BU-120/HTS-20

Powered Subwoofer

SERVICE MANUAL

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

A Harman International Company

Rev G 6/2001

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.

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.

List of Safety Components Requiring ExactReplacements

F1	Fuse SLO BLO 1.0A 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 or D1	Bridge diode. Use only factory replacement.
C1, 2	4700uF, 50V 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	10uF 50V electrolytic radial* BU120 and HTS-20 rev. A only.
S53AMI or CN1	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
R29	470Ω .25W METAL OXIDE, non flammable

* See Service Bulletin (INF2000-01 REV 2) page 15.

IMPORTANT SERVICE NOTES: When testing the BU120/HTS-20 Series amplifier, a load must always be connected to the output terminals, whether the woofer, or a 4 to 8 ohm resistive load.
All AC powered test instruments (meters, oscilloscopes, etc.) must have a floating ground, i.e. be connected to an isolation transformer.

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GENERAL SPECIFICATIONS

Frequency Response (± 3dB)	30Hz – 150Hz
Output (RMS)	150W
Driver	12" Woofer
Crossover Frequency	50Hz ~ 150Hz (continuously variable)
Dimensions (H x W x D)	14 ½"(36.8cm) x 14 ½" (36.8cm) x14 ½" (36.8cm) Add 1¾" (4.5cm) for feet.
Weight	43 lbs/19.5 kg,

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

REGARDING SERVICE FOR THE INFINITY HTS-20 SUBWOOFER

There are two versions, an "A" and "B", with minor internal differences.
Data for both versions is included, and differences noted in the following pages.
Units can be identified for service as follows:

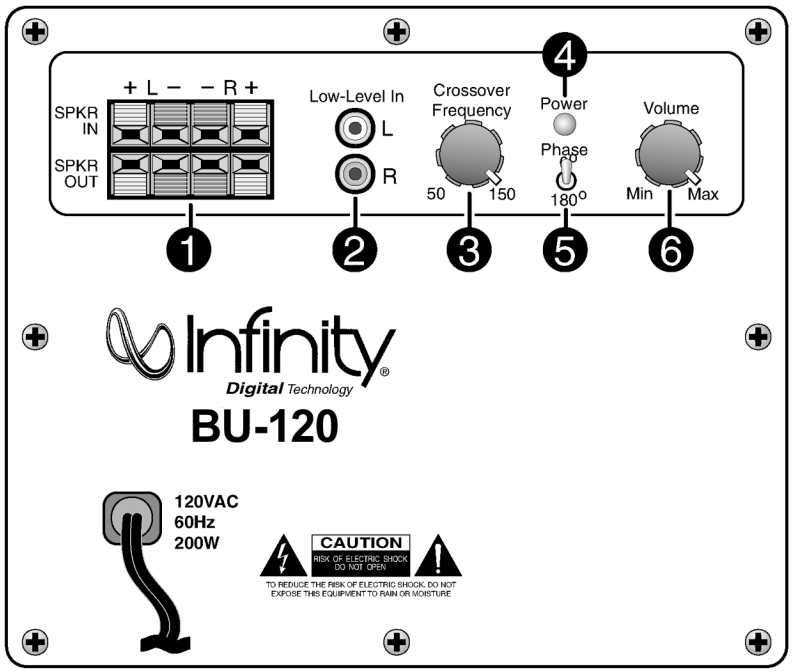
- Amplifier faceplate says "Made in Canada" on the "A" version.
- Amplifier faceplate says "Made in China" on the "B" version.

DETAILED SPECIFICATIONS

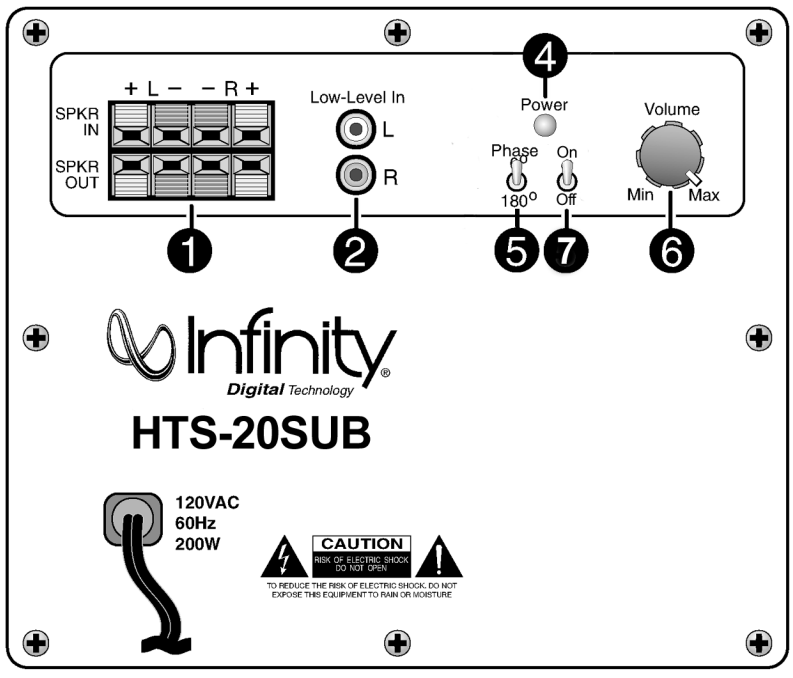
LINE VOLTAGE	Yes/No	Hi/Lo Line	Nom.	Unit	Notes
US 120vac/60Hz	Yes	108-132	120	Vrms	Normal Operation
EU 230vac/50-60Hz	Yes	207-264	230	Vrms	Normal operation, MOMS required
Asia 100vac/50Hz	No	90-110	100	Vrms	Normal Operation
Parameter	**Specification**	**Unit**	**QA Test Limits**	**Conditions**	**Notes**
Amp Section					
Type (Class AB, D, other)	D	n/a	n/a		Class D Preferred...Sink required for Class AB
Load Impedance (speaker)	4	Ohms	n/a	Nominal	Z-curve required
Rated Output Power	150	Watts	150	1 input driven	
THD	0.3	%	1	22k filter	75w (Power Bandwidth 30-100Hz)
THD @ 1 Watt	0.5	%	0.8	22k filter	
DC Offset	10	mV-DC	20	@ Speaker Outputs	
Damping factor	100	DF	50		
Input Sensitivity					
Input Frequency	40	Hz		Nominal Freq.	1 input driven
Line Input	63	mVrms	±2dB	To Rated Power/ Vol @ Max	1 input driven: AP source Z = 600 ohms
Speaker/Hi Level Input	4.8	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	65	dBr	55	relative to 1W Output	22k filter
Residual Noise Floor	3	mVrms	4	Volume @max, using RMS reading on A/P	22k filter required due to 100kHz switching noise present at speaker output
Input Impedance					
Line Input	10k	ohms	n/a	Nominal	
Speaker/Hi Level Input	200	ohms	n/a	Nominal	
Filters					0dBr = 1w @ 50Hz
Low Pass (fixed or variable)	Variable				
Low Pass filter (point or range)	50-150	Hz	±2dB	-3dB Point	
Slope	18-24	dB/Octave	n/a		
Subsonic filter (HPF)	34	Hz	±2dB	-3dB Point	
Slope	24	dB/Octave	n/a		

Limiter (yes/no)	yes				
Max. Output Power/THD=10%	150w/10 %	P-max/THD	functional	Maximum Output Power	Maximum THD as a result of limiting.
Features					
Phase Switch (yes/no)	yes	—	functional		
Volume pot Taper (lin/log)	linear	—	functional		
Input Configuration		—			
Line In (L,C,R,AC3,Mono)	L,R	—	functional	Enabled w/Line/Spkr Input Select Switch	
Line Outputs (L,C,R)	L,R	—	functional		Buffered Output / Pre-Volume control
Spkr/Hi Level In (L,C,R,mono)	L,R	—	functional	Enabled w/Line/Spkr Input Select Switch	
Spkr Out: Hi Pass Filter	100	Hz	functional	8 ohm Satellite: 6dB/oct passive xover	Driven from zero ohms source impedance
Signal-Present LED	Yes	—	—	—	Bi-Color LED (green=signal/ red=no signal)
Signal-Present Input Freq.	100	Hz	functional	Nominal	200uF Series Cap on PCB
Signal-Present Level	35	mV	functional	100Hz into Line Input w/ 1 ch. driven	
Power on Delay time	<2	sec.		AC Power Applied	
Transients/Pops					
Turn-on/off Transient	500	mV-peak	2v-pp	@ Speaker Outputs	AC Line cycled from OFF to ON or ON to Off
Efficiency					
Stand-by Input Power	14	Watts		@ nom. line voltage	
Power Cons.@rated power	110	Watts		@ nom. line voltage	
Efficiency	136%	%		Relative to rated output	
Protection					
Short Circuit Protection	yes		functional	Direct short at output	
BU120 Line Fuse Rating	1.0	Amps		Type-T or Slo Blo	
HTS-20 Line Fuse Rating	2.0	Amps		Type-T or Slo Blo	

CONTROLS AND THEIR FUNCTION



1. High-Level input and Output terminals
2. Low-Level Input Jacks: connect to preamplifier outputs
3. Crossover Frequency: controls upper-corner roll-off points.
4. Power-On indicator
5. Phase: 0/180 switch to change audio-signal polarity.
6. Volume Control: controls volume of subwoofer.
7. Crossover Bypass switch: when ON reproduces full range of low frequencies set by a Dolby Digital or DTS receiver.



BU-120/HTS-20 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 1

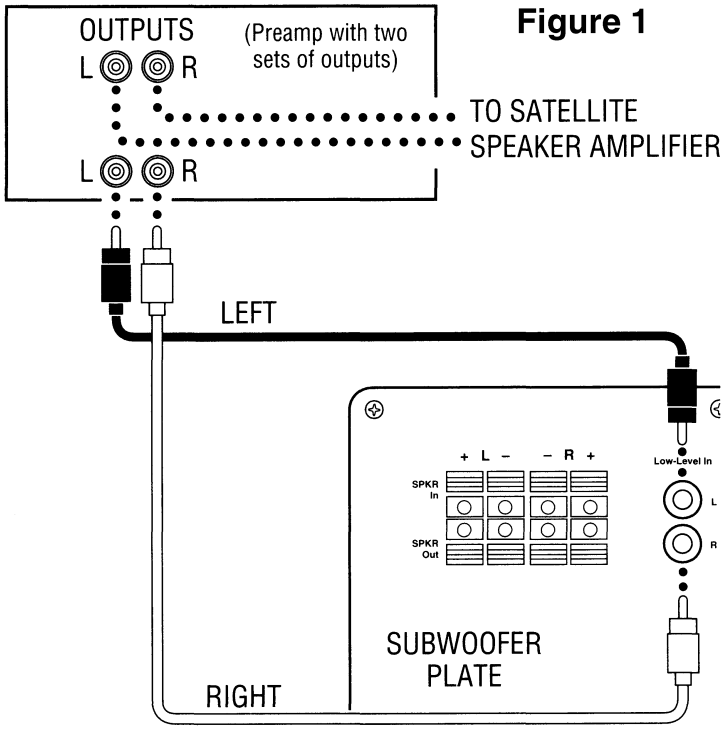
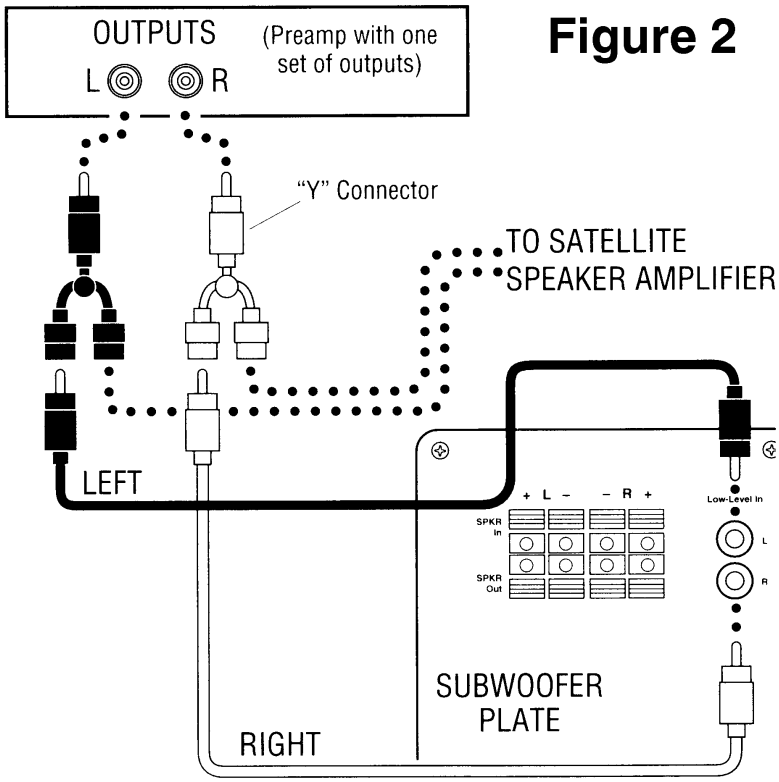


Figure 2. ***- You can use this method (2"Y" connectors) if your preamp has only one set of outputs.***

Figure 2



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).

