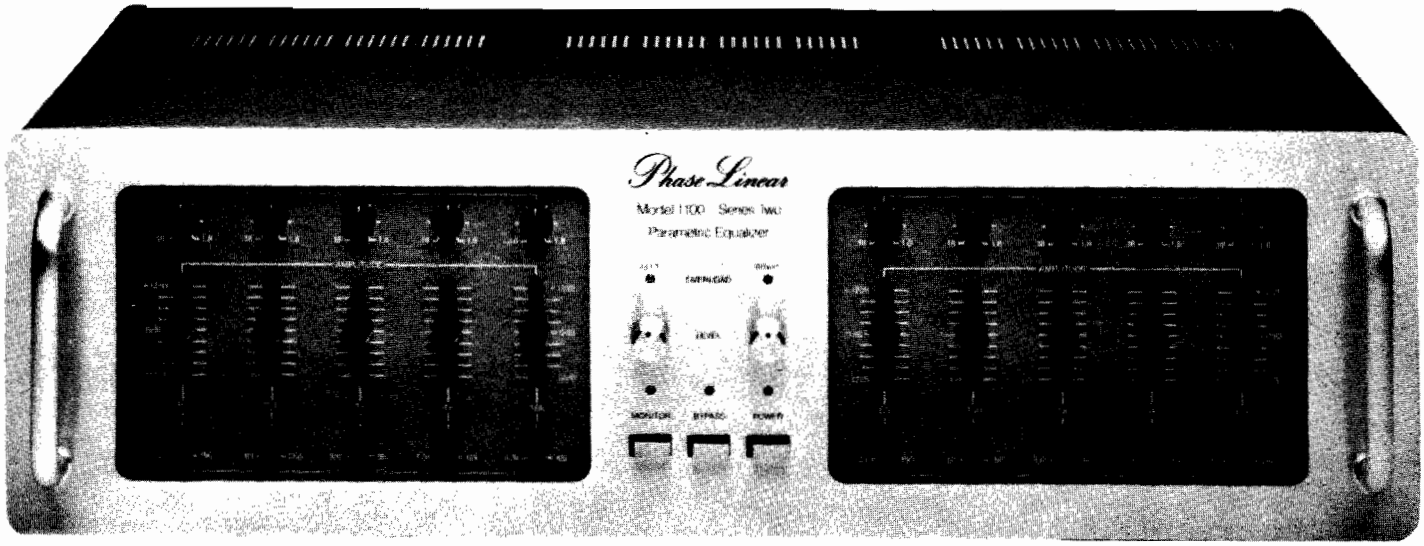
1100 SERIES TWO PARAMETRIC EQUALIZER

Service Manual



Phase Linear®

1100 SERIES TWO

PARAMETRIC EQUALIZER

Service Manual

* * * * * * * * *

Contents:

	p.
1-0. SPECIFICATIONS.	3
2-0. INSTALLATION INSTRUCTIONS .	4
3-0. FRONT PANEL CONTROLS. . . .	6
4-0. CIRCUIT DESCRIPTIONS. . . .	8
4-1. Signal Flow Diagram. . . .	8
4-2. Power Supply	9
4-3. Output Relay	9
4-4. Level Card	9
4-5. Filter Cards	.10
4-6. General Theory of Operation.	.10
5-0. SCHEMATIC AND ASSEMBLY DIAGRAMS.	.12
5-1. Schematic Diagram, Model 1100II	.13
5-2. Assembly Diagram, PL61 Paramudder PCB	.14
5-3. Foil Pattern, PL61 Paramudder PCB	.15
5-4. Assembly Diagram, PL60 Filter PCB.	16
5-5. Foil Pattern, PL60 Filter PCB	.17
5-6. Foil Pattern, PL59 Level PCB.	.17
5-7. Assembly Diagram, PL59 Level PCB.	.18
5-8. Power Transformer Primary Schematic and Line Voltage Conversion Information.	.19
6-0. TEST PROCEDURE.	.20
6-1. Energizing	.20
6-2. Output Test.	.20
6-3. Frequency Response/ Channel Separation. .	.20
6-4. Overload Indicator/ Clipping Test	.20
6-5. Bypass Test.	.21
6-6. Tape Monitor Test. . .	.21
6-7. Amplitude Sliders. . .	.21
6-8. Center Frequency Cntl.	.21
6-9. Bandwidth Control. . .	.21
6-10. Noise Test.	.21
6-11. Distortion.	.22
7-0. DISASSEMBLY	.22
8-0. TROUBLESHOOTING AND ALIGNMENT	.26
8-1. Power Supply	.26
8-2. Signal Output.	.26
8-3. Frequency Response/ Channel Separation .	.27
8-4. Overload Indicator/ Clipping Malfunction	.27
8-5. Bypass Malfunction . .	.27
8-6. Tape Monitor	.27
8-7. Amplitude Slider/Gain Trim Adjust.	.27
8-8. Center Freq. Control .	.28
8-9. Bandwidth Control. . .	.28
8-10. Excessive Noise . . .	.28
8-11. Excessive Distortion.	.28
9-0. PARTS LIST.	.29

* * * * * * * *

CAUTION:

THIS MANUAL IS INTENDED FOR USE ONLY BY QUALIFIED TECHNICAL SERVICE PERSONNEL. HAZARDOUS VOLTAGES MAY BE ENCOUNTERED IN THE TEST AND SERVICING OF THE 1100 SERIES TWO PARAMETRIC EQUALIZER. USE EXTREME CAUTION; READ ALL UNSTRUCTIONS CAREFULLY.

1-0. SPECIFICATIONS

Performance:

(Unless otherwise stated, all controls are centered)

Rated Output Voltage/Load: 2.0 volts RMS/10k-ohms

Maximum Output Voltage/Load: 8.0 volts RMS/10k-ohms

Input Impedance: 50k-ohms shunted by less than 50pF

Input Sensitivity for Rated Output: 1.0 volt RMS

THD + Noise @ Rated Output: less than 0.02% (20Hz–20kHz)

Typical THD + N @ 1kHz: 0.005%

IM @ Rated Output (60Hz : 7kHz = 4 : 1): less than 0.02%

Frequency Response: 20Hz–20kHz, +0/-1dB

Slew Factor: greater than 5.0

Channel Separation: greater than 100dB @ 1kHz, and 80dB @ 20kHz

Signal-to-Noise Ratio: 100dB re 2.0 volts (20Hz–20kHz, flat)

Gain: +6dB maximum

Amplitude Range: ±12dB (continuous with center detent)

Bandwidth Range: 0.18 octave to 1.8 octaves (continuous)

Frequency Range: 9:1 (continuous with center detent)

Center Frequencies: 63Hz, 250Hz, 1kHz, 4kHz, 16kHz

General

Power Requirements: 120vAC (±10%) 60Hz (USA & Canadian models and selected export markets); 220/240vAC (±10%) 50/60Hz (general export model. Also available 265vAC (±10%) 50/60Hz (Australian model); 100vAC (±10%) 50/60Hz (Japanese model)

Power Consumption: 15 watts max.

Unit:

Dimensions: 19w x 5½H x 8d in. (48.3 x 14 x 20.3cm)

Weight: 9.5 lbs (4.3kg)

Shipping:

Dimensions: 21½w x 8½h x 15d in. (56.6 x 21.6 x 38.1cm)

Weight: 12 lbs. (5.4kg)

NOTE: Designs and specifications subject to change without notice due to improvements or modifications.

2-0. INSTALLATION INSTRUCTIONS

2-1. Separate components:

See fig.2-1. Connect a pair of shielded leads from the preamplifier output to EQ IN and another pair of shielded leads from EQ OUT to the inputs of the power amplifier.

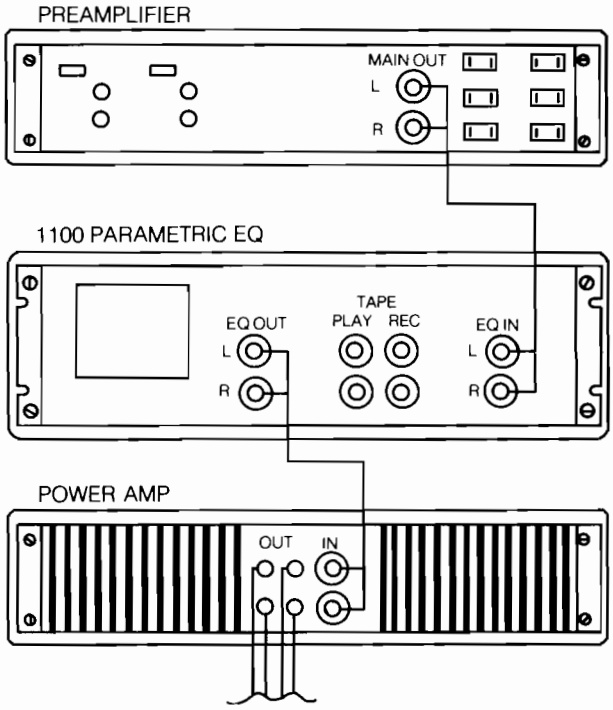


Fig. 2-1

Be sure to observe proper phasing of audio cables(left-to-left and right-to-right). There will be no connections made to the tape monitor jacks of the preamplifier. Connect the audio cable from EQ OUT directly to the inputs of the power amplifier, unless a Phase Linear Model 1200 Real Time Analyzer(RTA)is being utilized (see fig.2-2).

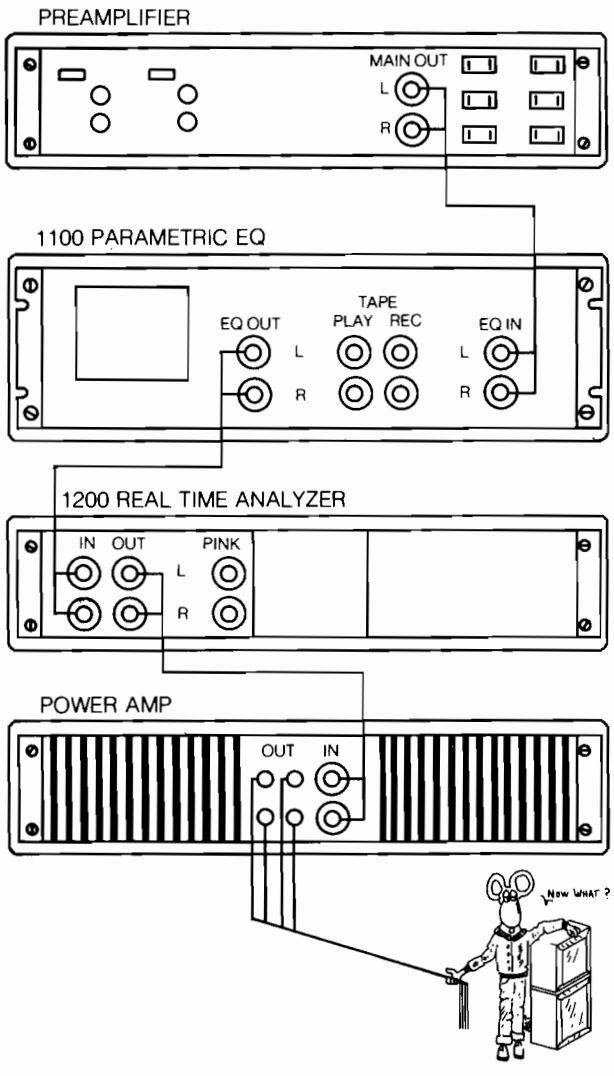


Fig. 2-2

2-2. Receiver or integrated amplifier:

See fig.2-3. Remove the shorting links supplied with the receiver or integrated amplifier(some receivers or integrated amplifiers will have a switch to separate the preamp and power amplifier stages of the unit)and run a shielded audio cable from the preamp OUT to the EQ IN, and a separate cable from the model 1100 EQ OUT back to the power amplifier input jacks.

