CREST AUDIO

CA Series

Power Amplifiers: CA4 CA6 CA9 CA12

Service Manual

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CREST AUDIO INC., 100 Eisenhower Dr., Paramus, N. J. 07652 USA 201-909-8700, FAX 201-909-8744

Crest Audio CA Series
Service Manual
Models CA4, CA-6, CA-9 and CA-12

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This symbol, a lightning flash with arrowhead within an equilateral triangle, appears on the amplifier chassis to warn the user that uninsulated "dangerous voltages" are present within the enclosure that may pose a risk of electric shock.

This symbol, an exclamation point within an equilateral triangle, appears on the amplifier chassis to warn the user to follow important operating procedures and precautions detailed in the user manual.

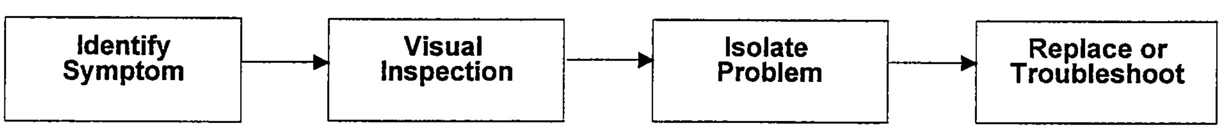
This manual and the procedures detailed within are intended for qualified technicians only! There are potentially lethal voltages present within an audio power amplifier, and it is the responsibility of the technician to exercise common safety practices to protect himself, his co-workers, and the end user.

In particular, always exercise caution when working on an amplifier with the chassis cover removed. Do not leave it unattended while it is connected to the AC mains. Never expose the amplifier or your test equipment to rain or moisture, and never work on an amplifier while you are standing in, sitting in, or otherwise in contact with rain or moisture. Before starting any repair or troubleshooting procedure, read and understand completely the instructions for the procedure.

1 INTRODUCTION

This service manual includes tests, calibrations, schematics, a full parts list/order form, and troubleshooting tips to assist you in the repair and maintenance of Crest Audio CA Series CA-2, CA-4, CA-6, CA-9 and CA-12 amplifiers.

The first step in troubleshooting is to identify the symptom. The next step is a complete visual inspection. You may isolate the problem, trace it to a module, and swap it with a good module or continue troubleshooting down to component level. If you follow this manual step-by-step it will be that easy. Good luck!



Glossary

Following is a list of terminology used in this manual.

Board — A printed circuit board, or "PCB."

Chassis — The steel case or frame in which the modules, transformer, etc. are mounted.

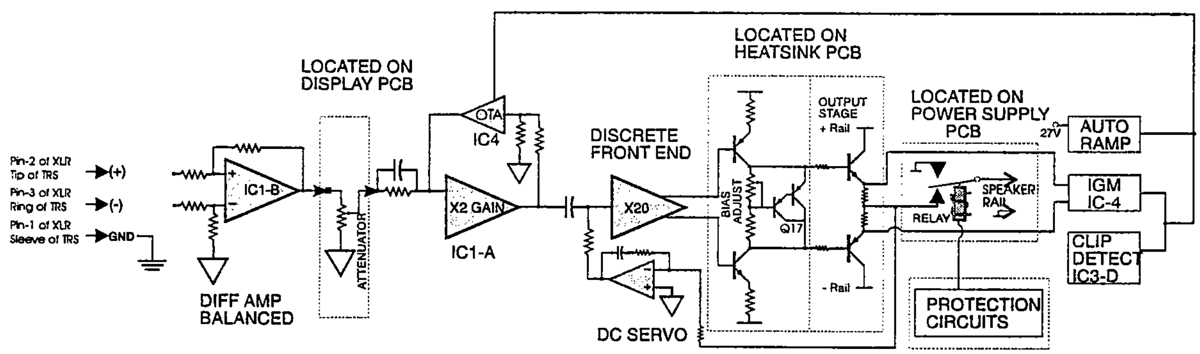
Rail — A supply voltage, positive or negative, for a given section of circuitry. Class AB amplifiers utilize one bipolar pair of voltage rails and Crest Class H amplifiers utilize two bipolar pairs of voltage rails. In this manual the term is used mainly to describe the supplies for the power output section.

