Infinity

Models:

SSW-10 subwoofer
Infinitesimal IV subwoofer
Servo Controlled subwoofer
RS Subwoofer

SERVICE MANUAL

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SPECIFICATIONS

Frequency Response	40 - 200 Hz
Crossover Frequency	40 - 200 Hz (Continuously Variable)
Output Power	100 Watts (RMS) into 2 ohms
THD (@ 75 W/100 Hz)	< .l %
Signal to noise ratio	> 80db
Input Impedance	25K Ω
Driver	10" (254mm) IMG Woofer - (DCR = 1.8 Ω)
Inputs	Line Level and Speaker Level
Outputs	
Infinitesimal IV/SSW-10/Servo Controlled Subwoofer	Full Range Speaker
RS Subwoofer	180 Hz High Pass Filter
Dimensions	
Infinitesimal IV/SSW-10/Servo Controlled Subwoofer	13.25" x 13.25" x 13" (337 x 337 x 330mm)
RS Subwoofer	23.25" x 7.25" x 13.25" (59x18.5 x 33.5mm)
Weight (Infinitesimal IV/SSW-10/Servo Controlled Subwoofer)	34 lbs. (15.4kg)

PRODUCT IDENTIFICATION

This service manual covers the following models:

SSW-10 subwoofer
Infinitesimal IV subwoofer
Servo Controlled subwoofer
RS Subwoofer (actually a different product, but the amplifier is nearly identical)

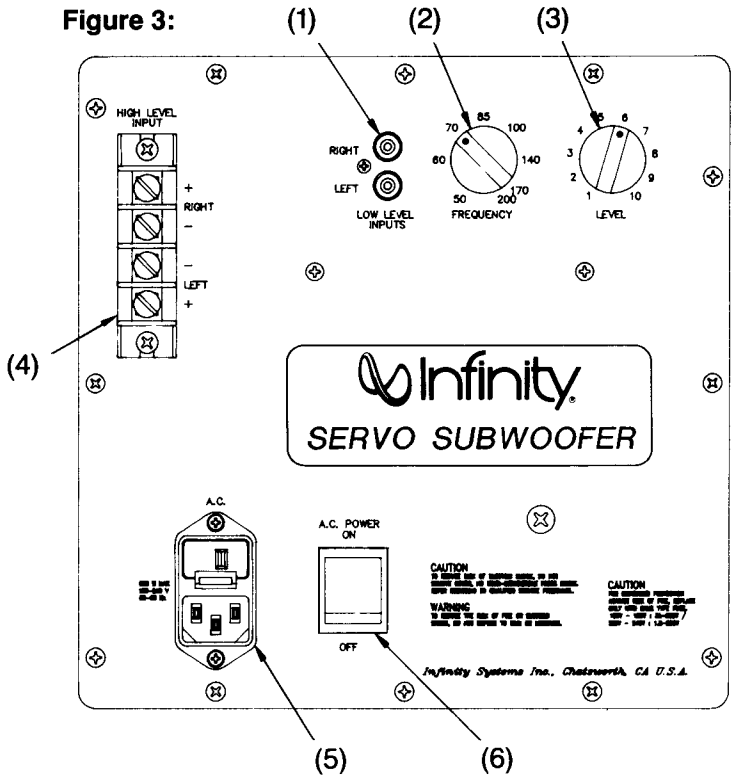
The ***Infinitesimal subwoofer, Infinitesimal IV Subwoofer, SSW-10, or Servo Controlled Subwoofer*** may be identified from the owner's manual, outer carton or amplifier plate***.*** It is a square black cube and is ported.

Alternately, the ***RS Subwoofer*** has a distinct rectangular enclosure. The differences in the RS Subwoofer include a non-removable power cord, *two* high level input terminals, and a passive high-pass filter for satellite speakers (active when the high level input terminals are utilized). There is no port.

INSTALLATION

Refer to figure 3 to identify the controls of the subwoofer's internal amplifier:

Figure 3:



(1) Low Level Input jacks: connect to preamp outputs
(2) Frequency: controls upper corner roll-off point
(3) Level: controls volume of subwoofer
(4) High Level Input terminal strip
(5) A.C. Line Cord
(6) A.C. power switch

Turn off your entire audio system prior to connecting your subwoofer. Make sure the subwoofer's On/Off Switch (6) is in the "off" position.

Verify the correct voltage (5) and fuse rating for your A.C. line current. (The subwoofer is shipped with the line voltage already set for 120 volts/60 Hz.) To change to another setting, simply pull the fuse drawer out of its socket and turn it until the proper voltage appears in the "window." Replace the fuse with the correct fuse size (see below). Then re-insert the fuse drawer into its receptacle. Ratings for the A.C. line voltage fuse are as follows:

VOLTAGE	FUSE SIZE
U.S.A. 120V/60 Hz	3 Amp slow–blow
100V/50/60Hz	3 Amp slow–blow
220V/50Hz	1.5 Amp slow–blow
240V/50 Hz	1.5 Amp slow–blow

Connect the subwoofer's A.C. Line Cord (5) to your preamplifier's or receiver's switched A.C convenience outlet.

If required, use a heavy-duty extension cord to reach the outlet. If the switched outlet is 2-prong, use a floater ("cheater") plug between the subwoofer's power cord and the outlet.

If using a switched outlet is not feasible, plug the subwoofer into any household A.C. outlet. The subwoofer draws very little current when it is not playing, so it may be left on without consequence. It is advised, however, to turn the subwoofer's power switch to OFF if the system is not to be used for more than a few days.

There are a number of ways to connect your subwoofer. Read these next few paragraphs carefully before you decide which method is most suitable for you.

1. The subwoofer can be fed directly by a low level signal from your preamplifier's output jacks by using a spare set of output jacks on your preamp, if it is so equipped (see figure 4a), or by using a "Y" connector if your preamp has only one set of outputs (see figure 4b). Use standard shielded leads terminated at each end with a male RCA connector. Connect one end of each stereo pair of leads to your preamplifier output (left and right) and connect the other end to the corresponding Left and Right Low Level Input jacks (1) on the subwoofer.

Note: When using an all-tube preamplifier, it is not recommended to use the low level method of connection if the leads going from the preamp to the subwoofer will be longer than 10 feet (3 meters). An all-tube preamplifier may not be able to handle the capacitance introduced by leads over 10 feet long.

Figure 4a:

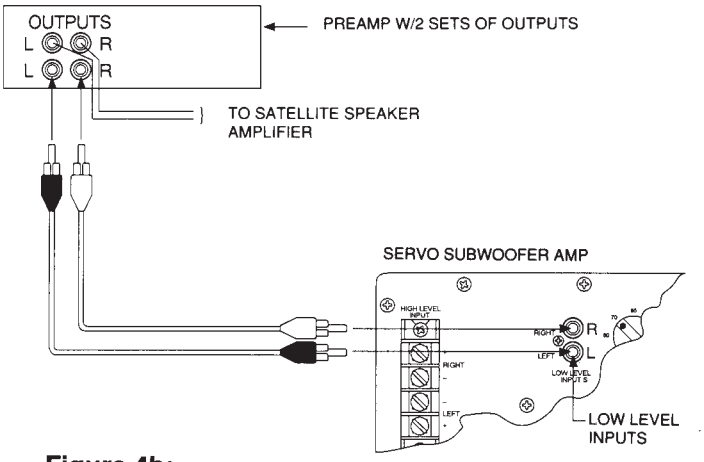
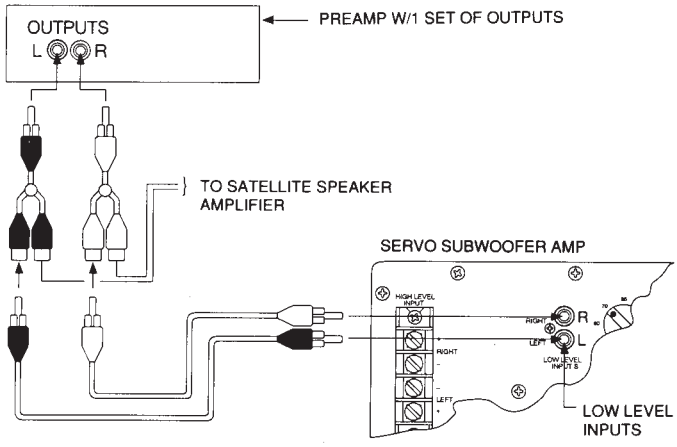
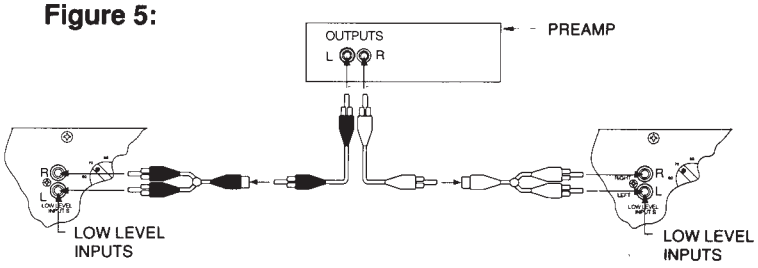


Figure 4b:



When using a single subwoofer, you must use a stereo pair of low-level leads from your preamp's outputs. When using two subwoofers, one for each channel, connect the left channel preamp out to both the Left and Right Low Level Input jacks of the subwoofer on the left by using a "Y" connector at the subwoofer's amplifier, and the right channel preamp out to both jacks of the subwoofer on the right in the same manner. See figure 5.

Figure 5:



2. The subwoofer may be connected by using its High Level Inputs (4) in either of two ways:

a. If your subwoofer is near your power amplifier/receiver and the amplifier's speaker outputs are readily accessible, you can connect the speaker outputs to the high level inputs of the subwoofer (as shown in figure 6).

b. Connect to the amplifier/receiver as stated above, while tapping off the high level outputs from the power source (as shown in figure 7).

You may use wires as thin as 22 gauge for these connections. Maintain proper polarity (+ to +, – to –) at all connections.

Figure 6:

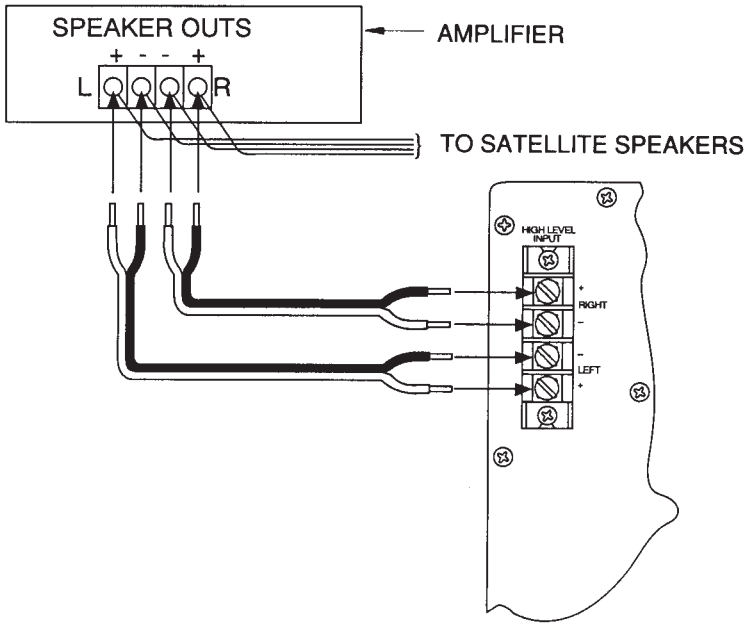
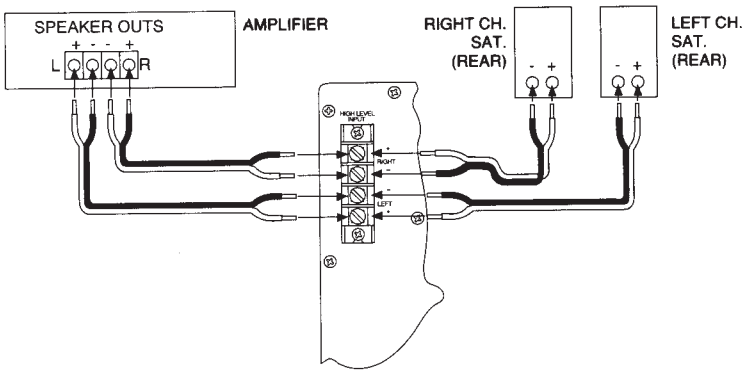


Figure 7:



OPERATION

1. Set the subwoofer's Level control (3) to 12 o'clock.
2. Set the subwoofer's Low Frequency Rolloff control (2) to 12 o'clock.
3. Switch the subwoofer's A.C. power switch (6) to the "ON" position.
4. Turn on your entire audio system.
5. Listen closely to the subwoofer. You should be able to hear a slight amount of noise coming from the speaker. If not, slightly increase the volume control of your preamplifier or receiver. Carefully turn up the subwoofer's Level control (3) until you hear noise, or a slight hum. Now turn the Level control on the subwoofer back to the 12 o'clock position. If you cannot hear noise or hum from the subwoofer, check the A.C. line cord. Is it connected to a "live" A.C. receptacle? Is it making proper contact?
6. Once you have confirmed the subwoofer is active, proceed by playing a CD, record, or cassette. Use a selection that has ample bass information.
7. Set the overall volume control of the entire system to a comfortable level. Begin with the subwoofer's Frequency (2) and Level (3) controls at the 12:00 position. Adjust the subwoofer's Level control (3) 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 level too loud following the belief that a subwoofer is there to produce lots of bass. This is not entirely true. A subwoofer is 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 level of the subwoofer so its impact on bass response is always there but is never obtrusive.
8. The frequency control (2) sets the frequency at which the subwoofer rolls-off, adjustable from 50 to 200 Hz. The setting of 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 100 Hz) then back the control down a bit until that area sounds more natural. If you are pleased with the mid bass but want to hear more low bass, turn the Frequency control DOWN a bit and the Level 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 get a reduction in low bass without changing mid bass, turn the Frequency control UP and the Level control DOWN.
9. 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 walls and corners, the greater the effect of low frequency enhancement. Experiment with the Frequency and Level controls in different locations until you are pleased with the results you obtain from your particular application.

A WORD OF ADVICE

The Low Frequency Rolloff and Level controls may be set anywhere within their rotation. However, it will be a most unusual circumstance if you have to set the Level 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. It would, therefore, be worthwhile if you tried several other locations before concluding that the Level control must be set at maximum.

In the event that the subwoofer is located so far from the listening area that its effect is not as prominent as desired, you may find that reversing the phase of the high level input wires may help. Connect the "+" speaker output terminals to the "–" high level input terminals of the subwoofer on BOTH channels. (Reversing the phase on only one channel will cancel out the signal to the subwoofer's amplifier, resulting in NO output from the subwoofer.)

A WORD ABOUT TONE CONTROLS

The tone controls on your electronic components (preamp, 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.

CARE OF YOUR SUBWOOFER

Your Infinity subwoofer cabinet is finished with a heavy duty, high quality vinyl which requires very little maintenance. Keep the cabinet clean by dusting it occasionally with a damp cloth or use a good quality furniture polish to maintain its original luster. (When using aerosol products, always spray the cloth, not the speaker to help prevent any of the product from drifting onto the driver or amplifier.)

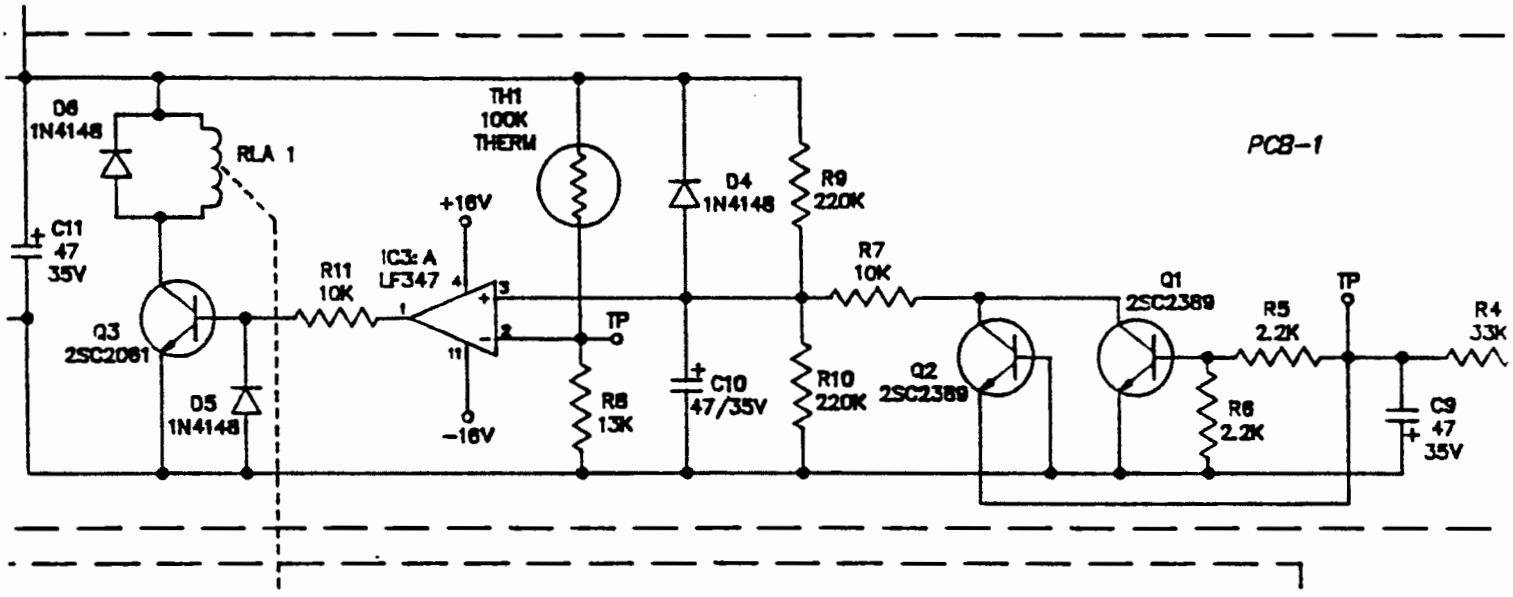
FEEDBACK

If the bass seems boomy, or you notice a rumbling sound when listening to record albums, the cause may be acoustic feedback. This means that low frequency vibrations from your speakers are reaching the turntable. To help isolate the turntable from these vibrations, place the turntable on a heavy, solid support, as far away as possible from the subwoofer. If you continue to experience difficulties after experimenting with placement, consult your Infinity dealer.