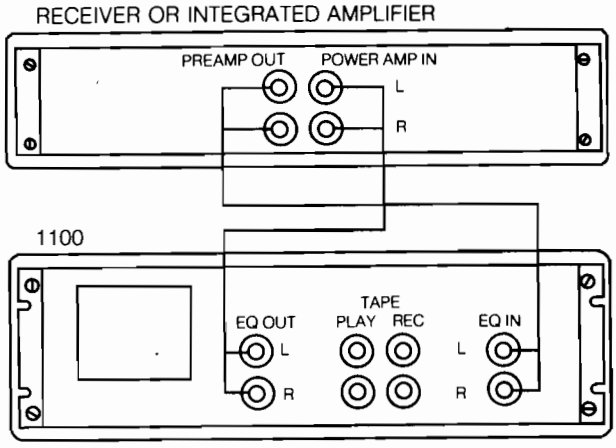


Fig. 2-3

2-3. Installation in a tape monitor circuit:

See fig.2-4. Optimum noise performance of the stereo system dictates that the preferred location of the model 1100 parametric equalizer is after the preamp and before the power amplifier. However, certain conditions and combinations of equipment may make installation in the tape monitor loop of the preamp necessary. There is nothing wrong with installing the model 1100 in this location - it will operate just as well.
Connect the equipment as shown in fig.2-4, paying careful attention to proper polarity. Make sure that the tape monitor switch on the preamp(receiver or integrated amp)is in the MONITOR(not SOURCE)position. Proper connection of a tape deck using the tape jacks on the model 1100 is shown in fig. 2-4. When recording, use the tape switch on the model 1100 for monitoring and playback of the tape deck.

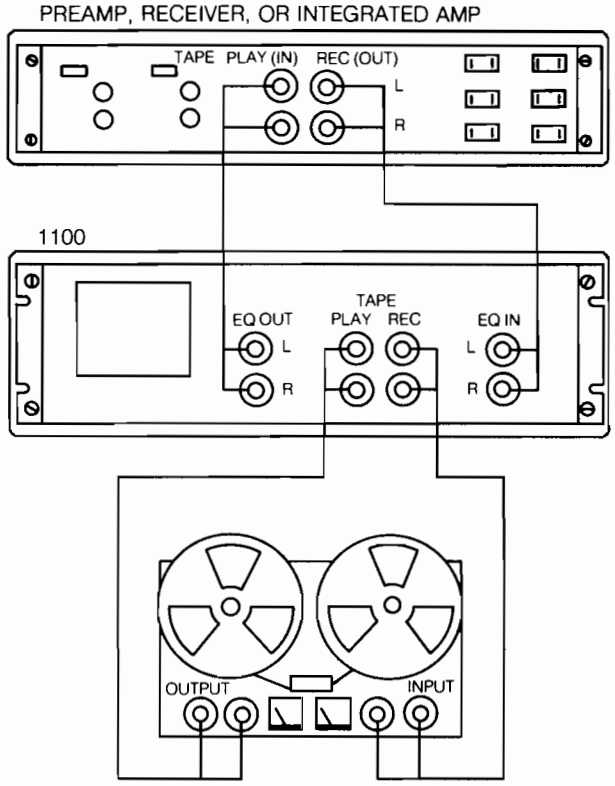


Fig. 2-4

2-4. Auxiliary Equipment:

The model 1100 places no special requirements or restrictions upon auxiliary equipment location within the audio path. In general, the model 1100 should be positioned after the preamp and before the power amplifier. There are two exceptions to this rule:

1) audio delay units and speaker equalizers furnished by the speaker manufacturer; these should be located after the model 1100 and before the power amplifier in the audio path.

2) outboard units such as noise reduction devices, expansion devices, tape decks, etc., should be series connected in the tape monitor circuit.

2-5. Single Channel Mono Operation:

By connecting the model 1100 as per fig.2-5 it is possible to create a single channel parametric equalizer having 10 bands of adjustment. Sufficient center frequency movement is possible so that 10 separate areas of correction can be applied to a room response.

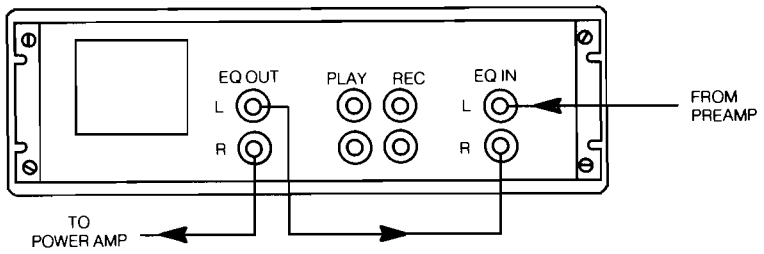


Fig. 2-5

3-0. FRONT PANEL CONTROLS

1. LEVEL control. Used to set overall output level of equalized signal.

2. OVERLOAD indicator. Amber LED illuminates whenever an overload condition exists.

3. BANDWIDTH control. Used to vary the bandwidth over which the AMPLIFUTE control will boost or cut the audio signal. Adjustment range is from .18 octaves(fully ccw) to 1.8 octaves(fully cw).

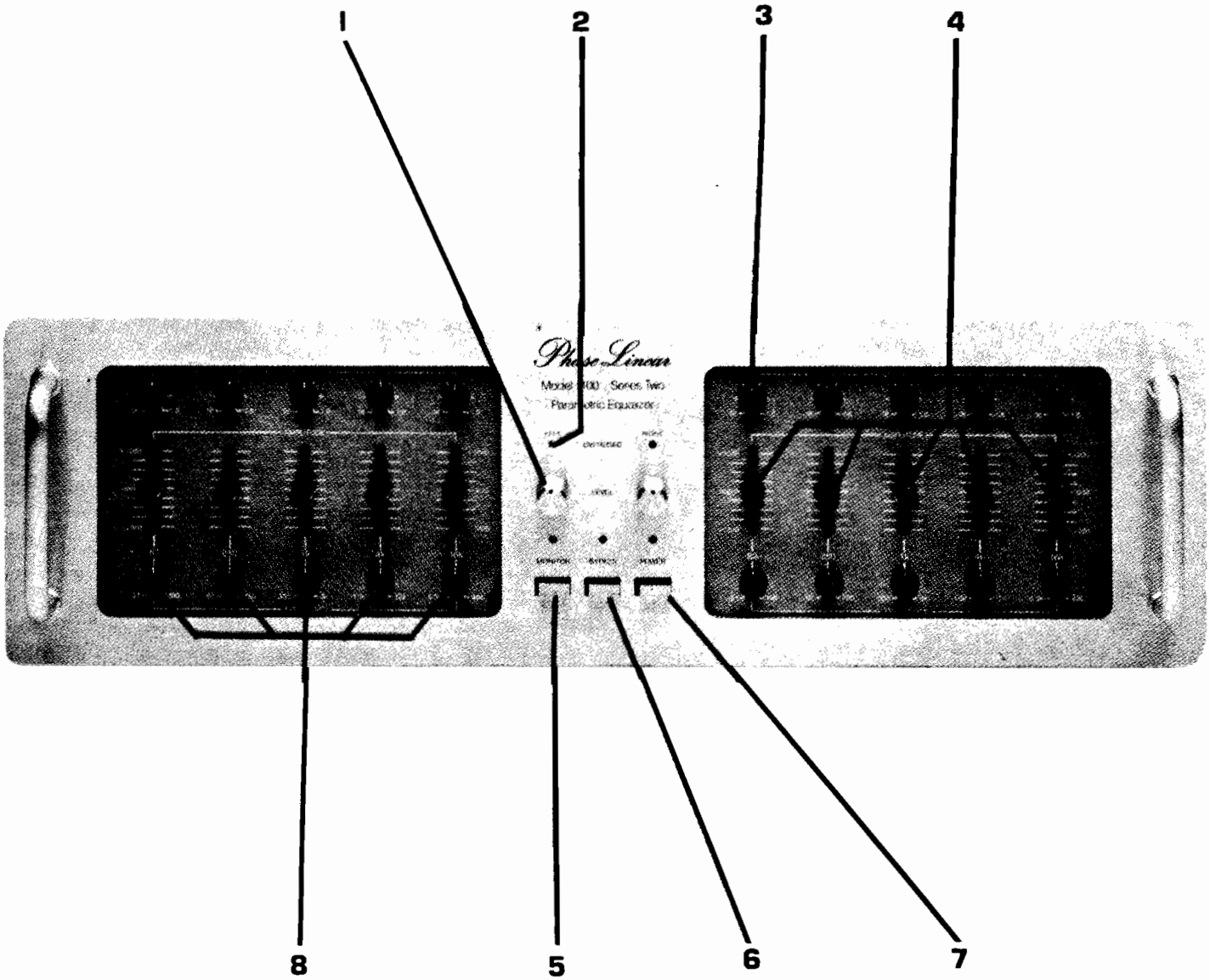
4. AMPLITUDE control. Used to boost or cut the audio signal ±12dB maximum.

5. MONITOR switch. Push in to monitor or play back a tape deck connected to the model 1100's tape jacks. Amber LED illuminates in the MONITOR (in) position.

6. BYPASS switch. Used to bypass all active circuitry of the model 1100. Allows conevnient A-B comparisons. Push in to bypass. Amber LED illuminates in bypass(in)position.

7. POWER switch. Push in to turn the model 1100 on. Amber LED illuminats in the "on" position.

8. FREQUENCY control. Used to shift the center frequency of the AMPLITUDE control. The frequency may be shifted by a factor of 3 about its center detent position, i.e. from 1/3.


1
2
3
4
Phase Linear
8
5
6
7

4-0. CIRCUIT DESCRIPTIONS

4-1. Signal Flow Diagram:

A signal flow diagram of the model 1100 is reproduced as fig. 4-1 and should be followed while reading the description below.

The audio signal enters via the EQ input jacks and is directly applied to the TAPE REC output jacks as well as the tape MONITOR switch. Inputs available at the TAPE PLAY jacks also are routed to the tape MONITOR switch. Notice that the location of the tape MONITOR switch defines the model 1100 as a line equalizer type instrument as opposed to a tape equalizer type. It is not possible to record through the model 1100 without re-connecting it in series with tape record inputs of the tape machine.