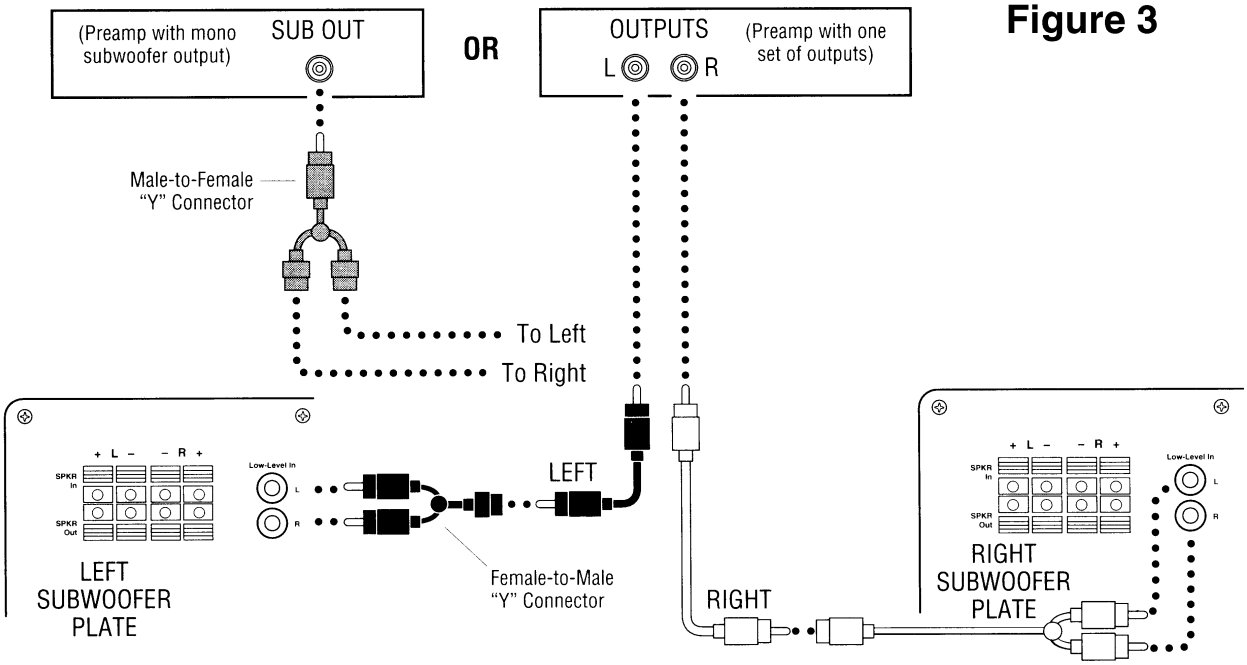


Figure 3

Figure 3. ***- Use this method when using a single subwoofer output 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 4).

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

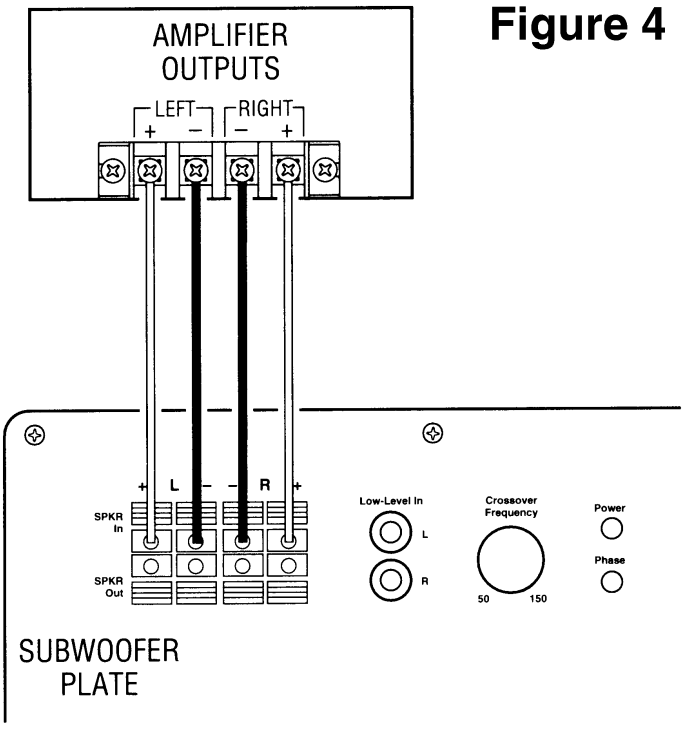


Figure 4

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

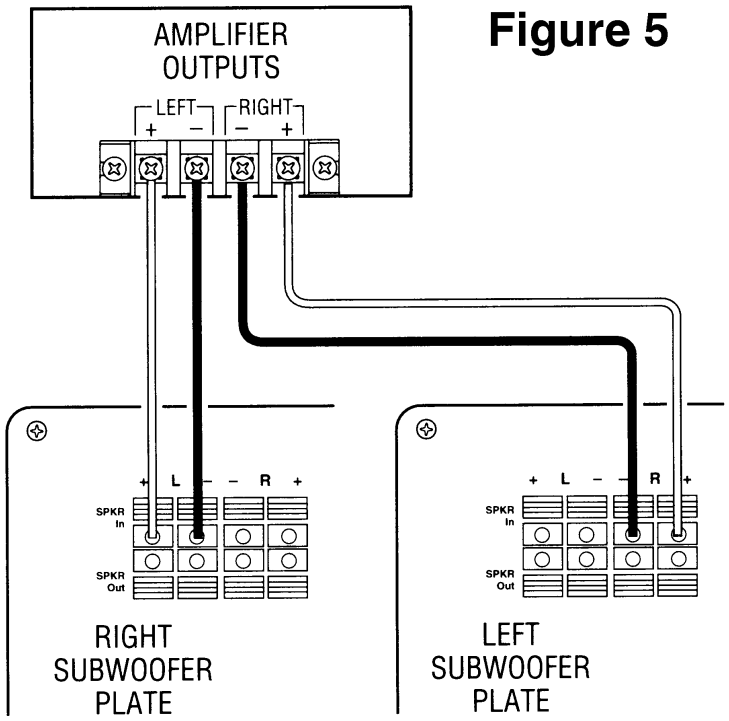


Figure 6. ***- Use this method when connecting one subwoofer to satellites.***

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 6.

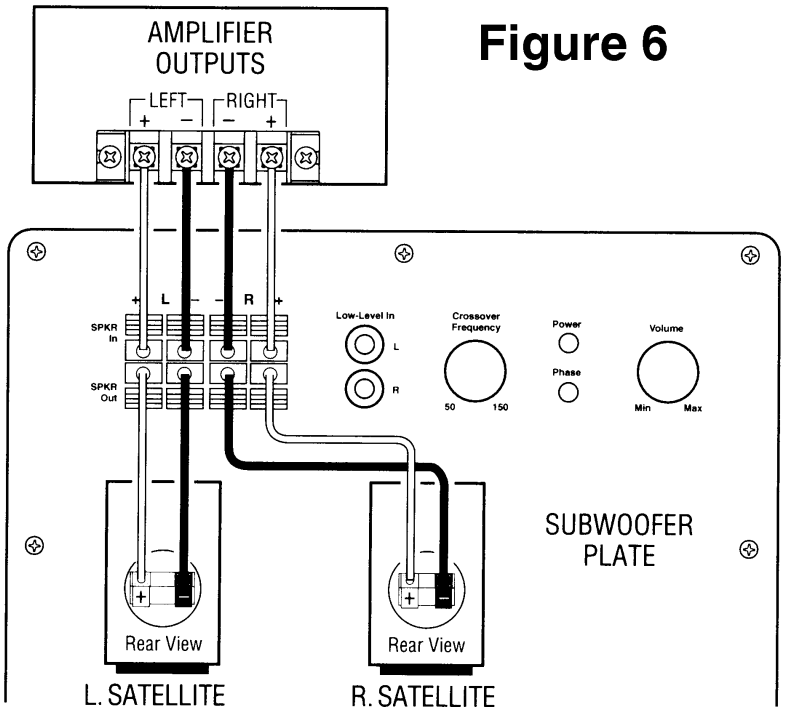


Figure 7. - Use this method when connecting two subwoofers to satellites.

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

BU-120
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).

HTS-20 - Has no external control. If you are using a receiver or surround processor containing a Dolby Digital and/or DTS decoder, set the crossover bypass switch to "On". If you are using a stereo or Dolby Pro Logic receiver, set this switch to "Off"; this places the preset roll-off crossover frequency point at 100Hz.

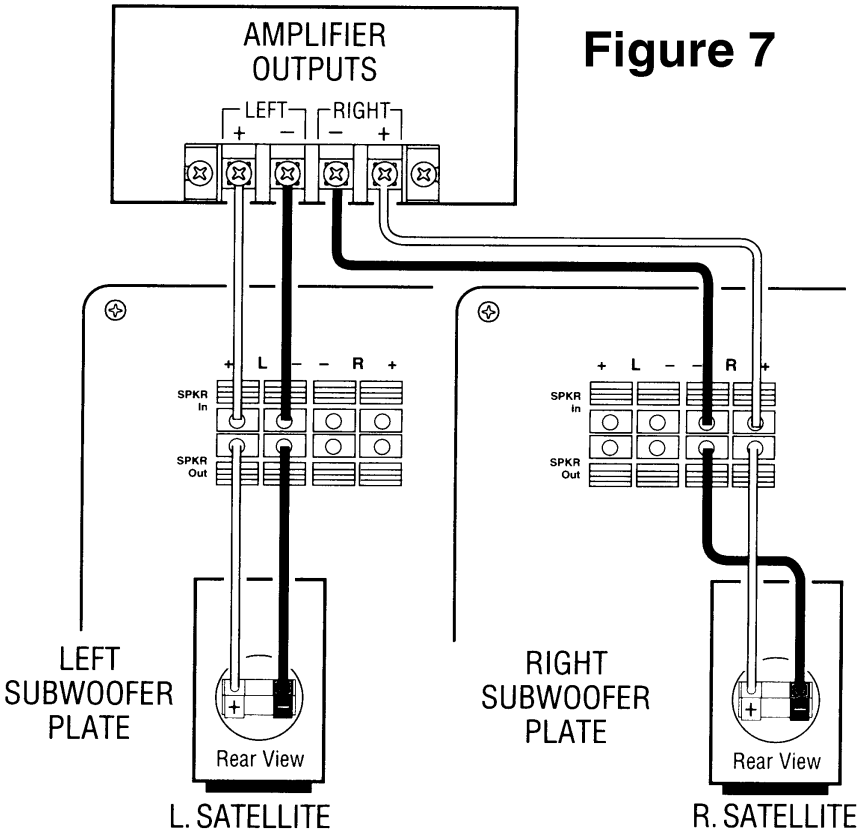


Figure 7

OPERATION

Setting the Controls

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

2. BU120 - Initially set the subwoofer's Crossover Frequency control to 12 o'clock.
HTS-20 - If you are using a receiver or surround processor containing a Dolby Digital and/or DTS decoder, set the crossover bypass switch to "On". If you are using a stereo or Dolby Pro logic receiver, set this switch to "Off"; this places the preset roll-off crossover frequency point at 100Hz.
3. Set the subwoofer's Phase switch to the "0" 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 (BU120 only)

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.

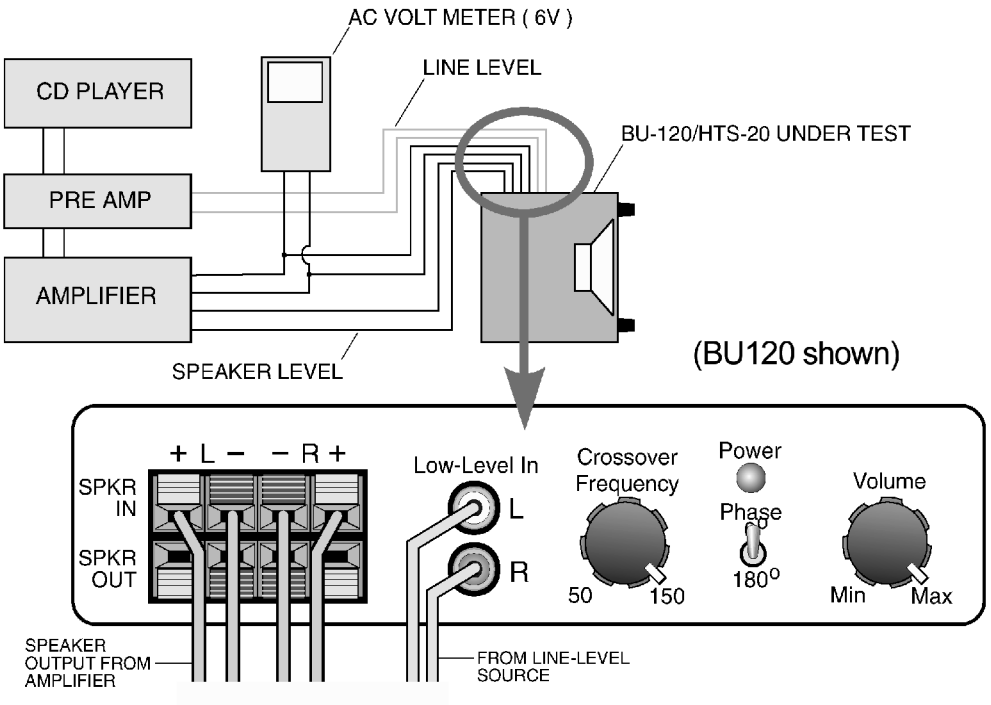
A Word of Advice

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-120/HTS-20 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. BU-120 - Low Pass control should be set fully clockwise (150). HTS-20 - Crossover Bypass switch should be set to ON.
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.

