by two sets of four independent gain reduction stages. The gain reduction action of these stages is controlled by complex gain determining signals derived from the combined and weighted absolute values of each band's left and right audio channels.

4.1 SIMPLIFIED THEORY OF OPERATION (Cont.)

The OPERATION switch controls the overall attack and release time ranges of the bands in settings of S for slow, M for medium, and H for high. This allows the user the flexibility to tailor the gain reduction action for each particular format.

This four position switch tailors the overall response of the bands. When placed in the (S)low position, the gain reduction stages act as transparent AGC's and as dynamic equalizing devices, when placed in the (M)edium position, the stages act as more aggressive medium speed compressors, and in the (F)ast position, they act as more radical high speed compressors.

The fourth position of the switch is labeled "proof" and is used to bypass the multiband gain control devices and output equalizers. This is achieved by connecting the balanced input amplifier stages to the master output level controls and therefore the output amplifiers.

Two additional control switches provide even more audio sound quality control. These controls are called the Multi/Wide and Compress/Limit switching circuits.

The positive effects of multiband audio processing is its ability to control the "pieces" of the audio waveform separately. This prevents the audible gain intermodulation effects of wideband devices which occurs when large amplitudes of one portion of the audio spectrum abruptly enter and leave a complex audio waveform. An example of this can be best invisioned by imagining what happens to a gain controlled audio waveform of a -10 dbm voice soloist when abruptly joined by a +10 dbm bass drum beat.

The negative side effect of the multiband principle is the fact that the automatic equalization effect at the output of such processors audibly varies if the input signals vary widely in levels. This has been the reason for usually seeing some form of AGC in front of multiband compressors.

These effects are controlled by the Multi/Wide switch. In the Multi mode, the SEP-800 behaves as a conventional multiband audio processor. In the Wide mode however, the characteristics of the unit are modified to eliminate the above negative side effects. While still processing audio in multiple bands, and providing multiband control of program dynamics, the bands are controlled in a fashion which eliminates automatic dynamic equalization.

The Compress/Limit switch allows the SEP-800 processor to behave as two different types of processors and in one package. This is achieved by affecting dynamic attack and release characteristics of the unit and the PEAK to AVERAGE control characteristics of the unit as well.

4.1 SIMPLIFIED THEORY OF OPERATION (Cont.)

In the Compress position, the unit produces substantial increases in the RMS and loudness of program material while having little effect on the TRANSIENT portions of program content. This allows substantial levels of audio processing of program signals without "sounding" processed.

In the Limit position, the unit provides simultaneous peak and average limiting which significantly reduces the peak to average ratios of the audio signals. This setting does not sound as natural as the Compress position, but it allows greater loudness without having to resort to the same amounts of post peak clipping.

The left and right four band outputs are next fed to D.C. controlled Voltage Controlled Amplifiers or VCA's. Each band of the stereo channels is controlled by a single potentiometer which provides a control voltage that regulates the output gain of both channels.

These output controls are labeled L, M1, M2, and H and adjust the stereo output gains of each band from -12db to +6db from a 12 o'clock reference setting. These controls equalize the four ranges of the stereo audio signals to the desired tonal balance of the user.

The outputs of the four stereo bands are next fed into summation amplifiers which recombine the individually gain controlled bands back into full frequency response left and right audio channels.

Following the summation amplifiers, the recombined audio channels are controlled by left and right rear panel master output controls which allow control of the output levels from "off" to a maximum of +18dbm at the balanced output terminals.

The master output controls then feed pairs of non-inverting and inverting amplifiers which form differential output amplifier pairs. These pairs provide equal but opposite phased (+) and (-) output signals that become balanced when referenced to the unit's chassis ground.

At the rear of the chassis, the left and right processed audio signals are R.F. bypassed to chassis ground by Pi type LC low pass output filter located in the R.F. shield compartment in order to prevent any R.F. on the output audio cables from entering back into the unit. Finally, the left and right processed audio signals leave the SEP-800 unit through the (+) and (-) balanced audio output terminals located on the rear panel.

5.1 RE-ALIGNMENT PROCEDURES

Only two types of internal alignment of SEP-800 are possible. Both alignments are used mainly for manufacturing purposes but can be used in the field if certain component replacements are found necessary.

These alignments are for LM337/LM317 power supply regulator adjustments and for certain LM13600 adjustments. Even with replacement of these components, re-alignment is not normally necessary for proper unit operation.

NO NORMAL OR ROUTINE RE-ALIGNMENT of this unit is necessary or recommended for the life of the unit.

+15 AND -15 VOLT REGULATOR ADJUSTMENTS

1. Move the +15V and -15V Supply jumpers to their "OUT" positions.
2. While measuring the CATHODE of CR1, adjust R3 for +15V plus or minus .05V.
3. While measuring the ANODE of CR2, adjust R4 for -15V plus or minus .05V.
4. Replace both jumpers to their "IN" positions. Calibration is now complete.

STEREO CHANNEL GAIN BALANCE ADJUSTMENTS

1. Apply either pink noise or mono program material to the left input of the SEP-800.
2. Adjust the input until the rear calibration LED begins to light.
3. Move the STEREO/MONO jumper on the circuit board to the MONO position.
4. With an oscilloscope, monitor the Left and Right outputs of the SEP-800 in the X-Y or lissajous mode with all controls at normal operating positions.
5. Adjust the L, M1, M2, and H balance controls located on the circuit board for the "thinnest" diagonal line as can be displayed on the oscilloscope trace.
6. Move the STEREO/MONO jumper back to the STEREO position. Calibration is now complete.

INPUT INDICATOR SYSTEM ADJUSTMENT

1. Apply a 1KHz tone or pink noise to the LEFT AND RIGHT inputs of the SEP-800.
2. Adjust the RIGHT input potentiometer until the RIGHT rear calibration LED JUST begins to light.
3. With an RMS Voltmeter or Oscilloscope, measure the rms or peak to peak voltage of the signal at pin 7, U5.
4. Move the Voltmeter or Oscilloscope to pin 1, U5 and carefully adjust the LEFT input potentiometer until the rms or peak to peak voltage of the signal at this pin is EQUAL TO THE PIN 7 VOLTAGE.
5. Adjust the L CH. calibration potentiometer on the circuit board until the LEFT REAR INPUT CALIBRATION LED JUST BEGINS TO LIGHT. Calibration is now complete.

5.2 TROUBLESHOOTING

GENERAL

Years of experience has demonstrated to us that our equipment is generally the first to be suspected of causing distortion or loudness problems which occur from time to time with a station's sound quality. This is only natural since the main function of our equipment is to improve loudness and quality by processing the audio.

However, the overwhelming majority of equipment which is returned to us for servicing is usually found to be working properly. In many cases the trouble is later traced to station equipment BEFORE or AFTER the processor.

This does not mean that CRL equipment never fails. But if problems do occur, don't forget to perform basic input and output tests on each piece of equipment before assuming that the processor is at fault. It is a good idea to write down all switch settings. Disc jockeys have been known to change the settings to suit their own taste without telling anyone. We advise you to check the following things before calling us for assistance at 602-438-0888.

1. Check for input and output levels causing overloads to the equipment under test, or the equipment following it. Make certain any additional equipment which may be connected between CRL units is not being over-driven.
2. Check for failures in monitoring or other test equipment if measurements are erratic. Strong RF fields can make some test equipment give strange results. It is a good idea to use an oscilloscope to verify monitoring and other meter

5.2 TROUBLESHOOTING (Cont.)

type indication equipment. For example, if your modulation monitor was out of calibration and you were overmodulating without realizing it, you would likely hear distortion. If it becomes necessary to increase the output of a limiter to maintain modulation levels, you should suspect that the transmitter modulator tubes are getting soft. Check all transmitter readings and change any tubes that have parameters out of the ordinary.