CIRCUIT DESCRIPTION

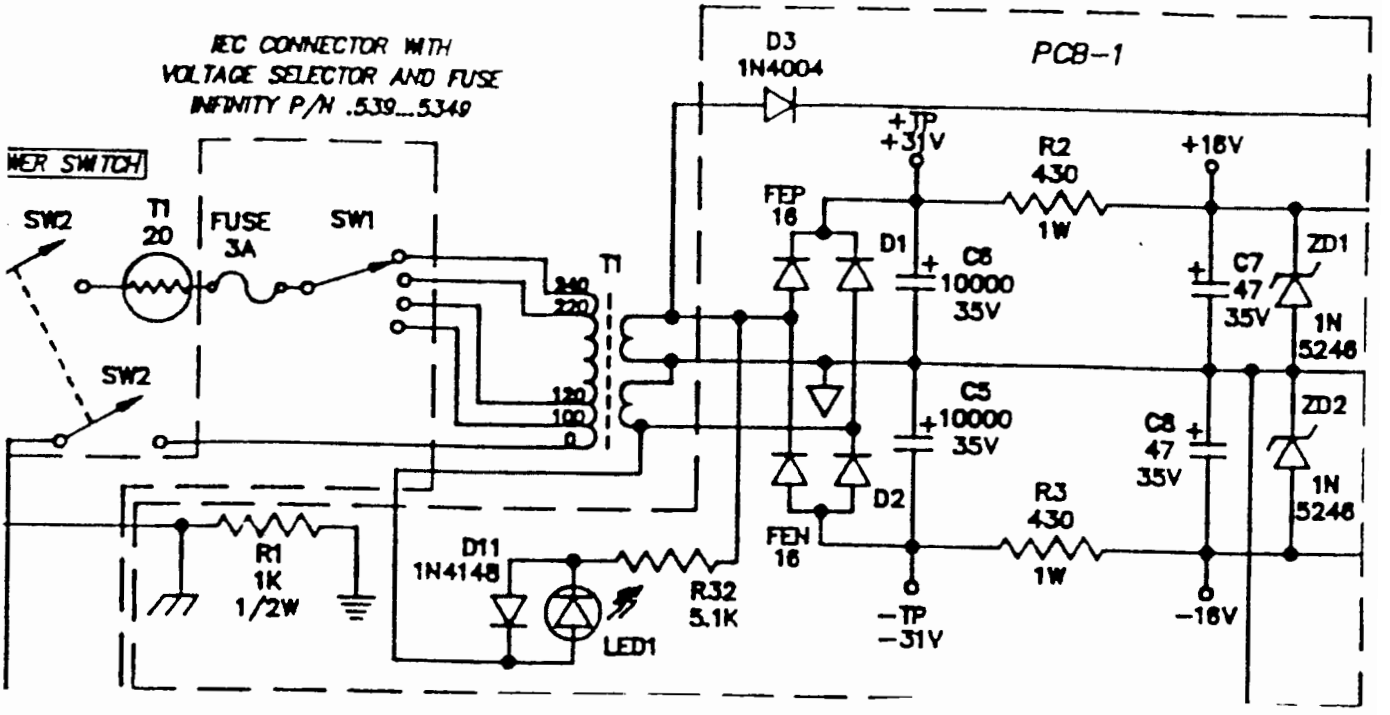
THERMAL PROTECTION

TH 1 is a temperature sensitive resistor or Thermistor. TH 1 and R8 form a variable divider, R9 and R10 form a fixed divider. IC3A is an comparative IC. When TH 1 heats up the resistance of the Variable Divider goes down, IC3A senses the drop in the resistance, and the difference between the Variable Divider and the Fixed Divider, it causes Q3 to go high which causes RAL 1 to open. When RAL 1 opens the woofer is taken out of the circuit.



A.C. Filtering

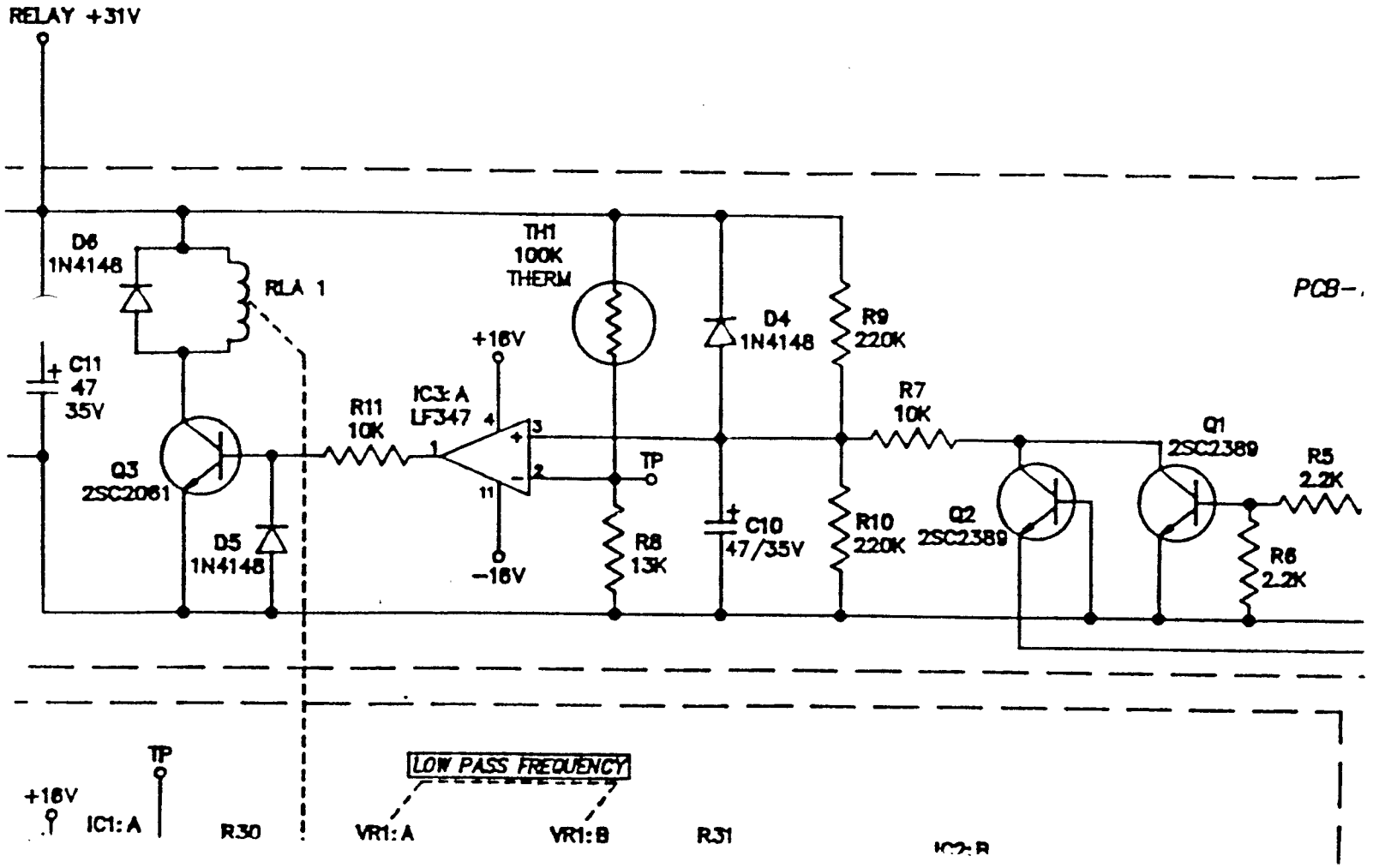
The A.C. Filtering is accomplish by the use of C5 and C6 which produces the 31 Volt Rails. The 16 Volt rails at C7 and C6 are regulated by ZD1 and ZD2 in conjunction with R1 and R2.



D.C. PROTECTION

Q1 and Q2 sense the output of the amp. for D.C. If the output of the amp. goes DC approximately 2 Volts it will cause the resistance in the Variable divider to go low, which will cause Q3 to go high which in turn will cause RAL 1 to open. This will take the woofer out of the circuit.

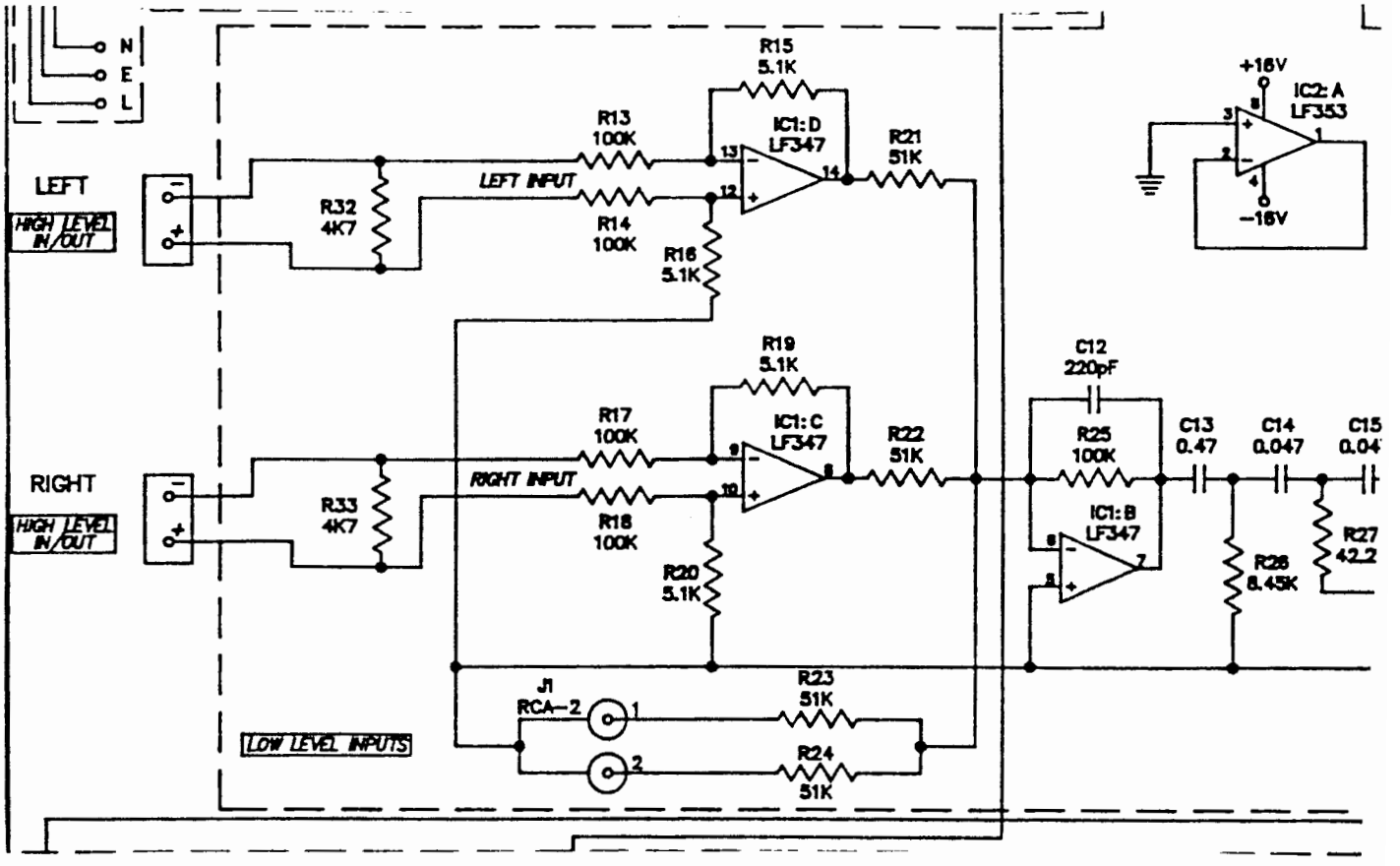
CIRCUIT DESCRIPTION (cont'd)



CIRCUIT DESCRIPTION (cont'd)

LOW LEVEL INPUT

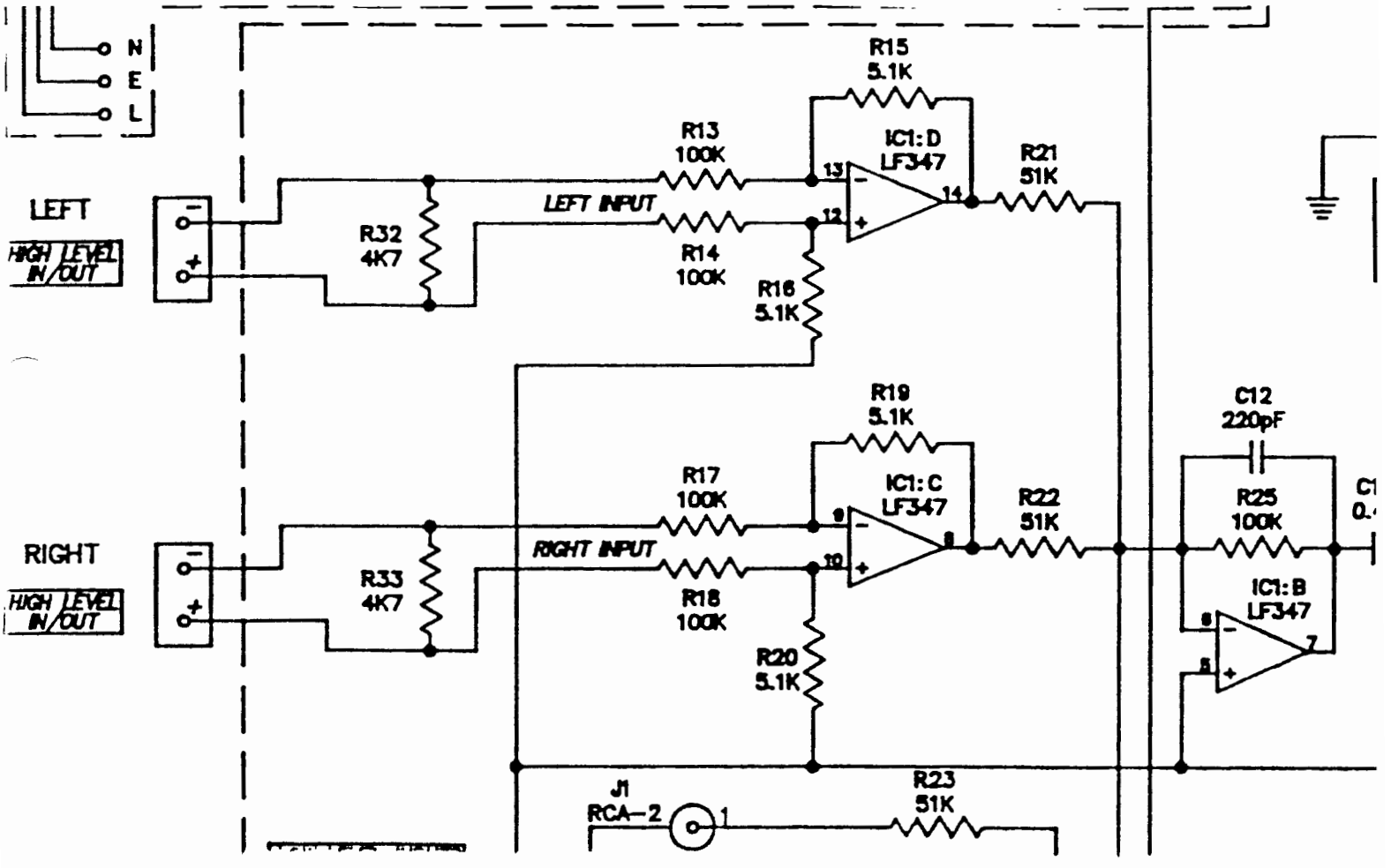
The Right and Left inputs are summed together at IC1b pin 6. At this point the signal goes through the high pass filter, (C13, C14, C15, R26, R27, R28). After which the signal goes through the Low Pass Filter, The use of C16, C17, C18, inconjunction with VR1:A VR1:B the Low Pass frequence control is achieved. The Low Frequency Level control is achieved by the use of a 20K ohm pot. (VR:2A, VR:2B) At this point the signal is sent to the Servo Control System.



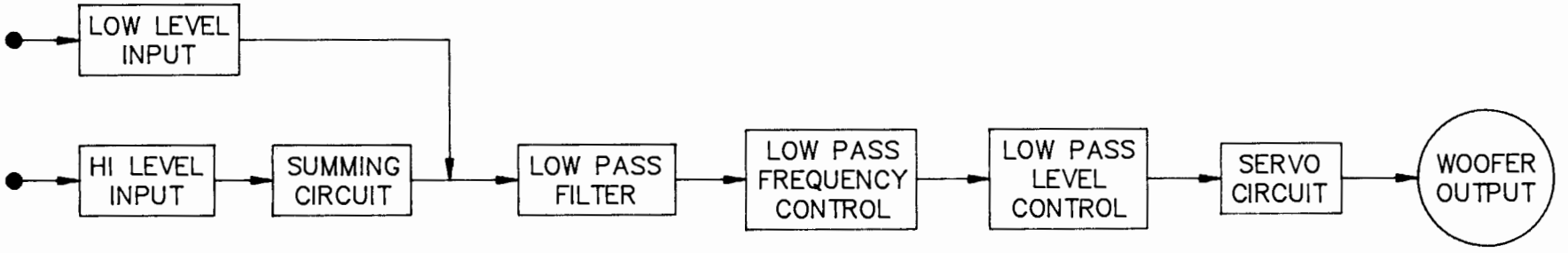
CIRCUIT DESCRIPTION (cont'd)

HIGH LEVEL INPUT

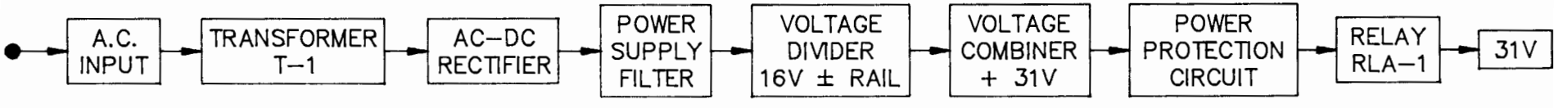
The High Level inputs are controlled by the Balancing IC1:C and IC1:D. They are summed together at IC1:B, at this point the signal path is the same as the Low Level Inputs.



