BU-150

Powered Subwoofer

SERVICE MANUAL

Infinity Systems Inc.
250 Crossways Park Drive
Woodbury, N.Y. 11797
1-800-553-3332

A Harman International Company

Rev A 3/2000

SAFETY INFORMATION

Warning

Any person performing service of this unit will be exposed to hazardous voltages and the risk of electric shock. It is assumed that any person who removes the amplifier from this cabinet has been properly trained in protecting against avoidable injury and shock. Therefore, any service procedures are to be performed by qualified service personal ONLY!

Caution

This unit does not have a power switch. Hazardous voltages are present within the unit whenever it is plugged in.

Before the amplifier is plugged in, be sure its rated voltage corresponds to the voltage of the AC power source to be used. Incorrect voltage could cause damage to the amplifier when the AC power cord is plugged in. Do not exceed rated voltage by more than 10%: operation below 90% of rated voltage will cause poor performance or may shut the unit off.

List of Safety Components Requiring Exact Replacements

F1	Fuse SLO BLO 1.5A 250V 20mm. UL approved
PWRCORD	SPT-2 or better with polarized plug, UL approved wired with the hot side to fused side. Use with factory replacement panel strain relief only.
T1	Transformer. Use only factory replacement.
DBR	Bridge diode. Use only factory replacement.
C1, 2	2200uF, 100V electrolytic filter caps. Be sure replacement part is at least the same working voltage and capacitance rating. Also the lead spacing is important. Incorrect spacing may cause premature failure due to internal cabinet pressure and vibration.
C6	4.7uF 100V electrolytic radial
S64AMI	Power output module. Use only factory replacement
Faceplate	Faceplate. Use only factory replacement
Air leak cover	Use only factory replacement
CMC1	Use only factory replacement
L1	Use only factory replacement
Fuse PCB	Use only factory replacement
Main PCB	Use only factory replacement

Leakage/Resistance Check

Before returning the unit to the customer, perform a leakage or resistance test as follows:

Leakage Current. Note there is no power switch on this unit. When the power plug is plugged in, the unit is live. Connect the unit to its rated power source. Using an ammeter, measure the current between the neutral side of the AC supply and chassis ground of the unit under test. if leakage current exceeds 0.5mA, the unit is defective. Reverse the polarity of the AC supply and repeat.

Resistance. Measure the resistance from either side of the line cord to chassis ground. If it is less than 500k ohms, the unit is defective.

WARNING! DO NOT return the unit to the customer if it fails one of these tests until the problem is located and corrected.

TABLE OF CONTENTS

GENERAL SPECIFICATIONS

Frequency Response (±3dB)	28Hz – 150Hz
Output (RMS)	200W
Driver	15" Woofer
Crossover Frequency	50Hz ~ 150Hz (continuously variable)
Dimensions (H x W x D)	17 ¾ " x 17 ¾ " x 17 ¾ " (451 x 451 x 451mm) Add 1¾ " (4.5cm) for feet.
Weight	55 lbs/20 kg

Refinements may be made on occasion to existing products without notice,
but will always meet or exceed original specifications unless otherwise stated.

DETAILED SPECIFICATIONS

LINE VOLTAGE	Yes/ No	Hi/Lo Line	Nom.	Unit	Notes
US 120vac/60Hz	Yes	108-132	120	Vrms	Normal Operation
Parameter	**Specification**	**Unit**	**Test Limits**	**Conditions**	**Notes**
Amp Section					
Type (Class AB, D, other)	D		n/a		Class D Preferred...Sink required for Class AB
Load Impedance (speaker)	8	Ohms	n/a	Nominal	Z-curve required
Rated Output Power	200	Watts	120	1 input driven	Input voltage 120 VAC, 60 Hz
THD	1	%	2	22k filter	120W (Power Bandwidth 30-100Hz) @ 120 VAC
THD @ 1 Watt	0.5	%	0.5	22k filter	
DC Offset	<20	mV-DC	30	@ Speaker Outputs	
Damping factor	>80	DF	>50		Measured across amplifier outputs
Input Sensitivity					
Input Frequency	35	Hz		Nominal Freq.	1 input driven
Line Input	265	mVrms	±2dB	To Rated Power/ Vol @ Max	1 input driven: AP source Z = 600 ohms
Speaker/Hi Level Input	7	Vrms	±2dB	To Rated Power/ Vol @ Max	1 input driven: AP source Z = 25 ohms
Signal to Noise					
SNR-A-Weighted	100	dBA	90	Relative to rated output	A-Weighting filter
SNR-unweighted	75	dBr	70	Relative to rated output	22k filter
SNR rel. 1W-unweighted (22k)	65	dBr	55	relative to 1W Output	22k filter
Residual Noise Floor	2	mVrms	3	Volume @max, using RMS reading DMM/VOM (or A/P) , BW <20KHz	
Residual Noise Floor	1.5	mVrms(max)	2	Volume @max, w/ A/P Swept Bandpass Measurement (Line freq.+ harmonics) , BW<20Khz	
Input Impedance					
Line Input	10K	ohms	n/a	Nominal	
Speaker/Hi Level Input	5K	ohms	n/a	Nominal	
Filters					0dBr = 1w @ 50Hz
Low Pass (fixed or variable)	Variable				
Low Pass filter (point or range)	60-180	Hz	±2dB	-3dB Point	
Slope	24	dB/Octave	n/a		
Q	1	Damping	n/a		
Subsonic filter (HPF)	25	Hz	±2dB	-3dB Point	
Slope	12	dB/Octave	n/a		
Q	1	Damping	n/a		

Limiter (yes/no)	yes				
THD at Max. Output Power	10	%	functional ck.	Maximum Output Power	Maximum THD as a result of limiting.
Features					
Phase Switch (yes/no)	YES	—	functional ck.		45 deg additional phase shift/switch op.OK
Volume pot Taper (lin/log)	LOG	—	functional ck.		
Input Configuration		—			
Line In (L&R)	LR	—	functional ck..		
Spkr/Hi Level In (L&R)	L,R	—	functional ck..	Enabled w/Line/Spkr Input Select Switch	
Spkr Out: Hi Pass Filter	100	Hz	functional ck..	8 ohm Satellite: 6dB/oct passive xover 200 Uf cap. Non polarized	
Signal-Present LED	Yes				
Signal-Present Input Freq.	35	Hz		Nominal	
Signal-Present Level line in	30	mV		35Hz into Line Input w/ 1 ch. Driven	Zo=600 Ohms
Signal-Present Speaker -in	2.6	V		35Hz into Speaker Input w/ 1 ch. Driven	
Signal-Present Turn-on time	1	sec.		Amp connected and AC on, then input signal applied	
Auto Mute/ Turn-OFF Time	> 3	min.		T before muting, after signal is removed	
Power on Delay time	1	sec.	3	AC Power Applied	
Transients/Pops					
Signal-Present Transient	5	mV-peak	n/a	@ Speaker Outputs	
Turn-on Transient	1	mV-peak	2v-pp	@ Speaker Outputs	AC Line cycled from OFF to ON
Turn-off Transient	2	mV-peak	4v-pp	@ Speaker Outputs	AC Line cycled from ON to OFF
Efficiency					
Stand-by Input Power	20	Watts	28	@ nom. line voltage	Input Line voltage 120 VAC
Power Cons.@rated power	210	Watts	220	@ nom. line voltage	
Efficiency	95.24%	%	54.55%	Relative to rated output	
Protection					
Short Circuit Protection	YES		functional ck..	Direct short at output	
Thermal Protection	YES		functional ck..	@1/8 max unclipped Power	Power transformer 85 deg C.
Line Fuse Rating	2	Amps	2		Slo-Blo type

CONTROLS AND THEIR FUNCTION

1. High-Level input and Output terminals

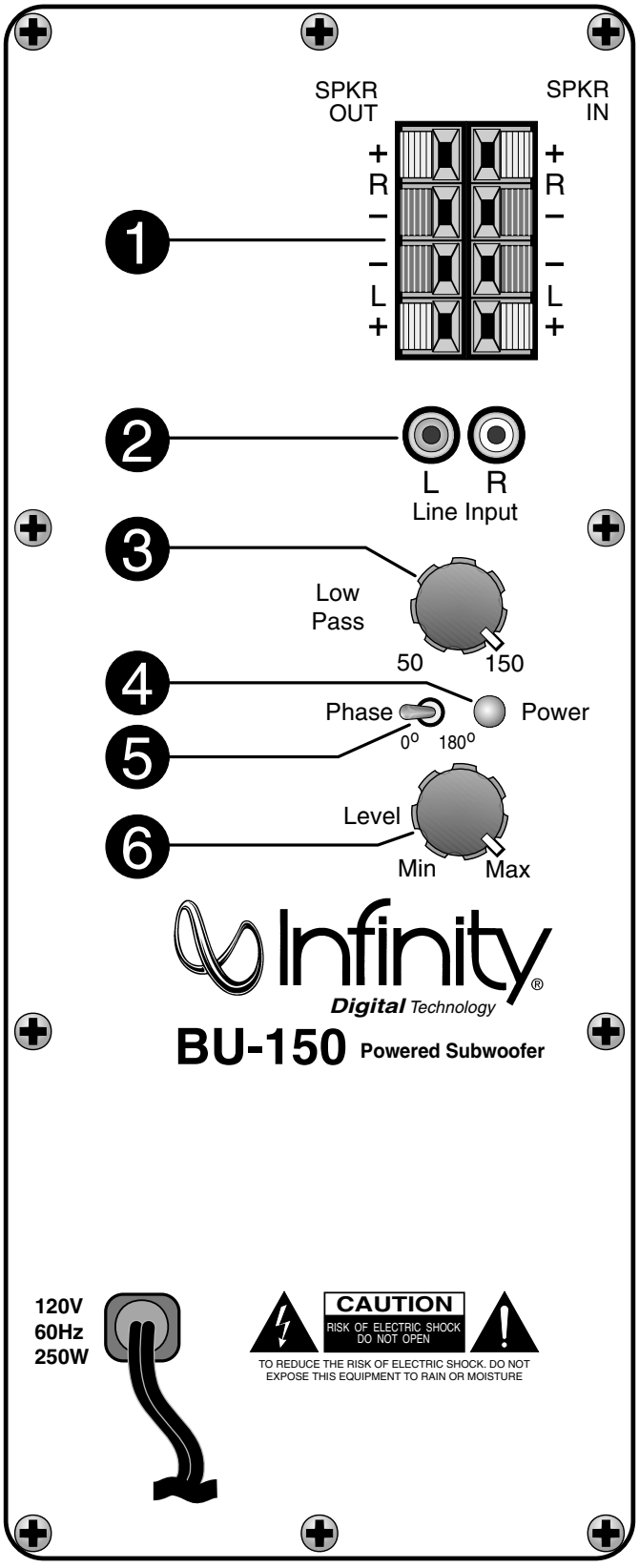
2. Low-Level Input Jacks: connect to preamplifier outputs

3. Low Pass: This is the crossover frequency control which determines the upper-corner roll-off points.

4. Power-On indicator

5. Phase: 0/180 switch to change audio-signal polarity.

6. Level: This controls the volume level of the subwoofer.



BU-150 CONNECTIONS

When connecting your subwoofer make sure you turn all the power off.