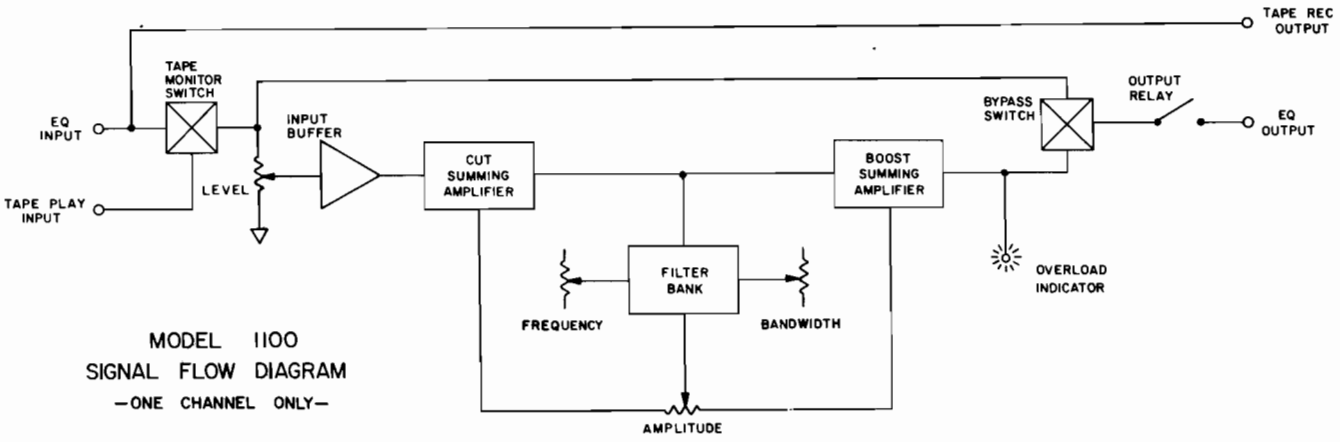


Fig. 4-1

The output of the tape monitor switch is applied to the BYPASS switch, where it exits through the output relay to the EQ OUT jacks whenever the BYPASS switch is pressed in. The bypass mode consists only of mechanical switches and the relay. There is no active circuitry in the bypass path. Power, however, must be applied so the output relay can be energized. The output of the tape MONITOR switch is also applied to the top of the LEVEL control. A percentage of the input signal is then passed through the input buffer to the Cut Summing Amplifier, whose output connects to the Boost Summing Amplifier, which is tied to the BYPASS switch.

Overload monitoring is done at the output of the Boost Summing Amplifier.

The output signal of the Cut Summing Amplifier is also applied to the five bandpass filters that make up the Filter Bank. All five outputs are available as inputs to either the Boost or Cut Summing Amplifiers depending upon the position of the AMPLITUDE control. Separate frequency and bandwidth controls are located on each filter card.

NOTE: The complete schematic diagram of the model 1100 appears on page 12 (fig. 5-1) and will be used for reference in the following discussion.

Mechanically, the model 1100 consists of a single mother board and the six daughter boards for each channel. These are

the five filter cards and one level card. The power supply, input capacitors and output relay are located on the mother board along with the pushbutton assembly comprised of the tape MONITOR, BYPASS and POWER switches. Phantom lines on the schematic diagram segregate each of the separate card circuits. Only the left channel is shown for clarity. The right channel is identical.

4-2. Power Supply:

All circuitry except the output relay operates off of regulated ±15VDC supplies. (This is why special transformers are required for extremely high or low nominal line voltages.) Regulation is accomplished by Z1 and Z2, three-terminal monolithic voltage regulators. Ripple smoothing is done with capacitors C2, C4 and C5. High frequency interference is filtered by C1 and C3. Capacitors C9 and C10 provide stability for Z1 and Z2 respectively. Diodes D1–D4 provide full-wave, center-tapped rectification for the voltage regulators.

4-3. Output Relay:

Transistor Q1 is used to control the output relay K1. Delayed turn-on of approximately 4 seconds is accomplished by the R-C charge time of R6 and C6, while the quick turn-off time is fixed by discharge time constant R5-C6. Diode D9 provides a lower point than can be accomplished by tying Q1's emmitter directly to ground.

4-4. Level Card:

Input buffering, level control, boost and cut summing operations and overload detection are all accomplished by the level card using one quad op amp(Z201), and a discrete current buffer stage.

Input buffering and a voltage gain of +6dB are done by (¼) Z201 and it's associated resistor network, R203 and R204. Input capacitors C7(mother board)and C201(level card)block all DC voltages from level control R201, while resistor R202 provides input bias currents for Z201.

Resistors R205 and R206, along with(¼)Z201 and it's current buffer make up an inverting summing amplifier used for the cut operation. Likewise resistors R207 and R208, along with(¼) Z201 make up another inverting summing amplifier used for boost control. Capacitors C202 and C203 are used for stability and bandwidth control. The outputs of all of the bandpass filters are routed to pin 6 for cut summing and to pin 2 for boost summing. The input to the filters exits on pin 4.

Overload detection is done by the remaining(¼)Z201 and it's associated components. Diode D201 and resistor R210 provide half-wave rectified peak audio information to the positive input(pin 3)of Z201, which is wired for voltage comparator operation. A reference voltage of approximately 11 volts is derived via R211 and R212 and applied to the negative input (pin 2)of Z201. Normal operation, then, is for the output (pin 1)of Z201 to set at the lower supply voltage limit of approximately -13 volts, therefore reverse biasing LED D201. Whenever the positive input exceeds 11 volts the comparator will

change state and forward bias LED D201. Diode D202 provides reverse breakdown voltage protection for the LED, while resistor R213 is used for current limiting.

4-5. Filter Cards:

Each filter card consists of a non-inverting, state variable bandpass filter, inverting gain amplifier, summing amp gain setting resistor R109, DC blocking capacitors C107 and C108, and amplitude potentiometer R114. All cards are identical except for the capacitor values of C101 and C102 and the color code dots which identify the location of the card.

The state variable bandpass filter consists of the differential summing amp made up of (¼)Z101, resistors R101–R106 and capacitor C103, and two integrators made up of (½)Z101, resistors R107, R108, R110 and capacitors C101 and C102. There is a net gain loss of approximately -9dB through the state variable filter which is made up by the inverting adjustable gain(6–12dB)amplifier consisting of (¼)Z1-1 and resistors R111–R113. Capacitor C104 is used for stability and bandwidth control. Frequency range is adjusted by potentiometer R108, while R103 controls bandwidth.

4-6. General Theory of Operation:

After the audio signal has been buffered and amplified it is made available to the cut summing amp where it is inverted and presented to the boost summing amp. The output of the cut summing amp is also applied to the intputs of the bandpass filters. Their outputs, in turn, appear on each slider of the AMPLITUDE control pots. With the AMPLITUDE pots centered in their detent positions, each bandpass output is AC grounded via the center-taps of the pots.

As the AMPLITUDE pot is rotated away from center(and the grounded tap point)more and more of the bandpass output signal is applied to either the boost or cut summing amps, depending upon rotation direction. In the full cut position (see fig.4-2)all of the bandpass output is tied via R109 to the cut summing amp. Since the bandpass filter is now in the feedback loop of the op amp it's effect has been inverted, i.e. it acts as a notch filter. It is added(summed)with the original signal and gives the desired cut characteristic. Due to the weighting characteristics of the respective summing resistors, one times the original signal is added to three times the output of the bandpass filter, thus giving the desired 12dB of the cut operation.

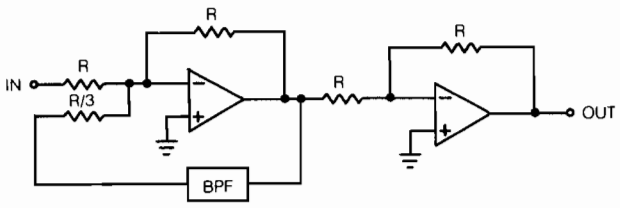


Fig. 4-2 Full Cut Operation

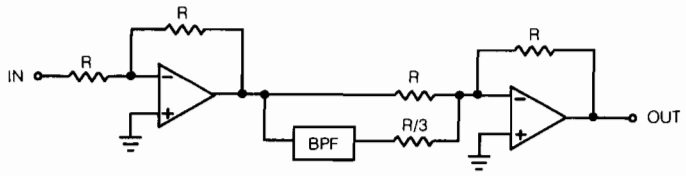


Fig. 4-3 Full Boost Operation

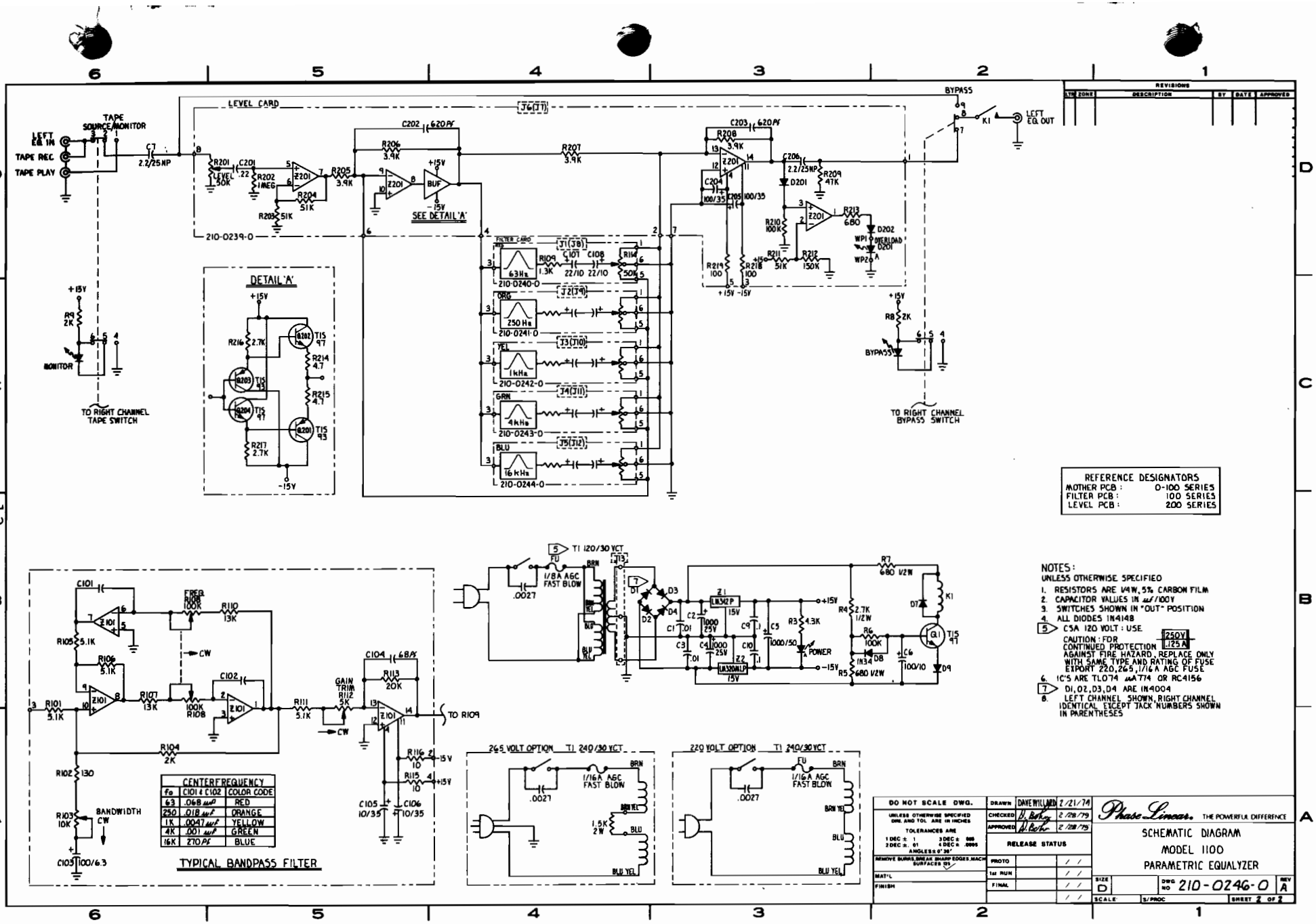
In the full boost position(see fig.4-3), all of the band-pass output is tied via R109 to the boost summing amp where it is added to the original signal to give the desired boost characteristic. Similar resistor weighting as in the cut operation gives the required boost of 12dB.