SIGNAL FLOW CHART



POWER SUPPLY FLOW CHART



THEORY OF OPERATION

To understand the workings of the Servo (or the velocity bridge servo) action of the Servo Control Subwoofer. We must first begin buy referring to fig. 1. This represents the fundamental way to look at how a velocity bridge works. It should be noted that the elements are arranged in a typical bridge topological arrangement. The active speaker and it's current sampling resistor form one arm of the bridge and the dummy speaker and it's sampling resistor form the other arm of the bridge. This dummy speaker is like the active one except that it's voice coil is frozen. If one looks at the difference in the voltage across the sampling resistors a-b as a function of frequency in the low frequency range of interest, it will be found that the resultant frequency response is proportional to the velocity of the moving cone and is a result of the back emf of the active speaker because it is moving and the dummy speaker is not. The resultant voltage difference, a-b, is entirely due to the motion of the active speaker and is thus called "motional voltage" and can be used for feedback correction of the motion. In actual practice, one wouldn't use a dummy speaker in the right hand arm of the bridge because it would take up too much power from the driving amplifier. In Fig. 2, the dummy speaker arm of the bridge is replaced by a higher impedance voltage divider circuit. R1 and R2 provide a reduced voltage at point B in respect to ground that is of the same amount as in Fig.1 and the R3-C1 network reduces the voltage at point B in the higher frequencies in an approximation to the way the dummy speakers voice coil inductance does so in Fig. 1.

Refer to Fig. 3. The curve marked velocity is how the frequency response of the difference a-b would look. If we could modify this curve to the form shown in the curve marked acceleration, we would have a measure of how the speaker's acoustic output looks and then, with feedback derived from this acceleration signal applied back around the driving amplifier, we could flatten out the response to some much lower frequency as shown in Fig. 4. In essence, that is what the circuitry does. The figure shows the effect of the negative feedback on the acoustic response and how the high frequency bandwidth is reduced to the working range of up to about 100-150 Hz by the input crossover filter.

Refer to fig. 5. The power amplifier block has conventional flat voltage gain of about 26 db and provides the power to drive the woofer appropriately. The servo amplifier provides the extra open loop gain required for the feedback so that about normal input to output gain from the signal input of the speaker is obtained when the feedback is active. Additionally, the capacitor Cx rolls off the high frequency response of the open loop gain so the closed loop response will be high frequency stable. The velocity bridge amplifier can be seen to amplify and differentiate (turn into an acceleration signal) the difference signal a-b. This processed signal is fed back out of phase into the servo summing junction

formed by the resistors Rx and Ry resulting in "acceleration" type motional feedback. Resulting acoustic frequency response is flat and overall acoustic frequency response when fed from the front end crossover electronics is determined essentially by those filters.

Note the labels PCFB and NVFB on the lines leading into the V bridge feedback amplifier. These stand for positive current feedback and negative voltage feedback respectively. This is another way to think of how this system works. The PCFB reduces the fundamental resonance of the speaker in the box and boosts the acoustic level on either side of the impedance peak. Without the stabilizing influence of the NVFB loop, the system would, of course, oscillate. By judicious choice of bridge balance and the R's and C's in the V bridge feedback amplifier, it is possible to make the unfiltered (by the front end before the servo crossover filters) acoustic response very flat down to arbitrarily low frequencies or some other shaped response if that were to be desired.