3. Since this is audio equipment, don't be afraid to use your ears. LISTEN to each unit of the equipment while it is in actual operation. A pair of good quality, 600 ohm or higher, headphones can be used to "bridge" the input and output. Listening can quickly locate a bad unit or clear a suspected one. AKG headphones such as their model 140 or 141 are good examples of typical 600 ohm headphones.

POWER SUPPLY STATUS INDICATORS

There are small red LEDs located on the edge of the printed circuit board near the regulator ICs. They indicate the output voltage of the internal power supply. If either the negative 15 volt or positive 15 volt supply should fail the associated LED will dim or go out.

OPERATE POSITION INDICATORS

These two small red LEDs label "MED" and "FAST" indicate when the OPERATION switch on the front panel is operating properly and is properly changing the processing characteristics of the SEP-800. When in the corresponding switch position, the appropriate indicator should light, otherwise the control switch has malfunctioned.

AM4 S SYSTEM INFORMATION

1. SPP800. This is a split band AGC amplifier that maintains a constant level and tonal balance into the following unit. It contains a pink noise generator for system set up and an optional phase rotator for removing asymmetry from voices.
2. SEP800. This is a stereo 4 band compressor with gating in each band. It provides a very dense, controlled signal that results in improved stereo coverage and loudness. The output of each of the 4 bands has a control that allows the "mix" of lows, mid-range, and highs to be adjusted to create a specific sound to suit the stations format. It dynamically equalizes program material for a consistent sound balance.
3. SMP900. This is a MATRIX processor. L+R and L-R are processed separately. It is designed to support mono loudness and prevent any loss of coverage.

SUGGESTED INITIAL SETTINGS

```
SPP800:  G/R:    -9          EQ:      12 to 2 o'clock
          GATE:  Off         OPERATION:  M
```

This unit is connected between the console and the phone lines or aural STL with the other units at the transmitter site. The YELLOW LED should flash on peaks and the RED LED should not flash with normal program material.

```
SEP800:  G/R:          -6          OPERATION:      M
          LIMIT/COMPRESS:  Compress  WIDE/MULTI:    Multi
          GATE:          -20        BAND CONTROLS:  12:00
```

This unit is connected to the phone lines or dual channel STL receivers at the transmitter site. The YELLOW LED should flash on peaks about 10 to 20 percent of the time. The RED LED will flash on peaks +10dbm above the YELLOW LED.

SMP900: G/R: -4 LIMITING: +1 EQUALIZATION: 12:00

The statement above concerning the flashing of the YELLOW & RED LED's applies here also. This unit is quite different from most limiters. PLEASE READ THE MANUAL CAREFULLY, and call us if you need help at 602-438-0888.

NOTE: This equipment is designed to sound good on typical consumer radios. It may sound overly bright on studio monitors. Use various types of radios to judge the right "sound" for your format. Change only one control at a time and PLEASE READ THE MANUAL.

FM4 G SYSTEM INFORMATION

1. SPP800. This is a split band AGC amplifier that maintains a constant level and tonal balance into the following unit. It contains a pink noise generator for system set up and an optional phase rotator for removing asymmetry from voices.
2. SEP800. This is a stereo 4 band compressor with gating in each band. It provides a very dense, controlled signal that results in improved stereo coverage and loudness. The output of each of the 4 bands has a control that allows the "mix" of lows, mid-range, and highs to be adjusted to create a specific sound to suit the stations format. It dynamically equalizes program material for a consistent sound balance.
3. SMP800. This is a split band limiter/clipper. The input AGC circuit is designed to support stereo loudness. The multiplex clipper treats highs and lows separately to provide a tightly controlled signal with very low distortion. The pre-emphasis and low pass filter are contained in this unit. If the stereo generator being used contains Pre-emphasis and or Low Pass Filters they should both be switched out or removed.
4. SG800. This unit is connected between the SMP800 and the FM Broadcast Exciter. It contains no audio processing or pre-emphasis. The pre-emphasis is contained in the SMP800 Limiter. The unit is extremely dynamic and will provide un-paralleled separation for the total system.

SUGGESTED INITIAL SETTINGS

```
SPP800:  G/R: -9          GATE:      Off
          EO: 12 to 2 o'clock OPERATION: M
```

This unit is connected between the console and the phone lines or aural STL with the other units at the transmitter site. When using a composite STL, everything can be located at the studio. The YELLOW LED should flash on peaks and the RED LED should not flash on normal program material.

```
SEP800:  G/R:      -6      OPERATION:      M      LIMIT/COMPRESS:  Compress
          GATE:     -20     WIDE/MULT:     -20     BAND CONTROLS:   12:00
```

This unit is connected to the phone lines or dual channel STL receivers at the transmitter site when not using a Composite STL. The YELLOW LED should flash on peaks about 10 to 20 percent of the time. The RED LED will flash on peaks +10dbm above the YELLOW LED and should not flash on normal program material.

SMP800: G/R: -4 CLIPPING: +1 AUTO/STD: Auto

This unit is connected between the SEP800 and the stereo generator in use. The YELLOW LED will flash brightly on program peaks. The RED LED's should not flash on normal program peaks.

SG800: There are no Processing controls as such on this unit. Refer to the installation procedure for correct input calibration.

NOTE: This equipment is designed to sound good on typical consumer radios. It may sound overly bright on studio monitors. Use various types of radios to judge the right "sound" for your format. Change only one control at a time & PLEASE READ THE MANUAL.

INTERFACING THE SEP-800 TO THE OPTIMOD 8100

This procedure is to be done after the SEP800 has been set up according to the manual and the output of the SEP800 is feeding the input of the 8100.

1. Place the "Compressor" switch on the 8100 to the "proof" position (this will also defeat the gating on the 8100).
2. Set the input attenuators of the 8100 so that there is a 0 to -20 indication on the 8100 multimeter in the left or right metering positions.
3. Set the multimeter to L-R and adjust the right input attenuator for the best null while sending FULL MONO.
4. Now observe the High Frequency Limit indicators. They should be blinking about no more than 10 to 15 percent of the time. If they are blinking more than this, reduce the output of the SEP800 to around 0dbm, then re-adjust the input attenuators on the 8100 to arrive at the above conditions.