There are several ways to connect your subwoofer. Read this section carefully to determine which method is best suited for your installation.

The subwoofer may be fed directly with a low-level signal taken from a preamplifier's output by using the second set of output jacks on the rear of the preamplifier (See Figure 1). If a preamplifier has only one set of outputs, you may use two (2) "Y" connectors (See Figure 2) to connect the subwoofer. Use standard shielded leads terminated at each end with male RCA connectors. Connect one end of each stereo pair of leads to the preamplifier's left and right outputs and connect the other end to the corresponding left and right LOW-LEVEL INPUTS (1) on the subwoofer.

If you are using a tube preamplifier and the connecting leads will be longer than 10 feet (3 meters), we recommend not using the above connection method. A tube preamplifier may not be able to handle the capacitance introduced by leads more than 10 feet in length. Instead, try using the high-level connection methods listed on pages 5-7.

Figure 1. **- A low-level signal can be used from a preamp's output by connecting second set of output jacks to the rear of your amplifier.**

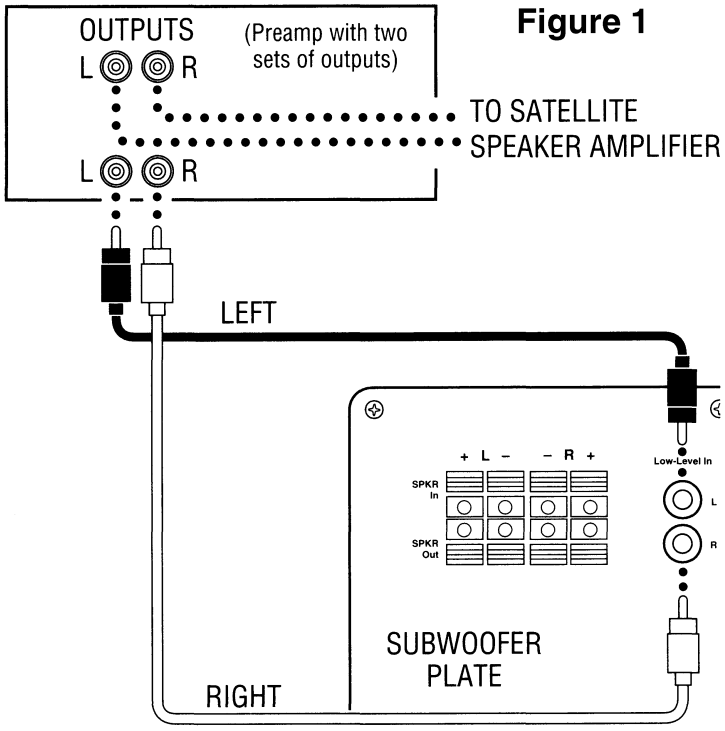
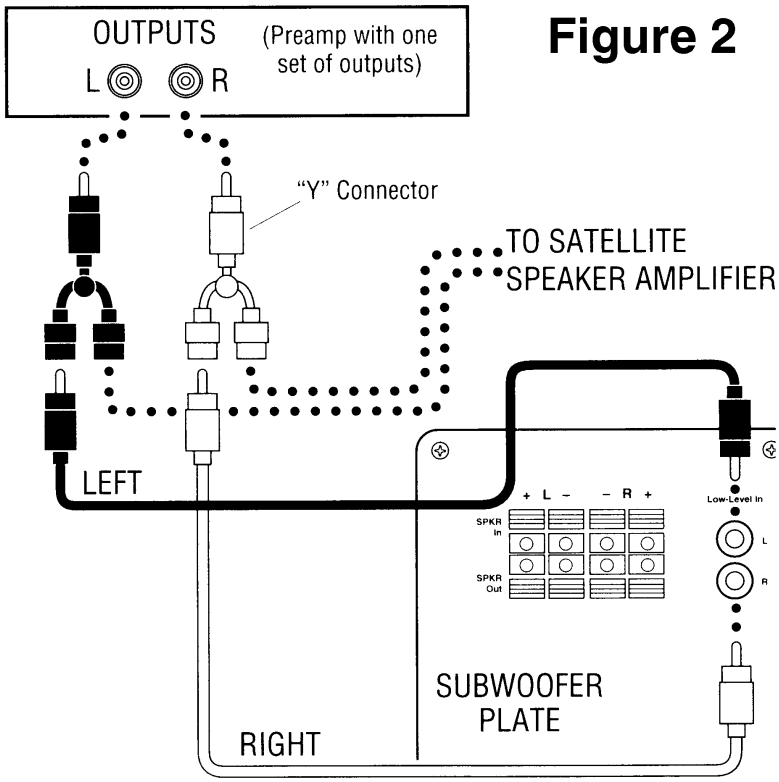


Figure 2. **- You can use this method (2"Y" connectors) if your preamp has only one set of outputs.**



When using a single subwoofer, you MUST use a pair of stereo low-level leads from your preamplifier's outputs. When using two subwoofers, one for the left and another for the right channels, connect the left preamplifier output to BOTH the left and right LOW-LEVEL INPUTS of the subwoofer used for the left channel by using a Female-to-Male "Y" connector at the subwoofer's output. Connect the right-channel preamplifier output to both jacks of the right-channel subwoofer in the same manner (See Figure 3). If the preamplifier has a mono subwoofer output, you'll also need a Male-to-Female "Y" connector to split the mono signal to the subwoofer pair (See Figure 3).

Figure 3

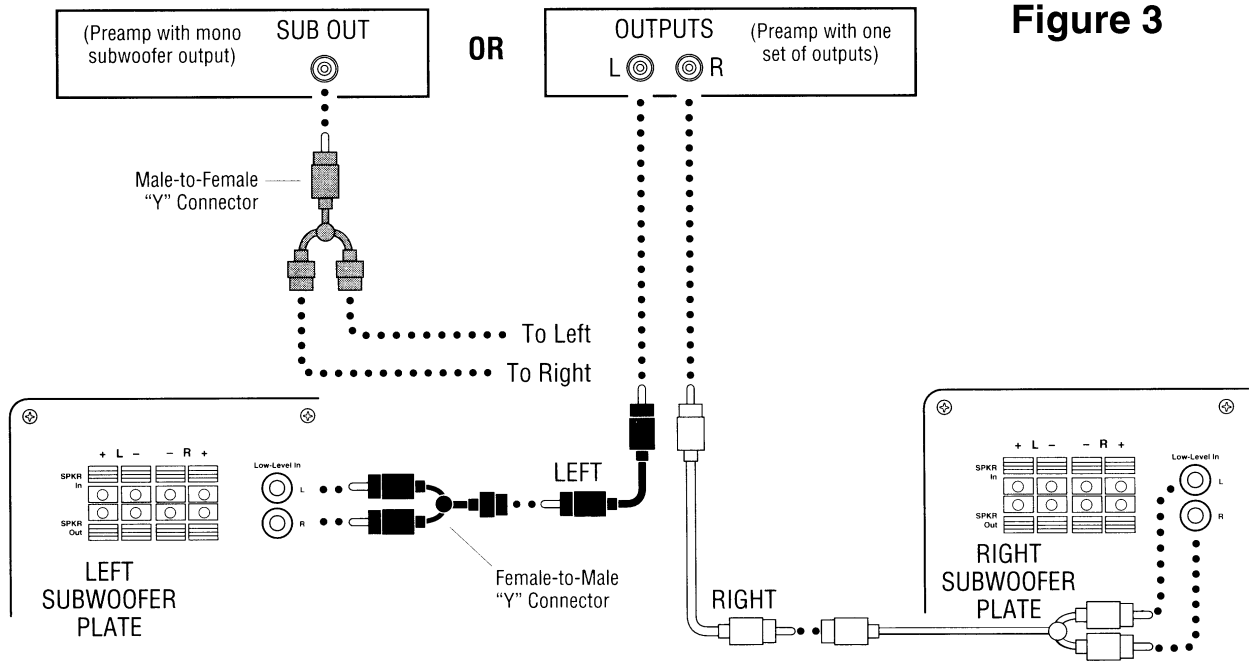


Figure 3. - Use this method when using single subwoofer or two subwoofers.

The subwoofer may be connected to your system using the HIGH-LEVEL INPUTS (4) on the plate located on the rear panel of the subwoofer. Use speaker wire, maintaining proper polarity (+ to + and - to -). Attach the speaker wire to the left and right HIGH-LEVEL INPUTS on the subwoofer and the other ends to the proper left and right OUTPUTS on your amplifier or receiver (See Figure 4).

If you plan to use two subwoofers (one for the left and the other for the right channel), connect wires from the left and right OUTPUT on your power amplifier or receiver and attach the other ends to the corresponding HIGH-LEVEL INPUTS on each subwoofer. Observe polarity (See Figure 6).

Figure 4. - Use this method when using a single subwoofer.