THEORY OF OPERATION

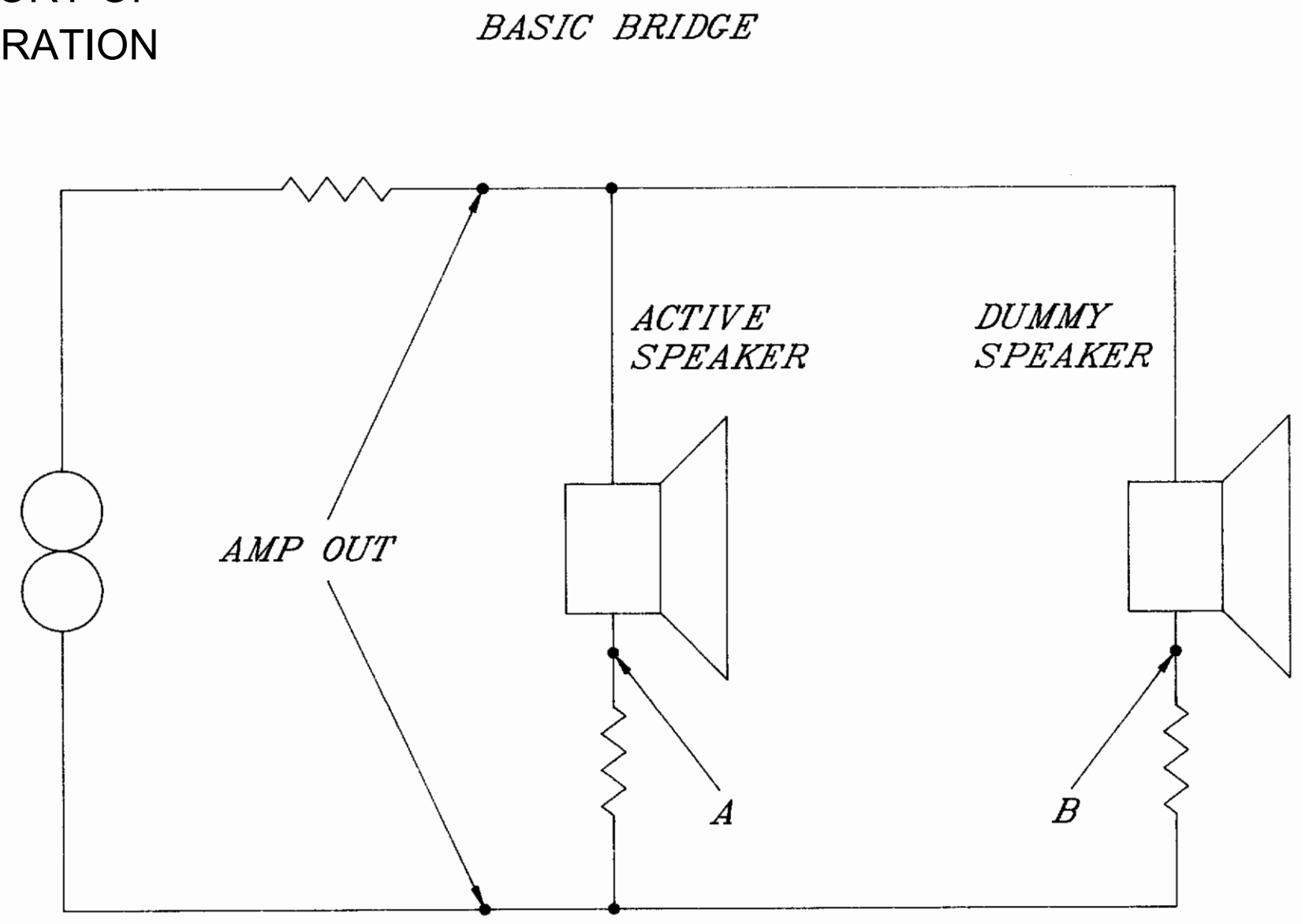


FIG. 1

THEORY OF OPERATION

MODIFIED BRIDGE

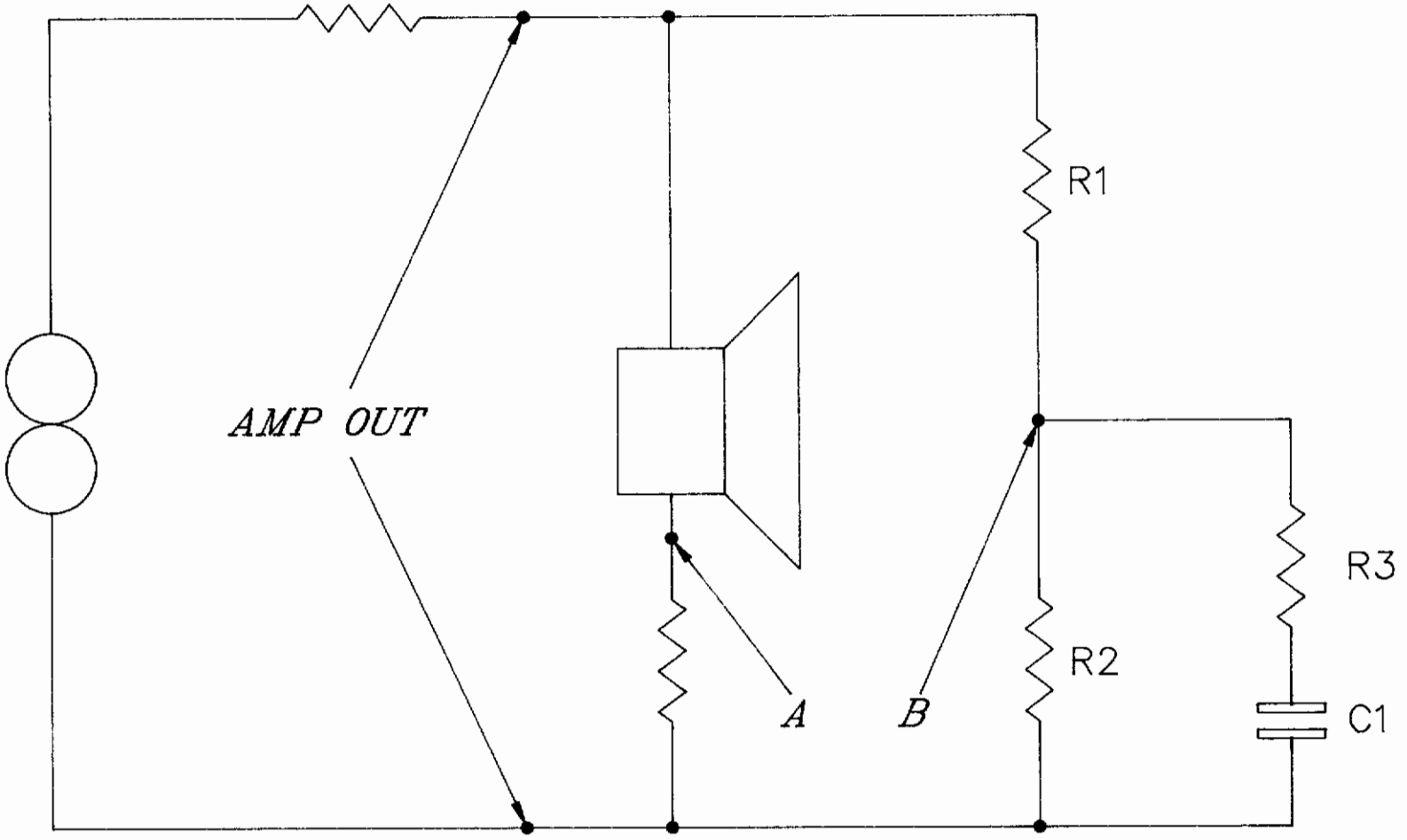


FIG. 2

THEORY OF OPERATION

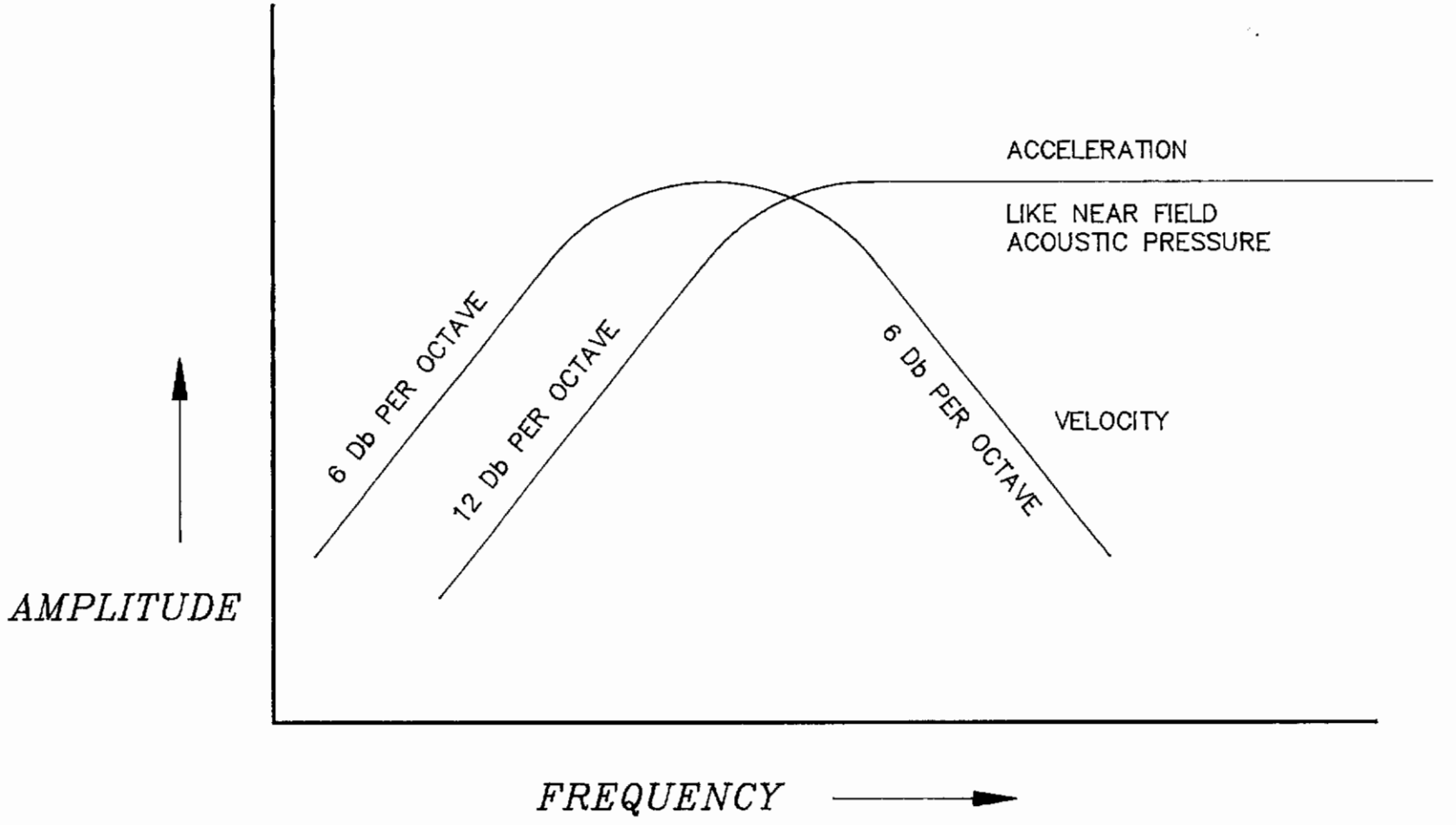


Fig. 3

THEORY OF OPERATION

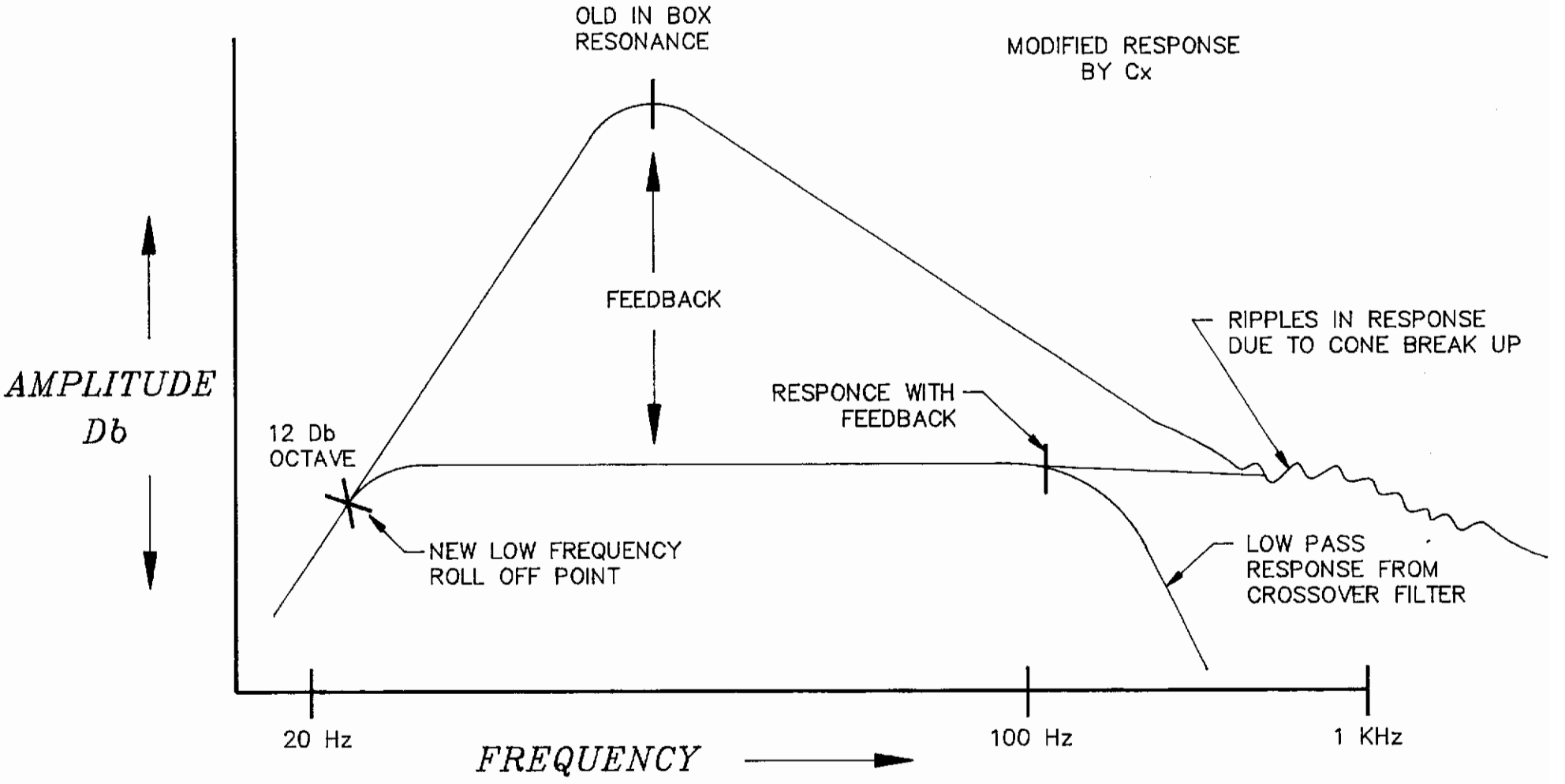
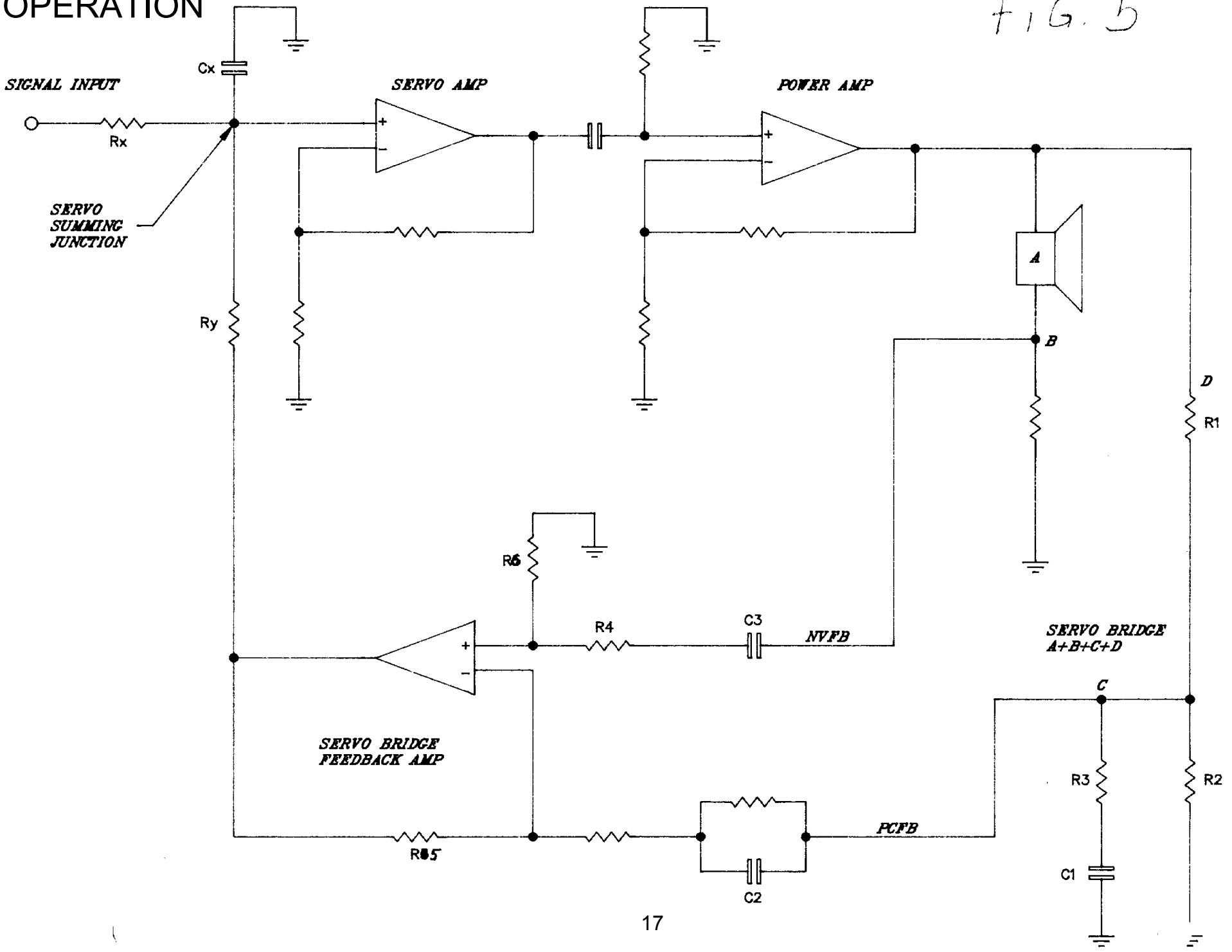


Fig. 4

THEORY OF OPERATION

FIG. 5



TROUBLESHOOTING
the RS/SSW-I0/INFINITESIMAL IV SUBWOOFER Amplifer

We are assuming at this point the unit has been tested and there is either distortion, no output, "breathing" from woofer, it blows fuses instantly, etc. If the problem is no output whatsoever and the woofer does not react at all upon hearing the relay close, disconnect and check the DCR of the woofer with a DMM; it should be 1.7 -2.2 Ω (to rule out a defective woofer). Another simple external problem that can be responsible for little or no output is: using the high level input terminals and having one polarity reversed on either input cable — (the right and left signal will effectively **cancel** at the subwoofer input.) The relay should close (an audible "click") 2 - 5 seconds after turning on the unit. And obviously if no "click" is heard the relay has not closed and there will be no output. **However whether the relay closes or not is of no consequence in the early stages of troubleshooting once the unit has been found defective. 99% of the time the relay itself is not defective.**

FOR ALL PROBLEMS (EXCEPT BLOWING FUSES, SEE SECTION IV):

After amplifier removal from cabinet, pull back plastic cover (NOTE: plastic amp cover not present on early RS Subwoofer models) and examine PC-1 (main circuit board). It is usually not necessary to completely detach the amp cover from the amp assembly.

I RELAY IS CLOSING NORMALLY (Audible "click" is heard 1 - 5 seconds after power is turned on):

A. **R2 & R3, 430Ω 1watt resistors are burnt up or discolored:** problem is most likely defective ICI and IC2 on PC-2 (the small input board) OR one or both of the zener diodes in the power supply.

B. To check, replace R2 & R3, power up unit and check DC voltages across R2 & R3; it should be ± 11-14 VDC. **If voltage is higher,** remove socketed ICI and IC2 (LF347N & LF353N) on PC-2 (the small input board) or unsolder 5 - conductor ribbon attaching PC-1 to PC-2. If no change in voltage, on R2 replace ZDI, on R3 replace ZD2. **If voltage is normal OR drops to normal after IC removal/unsoldering ribbon,** replace ICI and IC2 on PC-2 (the small input board). If the IC's are in sockets (the latest model) it will be easy; if not the two IC's must be desoldered and removed without damaging the rest of the board. IC sockets are recommended for the new IC's. **Or replace PC-2 in its entirety. (Infinity part# A021-5158)**

C. **R2 & R3 look normal:** follow instructions "B" above concerning DC voltage across R2 & R3. If all voltages are normal, replace ICI and IC2 (LF347N & LF353N) on PC-2 (the small input board A021-5158).

NOTE : If PC-1 board is badly burnt because of R2 & R3 it is considered contaminated and should be replaced in its entirety. (Infinity part# A021-5152)

II RELAY IS NOT CLOSING

A. Follow complete instructions "B" above (RELAY IS CLOSING NORMALLY) concerning DC voltages across R2 & R3. A short in ICI, IC2, or IC3 will prevent the relay from closing.

TROUBLESHOOTING (cont'd)

B. If all voltages are normal:

Check for +25 to 30 volts across relay terminals. (See drawing) If voltage is present, replace relay. If little or no voltage is present, check for+15 volts on pin I of IC3 (LF 347N on PC-1).
Check for +2.9 to 3 volts on pin 2.
Check for +12.7 volts on pin 3.
Use main filter caps, (common point), or black power supply wire for ground.
If any of the above voltages are abnormal:
Check DC voltage across R4 (33KΩ). (See drawing for location) Less than 50mV should be present. If higher, relay will not energize. DC is coming through the amplifier section. Check and replace semiconductors as necessary.
If there is negligible voltage across R4, (normal condition) replace LF 347N IC on PC-1.

III RELAY CLOSING NORMALLY, BUT NO OUTPUT OR DISTORTION EXISTS

A. Re-read or follow the instructions mentioned on the first page concerning other issues which could result in no output: (bad woofer or mis-wired high level input).

B. If those items check out, follow the signal path with schematic and DMM (oscilloscope is usually not required), checking for these approximate voltages at the points indicated below. Use main filter caps, (common point), or black power supply wire for ground:

TEST CONDITIONS:

Signal: l00mV @100 Hz connected to the low level input with a Y-cable (both right & left inputs). Both control pots (level and frequency) Full Clockwise.
Turn UUT on. **No speaker load should be connected at this time.**
ICI (LF347N) pin 7: 388 mV
ICI (LF347N) pin 1: 392 mV

Check C16 (.15μf Capacitor). One or both leads must be unsoldered for proper reading. Replace if defective.

IC2 (LF353N) pin 7: 380 mV
IC3 (LF347N) pin 14: 138 mV
R53 (See drawing): 117mV
R48 (See drawing): 2.7 volts

Loss of signal at this point means Relay contacts are defective. Replace if necessary.

Nominal Output at speaker cable: 2.7 volts

Note: When a loss of signal occurs between amplifier stages of different IC's, it's easy to be fooled when one amplifier stage is shorted out, "loading down" the previous section of another IC.

NOMINAL POT POSITIONS ON MAIN AMP BOARD — (VR3 - Full CW), (VR4 - Half-way position)

Another procedure for confining the problem to one board or the other is as follows:

1) Remove both IC's on smaller filter board (if they are in sockets), if not unsolder 5 - conductor ribbon attaching PC-1 to PC-2.
2) Follow "TEST CONDITIONS" above regarding signal injection except lead should be connected to C19 (See drawing for location).
3) Turn UUT on. Output at speaker cable should be .7 - .8 VAC. If output is normal, then problem or loss of signal is on smaller filter board.

TROUBLESHOOTING (cont'd)

IV UNIT BLOWS FUSES INSTANTLY

Desolder, remove power supply wires from PC-1 (blue & black). Replace fuse, power up unit again. Fuse will probably not blow. If it does, see *f#2.*

1) Problem is usually shorted output transistor or diode semi-bridge on PC-1. These consist of:

TIP 35C/36C	TO-218 package
BD 911/912	TO-220 package
FEN 16/FEP 16	TO-220 package

Recommended method to power up the unit after an output transistor replacement is with a Variac, slowly turning up the input voltage and watching a meter for high AC currents (greater than 100 mA).

Occasionally the output transistors are O.K. or after a replacement, high currents will continue to appear. The problem is with one of the biasing transistors Q4, 5, 6, 7, 8, or 9. All junctions can be tested in the circuit with a "diode check" function on a DMM. If a short is found, however, remember some output devices are in parallel and will have to be removed to confirm the short.

2) Problem is a shorted toroidal power transformer. Replace if defective.

RECOMMENDED FINAL INSPECTION

Check for a burnt or deformed thermistor (attached to power cord plug & switch). Replace if defective.

Make sure the toroidal transformer is tight and will not move easily by hand.

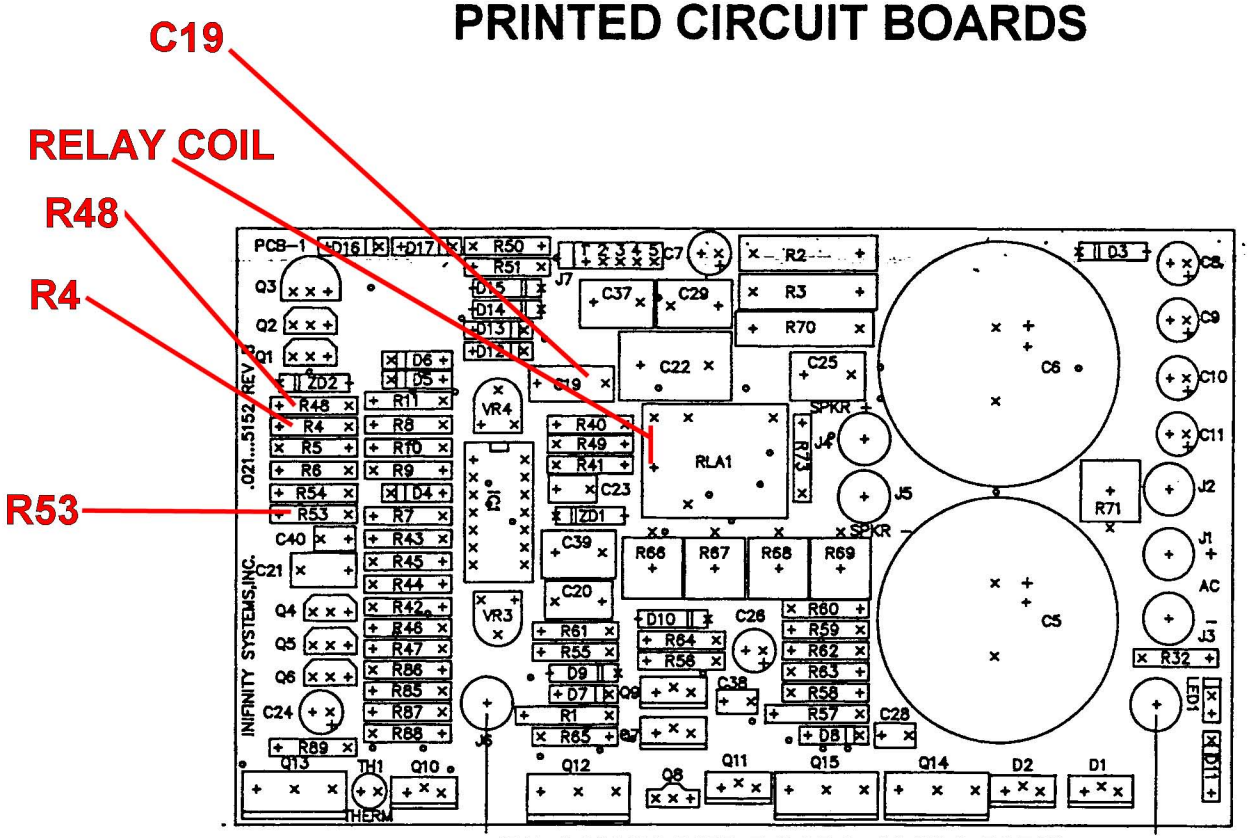
Make sure the two (three on the older RS sub) phillips screws holding the PC-1 transistor clamp (on the front of the faceplate) are tight. **Loose screws mean poor transistor heatsinking, possible premature failure.**

Make sure the correct line fuse is in place:

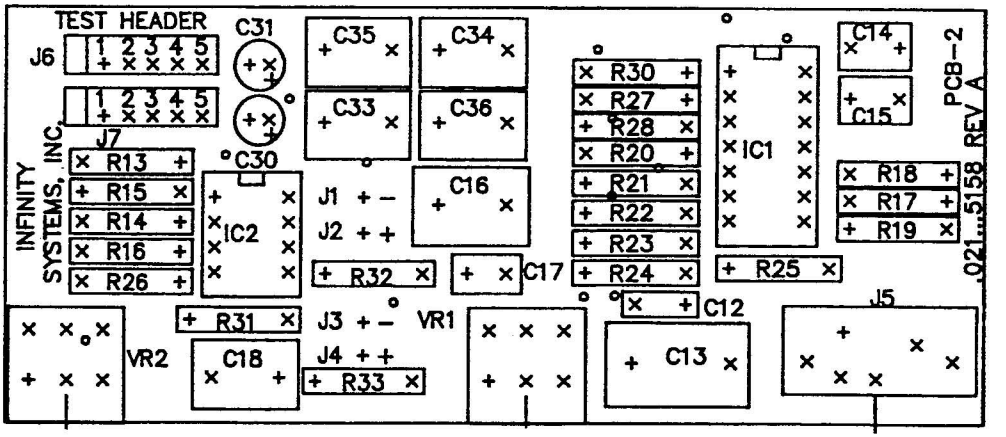
120 volt - 3A GMA slo-blo only
230 volt – 1.5A GMA slo-blo only

Make sure the red output wires are still maintaining an airtight seal as they thread through the plastic amp cover. Re-seal if necessary.

PRINTED CIRCUIT BOARDS

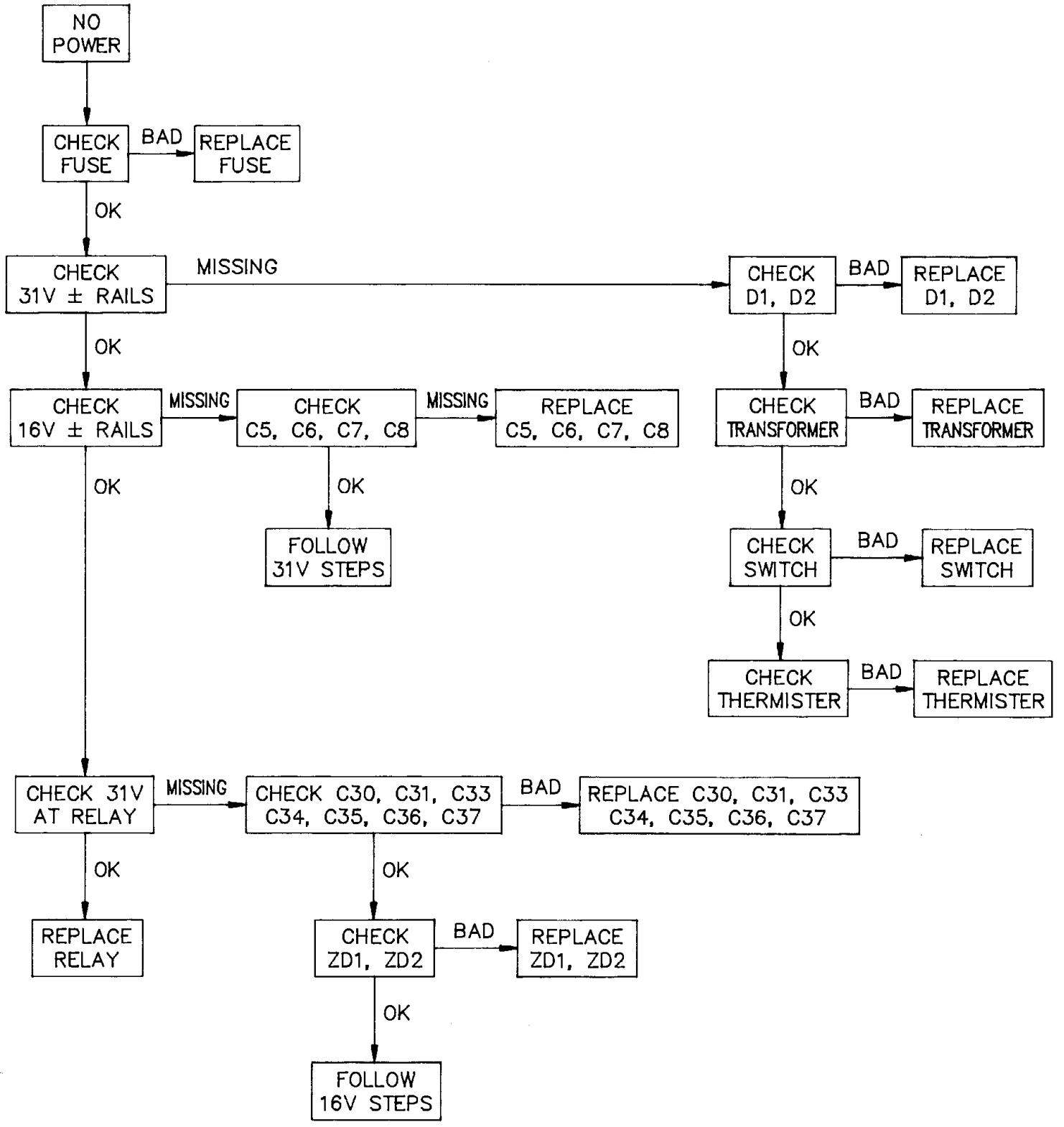


PC-1 MAIN AMP BOARD (A021-5152)