SEP800 PARTS LIST
(replaceable parts)

7/24/85

Quantity	Description	CRL p/n	Quantity	Description	CRL p/n
1	ASSEMBLY, BRACKET, RF, 3 TERMINAL, MP5A-2	80040-WO	4	hardware, multi-turn pot holder	13370
1	ASSEMBLY, BRACKET, RF, 8 TERMINAL, MP3	80010-WO	1	hardware, serial number sticker	16650
1	ASSEMBLY, HARNESS, SEP800	80350-WO	4	hardware, standoff, hex nylon, 6.32 x 1/4	13220
1	ASSEMBLY, PC BOARD, A500	80605-WO	1	hardware, strain relief, AC cord, nylon	13430
1	ASSEMBLY, SWITCH, #22	80810-WO	22	hardware, hex nut, 6.32 x 1/4, silver	13200
1	ASSEMBLY, SWITCH, #23	80820-WO	2	LED, assembly, green, 24V	13670
1	chassis, SEP800, painted	12460	4	LED, assembly, red, 24V	13680
8	coil, fixed, RF, 1mH, 10%	12570	4	LED, assembly, yellow, 24V	13690
2	connector, barrier, 6 position	12600	1	lid, SEP800, screened	13810
1	front, SEP800, screened	12950	4	resistor, multi-turn, 5 Kohm, lin, 10%	15120
1	fuse, 1/4 x 1 1/4, slo-blo, 3/10A	13040	4	resistor, variable, 5 Kohm, linear, 20%, 1/2W	15200
3	hardware, ground lug, internal tooth, #6	13140	1	socket, fuse holder, pan mnt, 1/4 x 1 1/4	16630
6	hardware, knob, aluminum skirted, 1/4	13250	1	switch, toggle, 4PDT, miniature	15585
16	hardware, lockwasher, internal tooth, #6	13270	1	switch, toggle, SP ON-OFF-ON, miniature	15570
4	hardware, mach screw, FPH, 6.32 x 1/4, black	13280	1	switch, toggle, SPDT, miniature	15580
4	hardware, mach screw, SPH, 6.32 x 5/8, black	13340	2	transformer, power, 110VAC/18VAC CT, .6A	15860
			1	wire, AC cord, 3 cond, 110VAC	16430

SEP800 ASSEMBLIES PARTS LIST
(replaceable parts)

Quantity	Description	CRL p/n	Quantity	Description	CRL p/n
1	ASSEMBLY, BRACKET, RF, 3 TERMINAL, MP5A-2	80040-WO			
1	bracket, RF shield, MP5A	11890	3	capacitor, feedthru, 1000 pf, 500V, threaded	11925
1	ASSEMBLY, BRACKET, RF, 8 TERMINAL, MP3	80010-WO			
1	bracket, RF shield, MP3	11880	8	capacitor, feedthru, 1000 pf, 500V, threaded	11925
1	ASSEMBLY, HARNESS, SEP800	80350-WO			
8	connector, female, 10 pin, .1" spacing	12630	8	connector, cover, 10 pin, .1" spacing	12610
1	ASSEMBLY, SWITCH, #22	80810-WO			
1	switch, rotary, 4 p, 2-6 pos (set for 4 pos)	15540			
1	ASSEMBLY, SWITCH, #23	80820-WO			
1	switch, rotary, 2 p, 2-6 pos (set for 6 pos)	15530	2	resistor, fixed, 1820 ohm, 1%, 1/4W, metal	14140
2	resistor, fixed, 392 ohm, 1%, 1/4W, metal film	14780	2	resistor, fixed, 3010 ohm, 1%, 1/4W, metal	14645
2	resistor, fixed, 1000 ohm, 1%, 1/4W, metal	14040	2	resistor, fixed, 4750 ohm, 1%, 1/4W, metal	14810

SEP800 ASSEMBLIES PARTS LIST
(replaceable parts)

7/24/85

Desigatior	Description	CRL p/n	Desigatior	Description	CRL p/n
A500	ASSEMBLY, PC Board, A500, level 7	80605-W0			
CAPACITORS					
C1	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970	C44	fixed, .01 uf, polypropylene, 2.5%, 630v, ax	12130
C2	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970	C45	fixed, .22 uf, polyester, 5%, 100v	12080
C3	fixed, 2.2 uf, tantalum, 20%, 25v, radial	12290	C46	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C4	fixed, 2.2 uf, tantalum, 20%, 25v, radial	12290	C47	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C5	fixed, 470 uf, electrolytic, 20%, 50v, radial	12000	C48	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C6	fixed, 470 uf, electrolytic, 20%, 50v, radial	12000	C49	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970
C7	fixed, 2.2 uf, tantalum, 20%, 25v, radial	12290	C50	fixed, 270 pf, silver mica, 5%, 500v	12180
C8	fixed, 2.2 uf, tantalum, 20%, 25v, radial	12290	C51	fixed, .47 uf, stack film, 5%, 63v, radial	12280
C9	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C52	fixed, .01 uf, polypropylene, 2.5%, 630v, ax	12130
C10	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C53	fixed, .22 uf, polyester, 5%, 100v	12080
C11	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C54	fixed, 270 pf, silver mica, 5%, 500v	12180
C12	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C55	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970
C13	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C56	fixed, .47 uf, stack film, 5%, 63v, radial	12280
C14	fixed, 10 uf, non-polar elect, 20%, 25v, rad	11975	C57	fixed, .0022 uf, polypropylene, 2.5%, 630v, ax	12110
C15	fixed, 10 uf, non-polar elect, 20%, 25v, rad	11975	C58	fixed, .047 uf, polyester, 5%, 100v	12050
C16	fixed, 10 uf, non-polar elect, 20%, 25v, rad	11975	C59	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C17	fixed, 10 uf, non-polar elect, 20%, 25v, rad	11975	C60	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C18	fixed, 10 pf, ceramic disc, 10%, 1kv, radial	11930	C61	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C19	fixed, 10 pf, ceramic disc, 10%, 1kv, radial	11930	C62	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C20	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C63	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C21	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C64	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970
C22	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C65	fixed, 270 pf, silver mica, 5%, 500v	12180
C23	fixed, 10 pf, ceramic disc, 10%, 1kv, radial	11930	C66	fixed, .47 uf, stack film, 5%, 63v, radial	12280
C24	fixed, 10 pf, ceramic disc, 10%, 1kv, radial	11930	C67	fixed, .0022 uf, polypropylene, 2.5%, 630v, ax	12110
C25	fixed, .1 uf, stack film, .5%, 63v, radial	80150-W0	C68	fixed, .047 uf, polyester, 5%, 100v	12050
C26	fixed, .1 uf, stack film, .5%, 63v, radial	80150-W0	C69	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C27	fixed, .1 uf, stack film, .5%, 63v, radial	80150-W0	C70	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C28	fixed, .1 uf, stack film, .5%, 63v, radial	80150-W0	C71	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C29	fixed, 270 pf, silver mica, 5%, 500v	12180	C72	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C30	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970	C73	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C31	fixed, .47 uf, stack film, 5%, 63v, radial	12280	C74	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C32	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C75	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C33	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C76	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C34	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C77	fixed, 270 pf, silver mica, 5%, 500v	12180
C35	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C78	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970
C36	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C79	fixed, .47 uf, stack film, 5%, 63v, radial	12280
C37	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970	C80	fixed, .0022 uf, polypropylene, 2.5%, 630v, ax	12110
C38	fixed, 270 pf, silver mica, 5%, 500v	12180	C81	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C39	fixed, .47 uf, stack film, 5%, 63v, radial	12280	C82	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C40	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C83	fixed, .1 uf, stack film, 5%, 63v, radial	12250
C40	fixed, .1 uf, stack film, 5%, 63v, radial	12250	C84	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970
C41	fixed, 270 pf, silver mica, 5%, 500v	12180	C85	fixed, 270 pf, silver mica, 5%, 500v	12180
C42	fixed, 10 uf, electrolytic, 20%, 25v, radial	11970	C86	fixed, .47 uf, stack film, 5%, 63v, radial	12280
C43	fixed, .47 uf, stack film, 5%, 63v, radial	12280	C87	fixed, .0022 uf, polypropylene, 2.5%, 630v, ax	12110

SEP800 ASSEMBLIES PARTS LIST
(replaceable parts)

7/24/85

Desigatator	Description	CRL p/n	Desigatator	Description	CRL p/n
=====	=====	=====	=====	=====	=====
A500	ASSEMBLY, PC Board, A500, level 7	80605-W0			