Figure 4

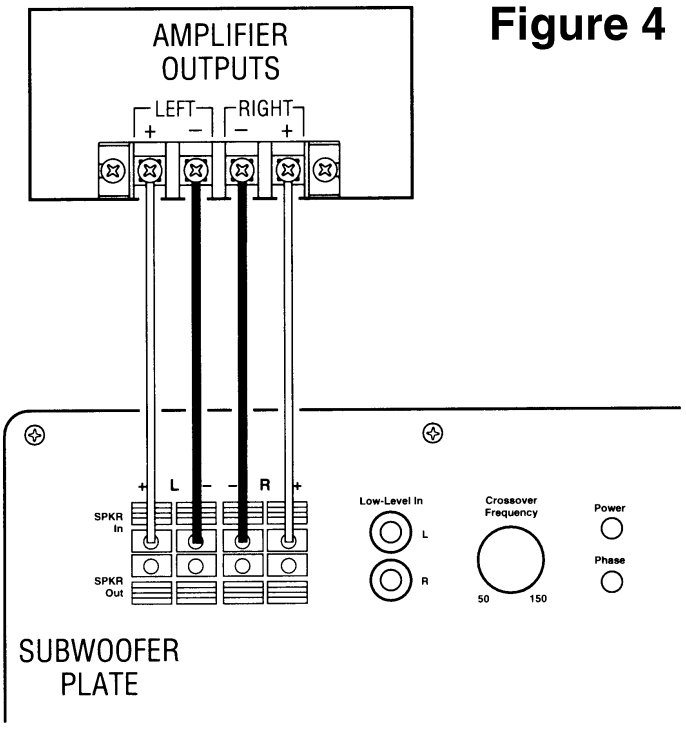


Figure 5. - Use this method when using two subwoofers.

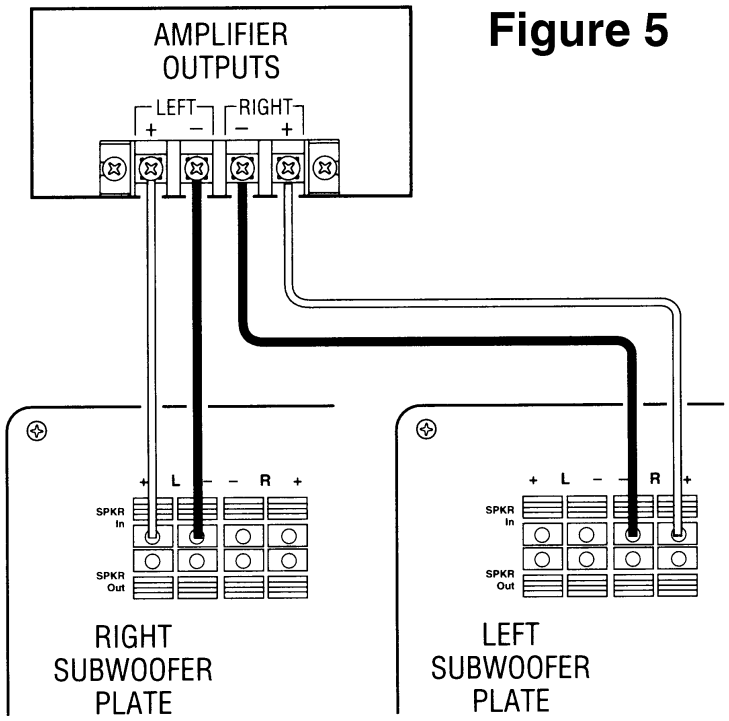


Figure 6. - Use this method when connecting one subwoofer to satellites.

Depending on whether you are using one or two subwoofers, connecting your satellites can be accomplished in one of two ways. If you are using a single subwoofer with a pair of satellites, connect them as shown in Figure 7.

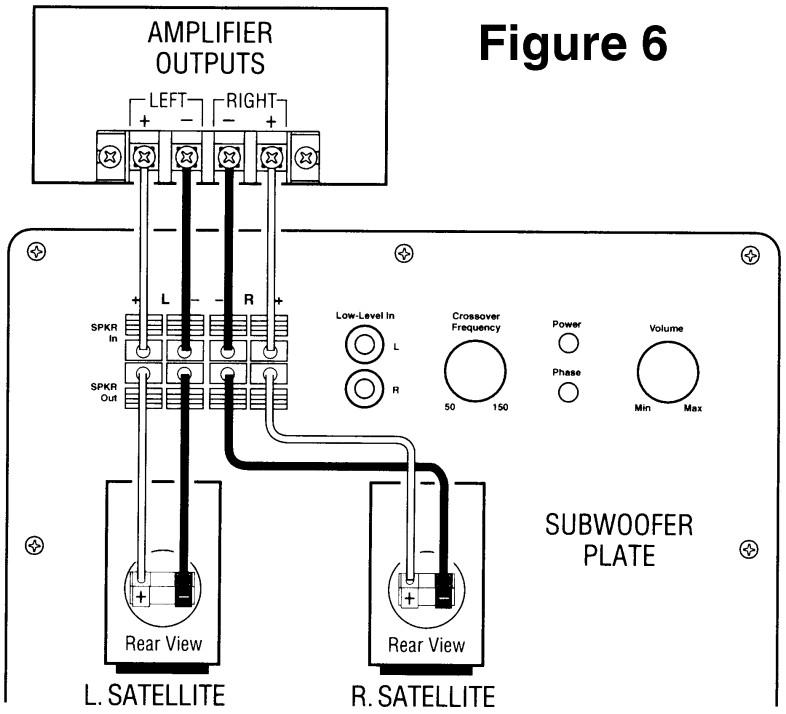


Figure 7. - Use this method when connecting two subwoofers to satellites.

If you are using two subwoofers as a stereo pair with a pair of satellites, connect them as shown in Figure 7.

The subwoofer has a variable frequency control that can be used to block unwanted frequencies (between 50 - 150Hz) from being reproduced by the subwoofer. When you set this control depends on the low-frequency capabilities of your satellite speakers. Adjust this knob to the lowest frequency that you satellite speakers were designed to reproduce (refer to Operation, step 7).

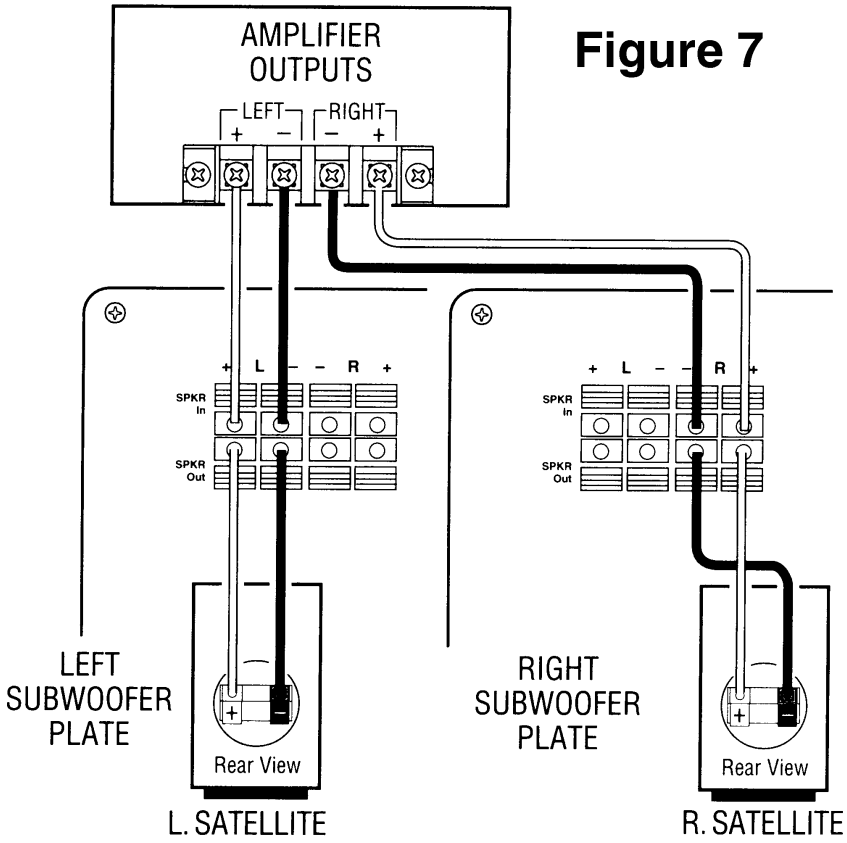


Figure 7

OPERATION

Setting the Controls

1. Initially set the subwoofer's Volume control to the minimum position.

2. Initially set the subwoofer's Crossover Frequency control to 12 o'clock.

3. Set the subwoofer's Phase switch to the "NOM" position

Turn the Power On

4. Turn on the entire audio system and play any music source.

5. Turn the Volume control to its mid position. If no sound emanates from the subwoofer, check the AC line cord and input cables. Are the connectors on the cables making proper contact? Is the AC plug connected to a "live" receptacle?

Adjusting the Volume

6. Set the overall volume control of the preamplifier or stereo to a comfortable level. Adjust the subwoofer's Volume control until you obtain a pleasing blend of bass. Bass response should not overpower the room but rather be adjusted so there is a harmonious blend across the entire musical range. Many users have a tendency to set the subwoofer volume too loud following the belief that a subwoofer is there to produce lots of bass. This is not entirely true. A subwoofer it there to enhance bass, extending the response of the entire system so the bass can be felt as well as heard. However, overall balance must be maintained; otherwise, the music will not sound natural. An experienced listener will set the volume of the subwoofer so its impact on bass response is always there but is never obtrusive.

The Crossover Frequency Controls

7. The Crossover Frequency control sets the high-frequency roll-off, adjustable from 50 to 150Hz. Where you set this control depends on the low-frequency capabilities of your satellite speakers, system placement, and other factors affecting the mid-bass region. Turn the control UP (clockwise) until you feel there is too much mid-bass information (around 100Hz), then back the control down a bit until that area sounds more natural. To hear more low bass, turn the Crossover Frequency control DOWN a bit and the Volume control UP by about the same amount. This will increase low bass while leaving the mid-bass sounding the same as it did before the adjustment. To reduce low bass without changing midbass, turn the Crossover Frequency control UP and the Volume control DOWN. Switch the Phase switch between "NOM" and "REV" positions while listening to music. The selection that sounds the best is the correct adjustment for your system.