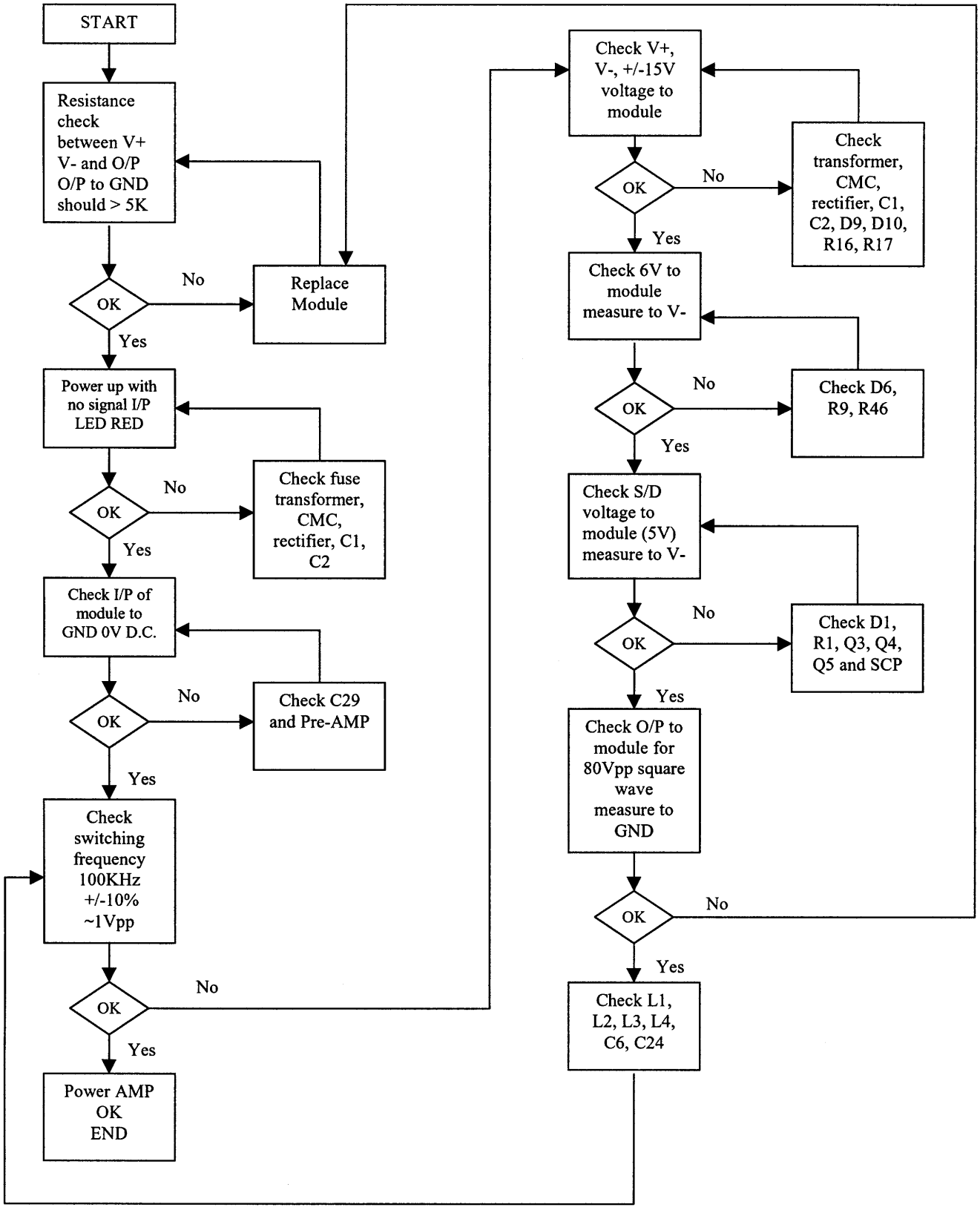
Driver Function

1. Remove driver from cabinet; detach + and - wire clips.
2. Check DC resistance of driver; it should be **4.6 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.

NOTE: When testing the BU120/HTS-20 amplifier, a load must always be connected to the output terminals, whether the woofer, or a 4 to 8 ohm resistive load.

BU-120/HTS-20 POWER AMP MODULE TESTING FLOW CHART (HTS-20 rev. " A" only)



Service Bulletin

Service Bulletin INF9902 Rev1 - February 2001 | This is considered a Minor repair

To: All Infinity Service Centers

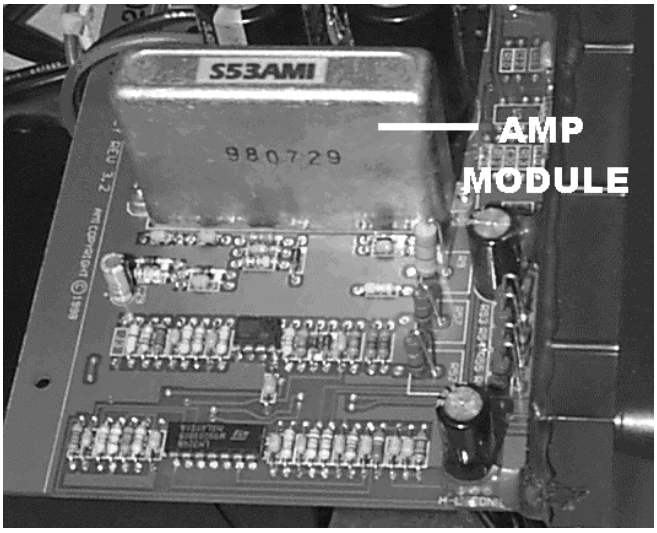
Models: BU-80, BU-120, BU150, HTS-10, HTS-20

Subject: Check Solder Joints in Event of Failure

Some performance related complaints in the BU Series powered Subwoofers may be caused by cold solder connections between the 28 pins of the Power Amp Module and the main circuit board. When troubleshooting, failure to check these joints can result in erroneous conclusions or wasted time.

In the event you receive a Subwoofer with the complaints "Dead, or No Output, or Motorboating (Oscillation)", perform the steps listed below *first* before any further troubleshooting takes place:

1) Unplug all cables, lay the subwoofer on a padded surface.
2) Remove all Philips screws around the outer perimeter of the amplifier faceplate.
3) Remove amplifier assembly; you should be able to remove the amplifier far enough out of the cabinet to service it without removing the woofer wires.
4) Locate the Power Amp Module; it is the large gray component with a metal case. On the solder side of the circuit board are the 28 soldered connections to the Module.
5) *Regardless of whether you can visibly see breaks in any of the connections or not*, carefully re-solder all 28 pin connections, adding 60/40 rosin core solder. Take care not "bridge" any connections on the board with solder.
6) Inspect the solder joints to the main filter capacitors C1 and C2 on the main PCB and re-solder if needed.
7) Replace the amplifier assembly back into the cabinet; replace the screws.
8) Test the unit by applying a signal from a music source, adjust the volume to a moderate level and confirm the original problem has been corrected.



IMPORTANT SERVICE NOTES: When testing the BU or HTS Series amplifier, a load must always be connected to the output terminals, whether the woofer, or a 4 to 8 ohm resistive load.
All AC powered test instruments (meters, oscilloscopes, etc.) must have a floating ground, i.e. be connected to an isolation transformer.

Service Bulletin

Service Bulletin INF2000-01 Rev2 - February 2001 | Warranty labor rate: MINOR repair

To: All Infinity Service Centers

Models: BU80, BU120, HTS-10 revA, HTS-20 revA subwoofers

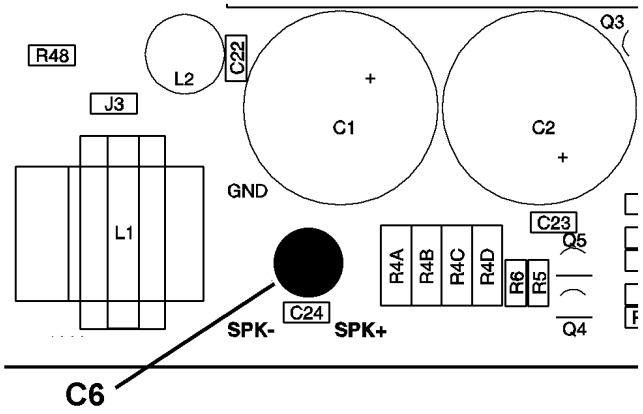
Subject: Failure of C6

In the event you receive a BU80, BU120, HTS-10 or HTS-20 subwoofer with the complaint "no output" and capacitor C6 (10uf 50v NPE) is damaged in the amplifier:

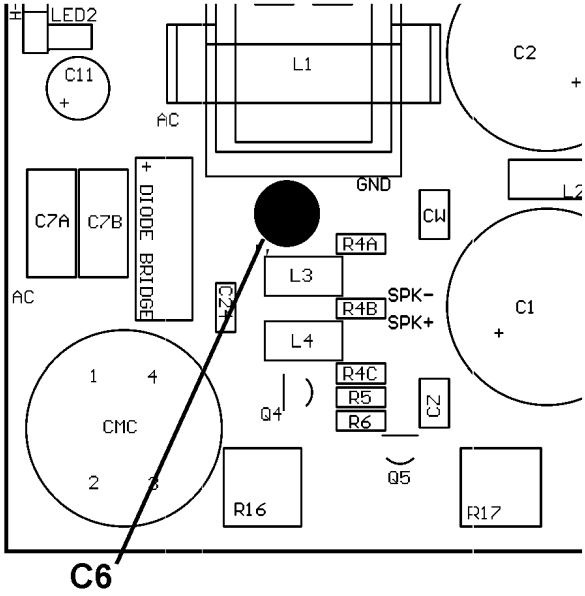
Order kit Infinity part# 30722 and replace the following included parts:

C6 – (10uf 100v NPE cap) C24 – (100nF 50v cap) R46 – (47 1/4W resistor)
R23 – (20k 1/2W resistor – used only on models BU120, HTS-20 revA)

BU80/HTS-10



BU120/HTS-20



General reference for location only; not all parts or designators may conform to these drawings.

FOLLOWING THE REPAIR:

Follow instructions included in bulletin #INF9902.

IMPORTANT SERVICE NOTES: When testing the BU or HTS Series amplifier, a load must always be connected to the output terminals, whether the woofer, or a 4 to 8 ohm resistive load.
All AC powered test instruments (meters, oscilloscopes, etc.) must have a floating ground, i.e. be connected to an isolation transformer.

Models	Serial number 120/230V	Status	Action
BU80 BU120 HTS-10 revA HTS-20 revA	All serial numbers affected	Replace if damaged	Replace C6,R23, C24, R46 with Infinity part# 30722

TECH TIPS

Troubleshooting tips and solutions to common service problems

For models: BU-120/HTS-20

TIP# INFTT2000-01

Complaint:

How do you replace or service any of the front panel components on the Subwoofer faceplate for model BU-120/HTS-20.

Probable Cause:

The High level Input terminals, potentiometers, RCA jack, and switch(es) are behind a sealed cover to protect the air-tight integrity of the cabinet enclosure.

Solution:

1) Unplug all external cables from the subwoofer; place the cabinet on a padded surface.

2) Remove any subwoofer grille; remove the woofer from the cabinet. Detach the two connections from the woofer terminals.

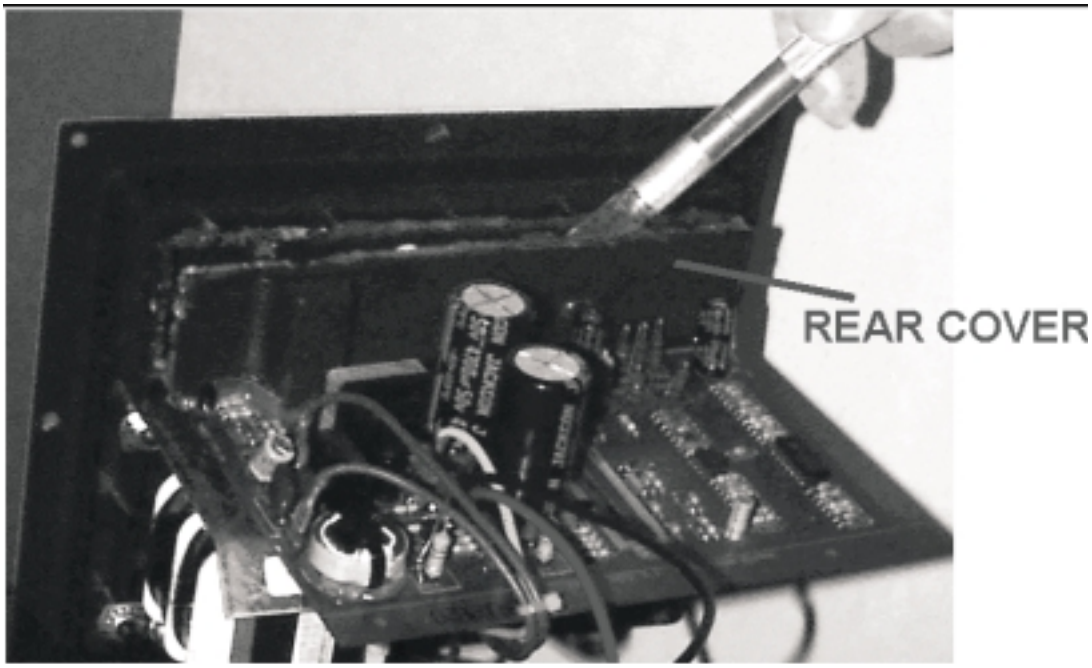
3) Remove all Phillips screws holding the amplifier to the cabinet; remove the amplifier.