DIODES

CR1	silicon, 1 amp, 50 PIV, 1N4001	12800	CR20	silicon, 100 ma, 100 PIV, 1N914B	12790
CR2	silicon, 1 amp, 50 PIV, 1N4001	12800	CR21	silicon, 100 ma, 100 PIV, 1N914B	12790
CR3	silicon, 1 amp, 50 PIV, 1N4001	12800	CR22	silicon, 100 ma, 100 PIV, 1N914B	12790
CR4	silicon, 1 amp, 50 PIV, 1N4001	12800	CR23	silicon, 100 ma, 100 PIV, 1N914B	12790
CR5	silicon, 1 amp, 50 PIV, 1N4001	12800	CR24	silicon, 100 ma, 100 PIV, 1N914B	12790
CR6	silicon, 1 amp, 50 PIV, 1N4001	12800	CR25	silicon, 100 ma, 100 PIV, 1N914B	12790
CR7	silicon, 100 ma, 100 PIV, 1N914B	12790	CR26	silicon, 100 ma, 100 PIV, 1N914B	12790
CR8	silicon, 100 ma, 100 PIV, 1N914B	12790	CR27	silicon, 100 ma, 100 PIV, 1N914B	12790
CR9	silicon, 100 ma, 100 PIV, 1N914B	12790	CR28	silicon, 100 ma, 100 PIV, 1N914B	12790
CR10	silicon, 100 ma, 100 PIV, 1N914B	12790	CR29	silicon, 100 ma, 100 PIV, 1N914B	12790
CR11	silicon, 100 ma, 100 PIV, 1N914B	12790	CR30	silicon, 100 ma, 100 PIV, 1N914B	12790
CR12	silicon, 100 ma, 100 PIV, 1N914B	12790	CR31	silicon, 100 ma, 100 PIV, 1N914B	12790
CR13	silicon, 100 ma, 100 PIV, 1N914B	12790	CR32	silicon, 100 ma, 100 PIV, 1N914B	12790
CR14	silicon, 100 ma, 100 PIV, 1N914B	12790	CR33	silicon, 100 ma, 100 PIV, 1N914B	12790
CR15	silicon, 100 ma, 100 PIV, 1N914B	12790	CR34	silicon, 100 ma, 100 PIV, 1N914B	12790
CR16	silicon, 100 ma, 100 PIV, 1N914B	12790	CR35	silicon, 100 ma, 100 PIV, 1N914B	12790
CR17	silicon, 100 ma, 100 PIV, 1N914B	12790	CR36	silicon, 100 ma, 100 PIV, 1N914B	12790
CR18	silicon, 100 ma, 100 PIV, 1N914B	12790	CR37	silicon, 100 ma, 100 PIV, 1N914B	12790
CR19	silicon, 100 ma, 100 PIV, 1N914B	12790	CR38	silicon, 100 ma, 100 PIV, 1N914B	12790

LEDS

DS1	discrete, minature, red, 6 mW, MV55A	13700	DS3	discrete, minature, red, 6 mW, MV55A	13700
DS2	discrete, minature, red, 6 mW, MV55A	13700	DS4	discrete, minature, red, 6 mW, MV55A	13700

CONNECTORS

J1	connector, male, mini-jump, .1", 3 required	12710	J9	connector, male, 10 pin, .1" sp, straight	12690
J2	connector, male, mini-jump, .1", 3 required	12710	J10	connector, male, 10 pin, .1" sp, straight	12690
J3	connector, male, mini-jump, .1", 4 required	12710	J11	connector, male, 10 pin, .1" sp, straight	12690
J4	connector, male, mini-jump, .1", 4 required	12710	J12	connector, male, 10 pin, .1" sp, straight	12690
J5	connector, male, mini-jump, .1", 4 required	12710	J13	connector, male, 10 pin, .1" sp, straight	12690
J6	connector, male, mini-jump, .1", 4 required	12710	J14	connector, male, 10 pin, .1" sp, straight	12690
J7	connector, male, mini-jump, .1", 3 required	12710	J15	connector, male, 10 pin, .1" sp, straight	12690
J8	connector, male, mini-jump, .1", 3 required	12710	J16	connector, male, 10 pin, .1" sp, straight	12690
			J17	connector, male, mini-jump, .1", 3 required	12710

SEP800 ASSEMBLIES PARTS LIST
(replaceable parts)

7/24/85

Desigatior	Description	CRL p/n	Desigatior	Description	CRL p/n
A500	ASSEMBLY, PC Board, A500, level 7	80605-W0			

TRANSISTORS

Q1	transistor, silicon, signal, NPN, 2N4123	15970	Q11	transistor, silicon, signal, PNP, MPS404A	15990
Q2	transistor, silicon, signal, NPN, 2N4123	15970	Q12	transistor, silicon, signal, PNP, MPS404A	15990
Q3	transistor, silicon, signal, PNP, 2N4125	15980	Q13	transistor, silicon, signal, PNP, MPS404A	15990
Q4	transistor, silicon, signal, PNP, 2N4125	15980	Q14	transistor, silicon, signal, PNP, MPS404A	15990
Q5	transistor, silicon, signal, PNP, MPS404A	15990	Q15	transistor, silicon, signal, PNP, MPS404A	15990
Q6	transistor, silicon, signal, PNP, MPS404A	15990	Q16	transistor, silicon, signal, PNP, MPS404A	15990
Q7	transistor, silicon, signal, PNP, MPS404A	15990	Q17	transistor, silicon, signal, PNP, MPS404A	15990
Q8	transistor, silicon, signal, PNP, MPS404A	15990	Q18	transistor, silicon, signal, PNP, MPS404A	15990
Q9	transistor, silicon, signal, PNP, MPS404A	15990	Q19	transistor, silicon, signal, PNP, MPS404A	15990
Q10	transistor, silicon, signal, PNP, MPS404A	15990	Q20	transistor, silicon, signal, PNP, MPS404A	15990