Room Placement

8. The room placement of the subwoofer is the most critical aspect of its installation. It will be necessary for you to try various locations in your listening room before you choose the final location. Some possible starting points include: behind the right channel satellite speaker, along the back wall between the satellites, along a side wall (but not too close to a corner), or behind a couch or a chair.

In general, the closer the subwoofer is to wall and corners, the greater the effect of low-frequency enhancement. Experiment with the Crossover Frequency and Volume controls in different locations until you are pleased with the result you obtain from your particular application.

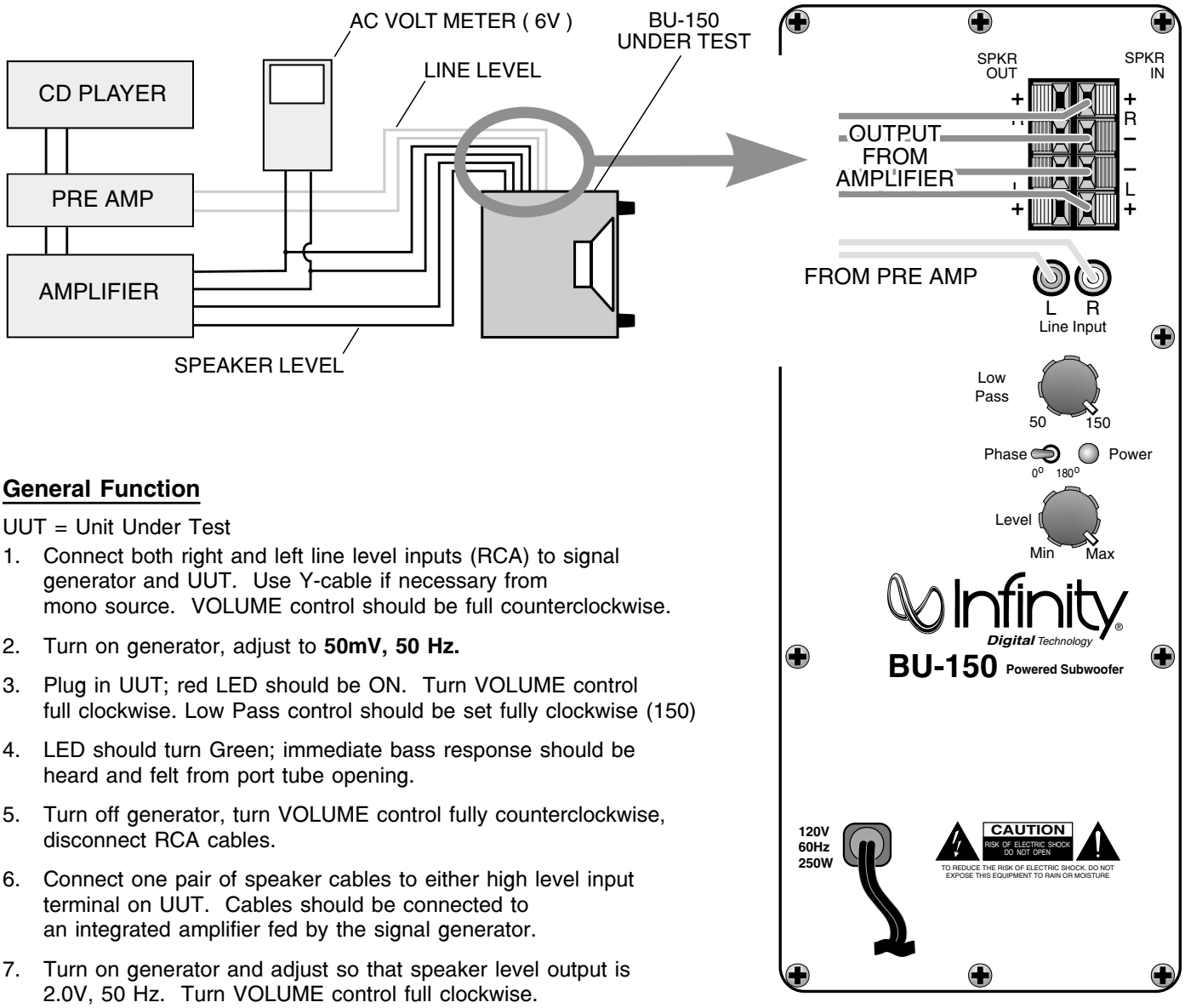
A Word of Advice

The Low-Frequency Roll-off and Volume controls may be set anywhere within their rotation. However, it will be a most unusual circumstance if you have to set the Volume control completely clockwise. This may indicate an unbalanced condition in your system (too much bass) or an especially large room, or room placement may not be correct. Try several other locations before concluding that the Volume control must be set at maximum.

A Word About Tone Controls

The tone controls on your electronic components (preamplifier, receiver, etc.) should be used with the utmost discretion. Excessive boost can create severe power demands on your power amplifier. Maximum bass boost can create a demand for literally hundreds of watts in the bass region, whereas in the "flat" position, or with the tone controls switched out of the system, your average listening level may be impressively and realistically loud at less than 10 watts. The remaining power capacity required is on reserve for power peaks on sharp transients and powerful crescendos.

BU-150 TEST SET UP AND PROCEDURE



General Function

UUT = Unit Under Test

1. Connect both right and left line level inputs (RCA) to signal generator and UUT. Use Y-cable if necessary from mono source. VOLUME control should be full counterclockwise.
2. Turn on generator, adjust to **50mV, 50 Hz.**
3. Plug in UUT; red LED should be ON. Turn VOLUME control full clockwise. Low Pass control should be set fully clockwise (150)
4. LED should turn Green; immediate bass response should be heard and felt from port tube opening.
5. Turn off generator, turn VOLUME control fully counterclockwise, disconnect RCA cables.
6. Connect one pair of speaker cables to either high level input terminal on UUT. Cables should be connected to an integrated amplifier fed by the signal generator.
7. Turn on generator and adjust so that speaker level output is 2.0V, 50 Hz. Turn VOLUME control full clockwise.
8. Green LED should light, immediate bass response should be heard and felt from the port tube opening.

Sweep Function

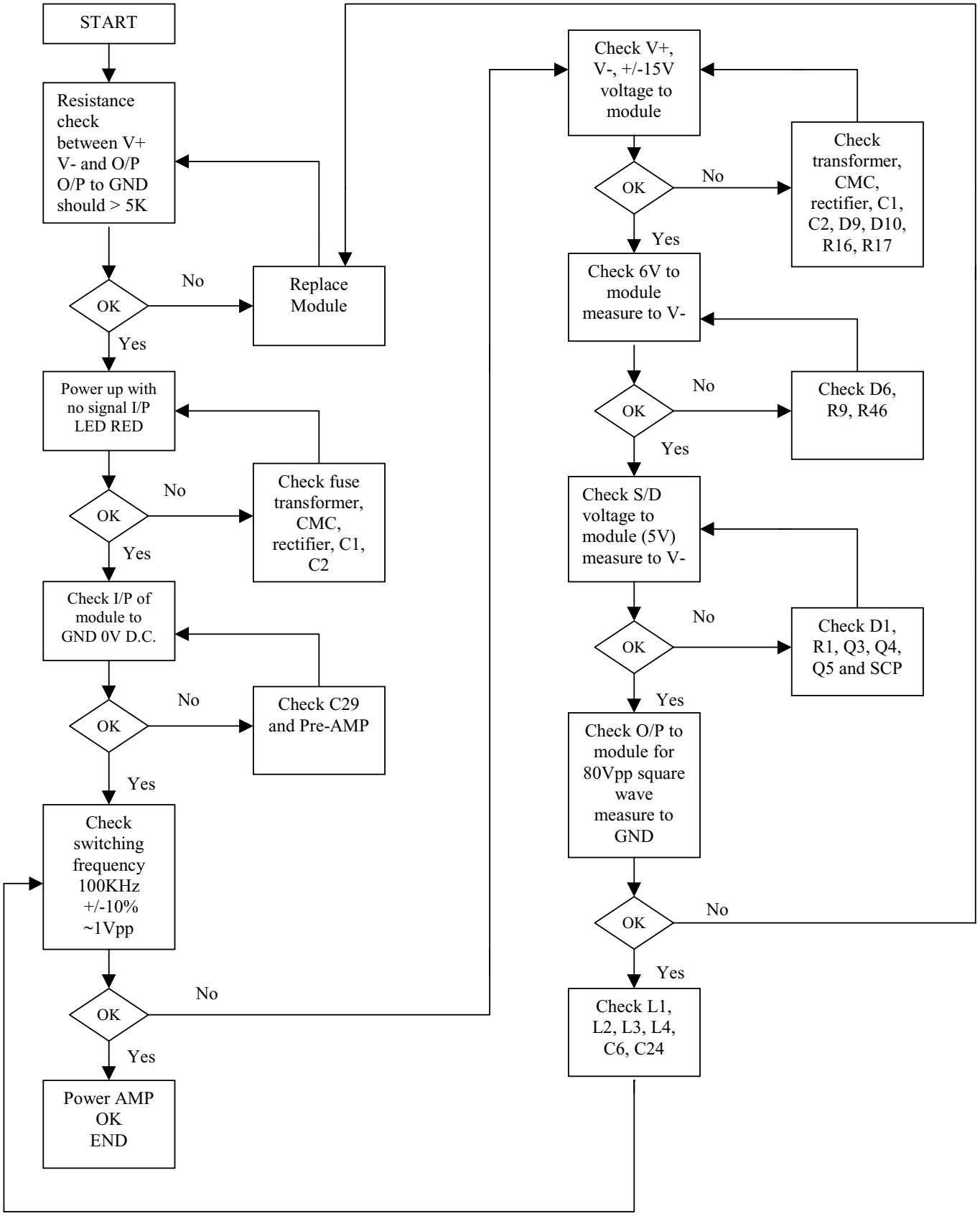
1. Follow steps 1-4 above, using a sweep generator as a signal source.
2. Sweep generator from 20Hz to 300Hz. Listen to the cabinet and drivers for any rattles, clicks, buzzes or any other noises. If any unusual noises are heard, remove driver and test.