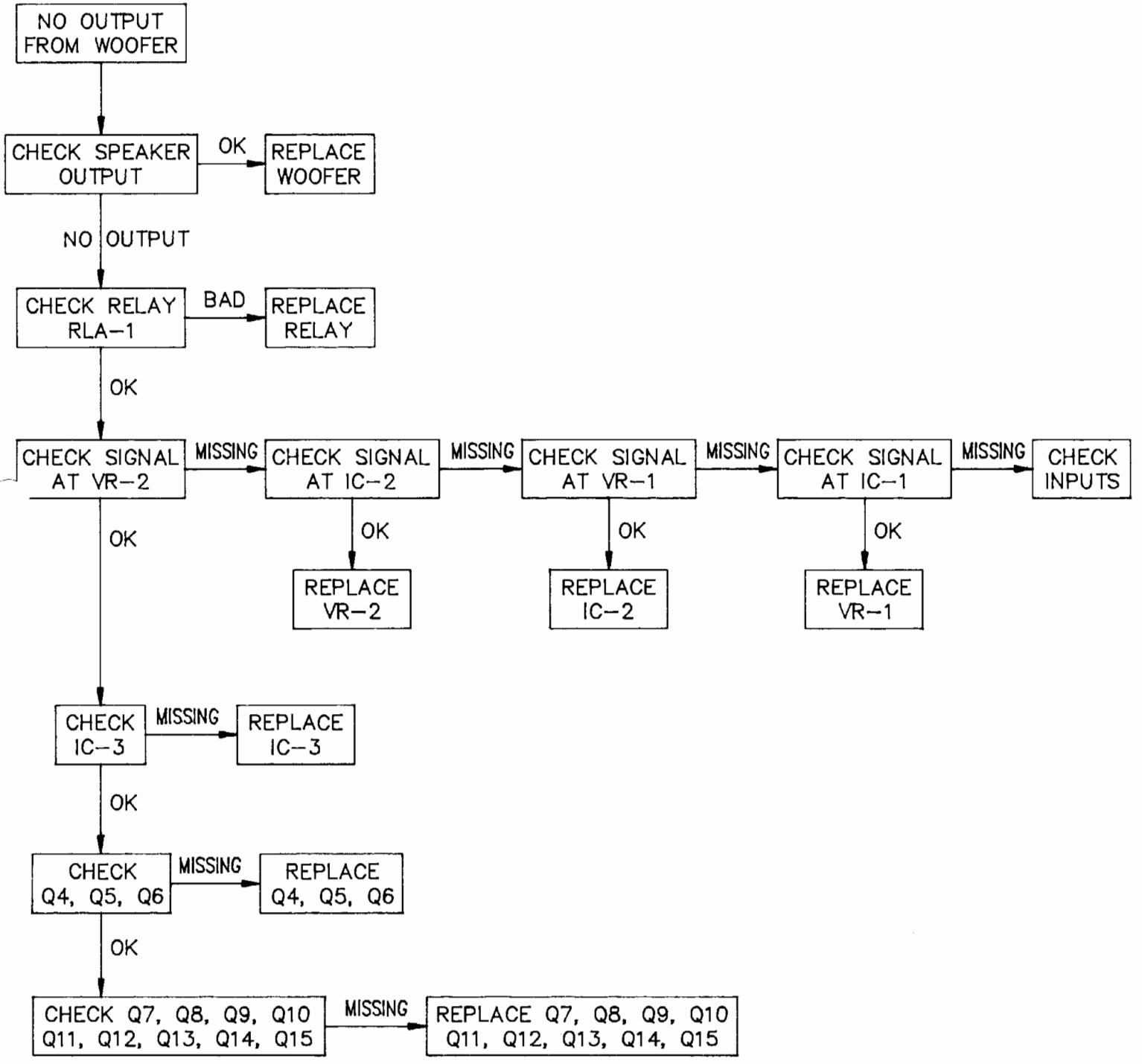


PC-2 FILTER BOARD (A021-5158)

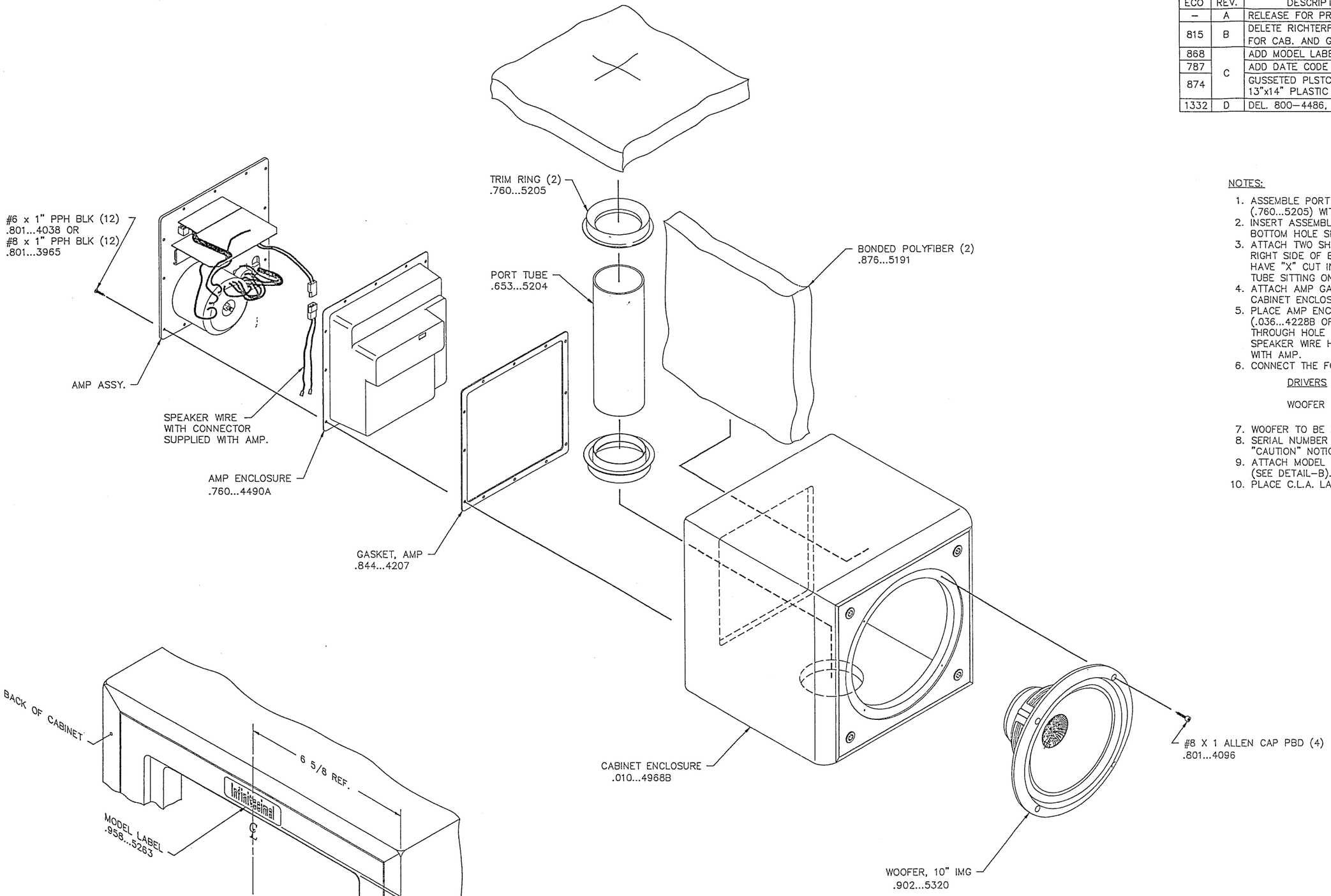
POWER SUPPLY FLOW CHART



SIGNAL FLOW CHART



REVISIONS				
ECO	REV.	DESCRIPTION	DATE	APPROVED
–	A	RELEASE FOR PRODUCTION	12–06–90	J.I. 02–07–91
815	B	DELETE RICHTERFOAM AND ADD PLASTIC TUBES FOR CAB. AND GRILLE; CHG. TAPE TO CLEAR	02–28–91	J.I.
868	C	ADD MODEL LABEL (SEE DETAIL–B)	07–17–91	J.I.
787		ADD DATE CODE LABEL (958–5351)		
874		GUSSETED PLSTC BAG WAS 30" PLSTC TUBE, 13"x14" PLASTIC BAG WAS 14" PLASTIC TUBE		
1332	D	DEL. 800–4486, DEL. 939–4811	10–20–94	10-20



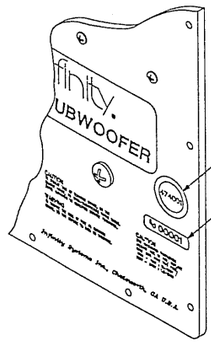
NOTES:

1. ASSEMBLE PORT TUBE (.653...5204) AND (2) TRIM RINGS (.760...5205) WITH HOT MELT.
2. INSERT ASSEMBLED PORT TUBE THROUGH AMP CUTOUT INTO BOTTOM HOLE SECURING IT WITH HOT MELT.
3. ATTACH TWO SHEETS OF BONDED POLYFIBER (.876...5191); ONE TO RIGHT SIDE OF ENCLOSURE AND THE SECOND PIECE MUST HAVE "X" CUT IN THE MIDDLE TO FIT OVER ASSEMBLED PORT TUBE SITTING ON BOTTOM OF ENCLOSURE WITH HOT MELT.
4. ATTACH AMP GASKET (.844...4207) TO AMP STEP ROUT IN CABINET ENCLOSURE ALIGNING SCREW HOLES.
5. PLACE AMP ENCLOSURE (.760...4490A) OVER AMPLIFIER (.036...4228B OR .036...5024) PASSING ALL CONNECTING WIRES THROUGH HOLE IN ENCLOSURE. SEAL AMP ENCLOSURE SPEAKER WIRE HOLE. CONNECT SPEAKER WIRE SUPPLIED WITH AMP.
6. CONNECT THE FOLLOWING WIRES:

DRIVERS	POLARITY	WIRE COLOR
WOOFER	+	RED
	–	RED/BLK

7. WOOFER TO BE MOUNTED WITH CLIPS ORIENTED DOWN.
8. SERIAL NUMBER (.958...5351) TO BE PLACED ON AMPLIFIER ABOVE "CAUTION" NOTICE (SEE DETAIL–A).
9. ATTACH MODEL LABEL (.958...5263) CENTERED ABOVE AMP (SEE DETAIL–B).
10. PLACE C.L.A. LABEL (.958...5270) APPROXIMATELY WHERE SHOWN.

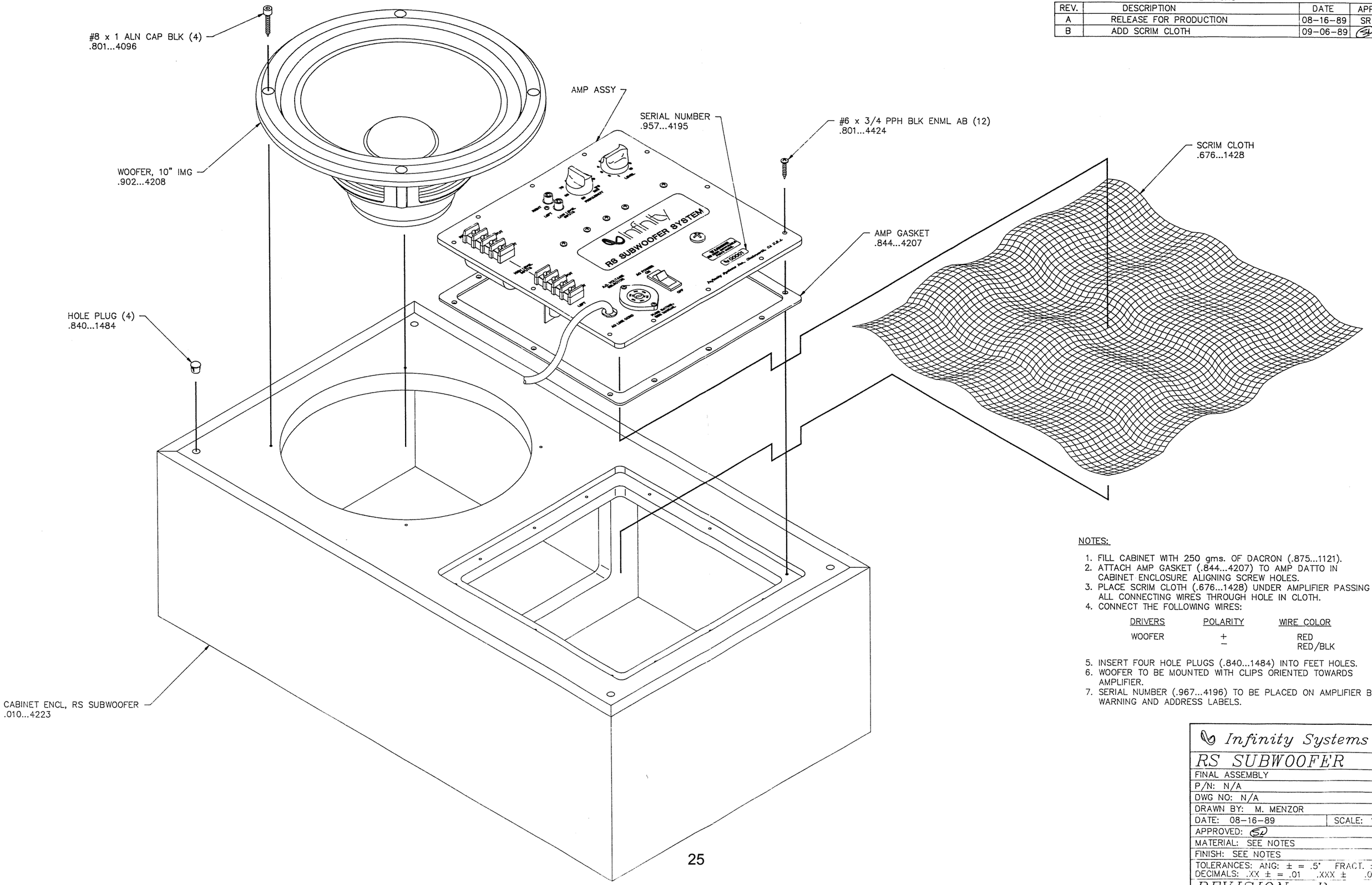
DETAIL–B
SCALE: 1/2x



DETAIL–A
SCALE: 1/2x

Infinity Systems Inc.	
SERVO CNTRL SUBWFR	
FINAL ASSEMBLY	
P/N: IF997005B	
DWG NO: IF997005B–01148–36D	
DRAWN BY: M. MENZOR	
DATE: 11–06–90	SCALE: 1/4x
APPROVED: J.I. 12–14–90	
MATERIAL: SEE NOTES	
FINISH: SEE NOTES	
TOLERANCES: ANG: ± = .5° FRACT. ± = 1/32 DECIMALS: .XX ± = .01 .XXX ± = .005	
REVISION D	SH. 1 OF 2

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	RELEASE FOR PRODUCTION	08-16-89	SR
B	ADD SCRIM CLOTH	09-06-89	SR



NOTES:

1. FILL CABINET WITH 250 gms. OF DACRON (.875...1121).
2. ATTACH AMP GASKET (.844...4207) TO AMP DATTO IN CABINET ENCLOSURE ALIGNING SCREW HOLES.
3. PLACE SCRIM CLOTH (.676...1428) UNDER AMPLIFIER PASSING ALL CONNECTING WIRES THROUGH HOLE IN CLOTH.
4. CONNECT THE FOLLOWING WIRES:

DRIVERS	POLARITY	WIRE COLOR
WOOFER	+	RED
	−	RED/BLK

5. INSERT FOUR HOLE PLUGS (.840...1484) INTO FEET HOLES.
6. WOOFER TO BE MOUNTED WITH CLIPS ORIENTED TOWARDS AMPLIFIER.
7. SERIAL NUMBER (.967...4196) TO BE PLACED ON AMPLIFIER BETWEEN WARNING AND ADDRESS LABELS.

Infinity Systems Inc.	
RS SUBWOOFER	
FINAL ASSEMBLY	
P/N: N/A	
DWG NO: N/A	
DRAWN BY: M. MENZOR	
DATE: 08-16-89	SCALE: 1/2x
APPROVED: SR	
MATERIAL: SEE NOTES	
FINISH: SEE NOTES	
TOLERANCES: ANG: ± = .5° FRACT. ± = 1/3 DECIMALS: .XX ± = .01 .XXX ± .005	
REVISION B	

SSW-10 subwoofer
Infinitesimal IV subwoofer
Servo Controlled subwoofer
RS Subwoofer

Electrical/Mechanical Parts Lists

For amplifier assemblies

Note:

These parts lists may contain some part numbers that are not valid, or No Longer Available.
Descriptions and Reference Designators, when included, should aid technicians in part substitution.

If necessary, call the Infinity Parts department at 1-516-496-3400 ext. 6553 for assistance.