* * * * * * * *

NOTES

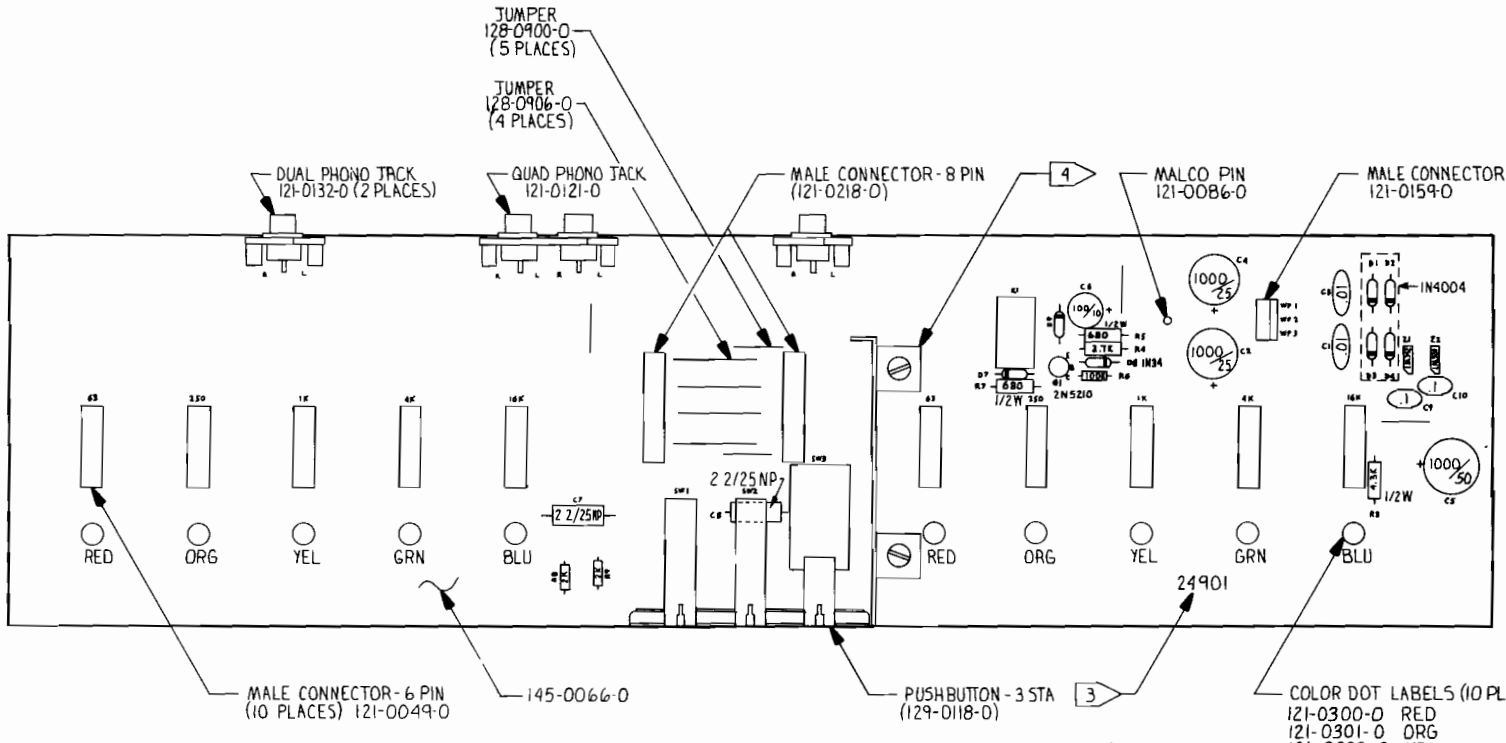
5-0. SCHEMATIC AND ASSEMBLY DIAGRAMS

		p.
5-1.	Schematic Diagram, Model 1100II.	.13
5-2.	Assembly Diagram, PL61 Paramudder PCB.	.14
5-3.	Foil Pattern, PL61 Paramudder PCB.	.15
5-4.	Assembly Diagram, PL60 Filter PCB.	.16
5-5.	Foil Pattern, PL60 Filter PCB.	.17
5-6.	Foil Pattern, PL59 Level PCB	.17
5-7.	Assembly Diagram, PL59 Level PCB	.18
5-8.	Power Transformer Primary Schematic and Line Voltage Conversion Information.	.19



5-1. Schematic Diagram, Model 1100II

REVISIONS					
LTR	ZONE	DESCRIPTION	BY	DATE	APPROVED
B	C-2	PER ECO 1018 - Q1 IS 2N5210	[illegible]	1-7-80	



NOTES : UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE 1/4 W ± 5% CARBON FILM
2. ALL DIODES ARE IN4148
3. DATE CODE : 24901
4. (141-0203-0) HUM SHEILD , (141-0204-0) INSULATION PAPER BOTH SIDES (2 PLACES), (122-0018-0) NUT (2 PLACES) AND (122-0049-0) SCREW (2 PLACES)

DO NOT SCALE DWG.	DRAWN	DRUEWILLARD	2/11/79
UNLESS OTHERWISE SPECIFIED DIM. AND TOL. ARE IN INCHES	CHECKED	S.M.K	2/28/79
TOLERANCES ARE 1 DEC ±: .1, 2 DEC ±: .01, 3 DEC ±: .005, 4 DEC ±: .0005, ANGLES ± 0° 30'	APPROVED	D. Bohn	3/2/79
REMOVE BURRS, BREAK SHARP EDGES, MACH SURFACES 125	RELEASE STATUS		
MAT'L:	PROTO.		/ /
FINISH:	1st RUN		/ /
	FINAL		/ /

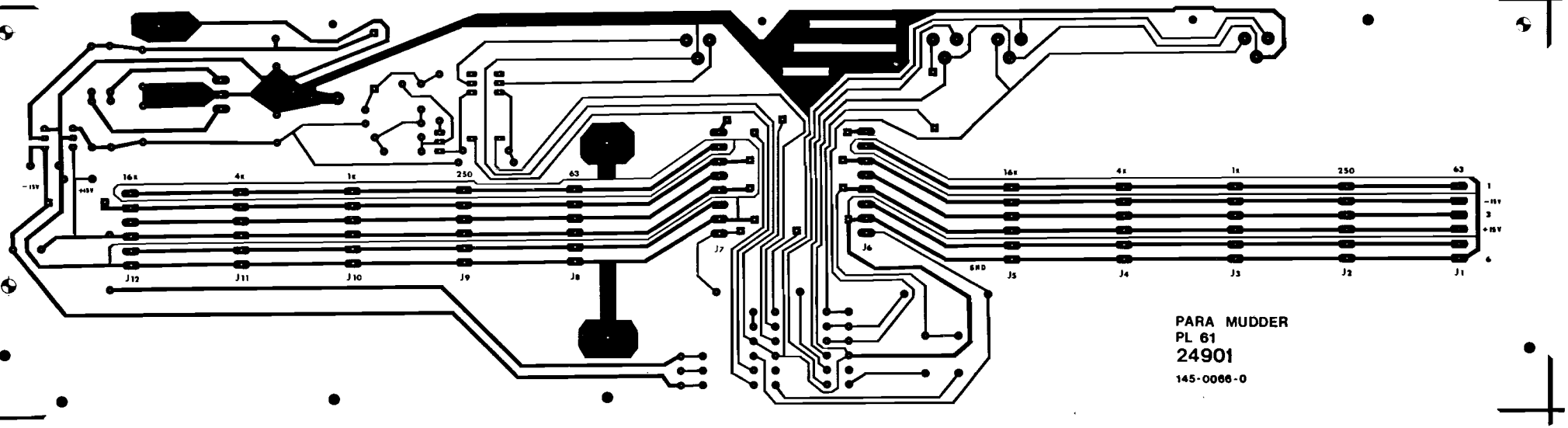
Phase Linear — THE POWER OF DIFFERENCE

ASSY PL-61
MODEL 1100
PARAMETRIC EQUALYZER

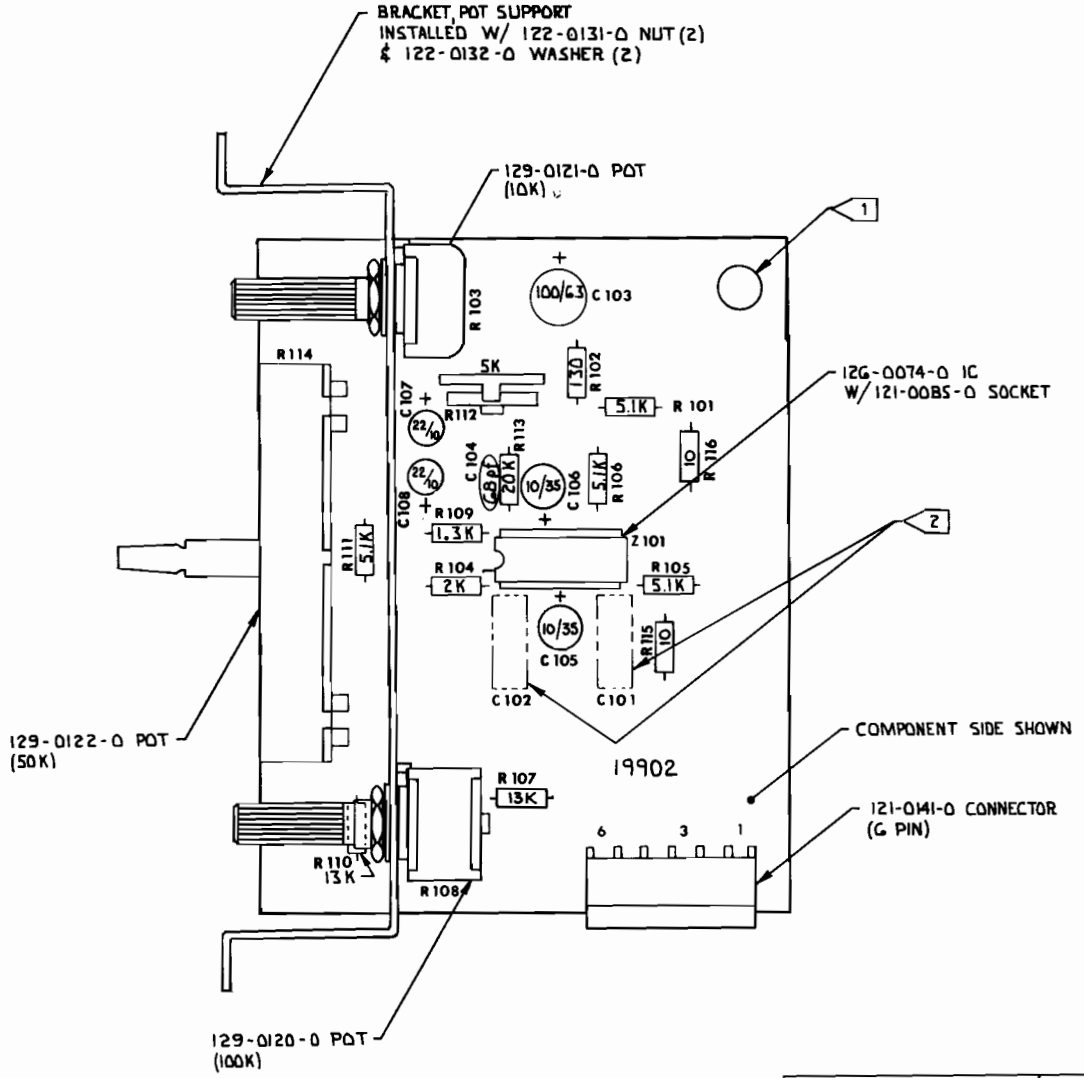
SIZE C | DWG. NO. 210-0246-0 | REV. B

SCALE: | W/PROC. | SHEET 1 OF 2

5-2. Assembly Diagram, PL61 Paramudder PCB



5-3. Foil Pattern, PL61 Paramudder PCB



REVISIONS					
LTR	ZONE	DESCRIPTION	BY	DATE	APPROVED

NOTES

1. COLOR DOT TO IDENTIFY PCB ASSY (SEE NOTE 2)
2. VALUE OF C101 & C102 WILL CHANGE WITH PCB ASSY AS FOLLOWS :

(RED)	.068/100V — 210-0240-0
(ORANGE)	.018/100V — 210-0241-0
(YELLOW)	.0047/100V — 210-0242-0
(GREEN)	.001/100V — 210-0243-0
(BLUE)	270pf/100V — 210-0244-0