Driver Function

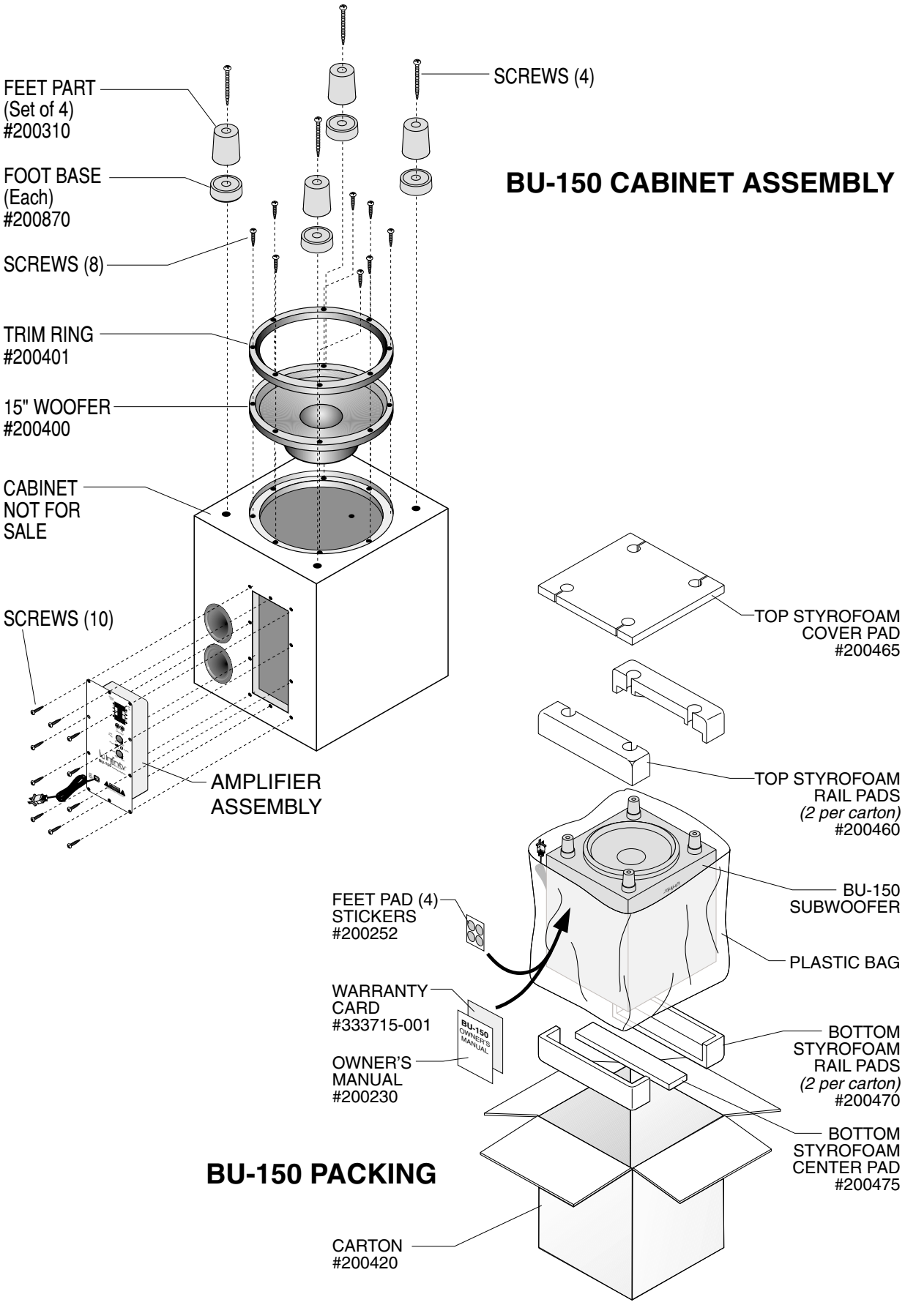
1. Remove driver from cabinet; detach + and - wire clips.
2. Check DC resistance of driver; it should be **6.4 ohms**.
3. Connect a pair of speaker cables to driver terminals. Cables should be connected to an integrated amplifier fed by a signal generator and adjust so that speaker level output is **5.0V.**