SERVO SUBWOOFER 10"

PCB PARTS LIST
.036...5024
P/L REVISION D - ECO #1151
SCHEMATIC REVISION B
February 1, 1993
SUPERSEDES ALL PREVIOUS PARTS LISTS

PCB-1 (.021...5152)

RESISTORS

1/4 WATT, TOL 5%, CARBON FILM

R4	33K Ω
R5,R6,R47	2.2K Ω
R7,R11,R44,R45,R53,R60	10K Ω
R9,R10	220K Ω
R32,R73,R86	5.1K Ω
R40	1M Ω
R41,R42,R43,R49	51K Ω
R46	180K Ω
R48	20K Ω
R50,R56	1K Ω
R51	22K Ω
R54	10 Ω
R55,R58	270 Ω
R59	560 Ω
R61,R64,R65	39 Ω
R62	4.3K Ω
R63	6.2K Ω
R81	3K Ω
R85	6.8K Ω
R88	1.8K Ω
R89	82 Ω
R87	NO LONGER USED

1/2 WATT, TOL 5%, CARBON FILM

R1	1K Ω
R5	75.6K Ω

1 WATT, TOL 5%, CARBON FILM

R2,R3	430 Ω
R70	2.7 Ω

WIREWOUND, 5 WATT, TOL 10%

R66,R67,R68,R69,R7	0.1 Ω

CAPACITORS

ELECTROLYTIC - 20% TOL - 20% DF - RADIAL LEAD

C5,C6	10000uF, 35V
C7,C8,C9,C10,C11,C24	47uF, 35V
C26	220uF, 10V

CERAMIC DISK - TOL 10% - RADIAL LEAD

C28,C38	100pF, 50V

CAPACITORS CONT.

POLYESTER FILM - 5% TOL - RADIAL LEAD

C19	0.47uF, 100V
C20	0.068uF, 100V
C21	0.047uF, 100V
C22	0.22uF, 100V
C23	0.022uF, 100V
C25,C29,C37,39	0.1uF, 100V
C40	1nF,100V
C41	NO LONGER USED

INTEGRATED CIRCUITS

IC3	QUAD OP-AMP LF347 (NAT'L SEMICONDUCTOR OR EQUIV.)

TRANSISTORS

Q1,Q2	2SC2389 (ROHM OR EQUIV.)
Q3	2SC2061 (ROHM OR EQUIV.)
Q4,Q5,Q6	2SA1038 (ROHM OR EQUIV.)
Q7	2SB1186A (ROHM OR EQUIV.)
Q8	MPSA12 (MOTOROLA OR EQUIV.)
Q9	2SD1763A (ROHM OR EQUIV.)
Q10	BD911 (SGS OR EQUIV.)
Q11	BD912 (SGS OR EQUIV.)
Q12,Q13	TIP35C (SGS OR EQUIV.)
Q14,Q15	TIP36C (SGS OR EQUIV.)

DIODES

ZENER

ZD1,ZD2	1N5246B

GERMANIUM

D14,D15	1N270

SILICON

D3,D9,D10	1N4004
D4,D5,D6,D7,D8,D11,D12,D13,D16,D17	1N4148

RECTIFIERS

D1	FEP16DT
D2	FEN16DT

POTENTIOMETER

VR3,VR4	.TRIM POT, 20K Ω

MISCELLANEOUS BOARD-MOUNTED COMPONENTS

TH1	NTC THERMISTOR, 100K OHM @ 25°C,10K OHM @ 85°C
RLA1	SPST RELAY ITT TAKAMISAWA,#LZ24
QTY 1	14 PIN SOCKET FOR IC3
QTY 1	5 PIN FRICTION LOCK HEADER, (MOLEX P/N 22-23-2051,INF P/N XXX-XXXX)

RESISTORS

1/4 WATT - TOL 1% - METAL FILM

R25,R13,R14,R17,R18	100.0K Ω
R15,R16,R19,R20	5.11K Ω
R21,R22,R23,R24	51.1K Ω
R26	8.45K Ω
R27	42.2K Ω
R28	169.0K Ω
R30,R31	6.81K Ω
R32,R33	4.7K Ω

CAPACITORS

CERAMIC DISK - TOL 10% - RADIAL LEAD

C12	220pF,100V

ELECTROLYTIC - 20% TOL - 20% DF - RADIAL LEAD

C30,C31	10uF, 35V

POLYESTER FILM - 5% TOL - RADIAL LEAD

C13	0.47uF, 100V
C14,C15	0.047uF, 100V
C16	0.15uF, 100V
C17	0.015uF, 100V
C18	0.082uF, 100V
C33,C34,C35,C36	0.1uF, 100V

INTEGRATED CIRCUITS

IC1. . . . . QUAD OP-AMP LF347, (NAT'L SEMICONDUCTOR OR EQUIV.)
IC2. . . . . DUAL OP-AMP LF353, (NAT'L SEMICONDUCTOR OR EQUIV.)

POTENTIOMETERS

VR1,VR2 . . . . . POTENTIOMETER, PANEL MOUNT, 20K OHM, NOBLE P/N VB12L(7X5)G3(PH2D)N15KC-B20KX2

DIODES

LED RED . . . . . STANLEY #BR3932S OR EQUIV, INF P/N 311-6039

SOCKETS/JACKS

QTY 1 . . . . . DUAL PCB MOUNT RCA,W/RED AND WHITE INSERTS (A/D ELECTRONICS P/N ARL-1416-2-G-R OR EQUIV.)

MISCELLANEOUS BOARD-MOUNTED COMPONENTS

QTY 1 . . . . . 5 PIN TEST HEADER, MOLEX P/N 22-54-1205
QTY 1 . . . . . 14 PIN SOCKET FOR IC1
QTY 1 . . . . . 8 PIN SOCKET FOR IC2

TRANSFORMER

T1 . . . . . TOROID, INF P/N 415-5155

BARRIER TERMINAL STRIP

QTY 1 . 4 TERM IN/OUT BARRIER STRP,MAGNUM #A481304-NL, INF P/N 545-5994

SWITCHES

QTY 1 . . . . . DPST SWITCHCRAFT P/N 360B5NN OR EQUIV, INF P/N 507-5967

WIRES

5 CONDUCTOR RIBBON . . . . . 95mm INTER-BOARD CONNECTION, 24 AWG
14 AWG RED . . . . . 280mm SPEAKER TERMINAL WIRE (PC1 - J4)
14 AWG RED/BLACK . . . . . 280mm SPEAKER TERMINAL WIRE (PC1 - J5)
14 AWG RED . . . . . 300mm SPEAKER TERMINAL WIRE (MOLEX/SPKR)
14 AWG RED/BLACK. . . . . 300mm SPEAKER TERMINAL WIRE (MOLEX/SPKR)
16 AWG RED . . . . . 55mm SWITCH - IEC WIRE (POSITIVE)
16 AWG BLACK . . . . . 65mm SWITCH - IEC WIRE (NEUTRAL)
16 AWG GREEN . . . . . 25mm SWITCH - IEC WIRE (GROUND)
18 AWG RED . . . . . 228mm LED WIRE (PC1 - LED1 ANODE)
18 AWG BLACK . . . . . 228mm LED WIRE (PC1 - LED1 CATHODE)
20 AWG WHITE . . . . . 114mm POS BARRIER STRIP WIRE (PC2 - J2)
20 AWG WHITE/BLACK . . . . . 114mm NEG BARRIER STRIP WIRE (PC2 - J1)
20 AWG BLUE . . . . . 114mm POS BARRIER STRIP WIRE (PC2 - J4)
20 AWG BLUE/BLACK . . . . . 114mm NEG BARRIER STRIP WIRE (PC2 - J3)

SCREWS/NUTS/WASHER

QTY 4 . SCREW,#4-40 x 1/2 PPH,SPEC BLK(IEC CONN/RCA), INF P/N 800-5971
QTY 2 . . . . SCREW,#10-32 x 3/4 PPH,(BARRIER STRIP), INF P/N 800-5356
QTY 3 . SCREW,#8-32 x 3/4",PPH SPEC,BLK(TRNSTR BRKT), INF P/N 800-5161
QTY 1 . . . . . SCREW,1/4 x 20 x 3 PPH SPEC,BLK, INF P/N 800-5156
QTY 1 . . . . . LOCKWASHER - SPLIT 1/4 BLK, INF P/N 827-0943
QTY 1 . . . . . HEX NUT 1/4 - 20 BLACK, INF P/N 810-0929
QTY 2 . . . . . KEP NUT,#10-32(BARRIER STRIP NUT), INF P/N 814-5357
QTY 1 . . . . . KEP NUT,4-40,ZINC (GROUND), INF P/N 814-5978

CONNECTORS

QTY 1 . . .205,FAST-ON TERMINAL-FML,.020" THK (BRASS),INF P/N 542-2695
QTY 4 . . . . . .250, FAST-ON TERMINAL-FEMALE,.032" THK
QTY 7 . . .205,FAST-ON TERMINAL-FML,.020" THK (TIN), INF P/N 542-4884
QTY 1 . . . . . .125" I.D. RING TONGUE TERMINAL
QTY 1 . . . . MOLEX OR EQUIV. CONNECTOR ASSY, INF P/N 639-6382 - PART A
(MOLEX P/N 03-09-2022 - MALE PLUG)
(MOLEX P/N 02-09-2103 - MALE TERMINAL)

QTY 1 . . . . MOLEX OR EQUIV. CONNECTOR ASSY, INF P/N 639-6383 - PART B
(MOLEX P/N 03-09-1022 - FEMALE RECEPTACLE)
(MOLEX P/N 02-09-1104 - FEMALE TERMINAL)

MISCELLANEOUS NON-BOARD-MOUNTED COMPONENTS

TH2 . . . . . NTC THERMISTOR, US SENSOR P/N SS10004
QTY 2 . . . . . KNOBS,CULVER #K-2I, INF P/N 710-1979G
QTY 1 . . . . . TRANSISTOR MOUNTING PLATE, INF P/N 707-5159

QTY 1. . . . . *** AC CONNECTOR, SCHURTER P/N 4303.1091
QTY 1. . . . . *** INTERCHANGEABLE FUSEDRAWER, SCHURTER P/N 4303.2114.01
*** = BOTH PIECES COMBINE INTO INFINITY P/N 539-5349

QTY 1 . . . . . INSULATOR, CRAYO-THERM, INF P/N 731-5160
QTY 1 . . . . . POWER CORD, TUMBLER #3271J66, INF P/N 615-5141
QTY 1 . . . . . .TRANSISTOR MOUNTING CARDBOARD, INF P/N 950-5178
QTY 1 . . . . . FUSE,250V 3A-BUSS ELECT. P/N GMC-3A, INF P/N 870-5150
QTY 1 . . . . . FUSE,250V 1.5A-BUSS ELECT. P/N GMC-1.5A,INF P/N 870-5354
QTY 1 . . . . . CHASSIS PLATE SBWFR AMP ASSY, INF P/N 045-5194
QTY 5 . . . . . TYWRAP 4" #08433 BLACK, INF P/N 861-1499
QTY 1 . . . . . 5 PIN CRIMP TERMINAL HOUSING,
(MOLEX P/N 14-60-1053, INF P/N XXX-XXXX)

SEMICONDUCTOR PART NUMBERS

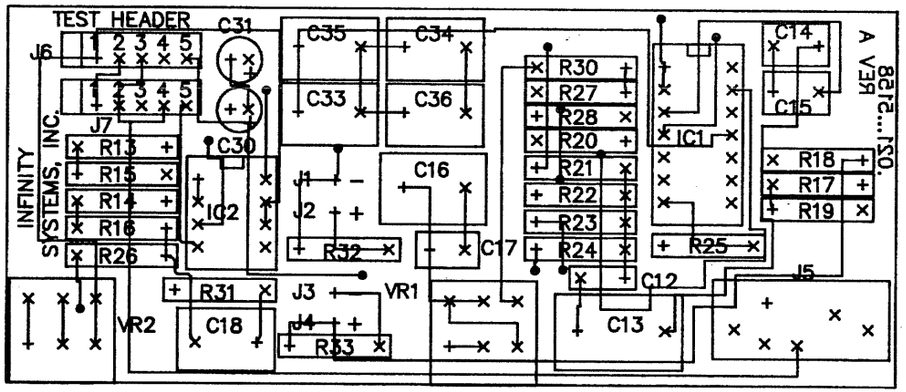
306-0798	1N4004 DIODE
306-0805	1N4148 DIODE
306-8042	FEP16DT DUAL DIODE
306-8043	FEN16DT DUAL DIODE
307-8039	IN5246B 16V ZENER DIODE
325-4258	LF347N IC QUAD OP-AMP
325-6548	LF353N IC DUAL OP-AMP
306-3891	2N4403 TRANSISTOR
306-3898	2N4401 TRANSISTOR
347-3982	TIP 36C TRANSISTOR
347-3989	TIP 35C TRANSISTOR
347-8024	BD911 TRANSISTOR
347-8025	BD912 TRANSISTOR
347-8127	2SC2061 TRANSISTOR
2050C238900T	2SC2389 TRANSISTOR
2050A103800T	2SC1038 TRANSISTOR
347-8029	2SD1763A TRANSISTOR
347-8030	2SB1186A TRANSISTOR
347-8033	MPSA12 TRANSISTOR

MISC.

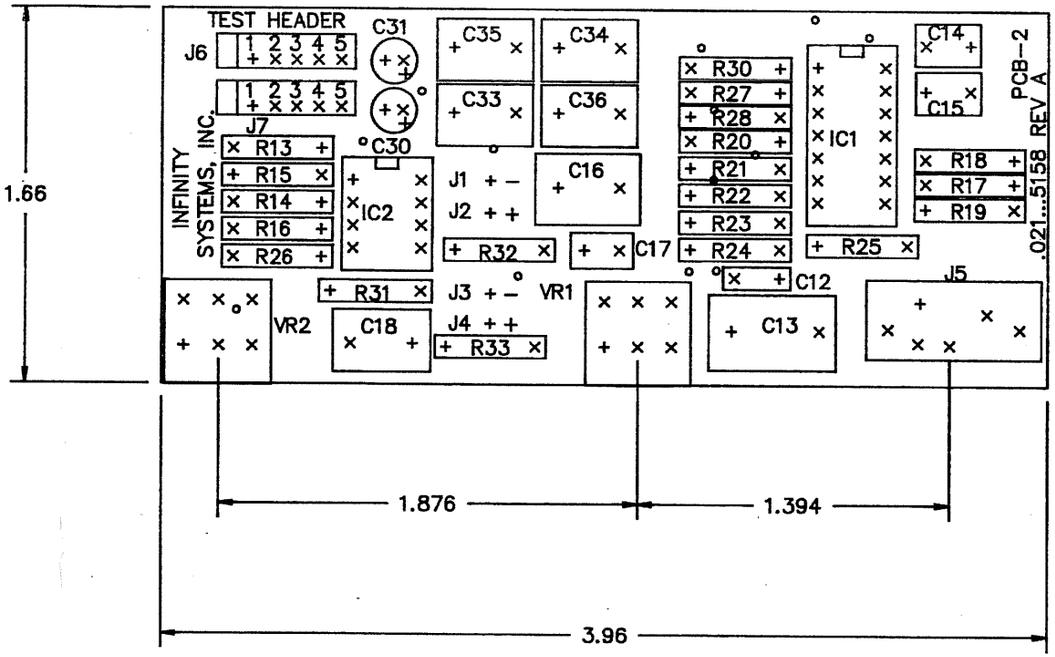
510-8084	SPEAKER SPST ITT #LZ24V RELAY
146-5127	LEVEL & LOW FREQ POT 20K X 2
870-5150	FUSE (120V) 5 X 20mm 3A SLO-BLO GMC
870-5354	FUSE (230V) 5 X 20mm 1.5A SLO-BLO GMC
539-5349	120V FEMALE PLUG SOCKETASS'Y w/ FUSE DRAWER
123-8038	430 OHM 1 WATT RESISTORS (R2,R3)
545-5994	HIGH LEVEL INPUT BLOCK – PLASTIC
615-5141	6" POWER CORD

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	RELEASE FOR PRODUCTION	02-19-91	

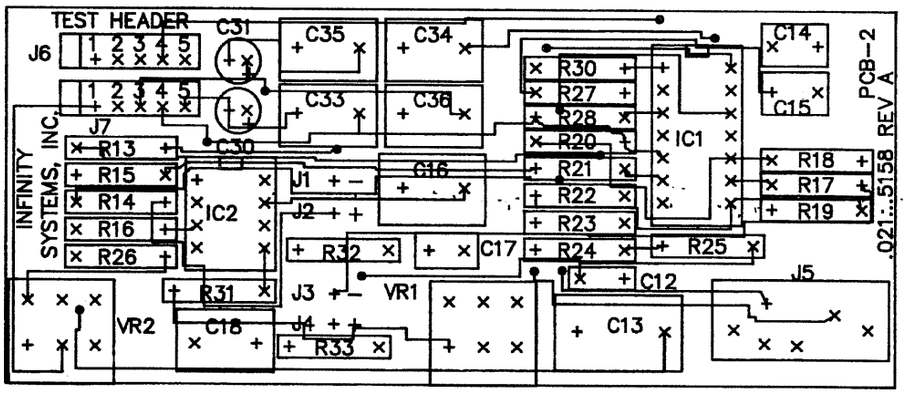
SOLDER SIDE



SILKSCREEN



COMPONENT SIDE



NOTES:
1. THIS CIRCUIT BOARD (.021...5158) IS USED IN CONJUNCTION WITH CIRCUIT BOARD .021...5152 TO CREATE AMPLIFIER ASSEMBLY .036...5024
2. CORRESPONDING SCHEMATIC DRAWING NUMBER: 036-5024-01157-36D REVISION C
3. CORRESPONDING DRILL CHART DRAWING NUMBER: 021-5158-01182-36D REVISION A

Infinity Systems Inc.