4) Remove all knobs, nuts, and Philips screws from the outer control section of the amplifier faceplate.

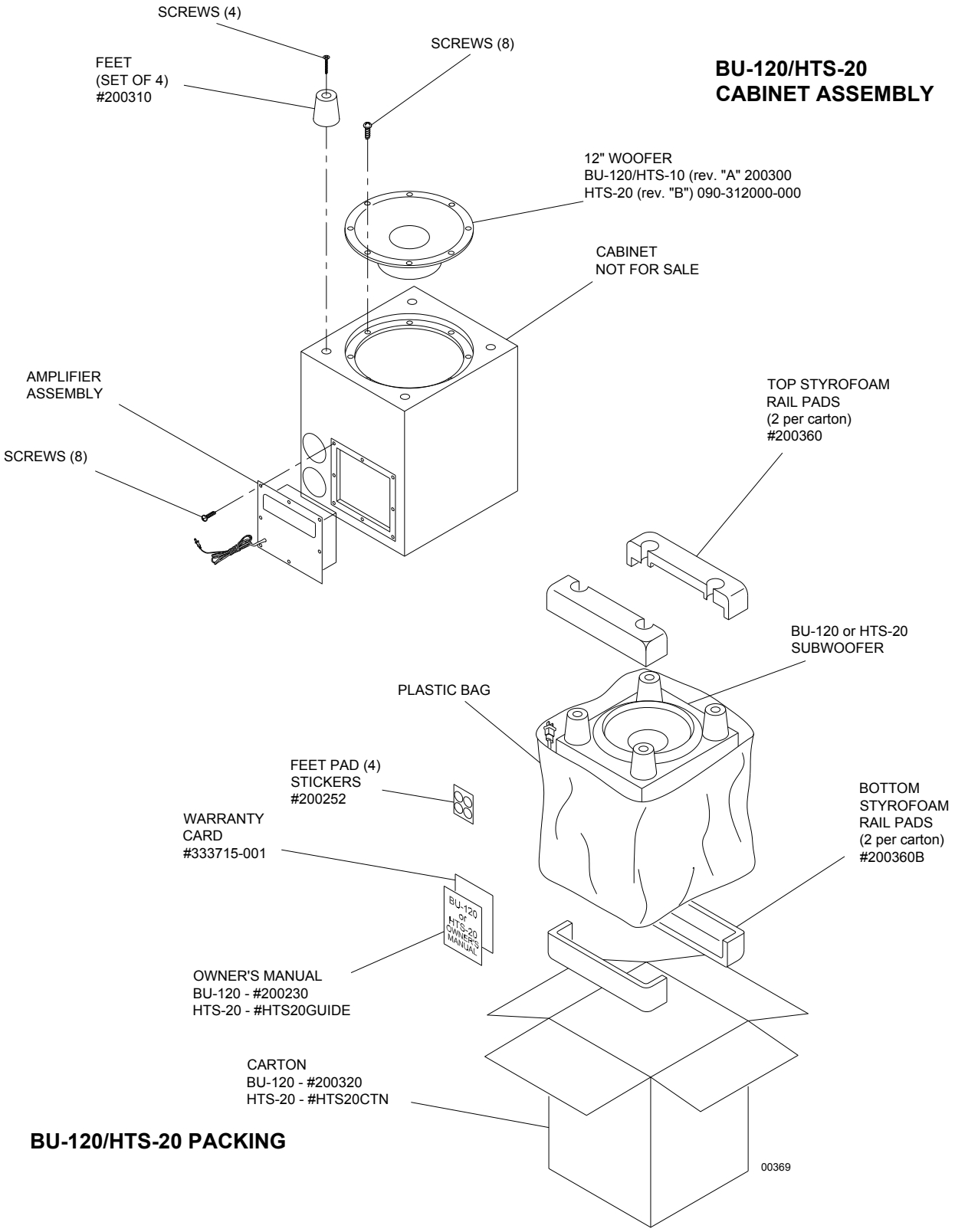
5) Locate the sealed cover on the inside of the amplifier faceplate (see illustration); the bead of adherent must be broken to remove the main PCB with front panel components from the plastic faceplate. This is most easily accomplished by CAREFULLY using a box cutter, exacto knife, or similar sharp instrument. First scrape all excess material from the three surfaces; then force the blade into the groove between the rear cover and the faceplate. DO NOT attempt to remove the rear cover from the main PCB.

6) When enough material is removed, the main PCB with cover should pull away from the faceplate, exposing the components.

7) After servicing a bead of “silicon seal” or similar adherent must be applied to all surfaces where it was removed. Reassemble the rest of the components in reverse order.



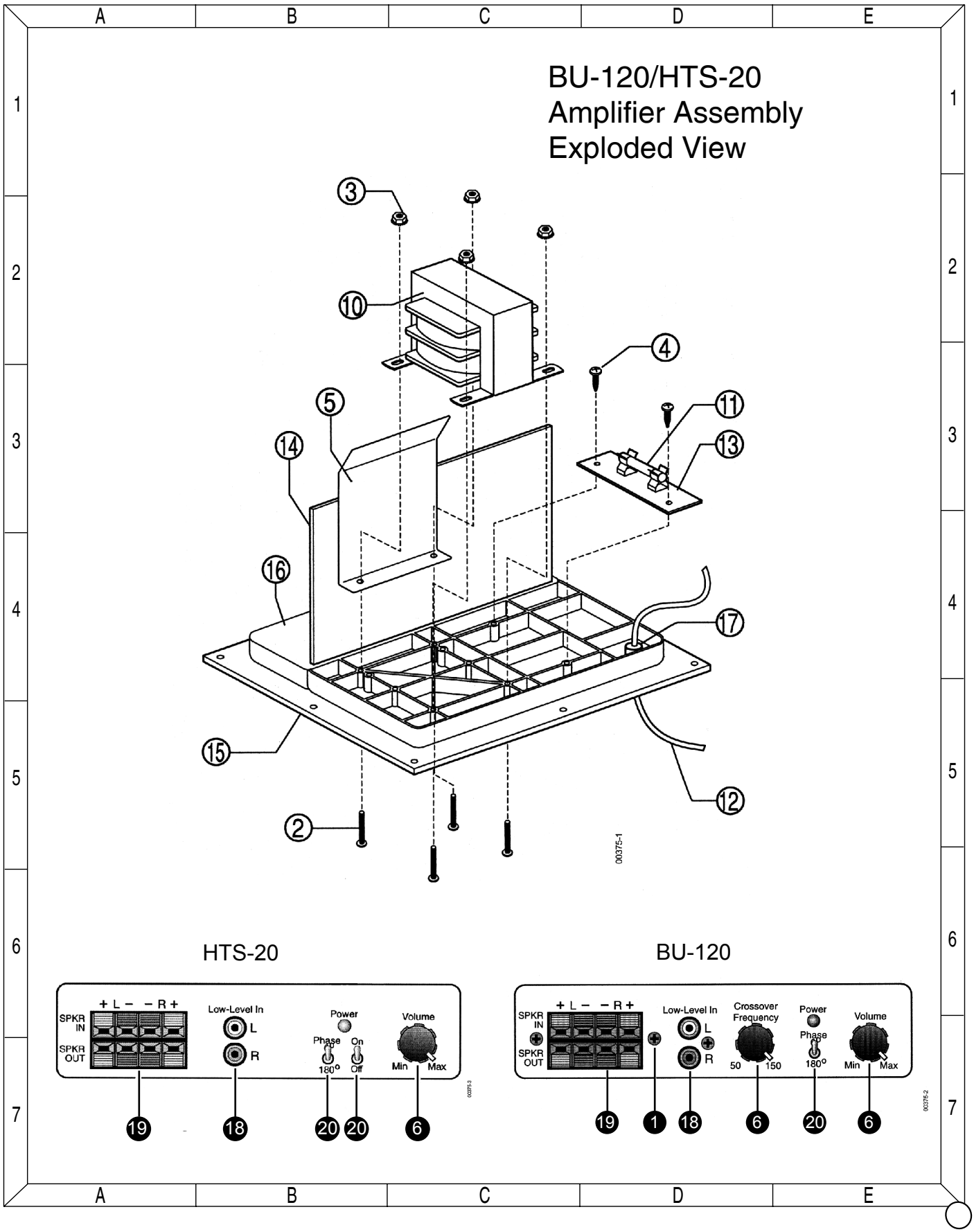
BU-120/HTS-20 PACKING & CABINET ASSEMBLY



BU-120/HTS-20 PACKING

NOTE: The HTS-20 subwoofer is part of the HTS-20 system and packaged with 5 satellite speakers; the master carton is not shown.