4. Sweep generator from 20Hz to 1kHz. Listen to driver for any rubbing, buzzing, or other unusual noises.

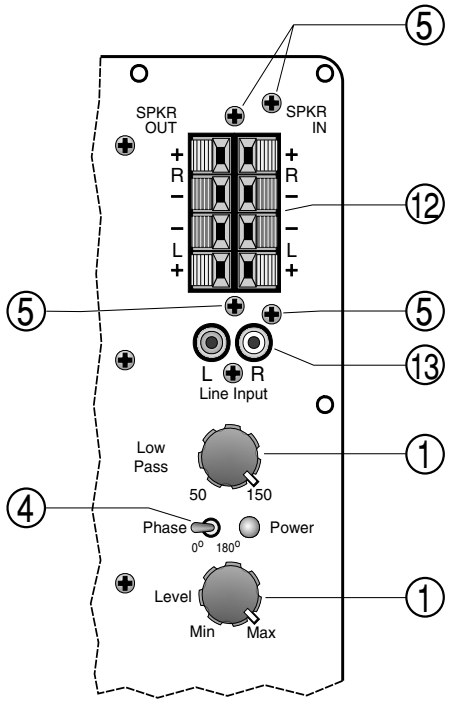
BU-150 POWER AMP MODULE TESTING FLOW CHART



BU-150 PACKING & CABINET ASSEMBLY

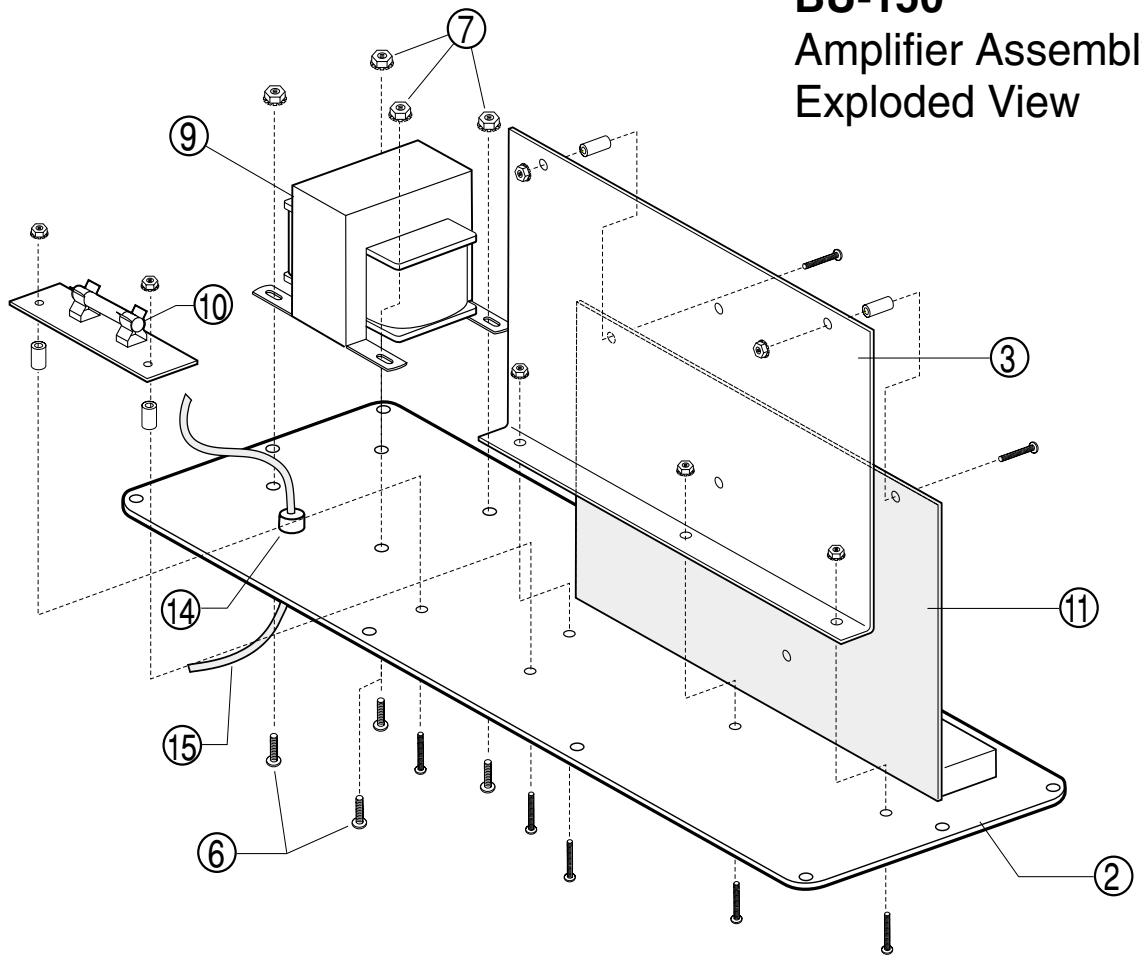


BU-150 AMPLIFIER ASSEMBLY EXPLODED VIEW

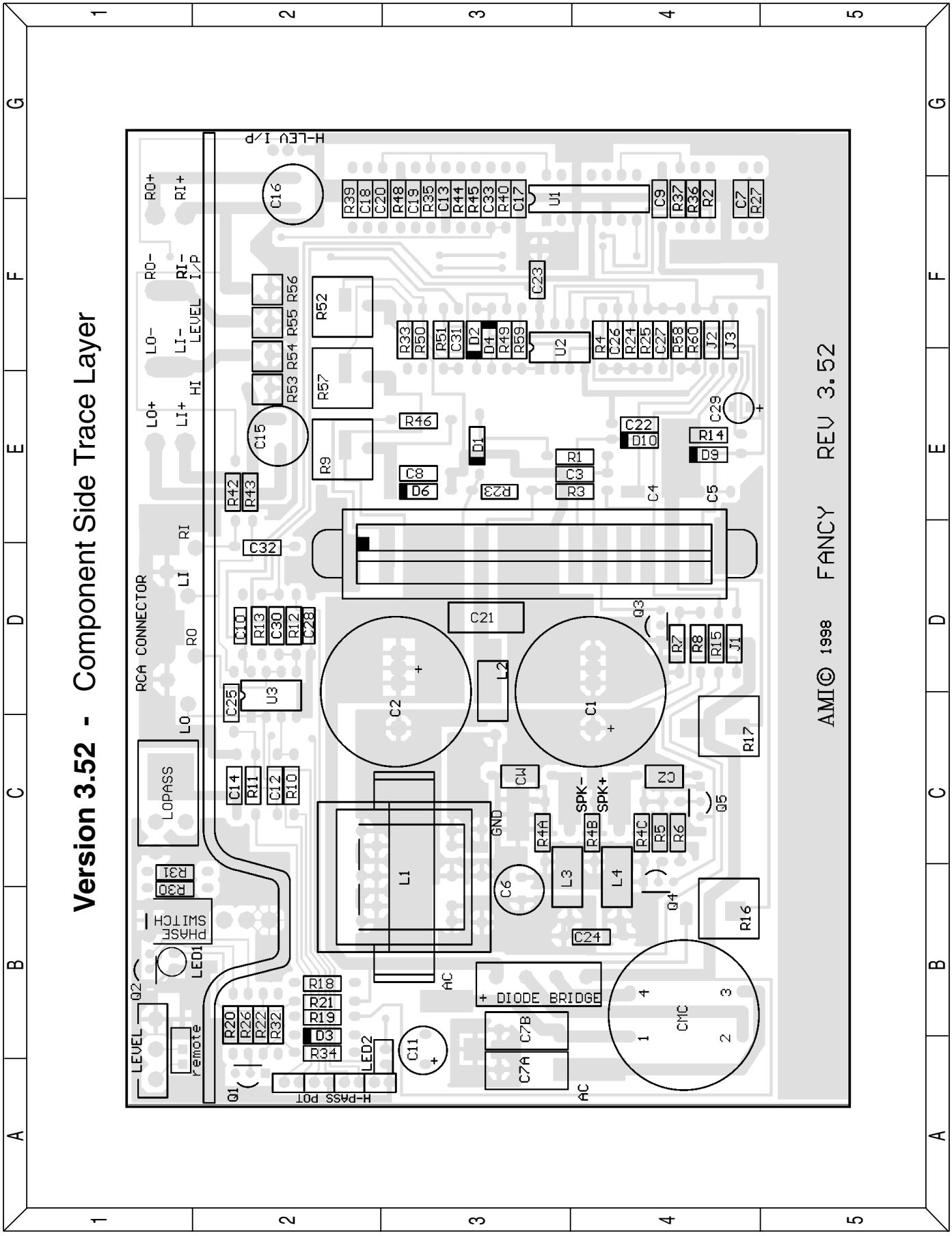


Ref.#	Part #	Description	Qty
1	A70302	Knobs	2
2	70317	Face Plate (Aluminum) SAFETY PART	1
3	70318	PCB Support SAFETY PART	1
4	70150	Phase Switch	1
5	70170	#4 x 0.5" Screws to secure input jacks	5
6	70171	#10 x 1" machine screw Bolts	4
7	70172	#10 Keps Nut	4
8	70173	#6 x 0.5" Screws for fuse PCB	2
9	80124	Transformer MCI4700 SAFETY PART	1
10	80123	250V, 1.5A, T type SLO BLO Fuse SAFETY PART	1
11	80112	Motherboard SAFETY PART	1
12	108115	High level input and output terminals	1
13	108320	Dual RCA input jacks	1
14	70305	Pwr Cord Strain Relief SAFETY PART	1
15	80105	Power cord, 2 conductor SAFETY PART	1