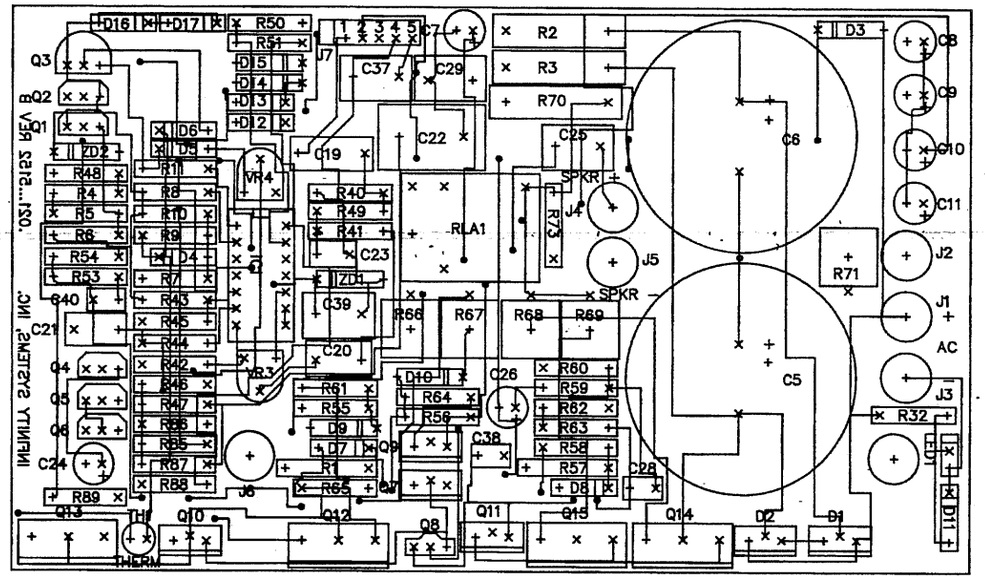
SERVO SUBWOOFER

PC-2 INPUT BOARD	
P/N: .021...5158	
DWG NO: 021-5158-01179-36D	
DRAWN BY: R. RAHL	
DATE: 02-08-91	SCALE: 2x
APPROVED:	
MATERIAL: SEE NOTES	
FINISH: SEE NOTES	
TOLERANCES: ANG: ± = .5° FRACT. ± = 1/32 DECIMALS: .XX ± = .01 .XXX ± = .005	

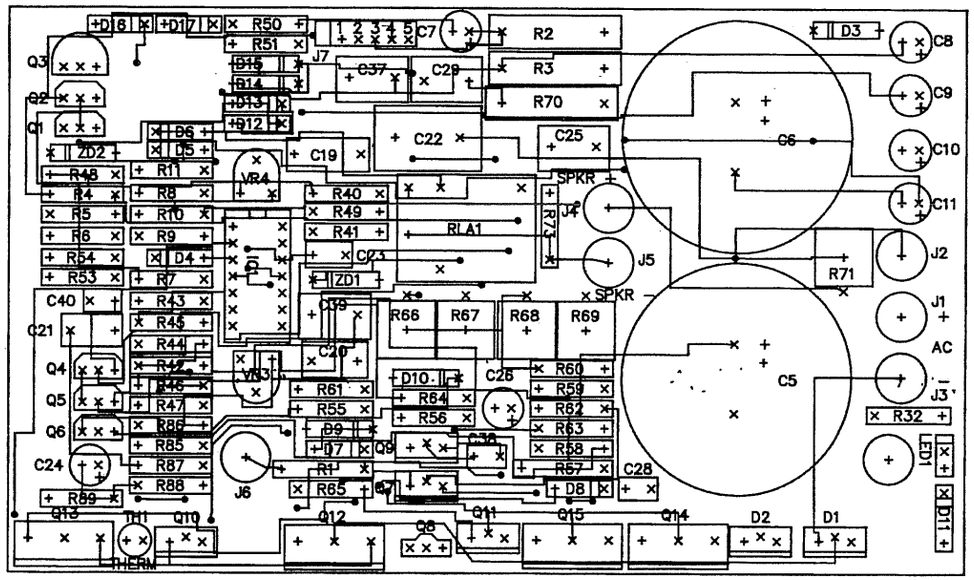
REVISION: A

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
–	SEE PAGE 1	–	

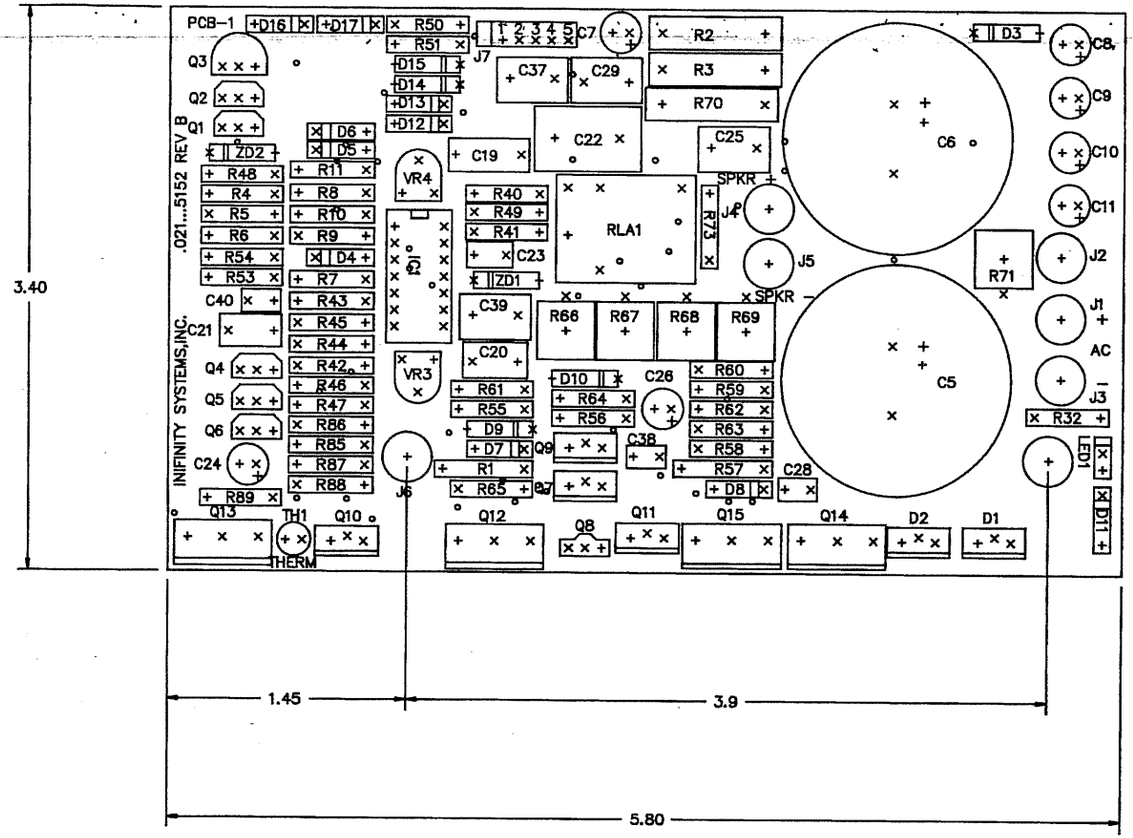
SOLDER SIDE



COMPONENT SIDE

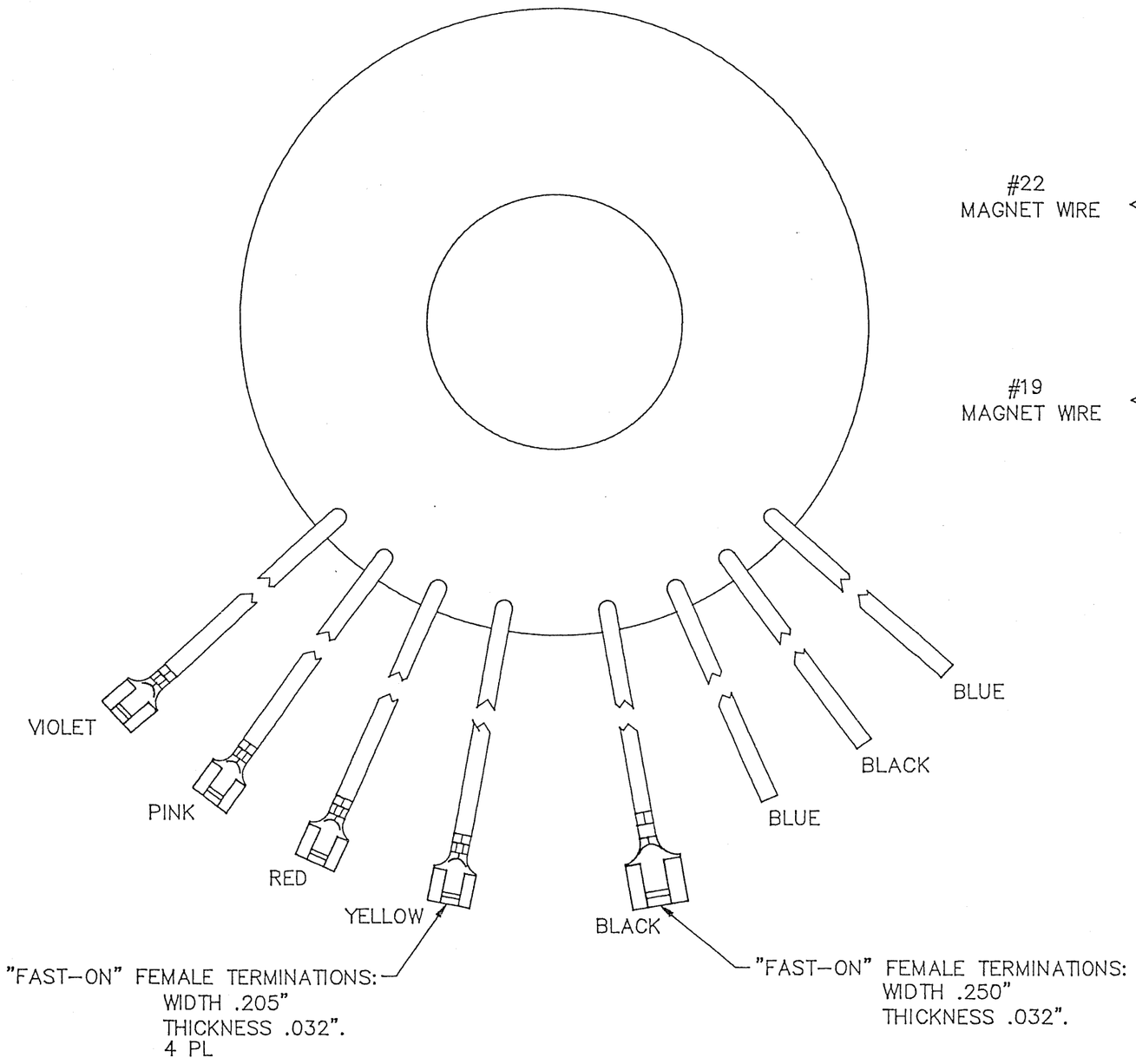


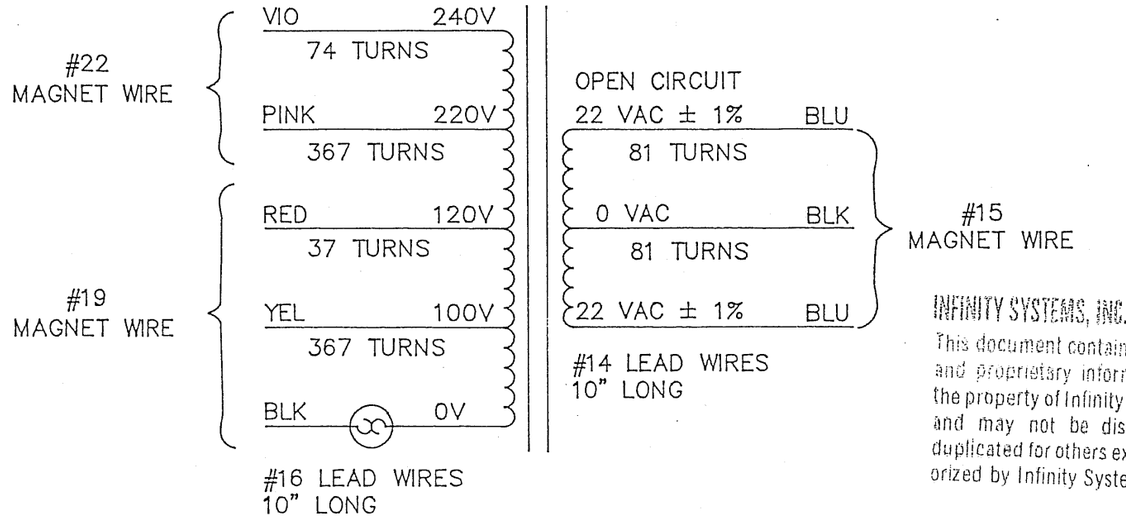
SILKSCREEN



Infinity Systems Inc.	
SERVO SUBWOOFER	
AMPLIFIER/SERVO BOARD FABRICATION DRAWING	
P/N: .021...5152	
DWG NO: 021-5152-01209-36D	
DRAWN BY: R. RAHL	
DATE: 02-25-91	SCALE: 2x
APPROVED: RP	
MATERIAL: SEE NOTES	
FINISH: SEE NOTES	
TOLERANCES: ANG: ± = .5° FRACT. ± = 1/32 DECIMALS: .XX ± = .01 .XXX ± = .005	
REVISION: B	page 2 of 3

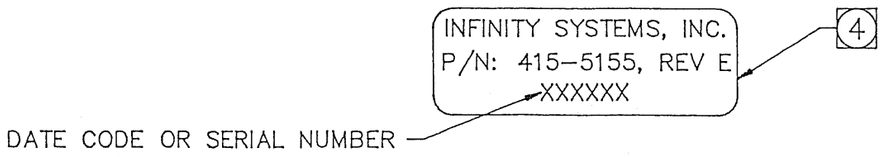
REVISIONS				
ECO	REV.	DESCRIPTION	DATE	APPROVED
–	A	RELEASE FOR PRODUCTION	08–24–90	GS
–	B	ADD NOTE 6	11–14–90	RP
863	C	CHG NOTE 6; ADD NOTE 7	05–08–91	RP
888	D	ADD NOTES 8,9,10; CHG NOTE 1	07–24–91	RP
1190	E	CHG NOTE 1,3,4 & 10; ADDED TERMINALS REMOVED ONE WIRE (ORG), ADDED 1% TOL.	04–30–93	5-3 5-3





NOTES:
1. CORE SPECIFICATIONS:
   GRAIN ORIENTED SILICON STEEL M4 OR BETTER
   OUTER DIMENSION: 3.25"
   INNER DIMENSION: 2.0"
   HEIGHT: 2.0"
   WEIGHT: 2.25"
2. CORE TO BE INSULATED WITH 30 MIL POLYPROPYLENE
3. INSULATION BETWEEN PRIMARY AND SECONDARY TO BE MYLAR 8–10 MIL THICK
4. LABEL TO BE PLACED UNDER FINAL TAPE WRAP (SEE DIAGRAM A)
   LABEL TO INCLUDE EITHER DATE CODE OR SERIAL NUMBER
   VENDOR TO CHOOSE LABEL SIZE
5. THERMAL PROTECTOR:
   MFG: PORTAGE ELECTRONIC PRODUCTS, INC.
   MODEL: G
   UL FILE: E42562
6. TRANSFORMER MUST BE UL, CSA, AND SEMKO CERTIFIED
7. TRANSFORMER TO BE HI–POT TESTED IN ACCORDANCE WITH CSA PROCEDURES
8. EXCITATION CURRENT: ≤ 15mA @ 120V 60Hz
9. POWER RATING: 170VA
10. MAXIMUM DIMENSIONS OF TRANSFORMER:
    HEIGHT: 2.75"
    DIAMETER: 4.13"

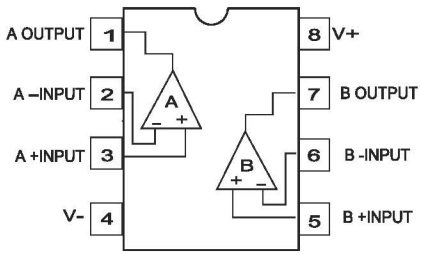
DIAGRAM A



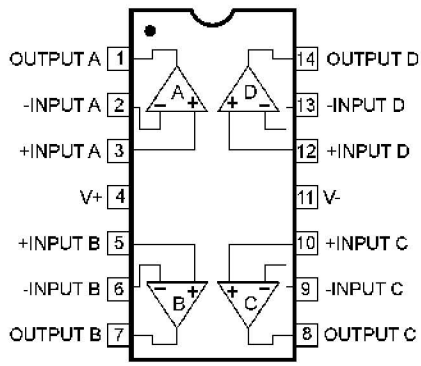
Infinity Systems Inc.	
SERVO CNTRL SBWFR	
POWER TRANSFORMER	
P/N: 415–5155	
DWG NO: 415–5155–01077–36D	
DRAWN BY: K. CHRISTIE	DATE: 08–13–90
APPROVED: 5-3	SCALE: 1/1
REVISION: E	PAGE 1 OF 1

Integrated Circuit/Transistor Diagrams

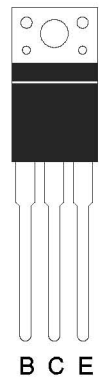
LF353N
OPAMP, DUAL
IC2



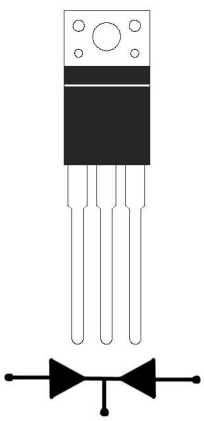
LF347N
OP-AMP, QUAD
IC1, IC3



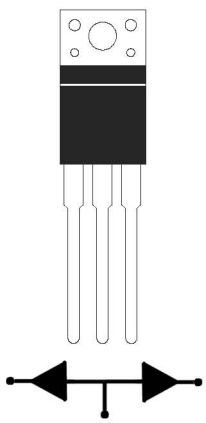
BD11, BD12
2SD1763A, 2SB1186A
Q7, 9, 10, 11