UNLESS OTHERWISE NOTED :

3. ALL RESISTORS ARE 1/4W ± 5%, CARBON FILM, VALUES IN OHMS.
4. CAPACITOR VALUES IN μf/100V.
5. DATE CODE : 19902

DO NOT SCALE DWG.	DRAWN	T. NILSON	1/19/79
UNLESS OTHERWISE SPECIFIED DIM. AND TOL ARE IN INCHES	CHECKED	CMcK	2/28/79
TOLERANCES ARE: 1 DEC ±: 1, 3 DEC ±: .005, 2 DEC ±: .01, 4 DEC ±: .0005, ANGLES ± 0° 30'	APPROVED	D. Bohn	2/28/79
REMOVE BURRS, BREAK SHARP EDGES, MACH SURFACES 125	RELEASE STATUS		
MAT'L	PROTO.		/ /
FINISH	1st RUN		/ /
	FINAL		/ /

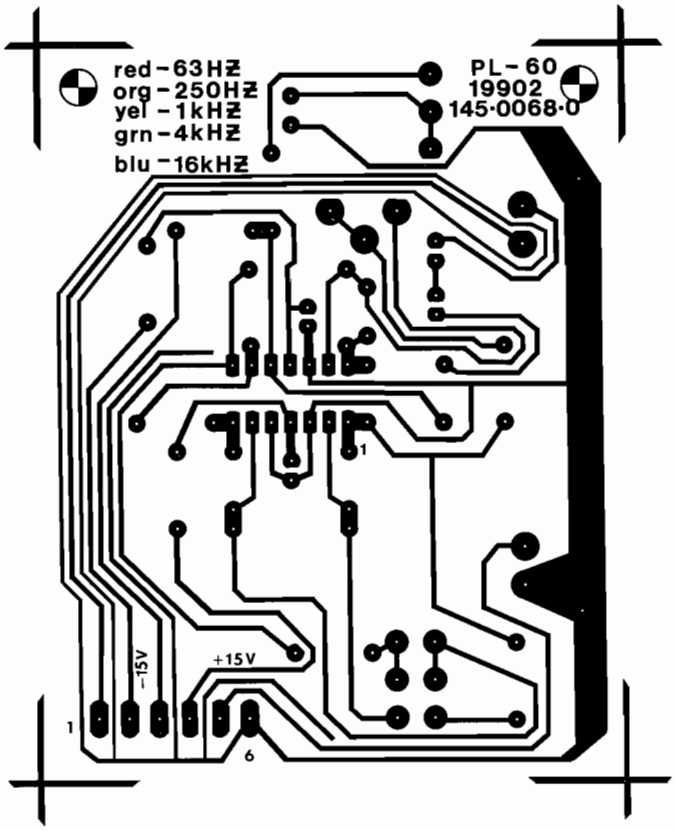
Phase Linear. THE POWERFUL DIFFERENCE.

PCB ASSY
FILTER BOARD
MODEL 1100 SERIES TWO

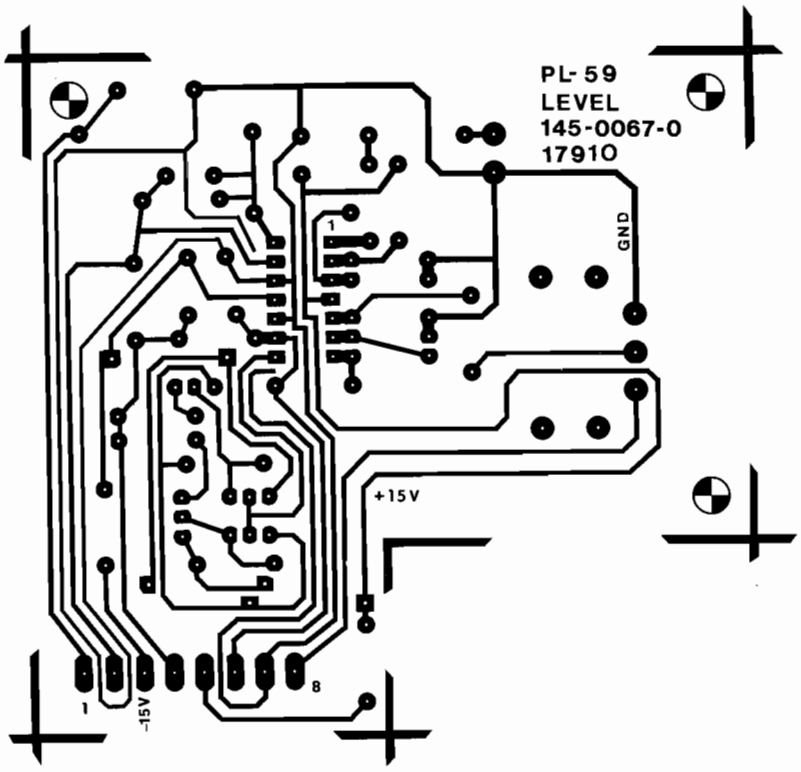
SIZE		DWG. NO.	REV.
C	PL60	210-0240-0 THRU 210-0244-0	A

SCALE: 2X | W/PROC. | SHEET 1 OF 1

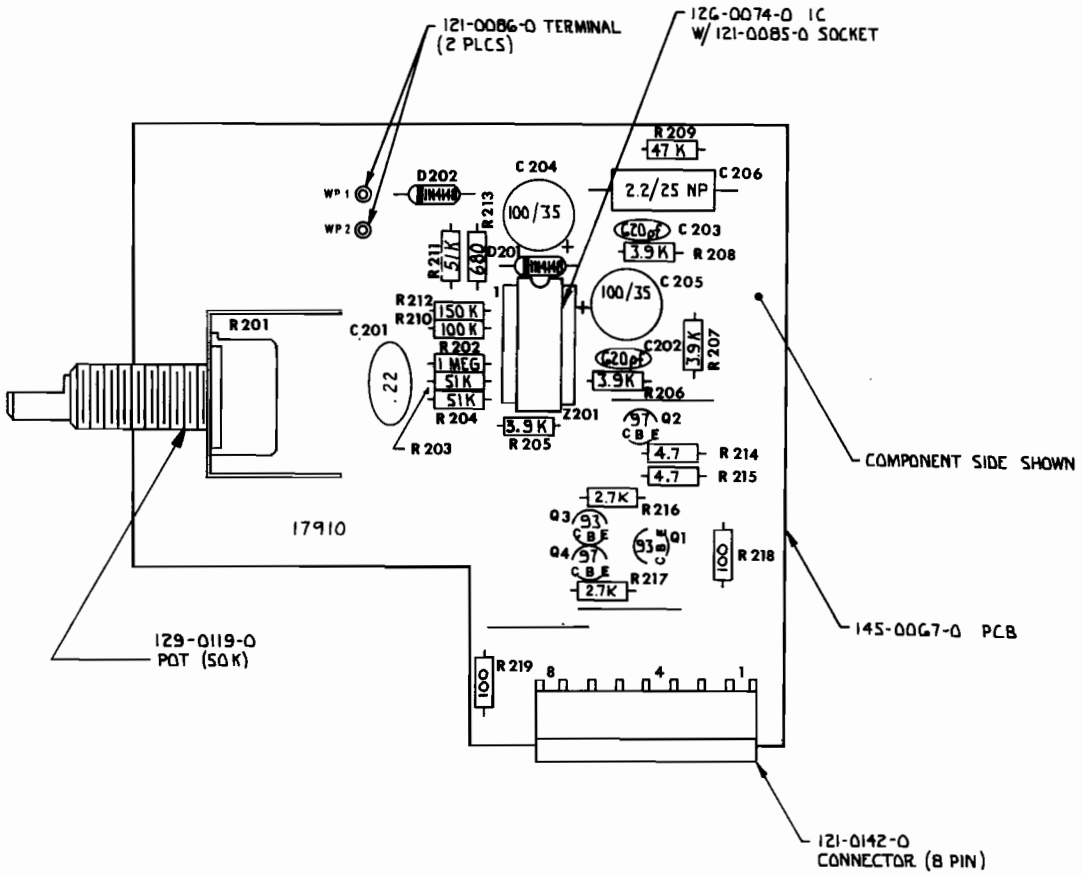
5-4. Assembly Diagram, PL60 Filter PCB



5-5. Foil Pattern, PL60 Filter PCB



5-6. Foil Pattern, PL59 Level PCB



NOTES

UNLESS OTHERWISE SPECIFIED :

1. RESISTORS ARE 1/4W ± 5%, CARBON FILM VALUES IN OHMS.
2. CAPACITOR VALUES IN μf/100V.
3. DATECODE : 17910

REVISIONS					
LTR	ZONE	DESCRIPTION	BY	DATE	APPROVED
B	C-4	PER ECO 982-50K POT CHANGE	EAT	11-09-79	D. Bohn

DO NOT SCALE DWG.	DRAWN	T. NILSON	1/17/79
UNLESS OTHERWISE SPECIFIED DIM. AND TOL. ARE IN INCHES	CHECKED	SMCK	2/28/79
TOLERANCES ARE 1 DEC ±: .1, 2 DEC ±: .01, 3 DEC ±: .005, 4 DEC ±: .0005, ANGLES ± 0° 30'	APPROVED	D. Bohn	2/28/79
REMOVE BURRS, BREAK SHARP EDGES, MACH SURFACES 125	RELEASE STATUS		
MAT'L:	PROTO.		/ /
FINISH:	1st RUN		/ /
	FINAL		/ /

Phase Linear. THE POWERFUL DIFFERENCE.