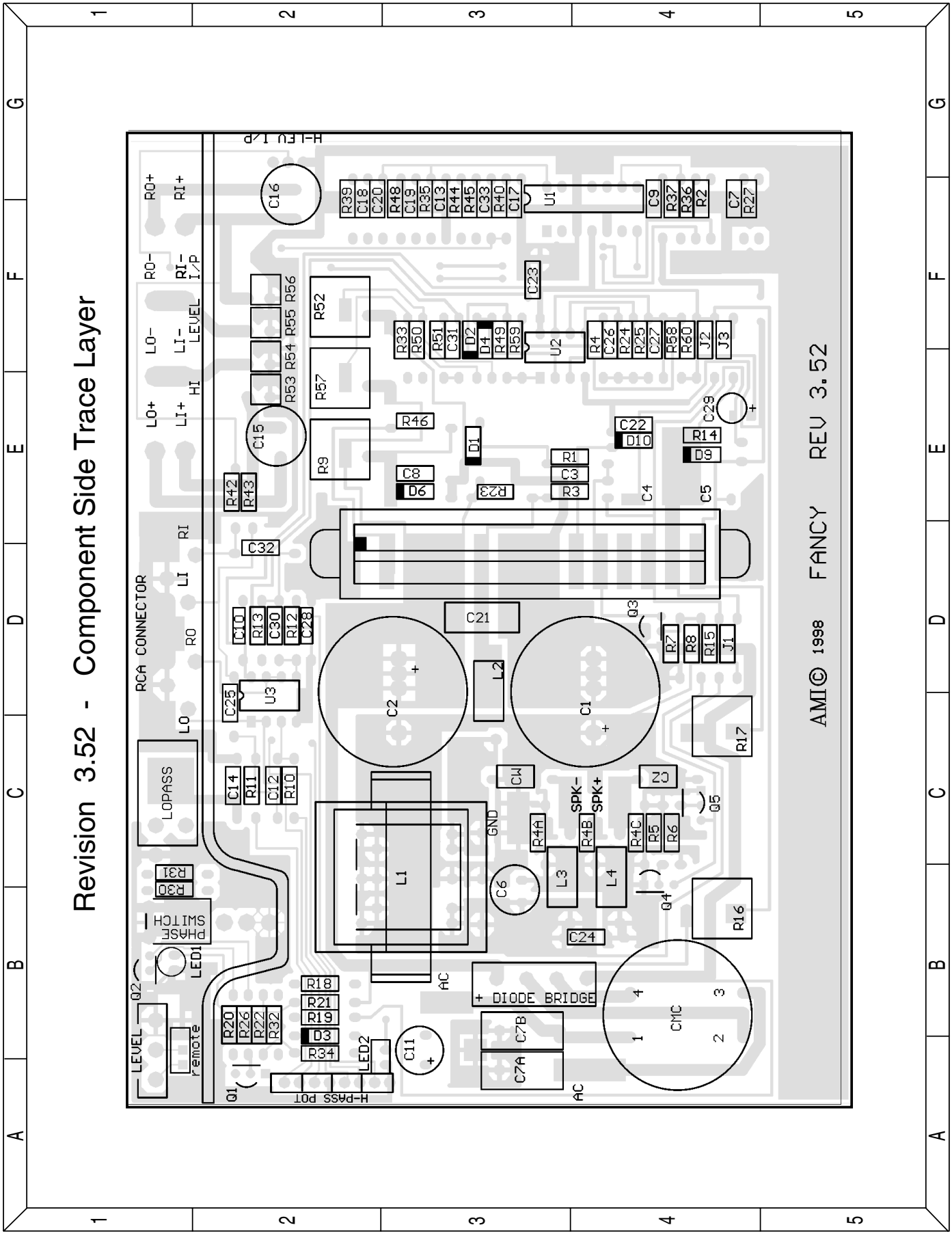
BU-120/HTS-20 AMPLIFIER ASSEMBLY EXPLODED VIEW



BU-120/HTS-20 AMPLIFIER ASSEMBLY EXPLODED VIEW LEGEND

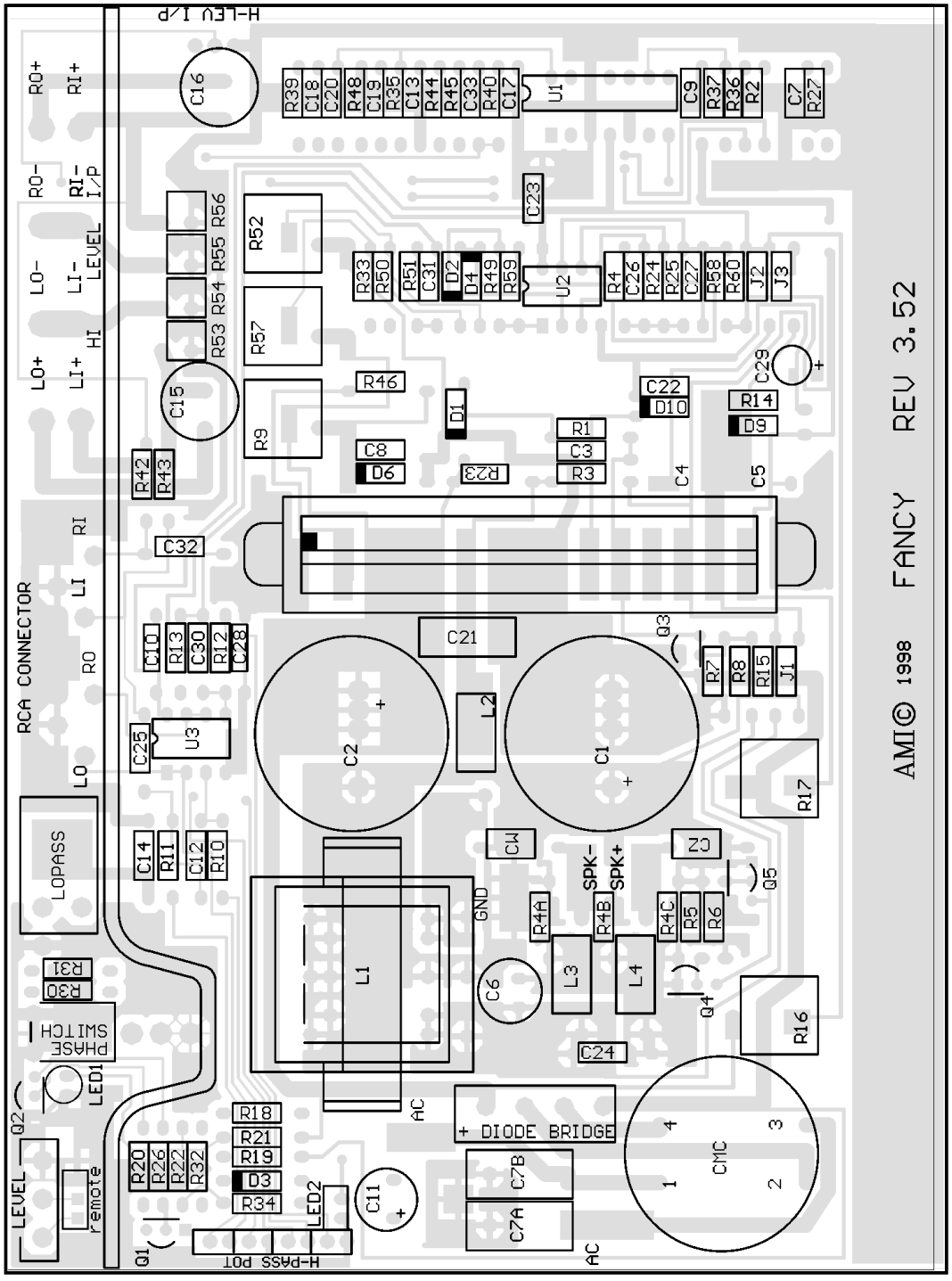
Ref#	Part#	Description	Qty
1	70170	#4x0.5" screws to secure input jacks	3
2	70171	#10 x 1" machine screw bolts for 4transformer 4 per unit	4
3	70172	#10 keps nuts for transformer	4
4	70173	#6 x 0.5" screws for fuse PCB	2
5	70301	Hum Shield Metal bracket mounted on transformer BU-120 and HTS-20 rev "A" ONLY	1
5	073-014023-900	Hum Shield Metal bracket mounted on transformer HTS-20 rev "B" ONLY	1
6	A70302	Volume Control/Crossover Knob BU-120 and HTS-20 rev "A" ONLY	2/1
6	061-2-020000-000	Volume Control Knob HTS-20 rev "B" ONLY	1
10	80110	T1 Transformer #4340 SAFETY PART BU-120 and HTS-20 rev "A" ONLY	1
10	042-010028-001	T1 Transformer SAFETY PART HTS-20 rev "B" ONLY	1
11	80111	F1 Fuse 250V, 1.0A, T type slo blo fuse SAFETY PART BU-120 and HTS-20 rev "A" ONLY	1
11	091-000096-000	F1 Fuse 250V, 2.0A, T type slo blo fuse SAFETY PART HTS-20 rev "B" ONLY	1
12	80105	Power cord, 2 conductor SAFETY PART BU-120 and HTS-20 rev "A" ONLY	1
12	083-041802-017	Power cord, 2 conductor SAFETY PART HTS-20 rev "B" ONLY	1
13	80106	Fuse PCB complete with connectors SAFETY PART BU-120 and HTS-20 rev "A" ONLY	1
13	011-080203-000	Fuse PCB complete with connectors SAFETY PART HTS-20 rev "B" ONLY	1
14	80112	Main PCB SAFETY PART BU-120 and HTS-20 rev "A" ONLY	1
14	015-131700-101	Main PCB SAFETY PART HTS-20 rev "B" ONLY	1
15	70303	Faceplate with labels SAFETY PART	1
16	A70304	Air leak cover SAFETY PART	1
17	70305	Pwr cord strain relief SAFETY PART BU-120 and HTS-20 rev "A" ONLY	1
17	061-314002-000	Pwr cord strain relief SAFETY PART HTS-20 rev "B" ONLY	1
18	108320	Dual RCA input jacks BU-120 and HTS-20 rev "A" ONLY	1
18	072-010058-000	Dual RCA input jacks HTS-20 rev "B" ONLY	1
19	108115	High level Input and Output terminals BU-120 and HTS-20 rev "A" ONLY	1
19	062-050800-000	High level Input and Output terminals HTS-20 rev "B" ONLY	1
20	70150	Phase Switch/Crossover bypass BU-120 and HTS-20 rev "A" ONLY	1/2
20	074-030002-000	Phase Switch/Crossover bypass HTS-20 rev "B" ONLY	2

BU-120/HTS-20 rev. A PCB (Component Side Trace)

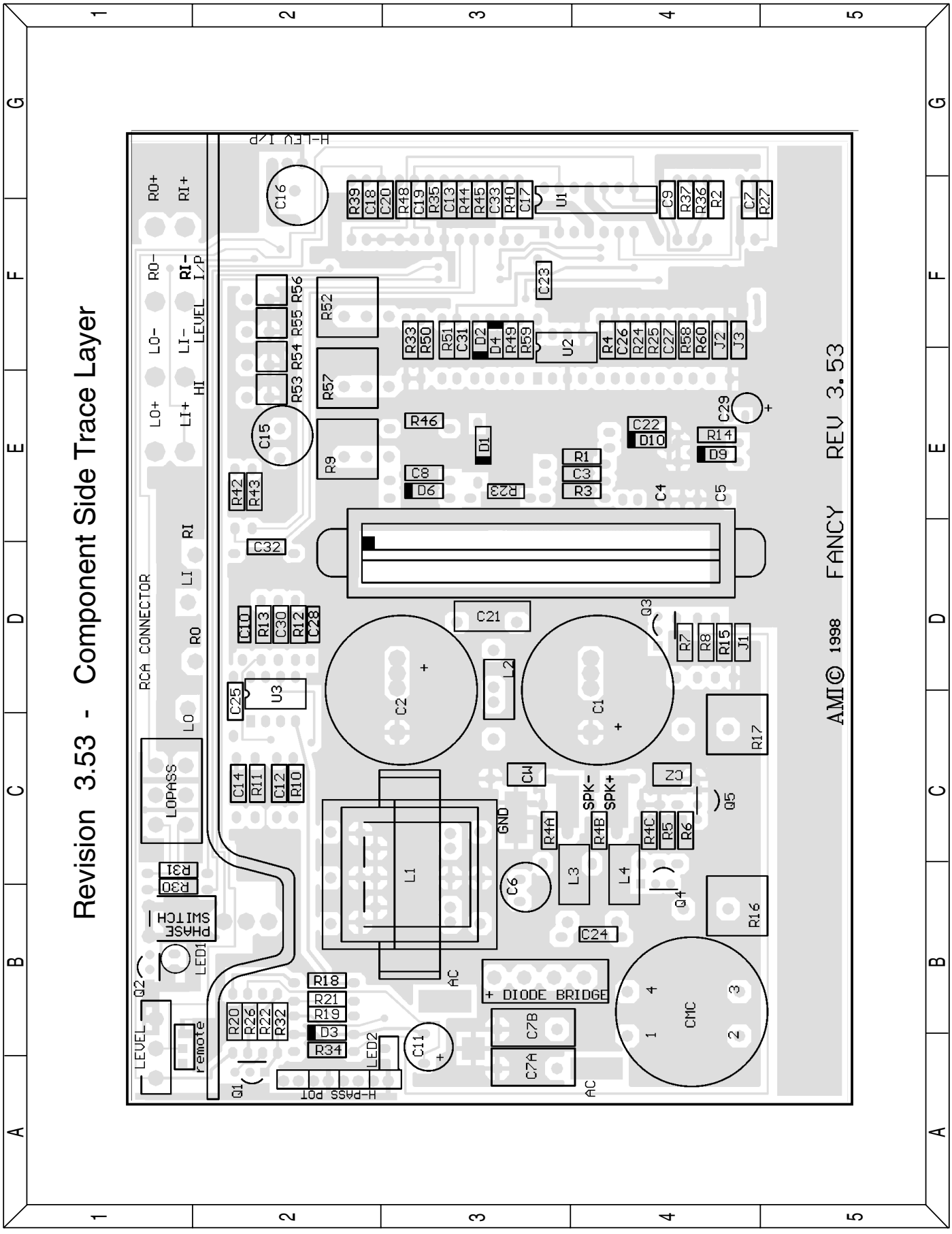


BU-120/HTS-20 rev. A PCB (Solder Side Trace)

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

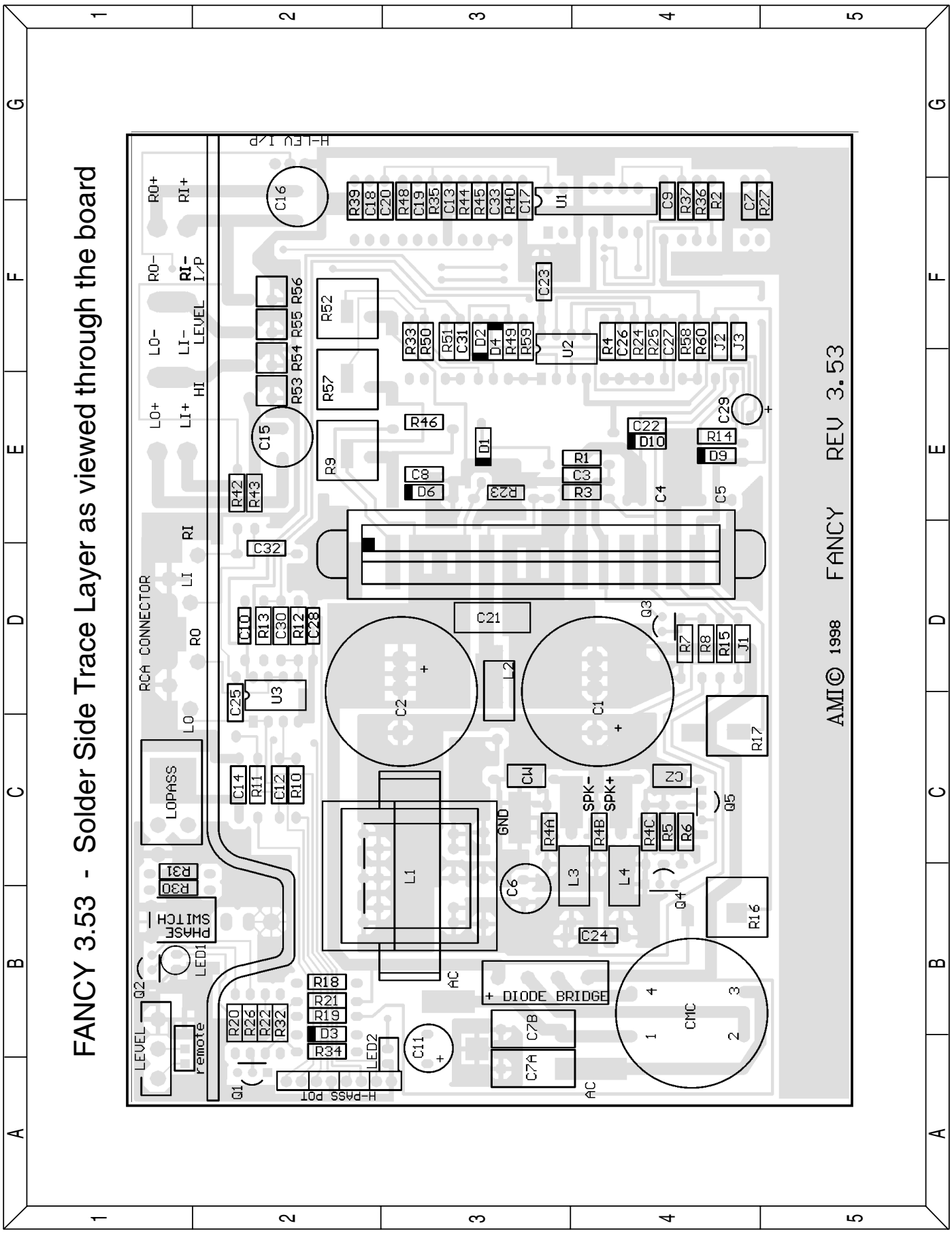


BU-120/HTS-20 rev. A PCB (Component Side Trace)