BU-150
Amplifier Assembly
Exploded View

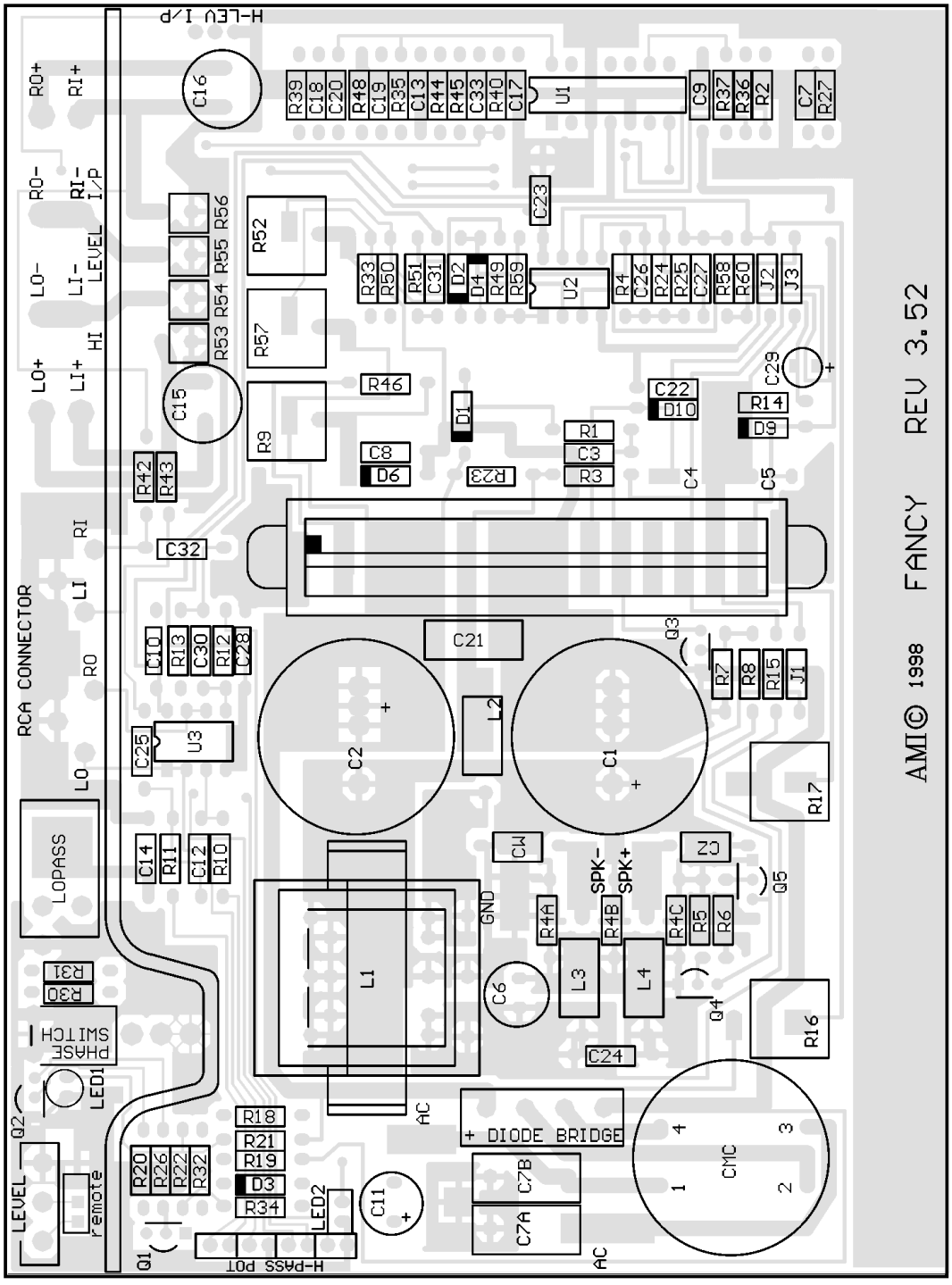


BU-150 PCB (Version 3.52) Component Side Trace

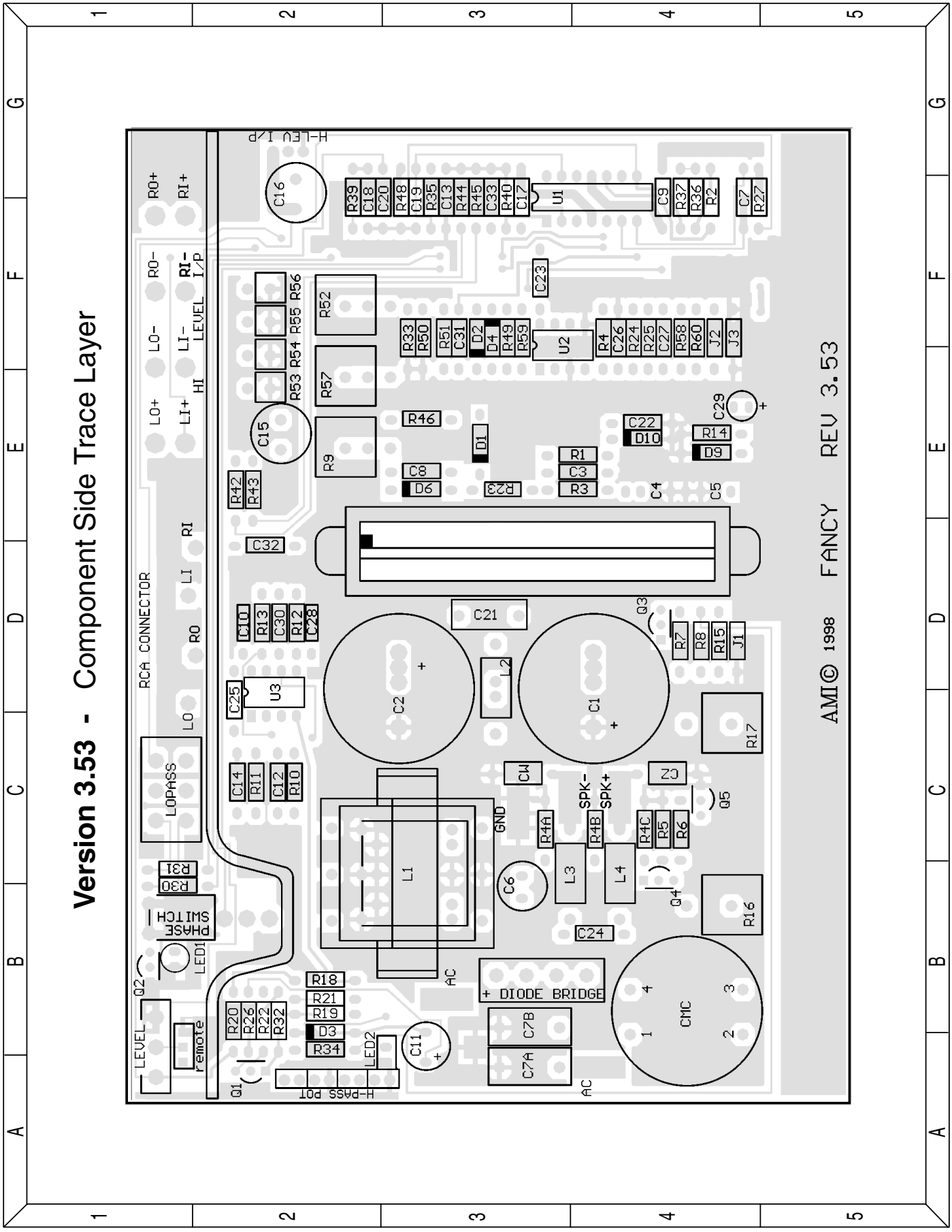


BU-150 PCB (Version 3.52) Solder Side Trace

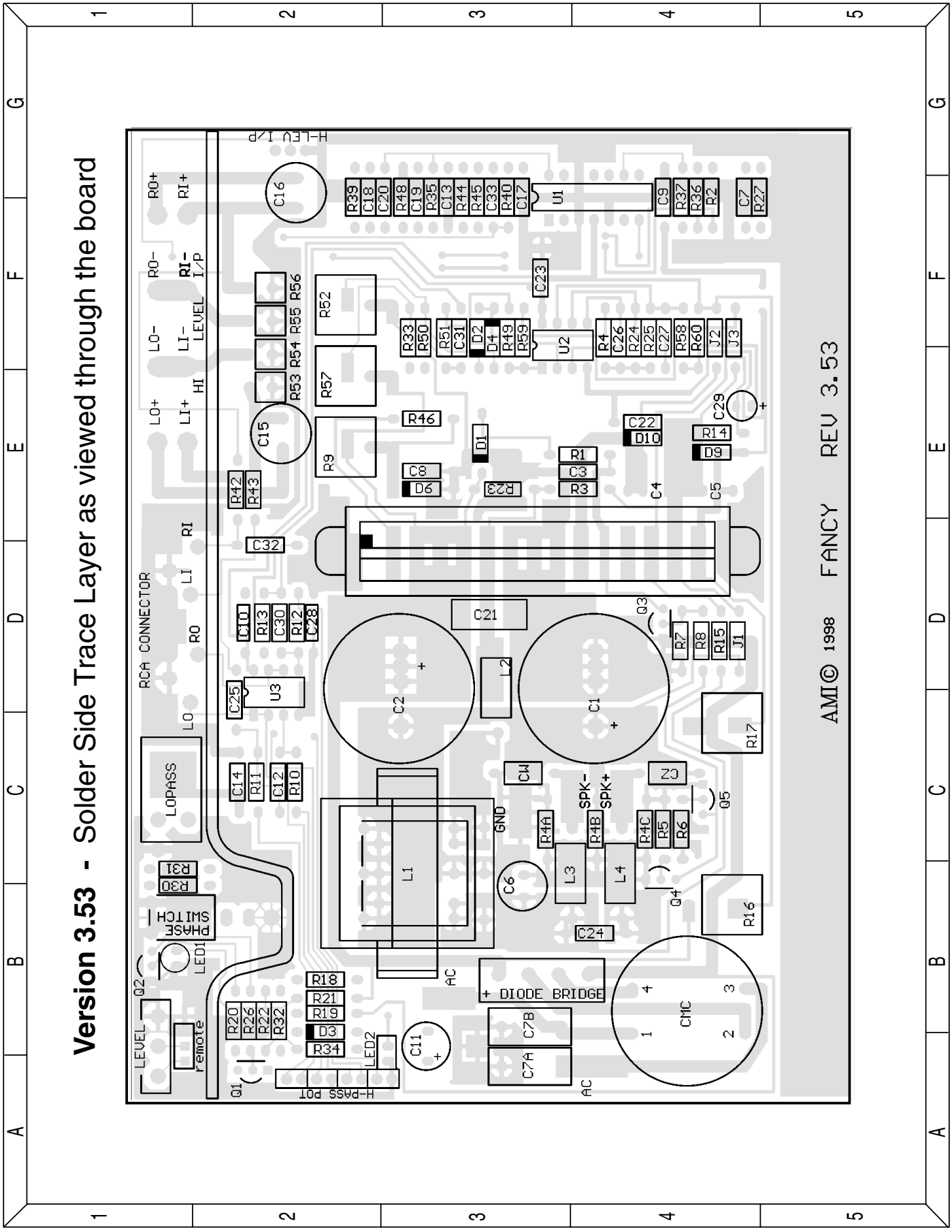
Version 3.52 - Solder Side Trace Layer as viewed through the board



BU-150 PCB (Version 3.53) Component Side Trace



BU-150 PCB (Version 3.53) Solder Side Trace



BU-150 ELECTRICAL PARTS LIST

BU-150 PCB REV 3.5

Resistors

REF #	PART #	DESCRIPTION	QTY
R1	40702	6.8M 1/4W ±5% carbon film	1
R2	40466	8.66k 1/4W ±1% metal film	1
R3	40458	43.2k 1/4W ±1% metal film	1
R4	40417	47k 1/4W ±5% carbon film	1
R4a/b/c	40105	0.1 1.2W ±5% 3pcs.	1
R5	40420	1k 1/4W ±5% carbon film	1
R6	40420	1k 1/4W ±5% carbon film	1
R7	40449	3.3k 1/2W ±5% carbon film	1
R8	40417	47k 1/4W ±5% carbon film	1
R9	40464	9.1k 10W ±5% power resistor Safety part	1
R14	40409	10k 1/4W 5% carbon film	1
R15	40406	100k 1/4W 5% carbon film	1
R16, 17	40465	2.4k 7W ±5% wirewound Safety part	2
R18	40424	330k 1/4W ±5% carbon film (LED sens)	1
R19	40466	3.9k 2W ±5% carbon film	1
R20	40405	4.7k 1/4W ±5% carbon film	1
R21	40443	39k 1/4W ±5% carbon film	1
R22	40449	3.3k 1/2W ±5% carbon film	1
R23	40461	20k 1/2W ±5% carbon film	1
R24	40418	22k 1/4W ±5% carbon film	1
R25	40417	47k 1/4W ±5% carbon film	1
R26	40701	1.0M 1/4W ±5% carbon film	1
R27	40440	6.81k 1/4W ±1% metal film	1
R30, 31	40441	13.7k 1/4W ±1% metal film	2
R32	40415	470k 1/4W ±5% carbon film	1
R33	40100	332 1/2W ±5% carbon film	1
R35	40422	301k 1/4W ±1% metal film	1
R36	40446	8.66k 1/4W ±1% metal film	1
R37	40446	8.66k 1/4W ±1% metal film	1
R39	40467	30.1k 1/4W 1% metal film	1
R40	40417	47k 1/4W 1% carbon film	1
R42, 43	40406	100k 1/4W ±1% carbon film	2
R44, 45	40409	10k 1/4W ±5% carbon film	2
R46	40104	4.7 1/4W ±5% carbon film	1
R48	40468	7.32k 1/4W ±1% metal film	1
R49	40415	470k 1/4W ±5% carbon film	1
R50	40100	332 1/4W ±5% carbon film	1
R51	40417	47k 1/4W ±5% carbon film	1
R52	40456	2.7k 5W ±5% wirewound Safety part	1
R53, 54, 55, 56	40106	100 2W 5% carbon film	4
R57	40456	2.7k 5W ±5% wirewound Safety part	1
R58	40469	5.49k 1/4W ±1% metal film	1
R59	40405	4.7k 1/4W ±5% carbon film	1
R60	40443	39k 1/4W ±5% carbon film	1
Crossover	40425	50k 1/4W ±10% Double Log Pot	1
Level	40402	5k 1/4W ±10% Single Linear Pot	1

Capacitors

REF #	PART #	DESCRIPTION	QTY
C1	30710	2200uF 100V +80/-20% Electrolytic Radial Safety part	1
C2	30710	2200uF 100V +80/-20% Electrolytic Radial Safety part	1
C3	30514	47nF 50V +80/-20% Mono-ceramic axial	1
C4, 5	30504	100nF 50V +80/-20% Mono-cer rad 0.2" /ax 0.3"	1
C6	30709	4.7uF 100V +80/-20% Electrolytic Radial NP Safety part	1
C7	30510	33n 50V ±10% Mono-ceramic axial	1
C7a/b	30505	100n 100V ±20% Metal Polyester Rad	2
C8, 9	30504	100nF 50V +80/-20% Mono-ceramic radial	1
C11	30702	100uF 35V +80/-20% Electrolytic Radial	1
C13	30507	10nF 50V ±20% Mono-ceramic axial	1
C14	30511	330nF 50V ±10% Mono-ceramic axial	1
C15, 16	30707	220uF 50V ±20% Electrolytic Radial	2
C17	30502	100nF 50V +80/-20% Mono-ceramic radial	1
C18	30517	68nF 50V ±10% Mono-ceramic axial	1
C19	30524	82nF 50V ±10% Mono-ceramic axial	1
C20	30504	100nF 50V ±10% Mono-ceramic axial	1
C21	30522	100nF 250V ±10% Polyester film	1
C22, 23	30502	100nF 50V +80/-20% Mono-ceramic axial	2
C24	30523	330nF 100V +80/-20 Mono-ceramic axial	1
C26	30508	10nF 50V ±10% Mono-ceramic axial	1
C27	30513	3.3nF 50V ±10% Mono-ceramic axial	1
C29	30711	22uF 35V +80/-20% Electrolytic Radial Safety part	1
C31	30525	120nF 50V ±10% Mono-ceramic axial	1
C33	30503	2.2nF 50V ±20% Mono-ceramic axial	1
CW	30505	100nF 100V ±20% Polyester film	1
CZ	30505	100nF 100V ±20% Polyester film	1