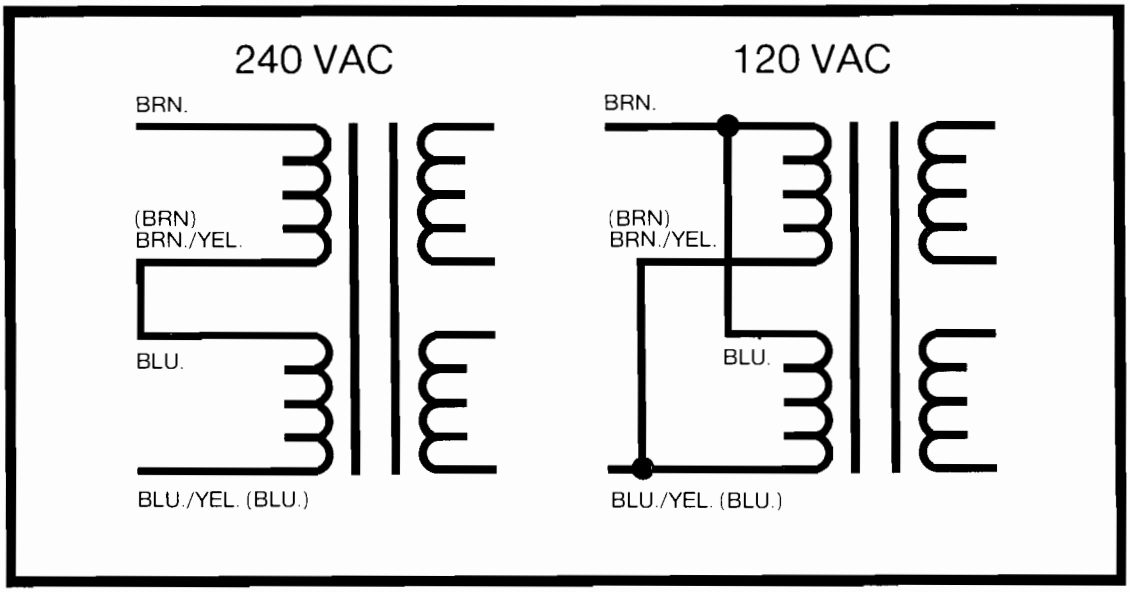
PCB ASSY
LEVEL BOARD
MODEL 1100 SERIES TWO

SIZE C | PL 59 | DWG. NO. 210-0239-0 | REV. B

SCALE: 2X | S/PROC. | SHEET 1 OF 1

5-7. Assembly Diagram, PL59 Level PCB

5-8. Power Transformer Primary Schematic and Voltage Conversion Information



IF THE PRIMARY VOLTAGE IS CHANGED, THE LINE FUSE MUST BE CHANGED AS FOLLOWS:

120 VAC: Use 1/8 AMP
240 VAC: Use 1/16 AMP

FOR 120VAC OPERATION: REPLACE WITH THE SAME TYPE 3AG(AGC) FAST-BLOW, 1/8-AMP, 250V FUSE.

REMPLACER POR UN FUSIBLE DE MEME TYPE 3AG(AGC) FAST-BLOW, 1/8-AMPERE, 250 VOLTS.

FOR 220VAC OPERATION: REPLACE WITH THE SAME TYPE 3AG(AGC) FAST-BLOW, 1/16-AMP, 250V FUSE.

REMPLACER POR UN FUSIBLE DE MEME TYPE 3AG(AGC) FAST-BLOW, 1/16-AMPERE, 250 VOLTS.

6-0. TEST PROCEDURE

Contents:

6-1. Energizing
6-2. Output Test
6-3. Frequency Response/Channel Separation
6-4. Overload Indicator/Clipping Test
6-5. Bypass Test
6-6. Tape Monitor Test
6-7. Amplitude Slider Test
6-8. Center Frequency Control
6-9. Bandwidth Control
6-10. Noise Test
6-11. Distortion Test

Required test equipment:

Dual-trace oscilloscope
AC voltmeter(VTVM) x2
Sine wave generator
THD analyzer
20Hz–20kHz bandpass filter(optional)

Unless otherwise indicated, the initial set-up of the unit requires that controls be set as follows:

LEVEL controls	-fully clockwise
BYPASS	-out
MONITOR	-out
AMPLITUDE sliders	-0dB(center detent)position
CENTER FREQUENCY	-12 o'clock position
BANDWIDTH	-fully clockwise(1.8 octave)

Connect sine wave signal generator to EQ INputs of the 1100II, and connect EQ OUTputs to scope and AC voltmeters(VTVM).

6-1. Energizing the Unit: Connect the 1100II to a proper line voltage source. Push the power switch to the ON position and verify immediate illumination of the power LED.

6-2. Output Test: Drive both inputs with a 250mV 1kHz sine wave signal and obtain a 0dB reference output on the AC voltmeters (using 1-volt scale). Verify output from both channels to within 3 dB of each other.

6-3. Frequency Response/Channel Separation: Sweep the signal generator from 20Hz to 20kHz and verify frequency response of ±2dB. Then reduce the left channel LEVEL control to full counter-clockwise and verify that any output from the left channel is greater than 100dB below the right channel using a 1kHz input signal and a 20Hz–20kHz bandpass filter. Without the bandpass filter separation is approximately 90dB. Repeat for left-to-right channel separation and then return to the initial set-up positions.

6-4. Overload Indicator/Clipping Test: Drive both inputs at 1kHz until both overload indicators illuminate. Verify output voltage of 6VAC ±1V and that the output waveform is beginning to clip. Return controls to initial set-up positions.

6-5. Bypass Test: Drive both inputs at 1kHz to obtain a 0dB reference output on the voltmeters(1-volt scale). Push the BYPASS switch and verify a 6dB drop in output level. Return BYPASS switch to initial set-up position.

6-6. Tape Monitor Test: Drive both inputs at 1kHz to obtain a 0dB reference on the voltmeters(1-volt scale). Connect scope and voltmeters to TAPE REC outputs and verify output from both channels. Output level should be the same as the input level. Reconnect scope and voltmeters to EQ OUT and drive the TAPE PLAY inputs. Push MONITOR switch "in" and verify output from both EQ OUTputs. Return to initial set-up positions.

6-7. Amplitude Slider Test: Drive both inputs at each of the following frequencies in turn to obtain a 0dB reference output. Move the AMPLITUDE sliders up and down to verify the corresponding boost and cut. After performing this test, return all controls to initial set-up positions.

Freq.	63Hz	250Hz	1kHz	4kHz	16kHz
Boost	+12dB	+12dB	+12dB	+12dB	+12dB
Reference	0dB	0dB	0dB	0dB	0dB
Cut	-12dB	-12dB	-12dB	-12dB	-12dB

Tolerances are ±2dB for both boost and cut

6-8. Center Frequency Control: Drive both inputs at each of the following frequencies in turn to obtain a 0dB reference output. Set the corresponding AMPLITUDE slider to the full cut position. Rotate the center FREQUENCY control from fully counterclockwise to fully clockwise and verify the following changes in level. After performing this test, return all controls to initial set-up positions.

Freq.	63Hz	250Hz	1kHz	4kHz	16kHz
CCW	+6dB	+6dB	+6dB	+6dB	+6dB
Reference	0dB	0dB	0dB	0dB	0dB
CW	+6dB	+6dB	+6dB	+6dB	+6dB

Tolerances are ±1dB for both CCW and CW

6-9. Bandwidth Control: Set the signal generator to each center frequency in turn. Set the corresponding AMPLITUDE slider to the maximum boost position. Sweep through the center frequency and verify a gradual roll-off on each side of the center frequency bandwidth. Next, set the BANDWIDTH control to the .18 octave position, sweep through the center frequency and verify a steep roll-off on either side of the indicated center frequencies. Return all controls to the initial set-up positions.

6-10. Noise Test: Set both LEVEL controls to minimum(CCW). Connect each EQ OUTput in turn to the 20Hz-20kHz bandpass filter and mV meter. Verify less than 20 microvolts of noise. If no bandpass filter is available the noise voltage will in-

rease by approximately 10dB, to 70 microvolts.

6-11. Distortion: Drive each input in turn to obtain a 2-volt output at any frequency within the 20Hz to 20kHz bandwidth. Connect the corresponding channel EQ OUTput to a suitable THD analyzer and verify less than 0.02% THD + Noise.

7-0. DISASSEMBLY

7-1. For access to the component parts of the PL61 paramudder PCB and for access or removal of the filter or level PCB's remove the top cover(9 phillips screws).

7-2. For access to the foil side and component parts solder connections of the PL61 paramudder PCB remove the bottom cover (9 phillips screws).

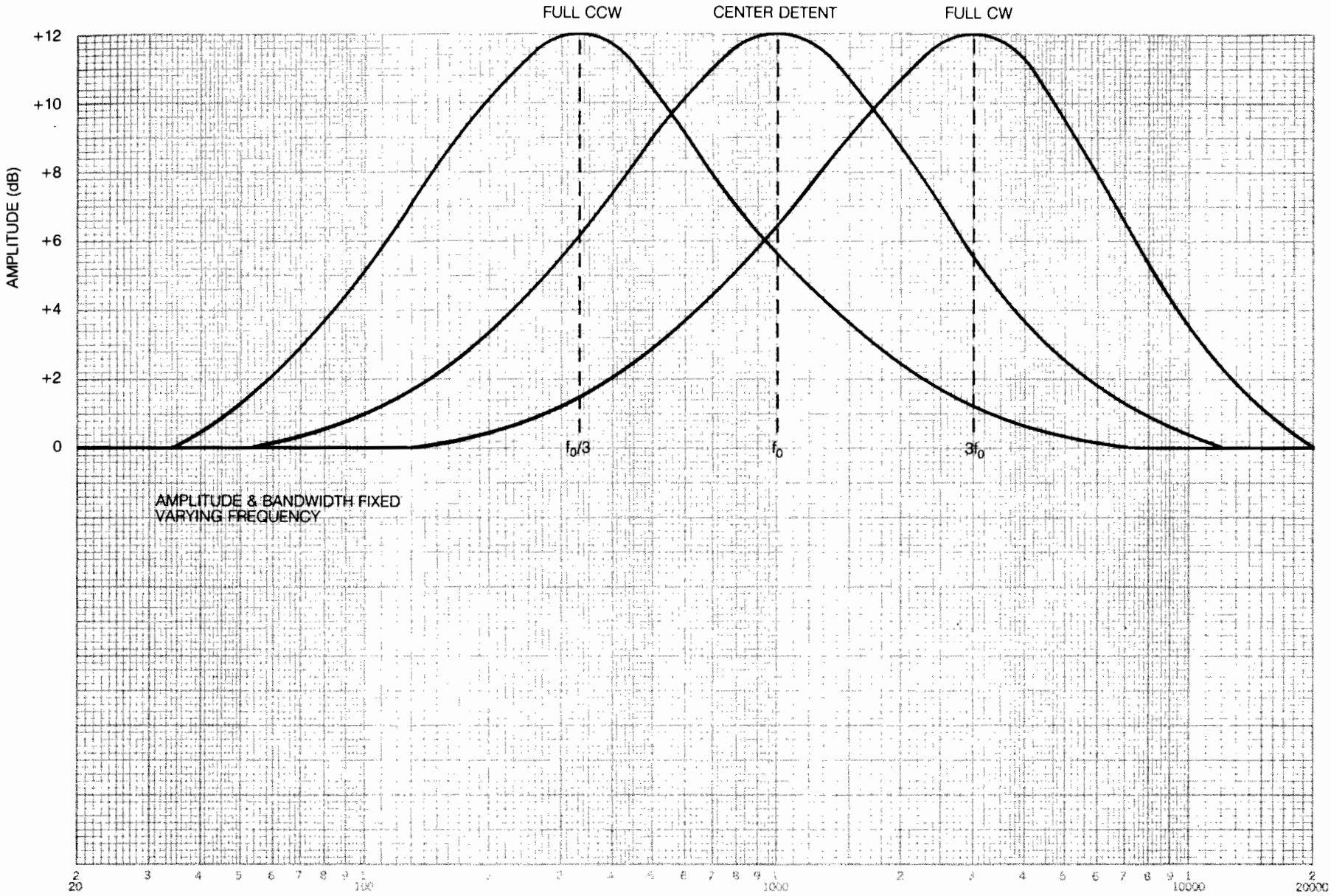
7-3. Front Panel Removal: The front panel can be removed by simply removing the rack-mount handles which in turn affix the front panel to the chassis. The LEVEL knobs must be removed before the front panel can be completely pulled away from the chassis.