BU-120/HTS-20 rev. A PCB (Solder Side Trace)

FANCY 3.53 - Solder Side Trace Layer as viewed through the board



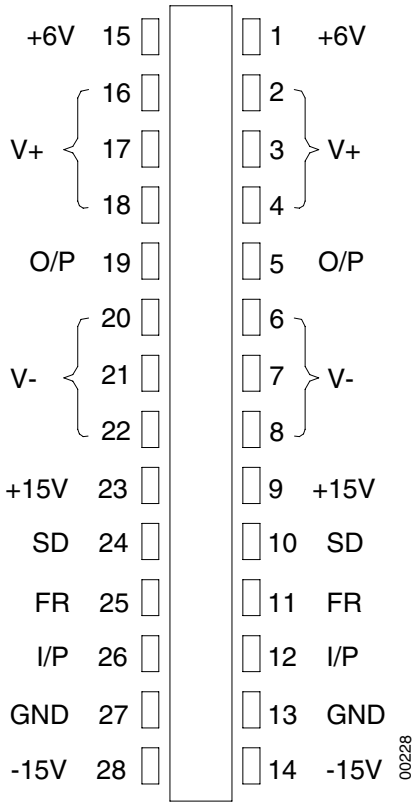
BU-120/HTS-20 rev. A ELECTRICAL PARTS LIST

REF#	PART#	DESCRIPTION	QTY
Resistors			
R1	40705	4.7M 1/4W 5% carbon film	1
R2	40426	24k 1/4W 5% carbon film	1
R3	40412	33.2k 1/4W 1% metal film	1
R4	40406	100k 1/4W 5% carbon film	1
R4a/b/c	40105	0.1 1/2W 5% 3pcs.	3
R5, 6	40420	1k 1/4W 5% carbon film	2
R7	40409	10k 1/4W 5% carbon film	1
R8	40406	100k 1/4W 5% carbon film	1
R9	40421	3.9k 5W 5%, 3W can be used	1
R14	40409	10k 1/4W 5% carbon film	1
R15	40406	100k 1/4W 5% carbon film	1
R16, 17	40101	820 2W 5% carbon film	2
R18	40407	220k 1/4W 5% carbon film (LED sens)	1
R19	40422	1k 1/2W 5% carbon film	1
R20	40405	4.7k 1/4W 5% carbon film	1
R21	40409	10k 1/4W 5% carbon film	1
R22	40410	2.2k 1/2W 5% carbon film	1
R24	40417	47k 1/4W 5% carbon film	1
R25	40406	100k 1/4W 5% carbon film	1
R26	40701	1.0M 1/4W 5% carbon film	1
R27	40428	8.2k 1/4W 1% metal film	1
R29	40103	470 1/4W 5% METAL FILM Safety part	1
R30, 31	40429	16.4k 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	40427	23.7k 1/4W 1% metal film	1
R37, 38	40417	47k 1/4W 5% carbon film	2
R39	40430	36.5k 1/4W 1% metal film	1
R40	40431	68k 1/4W 5% metal film	1
R42, 43	40406	100k 1/4W 5% carbon film	2
R44	40409	10k 1/4W 5% carbon film	1
R45	40409	10k 1/4W 5% carbon film	1
R46	40111	47 ohms 1/4W 5% carbon film	1
R48	40432	6.98k 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	40404	1k 2W 5% carbon film	1
R53, 54, 55, 56	40106	100 2W 5% carbon film	4
R57	40404	1k 2W 5% carbon film	1
R58	40435	8.06k 1/4W 1% metal film	1
R59	40405	4.7k 1/4W 5% carbon film	1
R60	40701	1.0M 1/4W 5% carbon film	1
R23	40438	20K 0.25W 1% metal film	1
Crossover	40425	50k 1/4W 10% Double Log Pot	1
Level	40402	5k 1/4W 10% Single Linear Pot	1
Capacitors			
C1, 2	30706	4700uF 50V -4% Electrolytic Radial Safety part	2
C3	30514	47nF 50V -4% Mono-ceramic axial	1
C4	30504	100nF 50V -4% Mono-cer rad 0.2"/ax 0.3"	1
C5	30504	100nF 50V -4% Mono-cer rad 0.2"/ax 0.3"	1
C6	30705	10uF 50V -4% Electrolytic Radial NP Safety part (See Service Bulletin INF2000-01 page 15)	1
C7	30510	33nF 50V 10% Mono-ceramic axial	1
C7a/b	30505	100nF 100V 20% Metal Polyester Rad	1
C8, 9	30504	100nF 50V +80/-20% Mono-ceramic axial	2
C11	30702	100uF 35V -4% 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 -4% Mono-ceramic radial	1
C18, 19, 20	30504	100nF 50V 10% Mono-ceramic axial	3
C24	30502	100nF 50V -4% Mono-ceramic axial	1
C26	30512	22nF 50V 10% Mono-ceramic axial	1
C27	30513	3.3nF 50V 10% Mono-ceramic axial	1
C28	30507	10nF 50V 20% Mono-ceramic axial	1
C29	30703	4.7uF 50V -4% Electrolytic Radial	1
C31	30514	47nF 50V 10% Mono-ceramic axial temp stable	1
Diodes			
D1	50101	ZENER 1N5256B 30V 5% 0.5W	1
LED 1 or 2	50106	Dual Cir LED (2 legged)	2
D2, 4	50104	1N4148 100V 0.1A	4
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	
Transistors			
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	60154	MPS A56 80V PNP	2
IntegratedCircuits			
U1	60100	LM324 Quad OpAmp +/-15	1
U2	60101	TLO 82 Dual OpAmp +/-15	1
	60301	S53AMI Power Amp module SAFETY PART	1
Inductors			
CMC1	80100	mc4438 Safety part	1
L1	80101	mc4436 Safety part	1
L2	80102	BL02RN2-R62 Ferrite Bead	1

BU-120/HTS-20 INTEGRATED CIRCUIT DIAGRAMS

S53AM/S64AMI - Power Amp module SAFETY PART

BU-120 and HTS-20 rev “A” ONLY



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

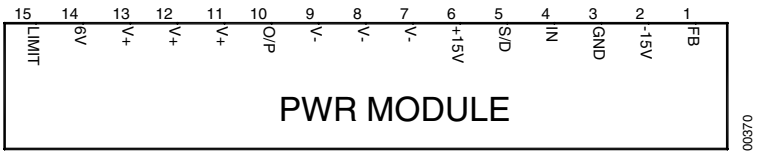
1) Align white indent marker on Amp Module with indent marker on main PCB; alternately position of label on the top of the module; incorrectly replacing the Module 180^0 in the PCB slot will result in its destruction.
2) All AC powered test instruments (meters, oscilloscopes, etc.) must have a floating 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 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)

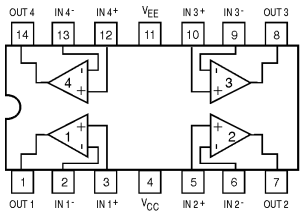
   (2) part# 60301N (nuts)

HTS-20 rev “B” ONLY

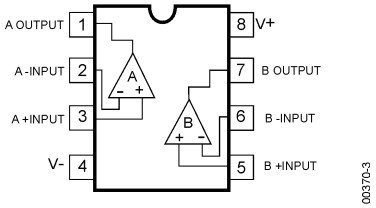


CN1

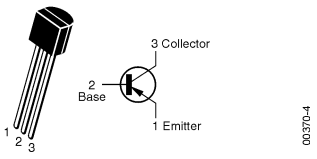
U1, IC101 - (LM324, TL074)
Quad Op Amp



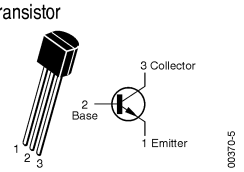
U2,IC102 - (TLO 82, BA4558)
Dual Op Amp



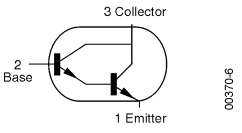
Q2,Q4,Q5,Q13,Q31,Q32 (MPS A56, 2N3906, 2SA1015, 2N5401) PNP Transistor



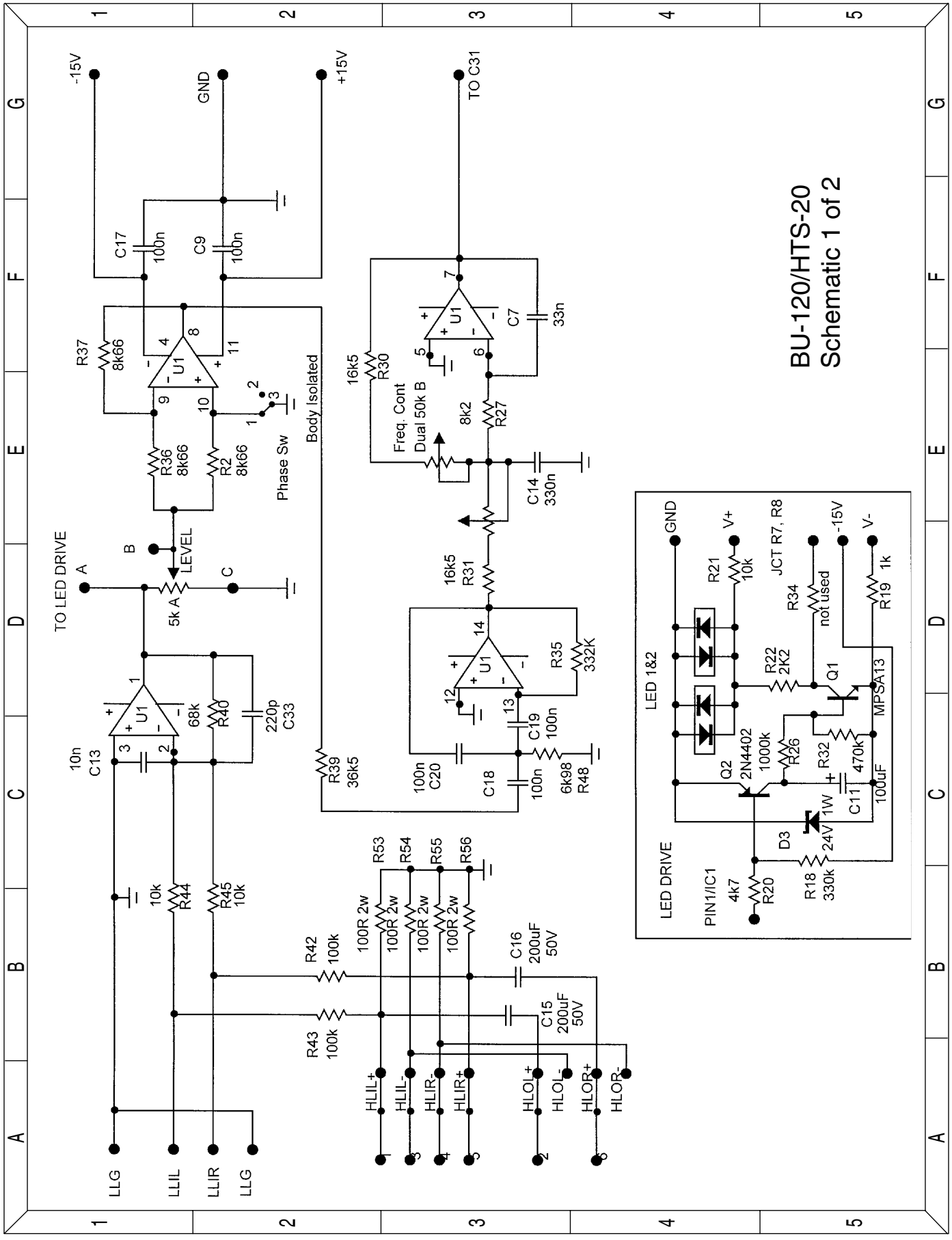
Q3,Q11,Q12,Q33 (2N3904, 2SC1815, 2N55551) NPN Transistor