RESISTORS

R1	fixed, 221 ohm, 1%, 1/4 w, metal film	14550	R34	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R2	fixed, 2210 ohm, 1%, 1/4 w, metal film	14420	R35	fixed, 332000 ohm, 1%, 1/4 w, metal film	14720
R3	variable, 1 Kohm, linear, 20%, 1/2 w, cermet	15150	R36	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R4	variable, 1 Kohm, linear, 20%, 1/2 w, cermet	15150	R37	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R5	fixed, 2210 ohm, 1%, 1/4 w, metal film	14420	R38	fixed, 39200 ohm, 1%, 1/4 w, metal film	14760
R6	fixed, 221 ohm, 1%, 1/4 w, metal film	14550	R39	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R7	fixed, 392 ohm, 1%, 1/4 w, metal film	14780	R40	fixed, 39200 ohm, 1%, 1/4 w, metal film	14760
R8	fixed, 392 ohm, 1%, 1/4 w, metal film	14780	R41	fixed, 4750 ohm, 1%, 1/4 w, metal film	14810
R9	fixed, 392 ohm, 1%, 1/4 w, metal film	14780	R42	fixed, 4750 ohm, 1%, 1/4 w, metal film	14810
R10	fixed, 392 ohm, 1%, 1/4 w, metal film	14780	R43	fixed, 604 ohm, 1%, 1/4 w, metal film	14910
R11	fixed, 27400 ohm, 1%, 1/4 w, metal film	14600	R44	fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R12	fixed, 27400 ohm, 1%, 1/4 w, metal film	14600	R45	fixed, 22.1 ohm, 1%, 1/4 w, metal film	14510
R13	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R46	fixed, 121000 ohm, 1%, 1/4 w, metal film	14260
R14	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R47	fixed, 18200 ohm, 1%, 1/4 w, metal film	14350
R15	fixed, 22100 ohm, 1%, 1/4 w, metal film	14500	R48	fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R16	fixed, 22100 ohm, 1%, 1/4 w, metal film	14500	R49	fixed, 121000 ohm, 1%, 1/4 w, metal film	14260
R17	fixed, 100 ohm, 1%, 1/4 w, metal film	16510	R50	fixed, 27400 ohm, 1%, 1/4 w, metal film	14600
R18	fixed, 47500 ohm, 1%, 1/4 w, metal film	14850	R53	fixed, 68100 ohm, 1%, 1/4 w, metal film	14950
R19	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180	R54	fixed, 6810 ohm, 1%, 1/4 w, metal film	14900
R20	variable, 10 Kohm, linear, 20%, 1/2 w, cermet	15140	R55	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R21	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180	R56	fixed, 332000 ohm, 1%, 1/4 w, metal film	14720
R22	fixed, 100 ohm, 1%, 1/4 w, metal film	16510	R57	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R23	fixed, 121000 ohm, 1%, 1/4 w, metal film	14260	R58	fixed, 332000 ohm, 1%, 1/4 w, metal film	14720
R24	fixed, 392 ohm, 1%, 1/4 w, metal film	14780	R59	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R25	fixed, 392 ohm, 1%, 1/4 w, metal film	14780	R60	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R26	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R61	fixed, 39200 ohm, 1%, 1/4 w, metal film	14760
R27	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R62	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R28	fixed, 121000 ohm, 1%, 1/4 w, metal film	14260	R63	fixed, 39200 ohm, 1%, 1/4 w, metal film	14760
R29	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180	R64	fixed, 4750 ohm, 1%, 1/4 w, metal film	14810
R30	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180	R65	fixed, 4750 ohm, 1%, 1/4 w, metal film	14810
R31	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R66	fixed, 604 ohm, 1%, 1/4 w, metal film	14910
R32	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R67	fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R33	fixed, 332000 ohm, 1%, 1/4 w, metal film	14720	R68	fixed, 22.1 ohm, 1%, 1/4 w, metal film	14510

SEP800 ASSEMBLIES PARTS LIST
(replaceable parts)

7/24/85

Desigatior	Description	CRL p/n	Desigatior	Description	CRL p/n
A500	ASSEMBLY, PC Board, A500, level 7	80605-WO			
RESISTORS					
R69	fixed, 121000 ohm, 1%, 1/4 w, metal film	14260	R121	fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R70	fixed, 18200 ohm, 1%, 1/4 w, metal film	14350	R122	fixed, 18200 ohm, 1%, 1/4 w, metal film	14350
R71	fixed, 100 ohm, 1%, 1/4 w, metal film	16510	R123	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R72	fixed, 121000 ohm, 1%, 1/4 w, metal film	14260	R124	fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410
R73	fixed, 27400 ohm, 1%, 1/4 w, metal film	14600	R125	fixed, 47500 ohm, 1%, 1/4 w, metal film	14850
R76	fixed, 68100 ohm, 1%, 1/4 w, metal film	14950	R126	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R77	fixed, 6810 ohm, 1%, 1/4 w, metal film	14900	R127	fixed, 15000 ohm, 1%, 1/4 w, metal film	14290
R78	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040	R128	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R79	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040	R129	fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410
R80	fixed, 1210 ohm, 1%, 1/4 w, metal film	14100	R130	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R81	fixed, 1210 ohm, 1%, 1/4 w, metal film	14100	R131	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180
R82	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R132	fixed, 8250 ohm, 1%, 1/4 w, metal film	15040
R83	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R133	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R84	fixed, 3320 ohm, 1%, 1/4 w, metal film	14650	R134	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R85	fixed, 3320 ohm, 1%, 1/4 w, metal film	14650	R135	fixed, 3320 ohm, 1%, 1/4 w, metal film	14650
R86	fixed, 3320 ohm, 1%, 1/4 w, metal film	14650	R136	fixed, 3320 ohm, 1%, 1/4 w, metal film	14650
R87	fixed, 18200 ohm, 1%, 1/4 w, metal film	14350	R137	fixed, 3320 ohm, 1%, 1/4 w, metal film	14650
R88	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180	R138	fixed, 18200 ohm, 1%, 1/4 w, metal film	14350
R89	fixed, 392 ohm, 1%, 1/4 w, metal film	14780	R139	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180
R91	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040	R140	fixed, 392 ohm, 1%, 1/4 w, metal film	14780
R93	fixed, 33200 ohm, 1%, 1/4 w, metal film	14690	R142	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R94	fixed, 33200 ohm, 1%, 1/4 w, metal film	14690	R144	fixed, 33200 ohm, 1%, 1/4 w, metal film	14690
R95	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R145	fixed, 33200 ohm, 1%, 1/4 w, metal film	14690
R96	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R146	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R97	variable, 10 Kohm, linear, 20%, 1/2 w, cermet	15140	R147	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R99	fixed, 22100 ohm, 1%, 1/4 w, metal film	14500	R148	variable, 10 Kohm, linear, 20%, 1/2 w, cermet	15140
R100	fixed, 100 ohm, 1%, 1/4 w, metal film	16510	R150	fixed, 22100 ohm, 1%, 1/4 w, metal film	14500
R101	fixed, 100 ohm, 1%, 1/4 w, metal film	16510	R151	fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R102	fixed, 18200 ohm, 1%, 1/4 w, metal film	14350	R152	fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R103	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R153	fixed, 18200 ohm, 1%, 1/4 w, metal film	14350
R104	fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410	R154	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R105	fixed, 47500 ohm, 1%, 1/4 w, metal film	14850	R155	fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410
R106	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R156	fixed, 47500 ohm, 1%, 1/4 w, metal film	14850
R107	fixed, 15000 ohm, 1%, 1/4 w, metal film	14290	R157	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R108	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040	R158	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R109	fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410	R159	fixed, 15000 ohm, 1%, 1/4 w, metal film	14290
R110	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R160	fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R111	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180	R161	fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410
R112	fixed, 8250 ohm, 1%, 1/4 w, metal film	15040	R162	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R113	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R163	fixed, 100000 ohm, 1%, 1/4 w, metal film	14180
R114	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R164	fixed, 3320 ohm, 1%, 1/4 w, metal film	14650
R115	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R165	fixed, 15000 ohm, 1%, 1/4 w, metal film	14290
R116	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R166	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R117	fixed, 15000 ohm, 1%, 1/4 w, metal film	14290	R167	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R118	fixed, 20000 ohm, 1%, 1/4 w, metal film	14435	R168	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R119	fixed, 22100 ohm, 1%, 1/4 w, metal film	14500	R169	fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R120	fixed, 100 ohm, 1%, 1/4 w, metal film	16510	R170	fixed, 15000 ohm, 1%, 1/4 w, metal film	14290

SEP800 ASSEMBLIES PARTS LIST
(replaceable parts)