7-4. Level PCB Removal. Remove the top cover and front panel(see above). Carefully pull the corresponding LED's away from the mount positioning card. The level PCB can now be pulled away from it's molex connector and removed from the unit.

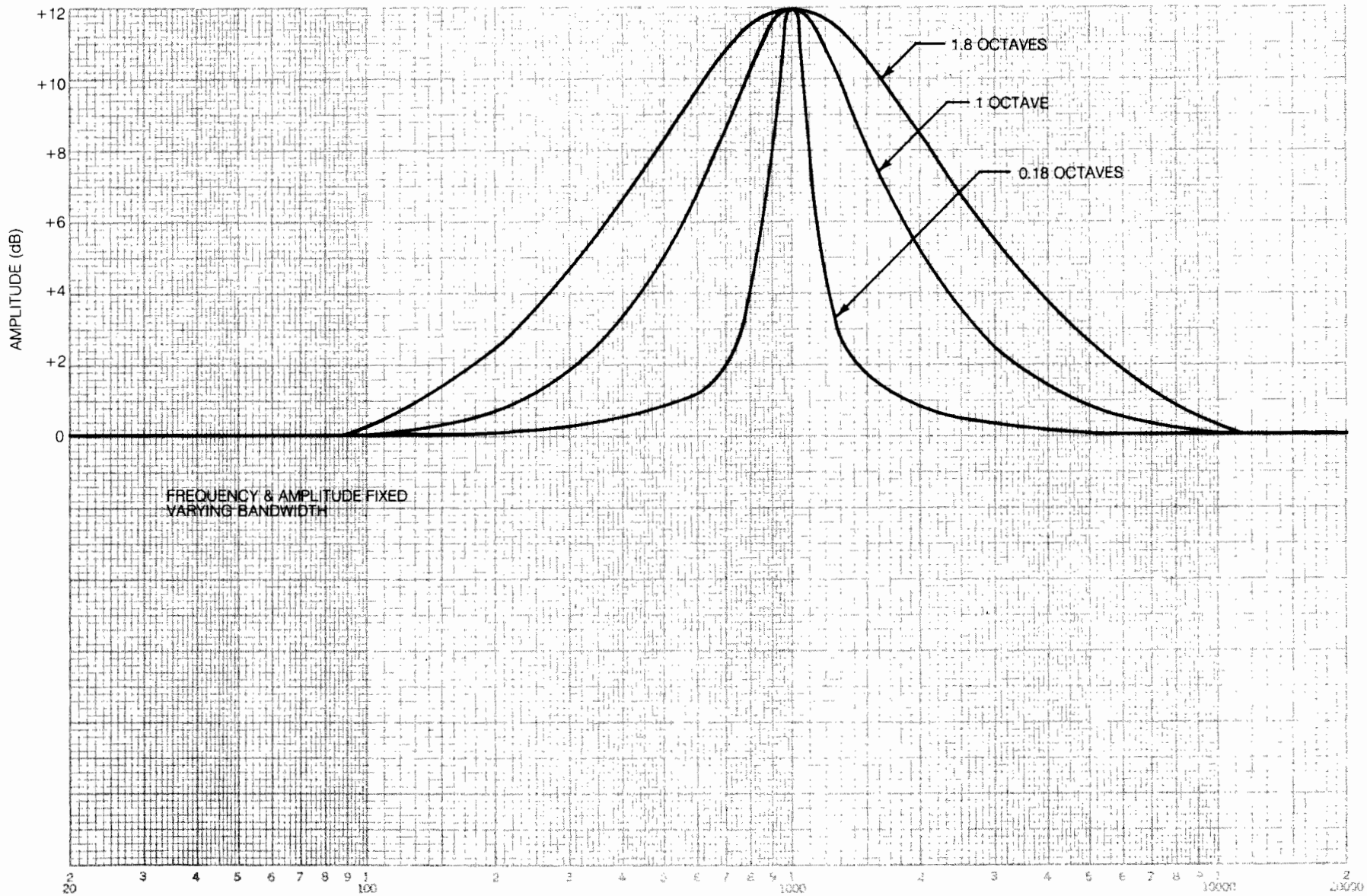
7-5. Filter PCB Removal: Remove the top cover and front panel(see above). Remove the two #4 thread-forming screws (corresponding to the filter PCB to be removed)which attach the PCB mounting bracket to the sub-front panel. The PCB can now be carefully pulled away from the molex connector and removed from the unit.

7-6. Switch Assembly Replacement: For easier access to the switch assembly first remove the left and right channel LEVEL PCB's(see above—step 7-4). Also remove the bottom cover. The switch assembly leads can now be de-soldered and the assembly removed.

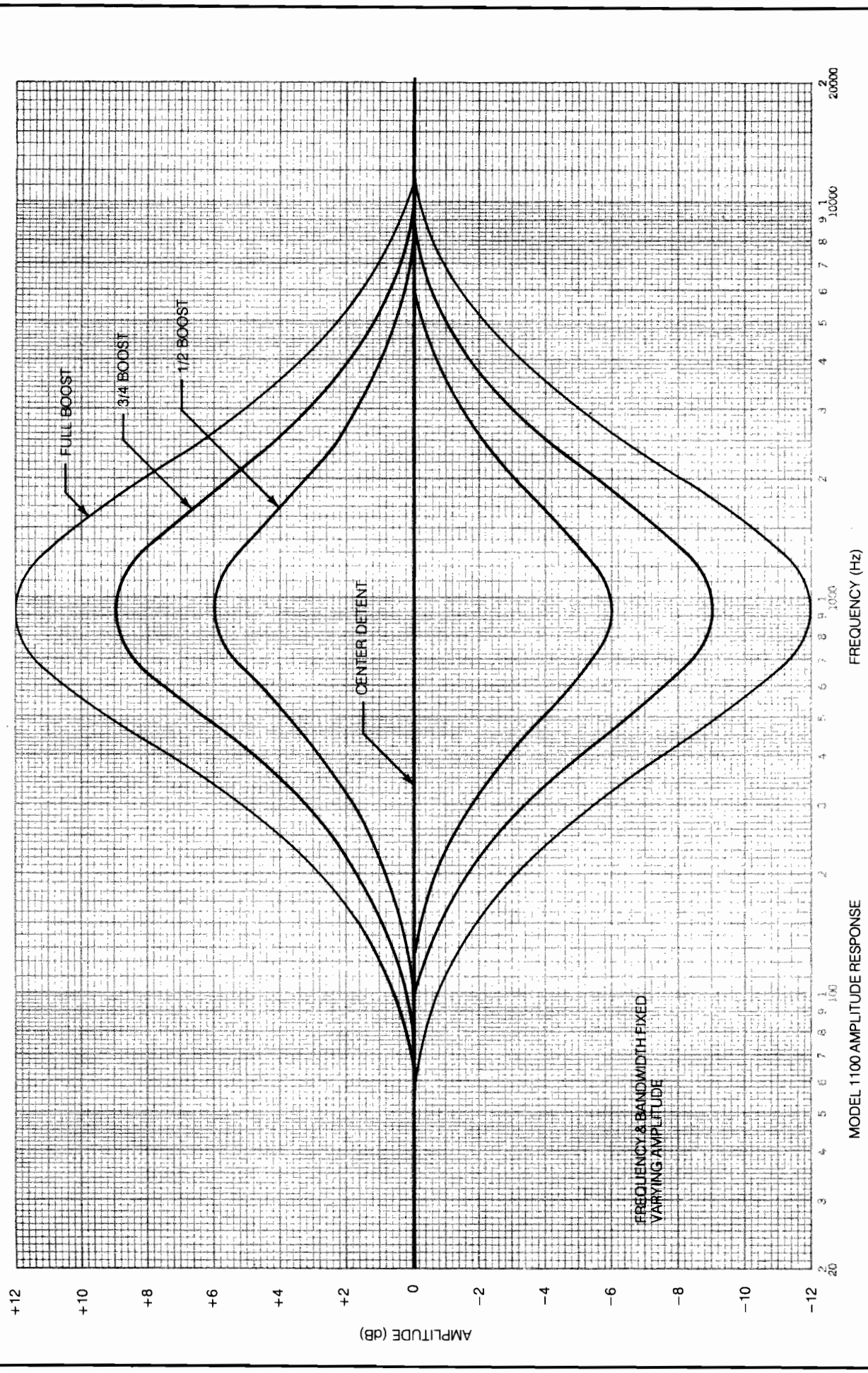
NOTE: Individual switches in the assembly cannot be replaced. If one switch becomes defective, the entire assembly must be replaced.



MODEL 1100 FREQUENCY RESPONSE



MODEL 1100 BANDWIDTH RESPONSE



MODEL 1100 AMPLITUDE RESPONSE

8-0. TROUBLESHOOTING AND ALIGNMENT

Contents:

8-1. Power supply
8-2. Signal output malfunction
8-3. Frequency response/channel separation
8-4. Overload indicator/clipping malfunction
8-5. Bypass malfunction
8-6. Tape monitor
8-7. Amplitude slider/gain trim adjust
8-8. Center frequency control
8-9. Bandwidth control
8-10. Excessive noise
8-11. Distortion

8-1. Power supply:

8-1.1. Power LED will not illuminate upon power up.

a. Remove top cover and check internal line fuse(see section 5-8, page 19 for proper fuse value information).

b. Check power transformer secondary molex connector for oxidation or intermittent contact.

c. Measure power transformer secondary voltage of 37VAC, ±2V unloaded; output at bridge rectifier, + and -19VDC, ±1V; output of regulator IC's Z1 and Z2, + and -12VDC, ±1V.

NOTE: The first model 1100II production run used 15-volt IC regulators. Approximate serial numbers for these units are from PQ1000 to PQ1200.

d. If voltage is still low after component replacement, some component or short condition may be loading the power supply. Turn the unit off immediately to avoid possible damage to the power supply.

Remove plug-in PC boards one at a time to isolate the defective circuit board. If you are still unable to locate the cause, then measure the resistance of each regulated supply to ground with an ohmmeter. If either supply measures less than approximately 450 ohms, trace the supply foil patterns to locate any solder bridges or shorted components.

8-2. Signal output malfunction:

8-2.1. No output from either channel.

a. See sec 8-1.
b. Check and/or replace output relay K1; check relay drive circuit Q1(TIS97)and D9(1N4148).
c. Check input and output jacks.
d. Check bypass and monitor switches for intermittent or open operation.