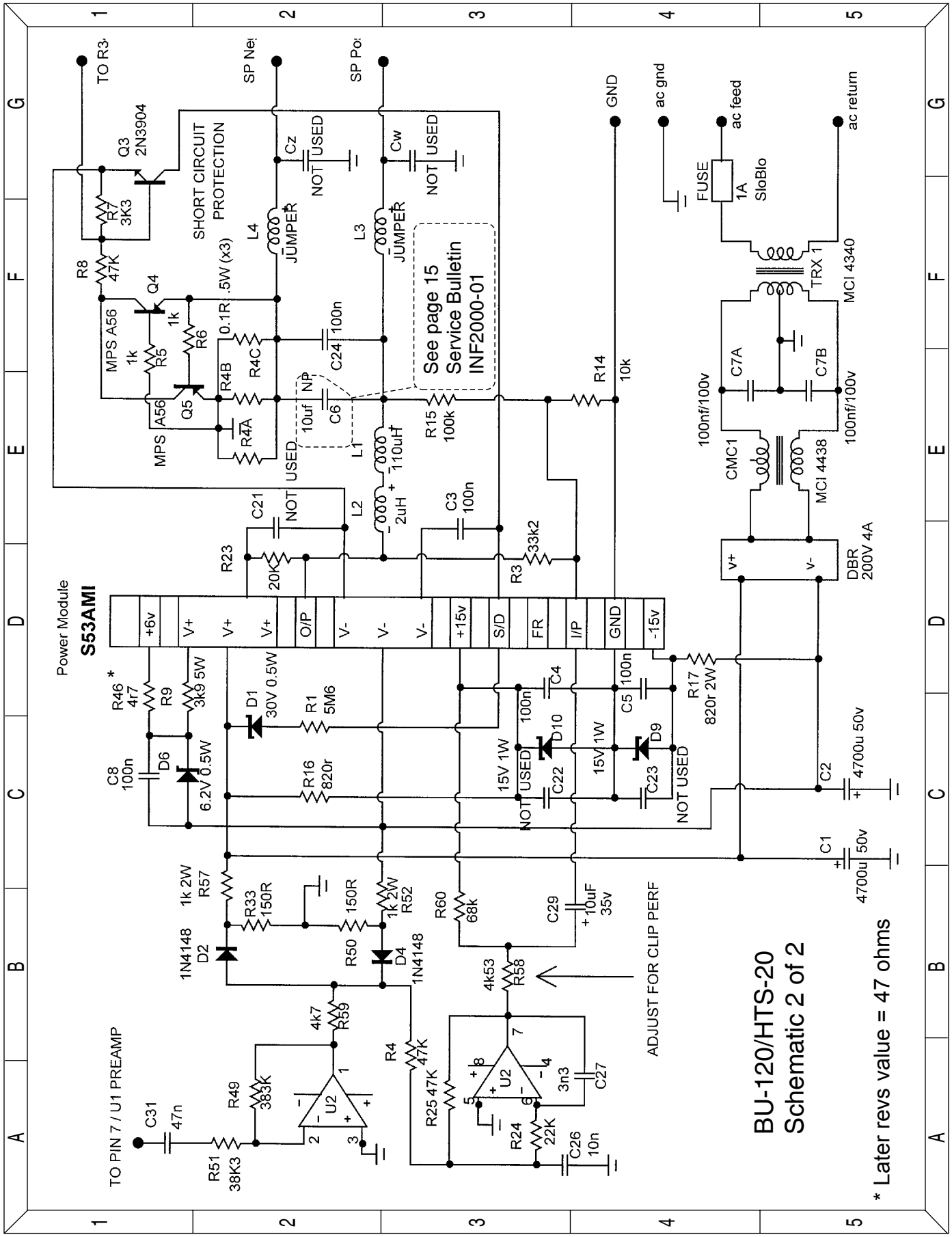
Q1 - (MPS A13)
30V NPN(Darl)
Transistor



BU-120/HTS-20 rev "A" SCHEMATIC 1 of 2



BU-120/HTS-20 rev "A" SCHEMATIC 2 of 2



HTS-20 (rev B) ELECTRICAL PARTS LIST

Part Number	Description	Ref Designator	Qty
MAIN PCB			
Semiconductors			
050-002400-100	zener diode 24V HZ-24-2	D11	1
050-003300-100	zener diode 33V 1N4752	D31	1
050-006200-100	zener diode PN:HZ6C2/Hit 6.2V 1/2W	D2	1
050-414802-100	Diode 1N4148	D121,122,123,124	4
050-524500-200	zener diode P/N:1N4744ARL 15V/1W	D3,4	2
051-101501-000	Transistor pnp 2sa1015gr TO-92	Q13	1
051-181502-000	Transistor npn 2sa1815gr TO-92	Q11,12	2
051-540101-000	Transistor pnp 2n5401 TO-92	Q31,32	2
051-555100-000	Transistor npn 2n5551 TO-92	Q33	1
052-401001-000	Diode Bridge P/N:KBU4A 4A/100V	D1	1
053-007400-000	IC TL074CN Quad Op-Amp	IC101	1
053-455801-000	IC BA4558 (ROHM) Dual Op-Amp	IC102	1
Resistors			
020-100497-120	Carbon resistor 1K 1/4W J	R15,37,38	3
020-100597-120	Carbon resistor 10K 1/4W J	R11,107,108,111,112, 113,124,125	8
020-100697-120	Carbon resistor 100K 1/4W J	R23,105,106	3
020-100797-120	Carbon resistor 1M 1/4W J	R13	1
020-150497-120	Carbon resistor 1K5 1/4W J	R126,127	2
020-150797-120	Carbon resistor 1M5 1/4W J	R31	1
020-220497-120	Carbon resistor 2K2 1/4W J	R12	1
020-220597-120	Carbon resistor 22K 1/4W J	R130,121	2
020-220697-120	Carbon resistor 220K 1/4W J	R122	1
020-270697-120	Carbon resistor 270K 1/4W J	R116	1
020-300497-120	Carbon resistor 3K 1/4W J	R16	1
020-330497-120	Carbon resistor 3K3 1/4W J	R33	1
020-330597-120	Carbon resistor 33K 1/4W J	R22	1
020-330697-120	Carbon resistor 330K 1/4W J	R109	1
020-360597-120	Carbon resistor 36K 1/4W J	R114	1
020-470197-121	Carbon resistor 4R7 1/4W J	R4	1
020-470497-120	Carbon resistor 4K7 1/4W J	R17,123	2
020-470597-120	Carbon resistor 47K 1/4W J	R128,128,32	3
020-470697-120	Carbon resistor 470K 1/4W J	R14	1
020-680497-120	Carbon resistor 6K8 1/4W J	R119,115	2
021-100096-120	Metal oxide film resistor 0R1 1/2W J	R34,35,36	3
021-100301-120	Metal oxide film resistor 100R 1W J	R101,102,103,104	4
021-100598-100	Metal film resistor 10K 1/8W F	R6	1
021-165597-100	Metal film resistor 16.5K 1/4W F	R117,118	2
021-220402-021	Metal oxide film resistor 2K2 2W J MO-200	R3	1
021-470498-100	Metal film resistor 4K7 1/8W F	R131	1
021-680598-121	Metal film resistor 68K 1/8W F	R5	1
022-680305-020	Cement resistor 680R 5W J P/N:SQM5M	R1,2	2
026-500495-252	VR Volume POT 5K	VR101	1
Capacitors			
030-100247-300	Ceramic capacitor 0u1/50V Z P:5	C5,6,7,9,10	5
032-100263-301	mylar capacitor 0u01/100V J P:5	C129,103,121	3

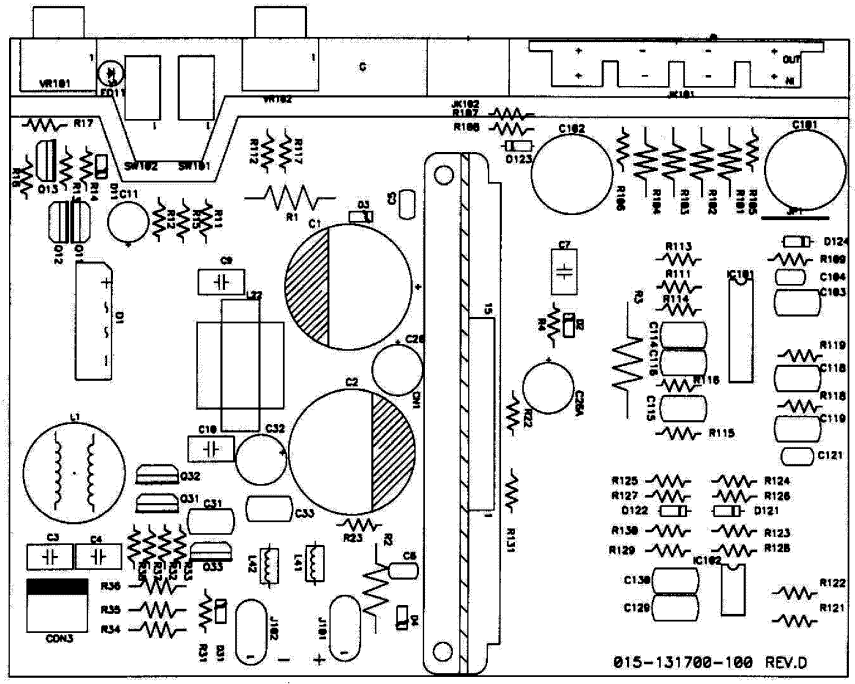
HTS-20 (rev B) ELECTRICAL PARTS LIST (Cont.)

Part Number	Description	Ref Designator	Qty
032-100364-300	mylar capacitor 0u1/100V K R	C3,4,33,26A	4
032-220163-300	mylar capacitor 0u0022/100V J	C104	1
032-3300025-300	mylar capacitor 0u0033/50V M	C130	1
032-330263-300	mylar capacitor 0u033/100V J P:5	C119	1
032-330354-303	mylar capacitor 0u33/63V K P:5	C118	1
032-470353-303	mylar capacitor 0u47/63V J P:5	C31	1
033-220543-200	elec capacitor 22uF/50V	C32	1
033-220645-300	elec capacitor 220uF/50V	C101,102	2
034-100635-300	elec capacitor 100uF/35V	C11	1
034-470415-301	elec capacitor 4u7/50V	C8	1
034-470745-200	elec capacitor 4700uF/50V	C1,2	2
035-100393-300	mylar capacitor 0u1/63V J P:5	C114,115,116	3
POWER AMP MODULE		CN1	1
050-414802-100	1N4148 Taping	D1-9	9
053-530000-100	Mosfet N-Channel IRF530 To-220	Q2,3	2
051-555100-000	Transistor NPN 2N5551 TO-92 Taping	Q1	1
053-035301-000	IC LF353N Dual Op-Amp	U1	1
053-741400-000	IC (Dip Type)P/N:74HC14N Hex Schmitt Trigger Inverter	U2,3	2
015-090500-100	MODULE PCB DOUB 99x55mm FR-4 REV:C		1
020-100297-120	Carbon resistor 10R 1/4W J Taping	R11,12	2
020-100397-120	Carbon resistor 100R 1/4W J Taping	R7	1
020-100497-120	Carbon resistor 1K 1/4W J Taping	R4,5,3,9	4
020-100697-120	Carbon resistor 100K 1/4W J Taping	R2	1
020-100797-120	Carbon resistor 1M 1/4W J Taping	R10	1
020-220397-121	Carbon resistor 220R 1/4W J Taping	R6	1
020-330497-120	Carbon resistor 3K3 1/4W J Taping	R8	1
020-680497-120	Carbon resistor 6K8 1/4W J Taping	R1	1
032-100394-302	mylar capacitor 0u1/100V J P:7.5 Taping	C9	1
034-100525-303	elec capacitor 10uF/25v m sm 4x7 p:1.5 105	C7	1
039-100343-100	mylar capacitor(axial) 100pF/50V J NPO Taping	C1,2,3,5	4
039-100345-100	mylar capacitor(axial) 0u1/50V M Z50U	C4	1
039-100464-100	mylar capacitor(axial) 0u001/100V K X7R Taping	C8	1
039-330344-101	mylar capacitor(axial) 330p/50V K X7R Taping	C6	1
072-040170-000	Connector P/N:211-215-000-000		1
073-014023-900	Shield cover 103.9x14x0.3t		1
073-032050-000	Heat sink 102.3x58mm		1
FUSE PCB ASS'y			
011-080203—000	FUSE PCB BORD SWD80 82x21x1.6mm 94V0		1
072-040039-000	Terminal (PCB TYPE) PC205 (t=0.8mm) T205MA		4
091-000096-000	FUSE P/N T2A/250V 5x20mm		1
091-000130-000	FUSE HOLDER P/N CQ-203SP		2
Miscellaneous			
008-061007-200	GASKET MODULE BLK CR C4305 1x7x80mm		1
008-061610-201	GASKET PCB PU FOAM SM-55 3x6x200mm		1
015-131700-101	MAIN PCB;FR-4 REV:F PCB;127x165mm		1
043-240130-010	choke coil 2.4mH (YT-8719)	L1	1
043-260330-001	filter coil 0.11mH (YT-8712-1)	L22	1

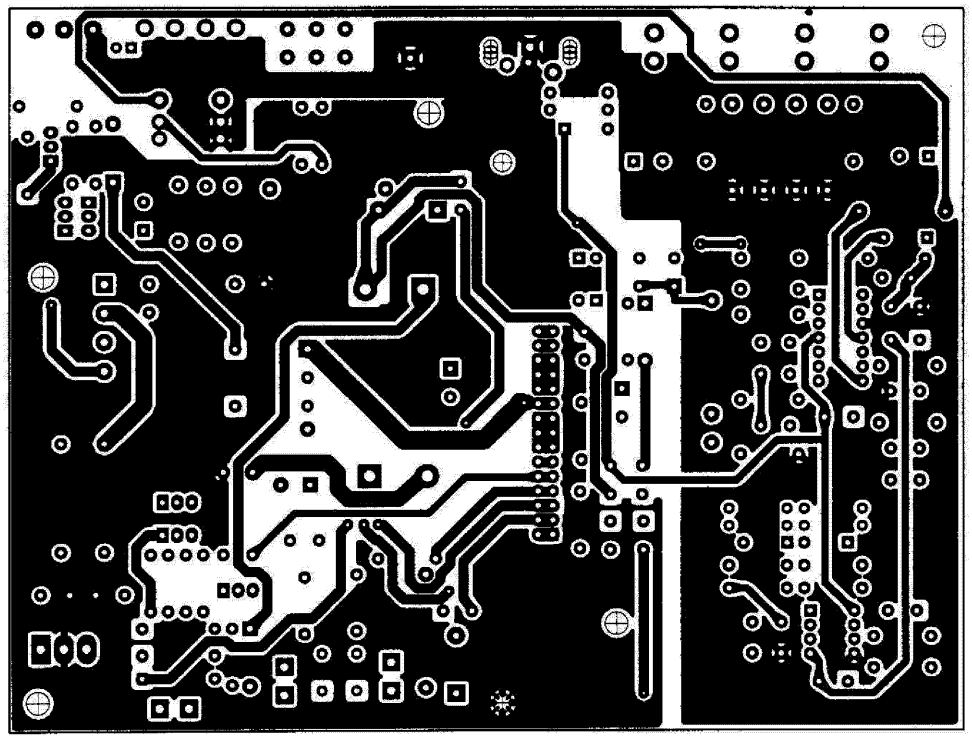
HTS-20 (rev B) ELECTRICAL PARTS LIST (Cont.)