7/24/85

Desigatior	Description	CRL p/n	Desigatior	Description	CRL p/n
A500	ASSEMBLY, PC Board, A500, level 7	80605-W0			
RESISTORS					
R171 fixed,	20000 ohm, 1%, 1/4 w, metal film	14435	R221 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R172 fixed,	22100 ohm, 1%, 1/4 w, metal film	14500	R222 fixed,	15000 ohm, 1%, 1/4 w, metal film	14290
R173 fixed,	100 ohm, 1%, 1/4 w, metal film	16510	R223 fixed,	20000 ohm, 1%, 1/4 w, metal film	14435
R174 fixed,	100 ohm, 1%, 1/4 w, metal film	16510	R224 fixed,	22100 ohm, 1%, 1/4 w, metal film	14500
R175 fixed,	18200 ohm, 1%, 1/4 w, metal film	14350	R225 fixed,	100 ohm, 1%, 1/4 w, metal film	16510
R176 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R226 fixed,	100 ohm, 1%, 1/4 w, metal film	16510
R177 fixed,	2200000 ohm, 1%, 1/4 w, metal film	14410	R227 fixed,	18200 ohm, 1%, 1/4 w, metal film	14350
R178 fixed,	47500 ohm, 1%, 1/4 w, metal film	14850	R228 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R179 fixed,	15000 ohm, 1%, 1/4 w, metal film	14290	R229 fixed,	2200000 ohm, 1%, 1/4 w, metal film	14410
R180 fixed,	1000 ohm, 1%, 1/4 w, metal film	14040	R230 fixed,	47500 ohm, 1%, 1/4 w, metal film	14850
R181 fixed,	2200000 ohm, 1%, 1/4 w, metal film	14410	R231 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R182 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R232 fixed,	15000 ohm, 1%, 1/4 w, metal film	14290
R183 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180	R233 fixed,	1000 ohm, 1%, 1/4 w, metal film	14040
R184 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650	R234 fixed,	2200000 ohm, 1%, 1/4 w, metal film	14410
R185 fixed,	15000 ohm, 1%, 1/4 w, metal film	14290	R235 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R186 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R236 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R187 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R237 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650
R188 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650	R238 fixed,	15000 ohm, 1%, 1/4 w, metal film	14290
R189 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650	R239 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R190 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650	R240 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R191 fixed,	18200 ohm, 1%, 1/4 w, metal film	14350	R241 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R192 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180	R242 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R193 fixed,	392 ohm, 1%, 1/4 w, metal film	14780	R243 fixed,	47500 ohm, 1%, 1/4 w, metal film	14850
R195 fixed,	1000 ohm, 1%, 1/4 w, metal film	14040	R244 fixed,	47500 ohm, 1%, 1/4 w, metal film	14850
R197 fixed,	33200 ohm, 1%, 1/4 w, metal film	14690	R245 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R198 fixed,	33200 ohm, 1%, 1/4 w, metal film	14690	R246 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R199 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R247 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R200 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R248 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R201 variable,	10 Kohm, linear, 20%, 1/2 w, cermet	15140	R249 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R203 fixed,	22100 ohm, 1%, 1/4 w, metal film	14500	R250 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R204 fixed,	100 ohm, 1%, 1/4 w, metal film	16510	R251 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650
R205 fixed,	100 ohm, 1%, 1/4 w, metal film	16510	R252 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650
R206 fixed,	18200 ohm, 1%, 1/4 w, metal film	14350	R253 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650
R207 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R254 fixed,	18200 ohm, 1%, 1/4 w, metal film	14350
R208 fixed,	2200000 ohm, 1%, 1/4 w, metal film	14410	R255 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180
R209 fixed,	47500 ohm, 1%, 1/4 w, metal film	14850	R256 fixed,	392 ohm, 1%, 1/4 w, metal film	14780
R210 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R258 fixed,	1000 ohm, 1%, 1/4 w, metal film	14040
R211 fixed,	15000 ohm, 1%, 1/4 w, metal film	14290	R260 fixed,	33200 ohm, 1%, 1/4 w, metal film	14690
R212 fixed,	1000 ohm, 1%, 1/4 w, metal film	14040	R261 fixed,	33200 ohm, 1%, 1/4 w, metal film	14690
R213 fixed,	2200000 ohm, 1%, 1/4 w, metal film	14410	R262 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R214 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R263 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150
R215 fixed,	100000 ohm, 1%, 1/4 w, metal film	14180	R264 variable,	10 Kohm, linear, 20%, 1/2 w, cermet	15140
R216 fixed,	3320 ohm, 1%, 1/4 w, metal film	14650	R266 fixed,	22100 ohm, 1%, 1/4 w, metal film	14500
R217 fixed,	15000 ohm, 1%, 1/4 w, metal film	14290	R267 fixed,	100 ohm, 1%, 1/4 w, metal film	16510
R218 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R268 fixed,	100 ohm, 1%, 1/4 w, metal film	16510
R219 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R269 fixed,	18200 ohm, 1%, 1/4 w, metal film	14350
R220 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150	R270 fixed,	10000 ohm, 1%, 1/4 w, metal film	14150

SEP800 ASSEMBLIES PARTS LIST
(replaceable parts)

7/24/85

Desigatior	Description	CRL p/n	Desigatior	Description	CRL p/n
A500	ASSEMBLY, PC Board, A500, level 7	80605-W0			

RESISTORS

R271 fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410	R287 fixed, 22100 ohm, 1%, 1/4 w, metal film	14500
R272 fixed, 47500 ohm, 1%, 1/4 w, metal film	14850	R288 fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R273 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R289 fixed, 100 ohm, 1%, 1/4 w, metal film	16510
R274 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R290 fixed, 18200 ohm, 1%, 1/4 w, metal film	14350
R275 fixed, 15000 ohm, 1%, 1/4 w, metal film	14290	R291 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R276 fixed, 1000 ohm, 1%, 1/4 w, metal film	14040	R292 fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410
R277 fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410	R293 fixed, 47500 ohm, 1%, 1/4 w, metal film	14850
R278 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R294 fixed, 15000 ohm, 1%, 1/4 w, metal film	14290
R279 fixed, 100000 ohm, 1%, 1/4 w, metal film	14180	R295 fixed, 1000 ohm, 1%, 1/4 w, metal film	14040
R280 fixed, 15000 ohm, 1%, 1/4 w, metal film	14290	R296 fixed, 2200000 ohm, 1%, 1/4 w, metal film	14410
R281 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R297 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
R282 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R298 fixed, 100000 ohm, 1%, 1/4 w, metal film	14180
R283 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R299 fixed, 15000 ohm, 1%, 1/4 w, metal film	14290
R284 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150	R300 fixed, 1210 ohm, 1%, 1/4 w, metal film	14100
R285 fixed, 15000 ohm, 1%, 1/4 w, metal film	14290	R301 fixed, 1210 ohm, 1%, 1/4 w, metal film	14100
R286 fixed, 20000 ohm, 1%, 1/4 w, metal film	14435	R302 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150
		R303 fixed, 10000 ohm, 1%, 1/4 w, metal film	14150

INTEGRATED CIRCUITS

U1 linear, dual opamp, TL072CP1	13590	U15 linear, dual opamp, TL072CP1	13590
U2 linear, 10 segment LED "VU" driver, LM3916N	13570	U16 linear, dual linearized OTA, LM13600N	13600
U3 linear, 10 segment LED "VU" driver, LM3916N	13570	U17 linear, dual opamp, TL072CP1	13590
U4 linear, dual opamp, TL072CP1	13590	U18 linear, dual linearized OTA, LM13600N	13600
U5 linear, dual opamp, TL072CP1	13590	U19 assembly, module, #1001	80470-W0
U6 linear, dual opamp, TL072CP1	13590	U20 linear, dual opamp, TL072CP1	13590
U7 linear, dual opamp, TL072CP1	13590	U21 linear, dual opamp, TL072CP1	13590
U8 assembly, module, #1001	80470-W0	U22 linear, dual linearized OTA, LM13600N	13600
U9 linear, dual opamp, TL072CP1	13590	U23 linear, dual opamp, TL072CP1	13590
U10 linear, dual opamp, TL072CP1	13590	U24 linear, dual linearized OTA, LM13600N	13600
U11 linear, dual linearized OTA, LM13600N	13600	U25 linear, dual opamp, TL072CP1	13590
U12 linear, dual opamp, TL072CP1	13590	U26 linear, dual opamp, TL072CP1	13590
U13 linear, dual linearized OTA, LM13600N	13600	U27 linear, dual linearized OTA, LM13600N	13600
U14 linear, dual opamp, TL072CP1	13590	U28 linear, dual opamp, TL072CP1	13590
		U29 linear, dual linearized OTA, LM13600N	13600