8-2.2. No output from one channel.

a. See step 8-2.1. b. above.
b. Check corresponding level IC Z201(RC4156).
c. Check corresponding buffer transistor Q201–Q204(TIS97,TIS93).
d. Check input and output jacks.
e. Check monitor and bypass switches.
f. Check all molex connectors for oxidized connections or

cracked or cold solder joints at connector pins.

8-3. Frequency response/channel separation:

8-3.1. Frequency response does not meet specifications.
a. Check and/or replace coupling capacitors C7(2.2/25vNP), C201(.22/100v), and C206(2.2/25vNP).
b. Check for solder bridges on filter PC boards.
c. See section 8-7 below.

8-3.2. Channel separation does not meet specifications.
NOTE: Be sure that the corresponding channel level control is fully clockwise or a shorting plug is used at the input.
a. Check mother, level and filter PC boards for solder bridges between channels.
b. If no bandpass filter is used for this measurement(see section 6-3, page 20)then channel separation should measure approximately 90dB.

8-4. Overload indicator/clipping malfunction:

8-4.1. Overload indicator fails to illuminate on overload inputs.
a. Check corresponding channel overload LED; replace as necessary.
b. Check and/or replace corresponding channel LED drive IC Z201(RC4156).
c. See section 8-1, page 23.

8-4.2. Overload indicator remains illuminated.
a. Check and/or replace corresponding channel LED drive IC Z201(RC4156).
b. See section 8-1, page 23.

8-5. Bypass malfunction:

a. Check and/or replace bypass switch.
b. Check mother PC board for cracked or cold solder joints.

8-6. Tape monitor:

a. Check and/or replace monitor switch.
b. Check tape input and output jacks.
c. Check mother PC board for cracked or cold solder joints.

8-7. Amplitude slider/gain trim adjust:

8-7.1. No boost or cut.
a. Check for defective(broken or cracked)center frequency potentiometer and replace if necessary.
b. Check for cracked or broken amplitude slide pot.
c. Check and/or replace corresponding channel filter PC board IC Z201(RC4156).
d. Check corresponding channel filter PC board for cracked solder joints or solder bridges.
e. See section 8-7.2.

8-7.2. Gain trim adjust.
1. Set sine wave generator to the desired corresponding center frequency.

2. Set amplitude slider to the center detent position.
3. Set levels to obtain a 0dB reference on an AC voltmeter(VTVM).
4. Set amplitude slider to the maximum boost position (+12dB).
5. Adjust gain trim pot R112 for +12dB above the 0dB reference.

8-8. Center frequency control:

8-8.1. No change in center frequency.
a. Check for broken or cracked center frequency pot and replace as necessary.
b. Check and/or replace corresponding channel filter PC board IC Z201(RC4156).
c. Check corresponding channel filter PC board for cracked or cold solder joints.

8-9. Bandwidth control:

8-9.1. No change in bandwidth.
a. Check for broken or cracked bandwidth pot.
b. Check and/or replace corresponding channel filter PC board IC Z201(RC4156).
c. Check corresponding channel filter PC board for cracked or cold solder joints.

8-10. Excessive noise:

a. Check ground lug near power supply.
b. Check/tighten mother PC board mounting/chassis ground screw near power supply.
c. Check and/or replace corresponding channel level PC board IC Z201(RC4156).
d. Check and/or replace buffer transistors Q201–Q204(TIS97, TIS93).
e. See section 8-1, page 23.

8-11. Excessive distortion:

a. Check and/or replace buffer transistors Q201–Q204(TIS97, TIS93).
b. Check corresponding channel level PC board IC Z201(RC4156).
c. Check mother PC board for cracked/cold solder joints.
d. Check input and output jacks.
e. See section 8-1, page 23.

9-0. PARTS LIST

Transistors:	PL Part No.
GES 97	126-0033
GES 93	126-0009

Integrated Circuits:	
78M15(+15v)	126-0111
79M15(-15v)	126-0112
78M12(+12v)	126-0121
79M12(-12v)	126-0122
RC4156(TLO74)	126-0062

Diodes:	
1N4148	126-0002
1N4004	126-0003
1N34	126-0021
LED:amber	126-0065

Capacitors:	
1000/50v:lytic:rad	127-0131
1000/25v:lytic:rad	127-0098
100/35v:lytic:rad	127-0034
100/10v:lytic:rad	127-0132
100/6.3v:lytic:rad	127-0033
2.2/25v:lytic:NP:ax	127-0141
22/10v:lytic:rad	127-0078
10/35v:lytic:rad	127-0101
.1/100v:mylar	127-0015
.22/100v:mylar	127-0028
.068/100v:poly	127-0148
.018/100v:poly	127-0149
.0047/100v:poly	127-0150
.001/100v:poly	127-0151
270pF/100v:mica	127-0152
.0027/150v:disc	127-0049
.01/100v:disc	127-0005
620pF/100v:disc	127-0046
68pF/100v:disc	127-0003

Switches:	
Sw. assy:3-station	129-0118
Relay:output	129-0064

POTENTIOMETERS:	
5K trim	129-0001
Level:50k-B	129-0119
Frequency:100k:dual	129-0120
Bandwidth:10k:RD	129-0121
Amplitude:slide:50kL	129-0122

Transformer:	PL Part No.
117-220v/30v:CT	125-0037

Printed Circuit Boards:	
PL61 paramudder	210-0246
PL59 level	210-0239
PL60 filter:63Hz	210-0240
PL60 filter:250Hz	210-0241
PL60 filter:1kHz	210-0242
PL60 filter:4kHz	210-0243
PL60 filter:16kHz	210-0244

Front Panel Components:	
Knob:level:.5"dia	142-0040
Knob:bdwth/freq:blk	142-0043
Knob:slide pot	142-0044
Pushbutton:switch	142-0028
Handle:rack-mount	142-0027
Handle end ferrule	143-0015

Metalwork:	
Front panel	220-0081
Sub-front panel	220-0078
Chassis	220-0080
Cover:top	220-0079
Cover:bottom	141-0127
Cover:transformer	141-0192
Plate:anti-ro:fuse	141-0190
Hum shield:pwr.sw	141-0203
Bracket:pot support	141-0197

Miscellaneous:	
Jack:phono:quad:PCB	121-0121
Jack:phono:dual:PCB	121-0132
Line cord:18-2	121-0016
Strain relief	121-0029
Fuseholder:AGC-open	121-0083
Fuse:AGC-1/8	121-0067
Foam back:slide pot	141-0191
Collector:LED	141-0196
Grommet:7/16"	121-0060
Grommet:9/16" ID	121-0217
Term. strip:3-lug	121-0216

USE ONLY REPLACEMENT PARTS ISSUED OR AUTHORIZED BY THE PHASE LINEAR FACTORY SERVICE DEPARTMENT. THE USE OF UNAUTHORIZED SUBSTITUTE PARTS BY A FACTORY-AUTHORIZED SERVICE AGENT WILL VOID THE FACTORY WARRANTY ON THE UNIT IN WHICH THEY ARE INSTALLED.

Phase Linear CORPORATION

20121 - 48th Avenue West, LYNNWOOD, WASHINGTON 98036 U.S.A. Telephone: (206) 774-3571

SERVICE BULLETIN

Please Read!

SUBJECT: Servicing of New Products:300II, 1100II, 1200II, 5100II, 7000II, and 8000II

In the past few months we have introduced six new products, some of which require special test equipment or jigs for proper testing and servicing. Attached you will find a list of required equipment/jigs for servicing these products. If you do not wish to acquire these items it will be necessary for you to return the defective unit directly to the factory service department for any major repairs. If you do wish to acquire them and cannot obtain the items or equivalents locally you may order items marked with an asterisk (*) from the Phase Linear Factory Service Department. There is an approximate 10 week lead time on equipment and jigs ordered. The exact price will be billed to your account when it has been determined.

It is our goal to provide service manuals for new products within four months after the first shipment of each new product. As you may or may not know, the models 5100II, 7000II, and 8000II are designed and manufactured by Pioneer Corporation in Japan. Therefore, it is their responsibility to provide us with service information for these three products such that we at Phase Linear can have the manuals printed in quantity and distribute them to our authorized servicing outlets. However, service manuals have been slow in coming from Pioneer and appear to be incomplete. Because of this we at the factory service department will have to revise or rewrite portions of the service manuals before we can have them printed and distributed. We are also in the process of writing service manuals for models 300II, 1100II, and 1200II but do not expect these to completed for the next several weeks but we are diligently working on them, so please bear with us. We will distribute service manuals to you as each is completed.

Parts for the models 5100II, 7000II, and 8000II must be ordered through Phase Linear from Pioneer. There is a minimum six week lead time for us to receive parts from Pioneer once the order is placed. We have placed an initial parts stocking order with Pioneer and a few of these parts are now starting to arrive; others are being delayed due to circumstances beyond our control. Most parts ordered for these three products from us by dealers or servicing outlets must placed on back order for the time being. Most all parts are readily available for the models 300II, 1100II, and 1200II.

If you have questions regarding this bulletin or if you require assistance contact the Phase Linear service department.

Required Test Equipment for Servicing of Models 300II, 1100II, 1200II, 5100II, 7000II, and 8000II

Model	Item	Major Spec or Requirement	Model or Equiv.	Approx. Cost ($)
300II	Dist.Analyzer	<.015%THD+N, <.005%IMD	Sound Tech 1700B	2000
1100II	No special test equipment required			
1200II	Microphone Calibrator	94dB @ 1KHz	B&K 23014	230
	SPL Meter	80dB range	ADC SLM100	75
5100II	AM Sig.Gen.	15uV sensitivity	*Meguro M221C	1000
	FM Sig.Gen.	Mono dist. <.05%	*Meguro MSG290A	5800
		Stereo dist. <.08% NOTE: Sound Tech 1000A okay for service only; will not resolve to specs.	*Meguro MSG211FSII Stereo Adaptor	1800
	Freq.Counter	76KHz	Heath SM4120	200
7000II	Wow/Flutter Meter	.03% JIS Wtd.	*Meguro MK668D	1000
	mV Meter(x2)	-80dB	HP 440GL	450 ea.
	Step Attenuator	Max 121dB;0.1dB/step	*Kikusui 984A	300
	Head Base Jig	Used for head replcmt.	*Custom Made	60
	Bar Tension Gauge	500g scale	*Ohba Siki	20
	Torque Cassette	Reel motor torque adj.	*Custom Made	60
	Mirror Cassette	Tape guide adjustment	*Custom Made	25
	Alignment Tool	0.07" square tip	*Pioneer GGK030	2
	Span Screw-driver	Head cover appearance screw removal & ass'y.	* Similar to Pioneer GGK035	must be cstm. made
	Pre-recorded Test Tapes	Tape speed/W&F	*Pioneer STD301	35
		Playback level adj.	*Pioneer STD303	35
		Frequency response	*Pioneer STD331A	35
		Head Azimuth	*Pioneer STD341A	35
	Blank Test Tapes	STD playback	*Pioneer STD601	20
		Chrome blank	*Pioneer STD603	20
		Metal blank	TDK Metal	--
		FeCr blank	Sony Duad	--
8000II	Wideband W/F Meter	.013% DIN-B	*Meguro MK615	2350
	Tracking Jig	Track sens.zero adj.	*Custom Made	35
	Silicone Oil	CS125000	--	--
	Motor Drive Dummy Load	Tracking sensor adj.	see schematic	
	Tonearm Jig	Blueprint provided		

(*)Available from Phase Linear Service Department on special order basis.