Part Number	Description	Ref Designator	Qty
050-505200-001	LED P/N:LT-2402-25 LED11		1
062-050800-000	Push Terminal 8P P/N E801	JK101	1
065-001540-090	P/N15L 1.5x1.8mm		
070-560891-108	SCREW BTS-3 2.6x8m/m	MODULE-PCB	4
072-010058-000	RCA JACK 2P P/N:052000W1G (Red,Wht)	JK102	1
072-040032-000	Terminal P:3.96 3P	CON3	1
072-040039-000	Terminal PCB TYPE PC205 (t=0.8mm)T205MA	J101,102	2
074-030002-000	Toggle sw P/NL101	sw101,102	2
091-000143-000	EMI BEAD P/NEM11-RH-3.5x0.8x9-PA		2
165-001540-090	P/N15L 1.5x1.8x40mm		2
042-010028-001	Transformer YT-9161-2 75W-120Vac		1

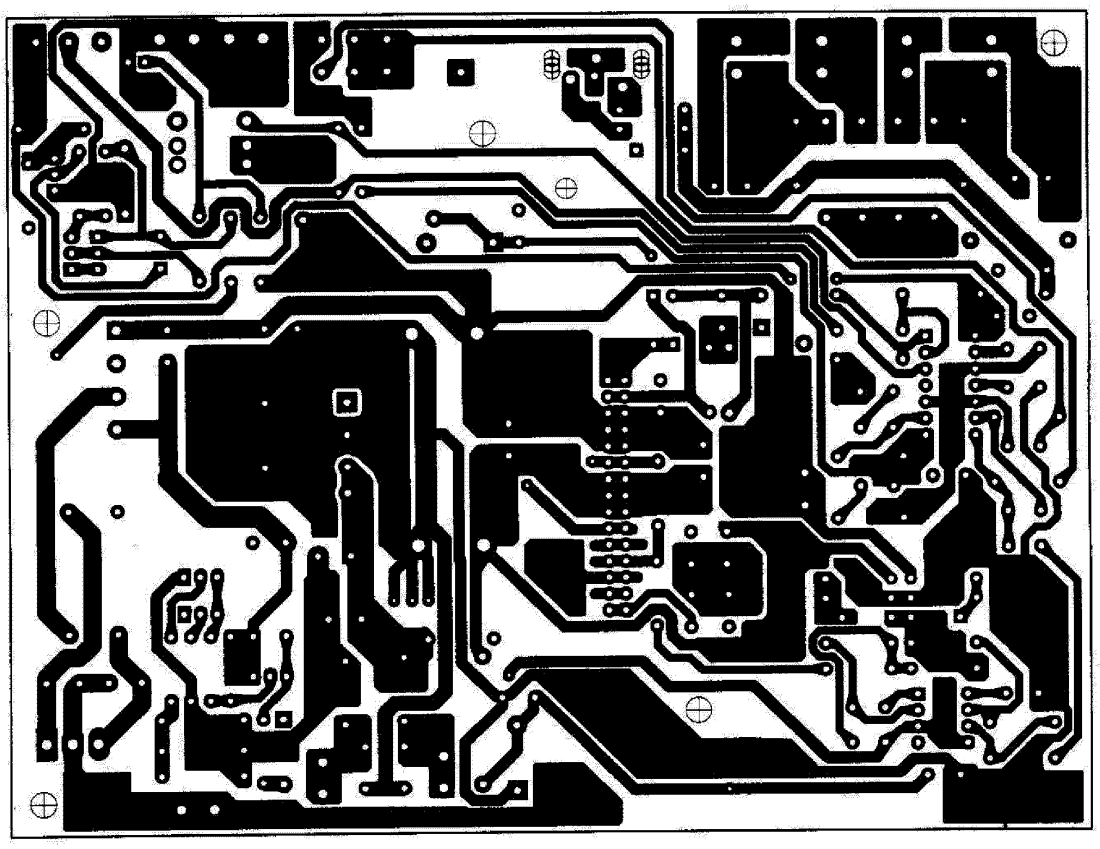
HTS-20 REV B CIRCUIT BOARDS



TOP SILK SCREEN

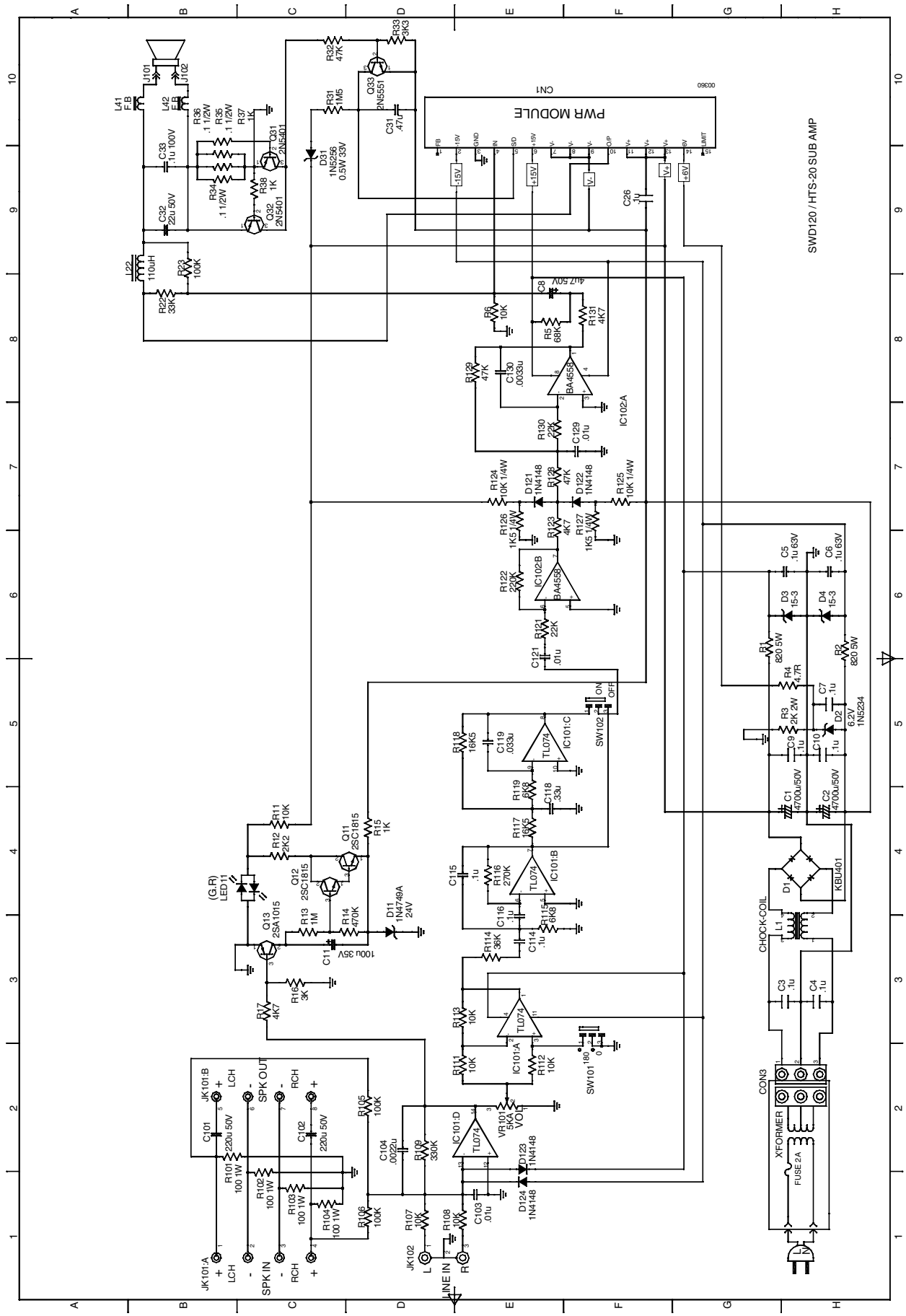


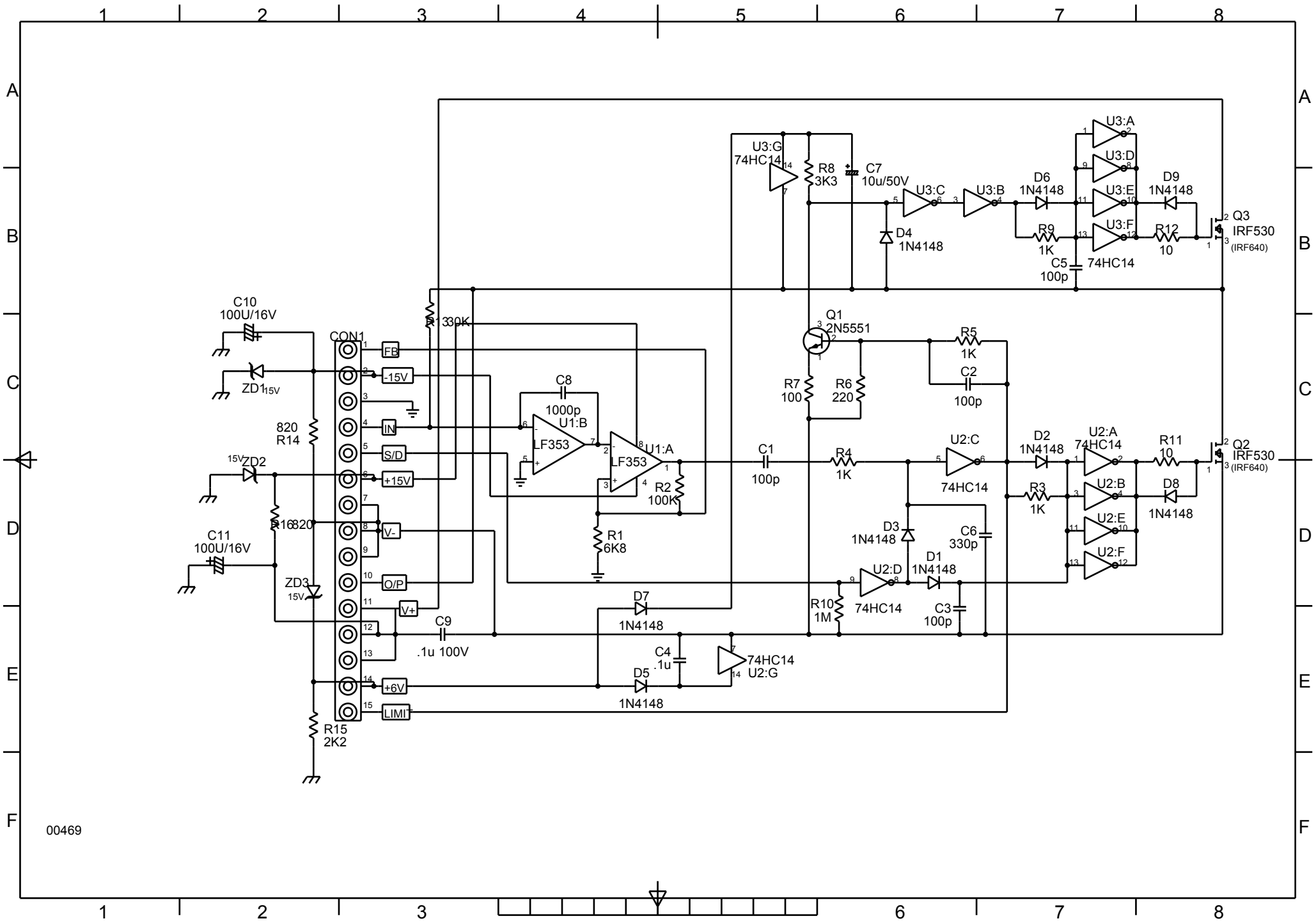
HTS-20 REV B CIRCUIT BOARDS (cont.)



SOLDER SIDE

HTS-20 REV B SCHEMATIC




U3:G
74HC14
R8
3K3
C7
10u/50V
U3:C
U3:B
D6
1N4148
U3:A
U3:D
U3:E
U3:F
D9
1N4148
Q3
IRF530
(IRF640)
D4
1N4148
R9
1K
R12
10
C5
100p
74HC14
C10
100U/16V
CON1
R13 330K
Q1
2N5551
R5
1K
C2
100p
R7
100
R6
220
ZD1 15V
FB
-15V
C8
1000p
U1:B
LF353
U1:A
LF353
820
R14
IN
S/D
+15V
15V ZD2
C1
100p
R4
1K
U2:C
74HC14
D2
1N4148
U2:A
74HC14
R11
10
Q2
IRF530
(IRF640)
R3
1K
U2:B
D8
1N4148
U2:E
U2:F
R16 820
R2
100K
R1
6K8
D3
1N4148
C6
330p
D1
1N4148
C11
100U/16V
ZD3
15V
V-
O/P
V+
U2:D
74HC14
R10
1M
C3
100p
D7
1N4148
C9
.1u 100V
C4
.1u
74HC14
U2:G
D5
1N4148
+6V
LIMIT
R15
2K2
00469