VOLTAGE REGULATORS

VR1 3 term var, pos, 1.2v - 37v, 1.5A, 15w, LM317T	13980	VR2 3 term var, neg, 1.2v - 37v, 1.5A, 15w, LM337T	13990
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MISCELLANEOUS

Quantity	Description	CRL p/n	Quantity	Description	CRL p/n
1	PC board, A500	13970	2	hardware, screw, nylon, SPH, 4.40 x 1/4	13380
9	connector, female, mini-jump, .1"	12660	4	hardware, washer, fiber, #6, 1/16 x 3/8	13450
10	hardware, bumper pad, .218"	13050	8	socket, DIP, 16 pin	15350
2	hardware, heatsink, extruded, black	13160	2	socket, DIP, 18 pin	15360
2	hardware, hex nut, 4.40 x 1/4, silver	13190	2	socket, DIP, 24 pin	15370
2	hardware, insulator, sil-pad	13240	17	socket, DIP, 8 pin	15380

REVISIONS			DFTSMN	ENGR	ECN
REV	DATE	DESCRIPTION			
A-1	6-10-86	Released for Production		P.S.	-

193 Hz start CROSS
88 Hz mod
100 Hz mod

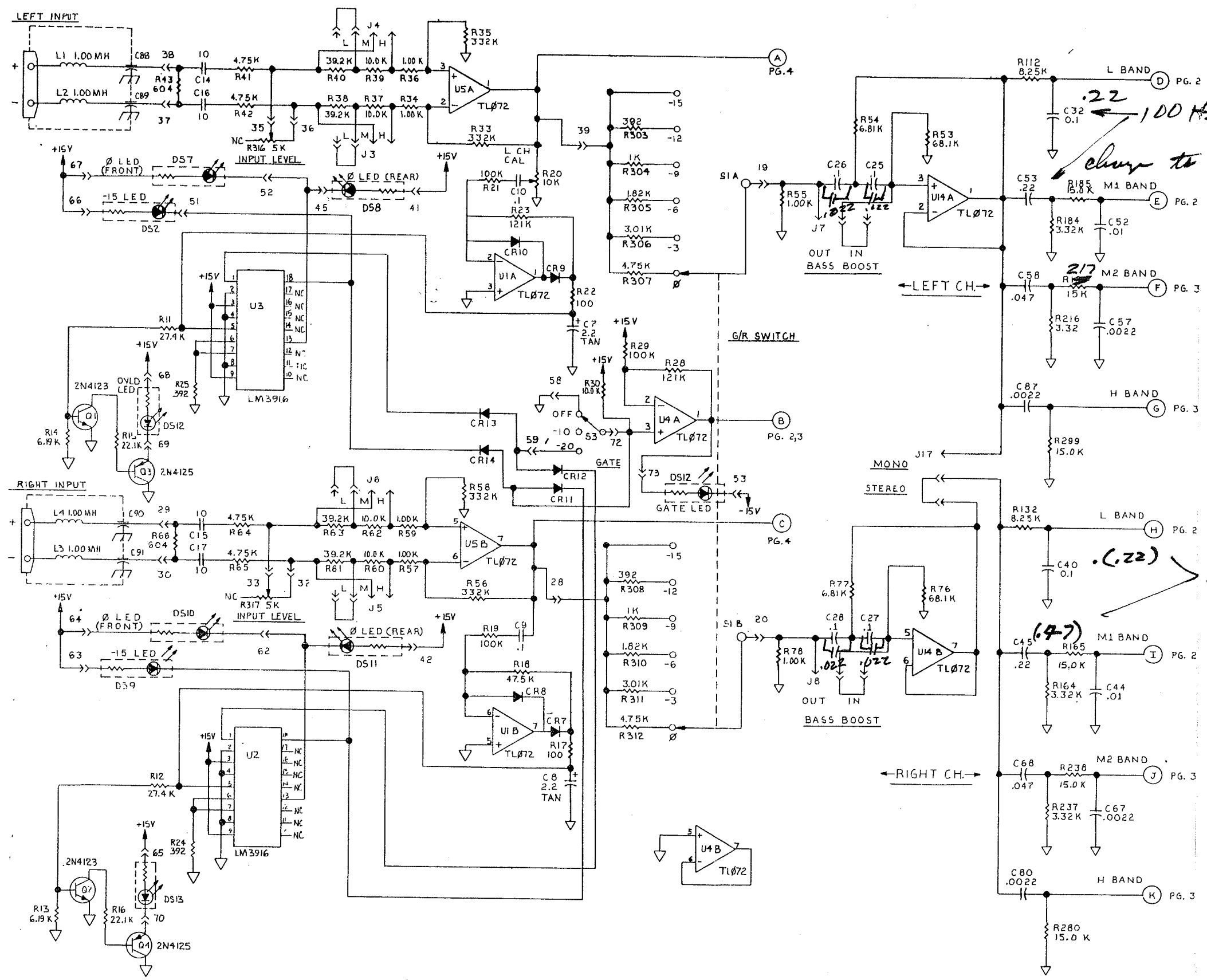
$$f = \frac{1}{2\pi RC}$$

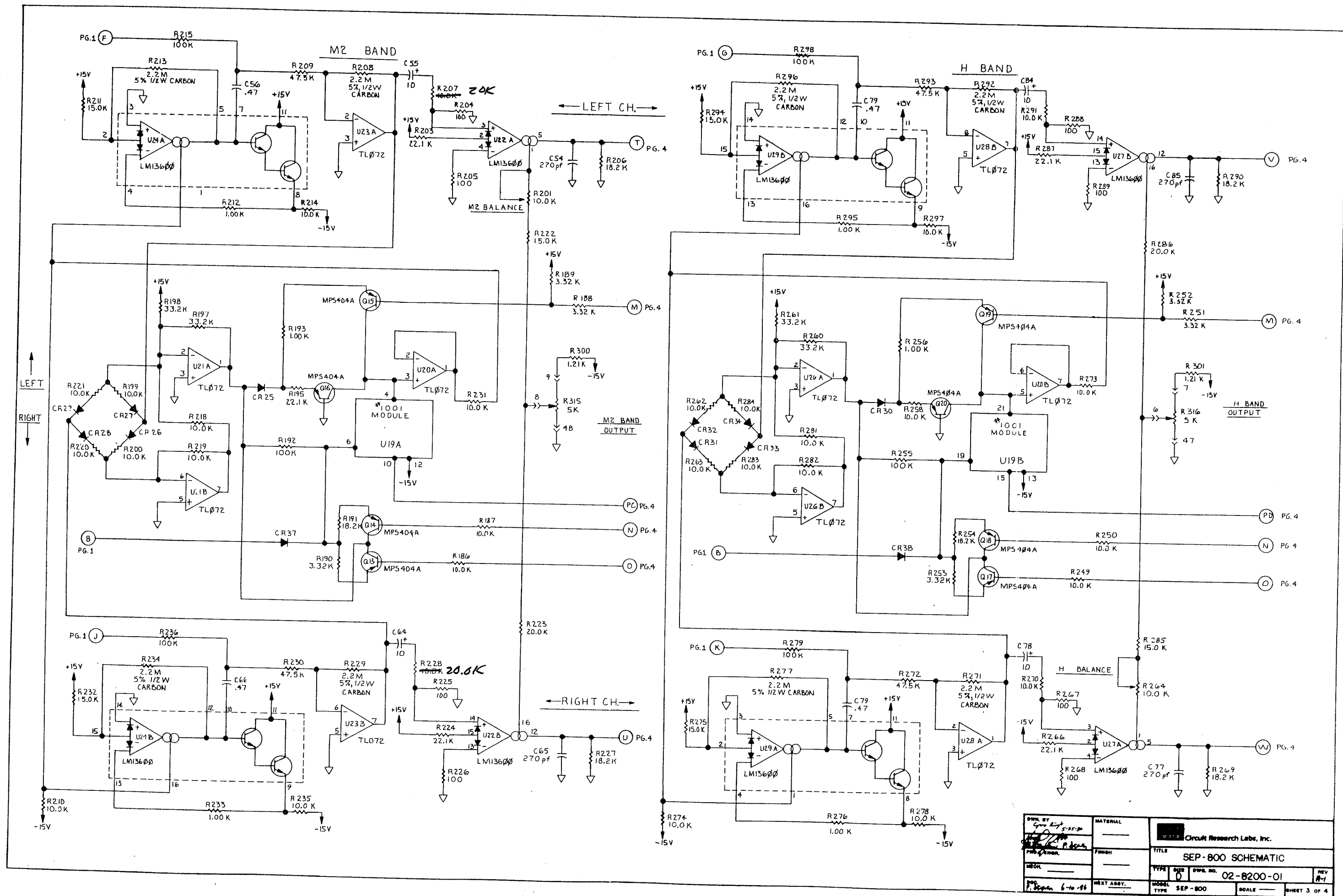
NOTES:

- ALL RESISTORS ARE 1/2, 1/4 WATT METAL FILM UNLESS OTHERWISE NOTED.
- ALL DIODES ARE 1N914B UNLESS OTHERWISE NOTED.
- ALL CAP VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.

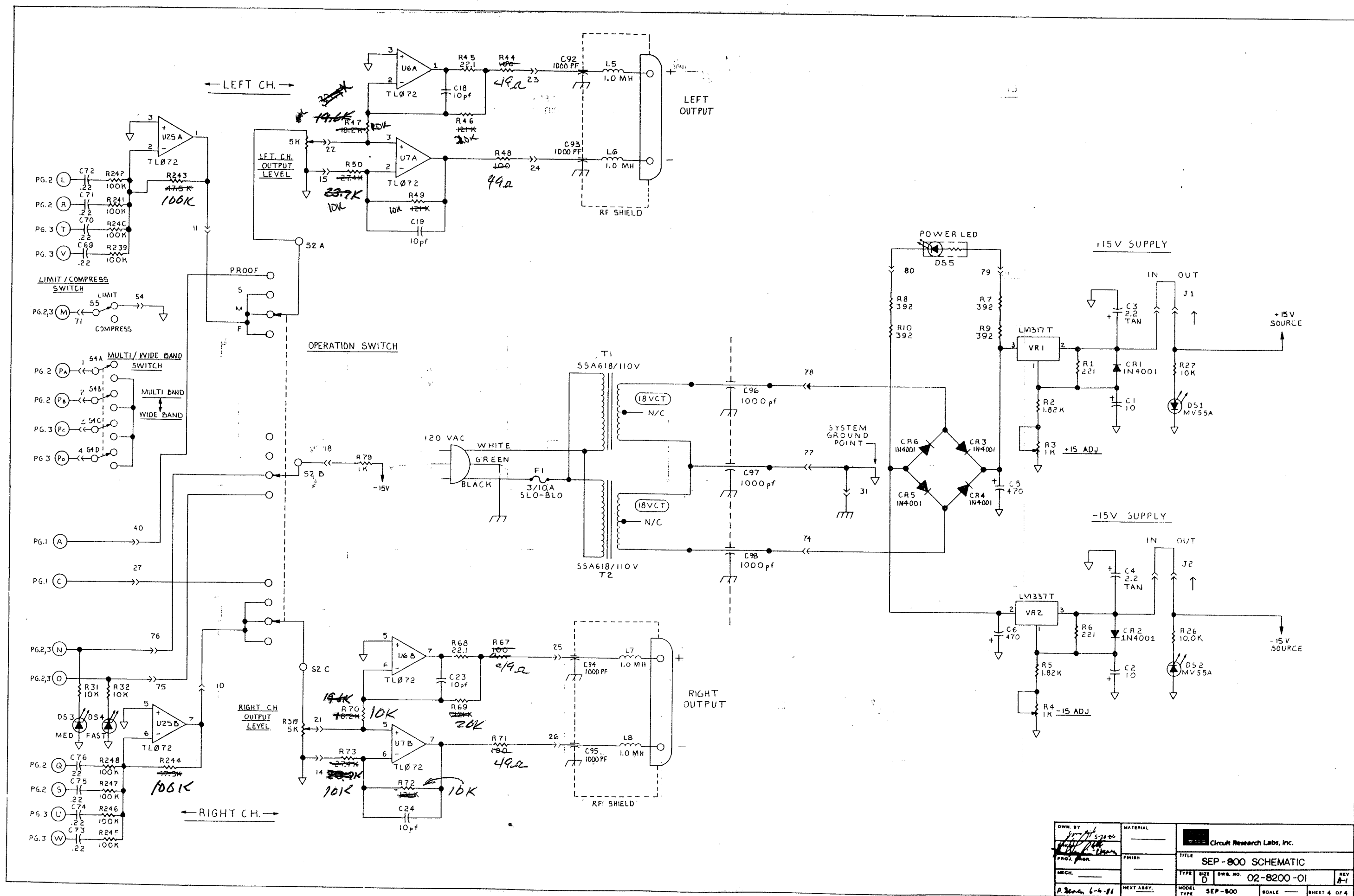
COMPONENT DESIGNATIONS		
FIRST	LAST	DELETED
C1	C38	
CR1	CR15	
F1	F1	
J1	J17	
L1	L3	
Q1	Q20	
R1	R319	
S1	S5	
T1	T2	
U1	U27	

DWN. BY <i>[Signature]</i>	MATERIAL	Circuit Research Labs, Inc.
PRO. ENGR. <i>[Signature]</i>	FINISH	
MECH.	TITLE SEP-800 SCHEMATIC	
DATE 6-10-86	REV. NO. 02-8200-01	REV. A-1
TYPE SEP-800	SCALE	SHEET 1 OF 4





DESIGNED BY C. R. L.	MATERIAL	Circuit Research Labs, Inc.	
DATE 6-10-66	FINISH	TITLE SEP-800 SCHEMATIC	
REV A-1	TYPE D	QTY 1	REV A-1
BY C. R. L.	DATE 6-10-66	QTY 1	REV A-1
MODEL SEP-800	SCALE	SHEET 3 OF 4	



OWN. BY	MATERIAL	Circuit Research Labs, Inc.	
PROJ. NO.	FINISH	TITLE SEP-800 SCHEMATIC	
MECH.		TYPE D	DWG. NO. 02-8200-01
REV. 1		MODEL TYPE SEP-800	SCALE
DATE 6-4-81	NEXT ASSY.	SHEET 4 OF 4	