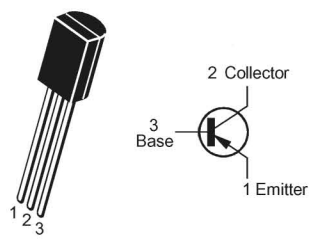
D1 FEP16



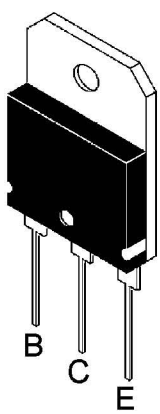
D2 FEN16



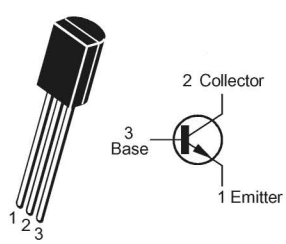
2SA1038
Q4,5,6



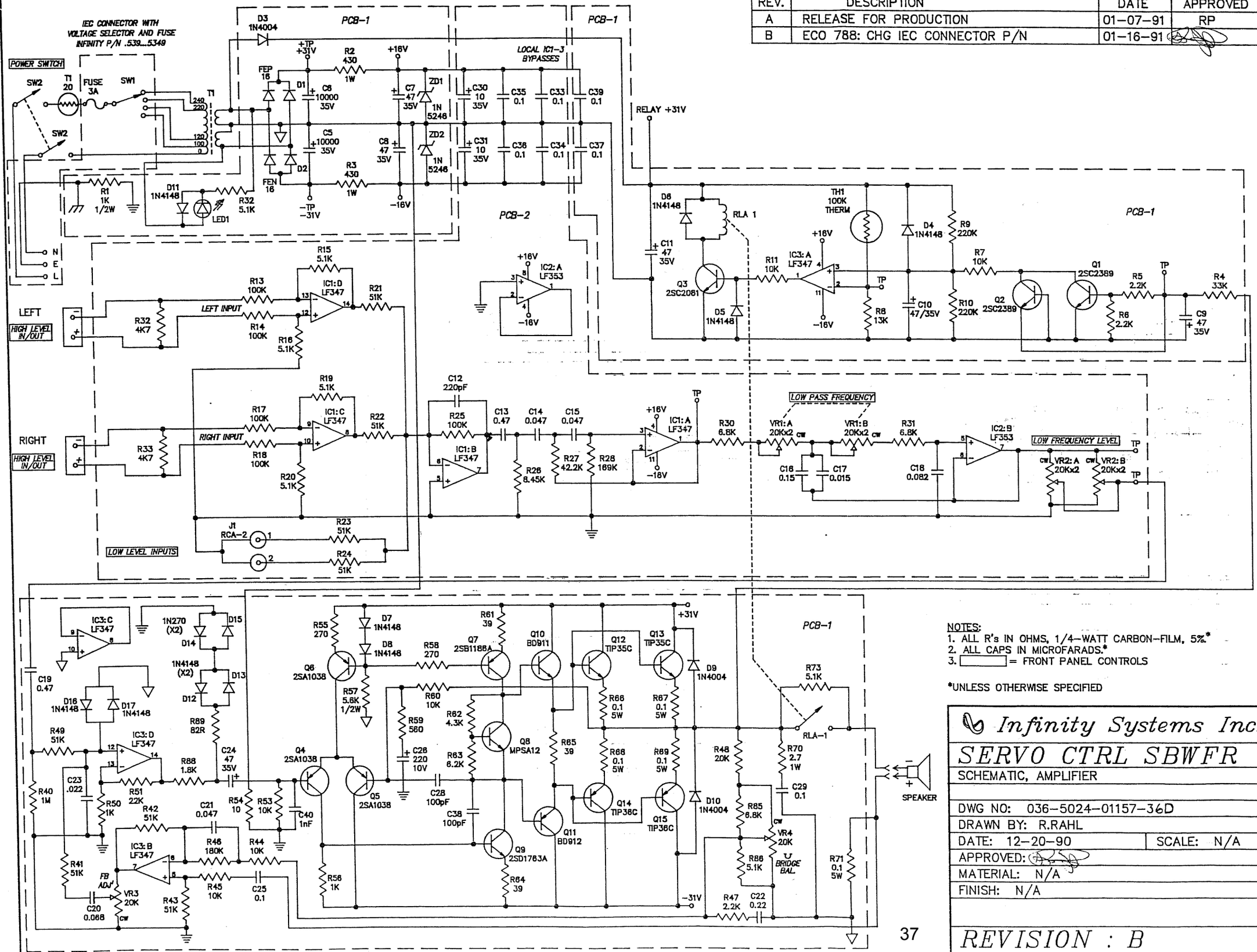
TIP35C, TIP36C
Q12-15



2SC2389, 2SC2061
Q1,2,3



REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	RELEASE FOR PRODUCTION	01-07-91	RP
B	ECO 788: CHG IEC CONNECTOR P/N	01-16-91	



NOTES:
1. ALL R's IN OHMS, 1/4-WATT CARBON-FILM, 5%.*
2. ALL CAPS IN MICROFARADS.*
3. [ ] = FRONT PANEL CONTROLS

*UNLESS OTHERWISE SPECIFIED

Infinity Systems Inc.

SERVO CTRL SBWFR

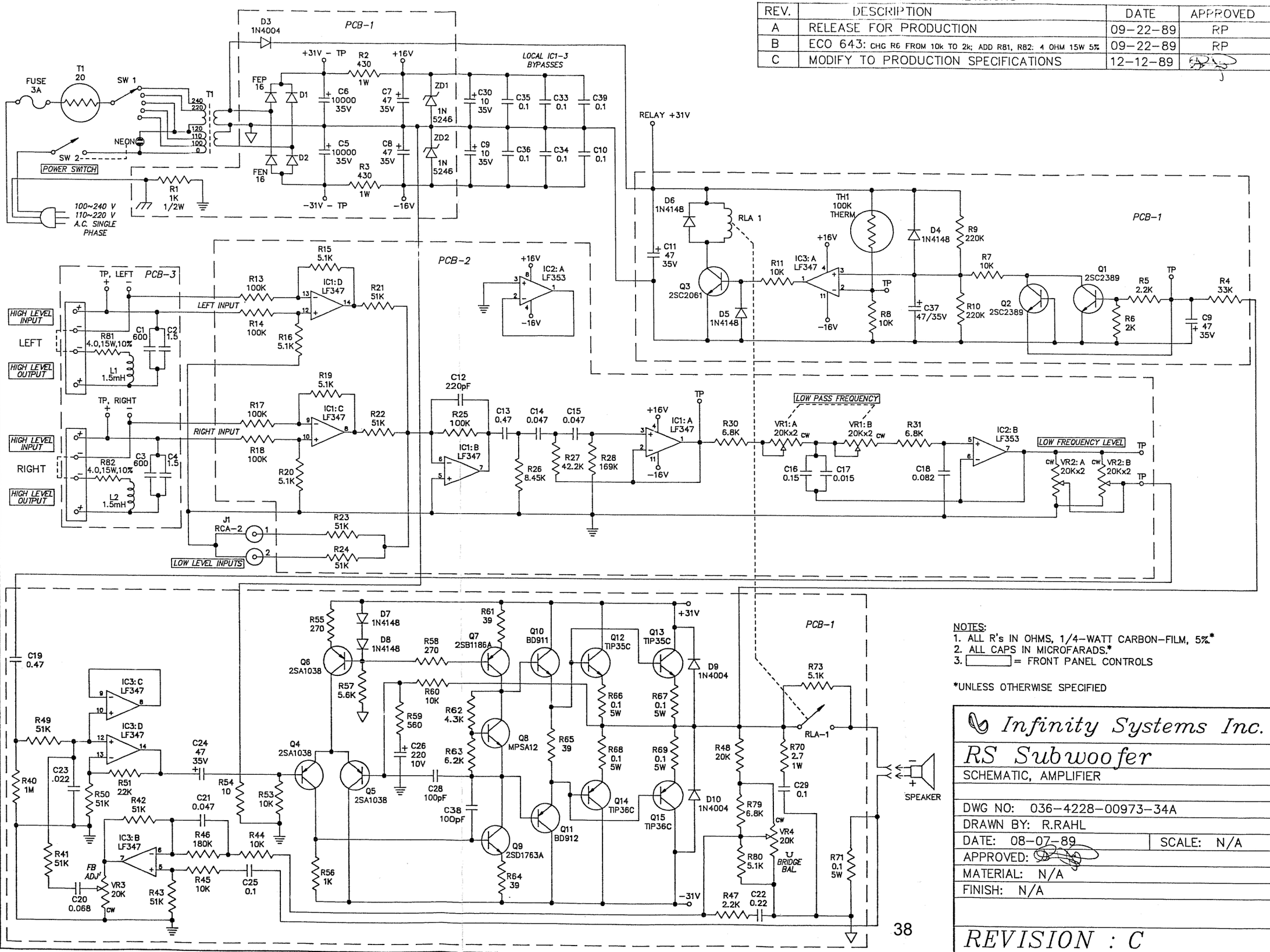
SCHEMATIC, AMPLIFIER

DWG NO: 036-5024-01157-36D
DRAWN BY: R.RAHL
DATE: 12-20-90 | SCALE: N/A
APPROVED:
MATERIAL: N/A
FINISH: N/A

REVISION : B

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
A	RELEASE FOR PRODUCTION	09-22-89	RP
B	ECO 643: CHG R6 FROM 10k TO 2k; ADD RB1, RB2: 4 OHM 15W 5%	09-22-89	RP
C	MODIFY TO PRODUCTION SPECIFICATIONS	12-12-89	



NOTES:
1. ALL R's IN OHMS, 1/4-WATT CARBON-FILM, 5%*
2. ALL CAPS IN MICROFARADS.*
3. [ ] = FRONT PANEL CONTROLS

*UNLESS OTHERWISE SPECIFIED

Infinity Systems Inc.

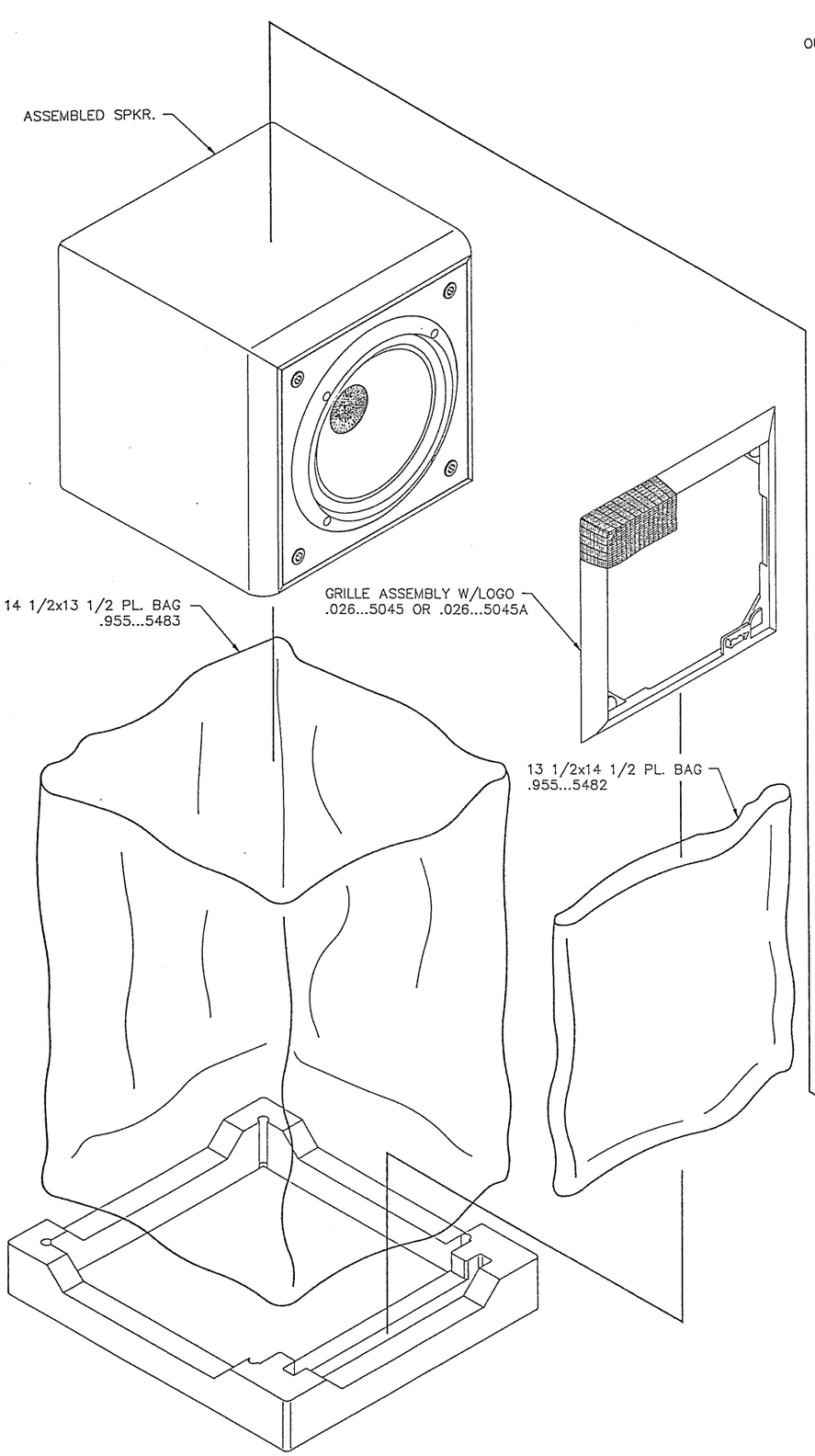
RS Subwoofer

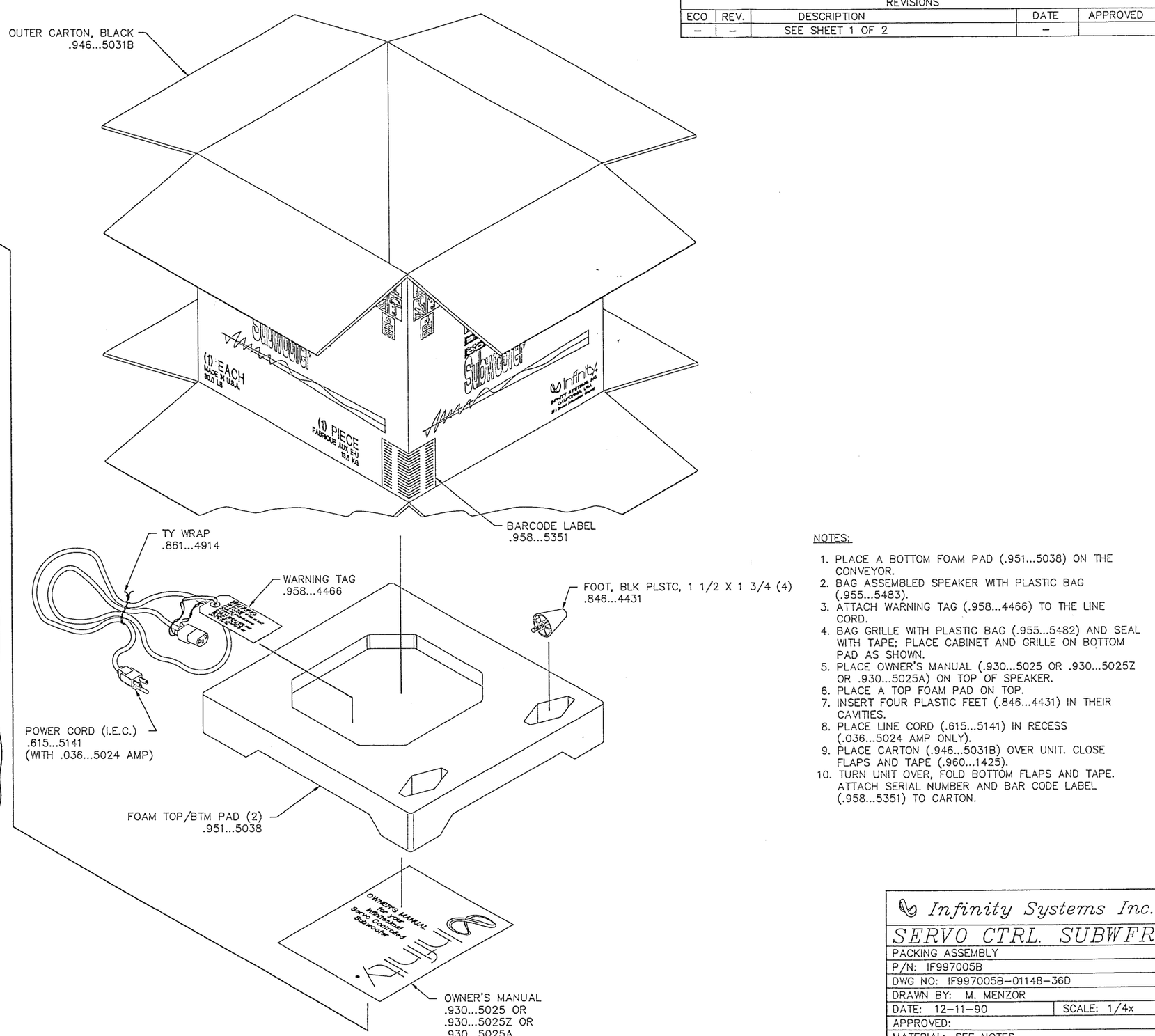
SCHEMATIC, AMPLIFIER

DWG NO: 036-4228-00973-34A
DRAWN BY: R.RAHL
DATE: 08-07-89 | SCALE: N/A
APPROVED:
MATERIAL: N/A
FINISH: N/A

REVISION : C

REVISIONS				
ECO	REV.	DESCRIPTION	DATE	APPROVED
–	–	SEE SHEET 1 OF 2	–	





NOTES:

1. PLACE A BOTTOM FOAM PAD (.951...5038) ON THE CONVEYOR.
2. BAG ASSEMBLED SPEAKER WITH PLASTIC BAG (.955...5483).
3. ATTACH WARNING TAG (.958...4466) TO THE LINE CORD.
4. BAG GRILLE WITH PLASTIC BAG (.955...5482) AND SEAL WITH TAPE; PLACE CABINET AND GRILLE ON BOTTOM PAD AS SHOWN.
5. PLACE OWNER'S MANUAL (.930...5025 OR .930...5025Z OR .930...5025A) ON TOP OF SPEAKER.
6. PLACE A TOP FOAM PAD ON TOP.
7. INSERT FOUR PLASTIC FEET (.846...4431) IN THEIR CAVITIES.
8. PLACE LINE CORD (.615...5141) IN RECESS (.036...5024 AMP ONLY).
9. PLACE CARTON (.946...5031B) OVER UNIT. CLOSE FLAPS AND TAPE (.960...1425).
10. TURN UNIT OVER, FOLD BOTTOM FLAPS AND TAPE. ATTACH SERIAL NUMBER AND BAR CODE LABEL (.958...5351) TO CARTON.

Infinity Systems Inc.	
SERVO CTRL. SUBWFR.	
PACKING ASSEMBLY	
P/N: IF997005B	
DWG NO: IF997005B-01148-36D	
DRAWN BY: M. MENZOR	
DATE: 12-11-90	SCALE: 1/4x
APPROVED:	
MATERIAL: SEE NOTES	
FINISH: SEE NOTES	
TOLERANCES: ANG: ± = .5' FRACT. ± = 1/32 DECIMALS: .XX ± = .01 .XXX ± = .005	
REVISION : D	SH. 2 OF 2