Diodes

REF #	PART #	DESCRIPTION	QTY
D1	50111	ZENER 1N4763A 91V ±5% 1W	1
LED 1 or 2	50106	Dual Cir LED (2 legged)	
D2, 4	50104	1N4148 100V 0.1A	2
D3	50102	ZENER 1N4749A 24V ±5% 1W	1
D6	50103	ZENER 1N5234B 6.2V ±5% 0.5W	1
D9, 10	50105	ZENER 1N4744A 15V ±5% 1W	2
DBR	50100	Bridge Rect 200V 4A Safety part	1

Transistors

REF #	PART #	DESCRIPTION	QTY
Q1	60151	MPS A13 30V NPN (Darl)	1
Q2	60152	2N3906 40V PNP, 2N4402 alternate	1
Q3	60153	2N3904 40V NPN, 2N4401 alternate	1
Q4, 5	60155	2N5401 80V PNP	2

Integrated Circuits

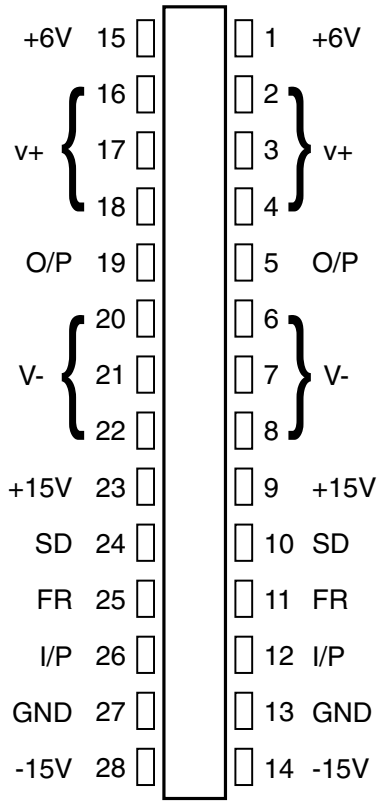
REF #	PART #	DESCRIPTION	QTY
U1	60100	LM324 Quad OpAmp +/-15V	1
U2	60101	TLO 82 Dual OpAmp +/-15V	1
	60302	S64AMI Power Amp module SAFETY PART	

Inductors

REF #	PART #	DESCRIPTION	QTY
CMC1	80100	mc4438 Safety part	1
L1	80121	mc4642 Safety part	1
L2	80122	Ferrite bead	1
L3	80122	Ferrite bead	1
L4	80122	Ferrite bead	1

BU-150 INTEGRATED CIRCUIT DIAGRAMS

S53AMI/S64AMI - Power Amp module SAFETY PART



NOTE: THE FOLLOWING PROCEDURES MUST BE FOLLOWED WHEN INSTALLING NEW S53AMI/S64AMI AMP MODULES: FAILURE TO FOLLOW ONE OR MORE OF THESE STEPS MAY RESULT IN THE INSTANT DESTRUCTION OF THE MODULE WHEN POWERED UP.

1) Align white indent marker on Amp Module with indent marker on main PCB; alternately observe position of label on the top of the module; incorrectly replacing the Module 180 in the PCB slot will result in its destruction.

2) All AC powered test instruments (meters, oscilloscopes, etc.) must have a floating ground, i.e. be connected to an isolation transformer.

3) Align and position the Amp Module before soldering.

4) Attach the amp Module with the mounting screws before soldering or powering up.

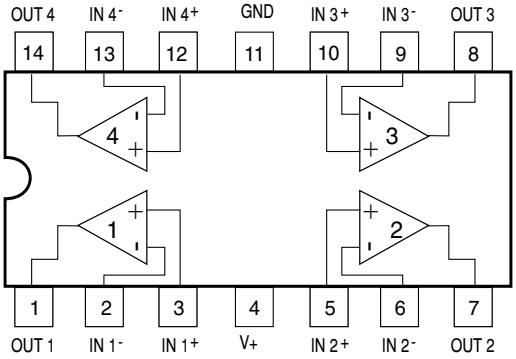
5) Use only rosin-core or non-acid core solder; thoroughly de-flux the surfaces after soldering.

If the new S53AMI/S64AMI Amp Module has larger mounting hole(s) in the case, and the stock screws no longer will fit, and screws of the proper type cannot be obtained locally order:

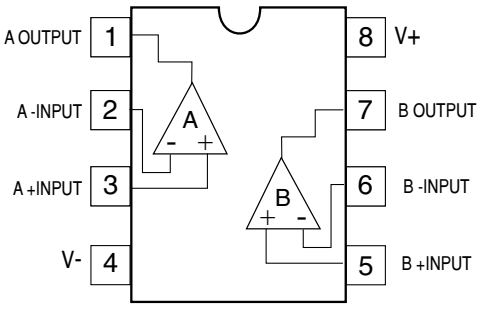
(2) part# 60301S (screws)

(2) part# 60301N (nuts)

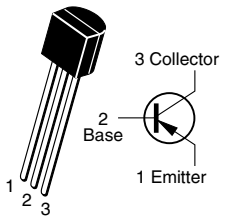
U1 - (LM324) Quad Op Amp



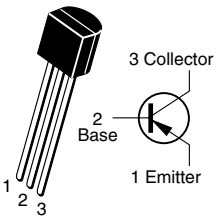
U2 - (TLO 82) Dual Op Amp



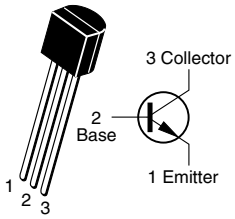
Q4, 5 - (MPS A56)
80V PNP Transistor



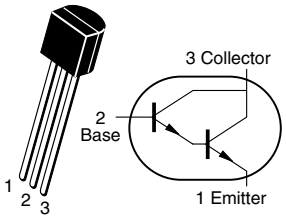
Q2 - (2N3906)
40V PNP Transistor



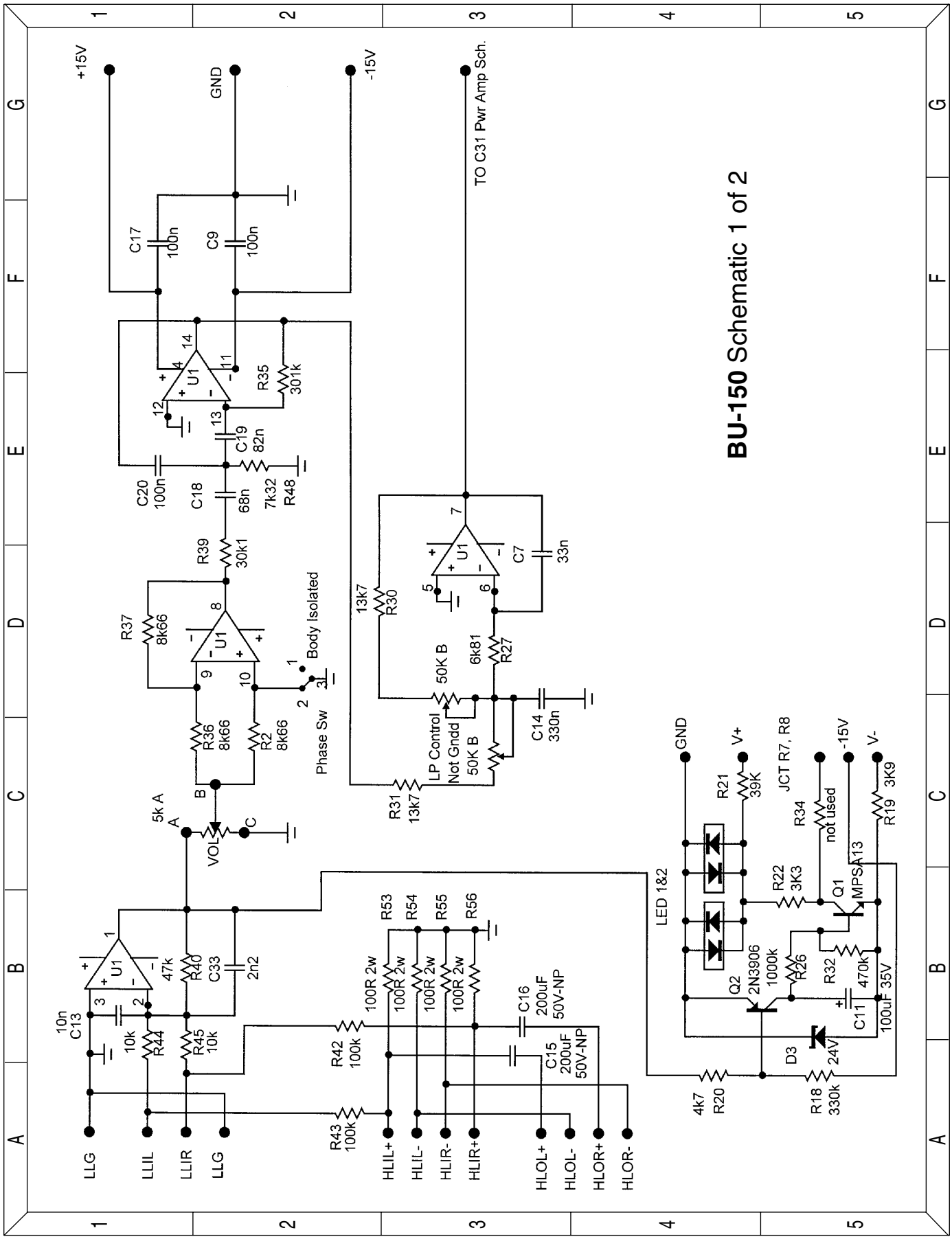
Q3 - (2N3904)
40V NPN Transistor



Q1 - (MPS A13)
30V NPN(Darl) Transistor



BU-150 SCHEMATIC 1 of 2



BU-150 SCHEMATIC 2 of 2