2 CIRCUIT DESCRIPTION

Crest Audio CA Series models CA-4, CA-6, CA-9 and CA-12 amplifiers are fan-cooled and use bipolar output transistors. Physically, the CA-4, CA-6 and CA-9 are two rack spaces (3.5 inches; 8.89 cm) high and the CA-12 is three rack spaces (5.25 inches; 13.43 cm) high. The modular sub-assemblies which make up these amplifiers are mounted in a 14 gauge, folded and welded steel box-type chassis with a removable top cover.

Two rear-mounted cooling fans draw cooling air in from the rear and pressurize the chassis. Directly in front of the fans are the two output module heatsinks. Because the air pushed from the fan does not have to change direction abruptly or flow around any obstructions, the airflow remains relatively laminar (that is, free of turbulence), which minimizes back pressure and enhances efficiency. Small ridges in the heatsink surface, as well as mounting screws protruding into the cooling airflow, induce microturbulence to ensure good heat transfer along the length of the heatsink. The air from the output module heatsinks exhausts through the front panel slots. A temperature sensing circuit, with a sensor on each module, monitors the temperatures of both heatsinks. This circuit, located on the power supply board, drives the cooling fans and varies the fan speed in proportion to the amount of cooling required.

CA SERIES BLOCK DIAGRAM



NOTE: All circuitry is located on the preamp board except where noted.

The inputs

Figure 2-1 is a block diagram of the signal path, from input to output, in a Crest Audio CA Series amplifier.

Crest Audio CA Series amplifiers use both female XLR connectors and 1/4 inch TRS connectors on the rear panel for inputs. Pin 1 on each XLR and the sleeve on each TRS is signal ground, pin 2 on each XLR and the tip on the TRS is the non-inverting (+), or "HOT", input and pin 3 on each XLR and the ring on the TRS is the inverting input (-), thus making a balanced input.

From the input connectors, the input signals are routed through a balanced input gain stage. After the input gain stage, the signals continue to a 3-pin mode select connector. (This connector, located internally on the input/preamp pcb, sets the amplifier to one of two operating modes; "stereo or "bridge", depending on the position of the mode select jumper). The "stereo" mode is normal two-channel operation, in which a signal at Channel A's input produces an amplified signal at Channel A's output, and likewise, a signal at Channel B's input produces an amplified signal at Channel B's output. In "bridge" mode, both outputs are driven from Channel A's input, the inverter circuit (on the preamp) reverses the polarity of the signal going into Channel B. This makes the two channels work in opposition, effectively making the two channels into a single mono amplifier with double the voltage swing. To "bridge", the load must be connected between Channel A and B's red output terminals referencing Channel B's red terminal as speaker (-). Mode select only acts on Channel B's signal never affecting the signal on Channel A.

The first active circuitry in the signal path is the balanced transformerless amplifier formed by operational amplifiers (op-amp) IC1B and IC2A OPA2604. The input stage presents a balanced input impedance of 20 kilohms.

In the middle

The signal is then routed to the input attenuators, or volume controls, located on the display board. It returns to op-amp IC3A and IC2B, set up as a unity gain stage. This is also where the clip limiting, IGM, muting, and Auto-Ramp circuits act on the signal. An operational transconductance amplifier, IC4, handles attenuation when necessary by shunting some of the signal off. When the OTA receives no control current from the clip limit, IGM, mute, or Auto-Ramp control circuits, it presents an ultra-high impedance at IC1A's non-inverting input, so the signal passes with no attenuation.

When attenuation is needed, the control current increases, in turn increasing the gain of the OTA, which lowers the impedance at the input of IC1A.

The signal is coupled through a capacitor to the junction of two resistors. One resistor sends the feedback signal from the servo circuitry, centered around op-amp IC2A. The combined audio and feedback signals continue through the other resistor into the amplifier front end, which provides the drive for the output section.

The outputs

Amplifiers are used in many types of electronic equipment. Basically, their function is to provide gain to an input signal, but how the signal is amplified and how the amplified signal is used varies. For this reason amplifiers have been divided into several *classes of operation.* An amplifier *class* simply refers to the configuration of the power supply and the output section of the amplifier. In order to understand *Crest class H*, the operation of the CA Series amplifiers, you must first understand the operation of *class AB* as described below.

The *class AB* power supply utilizes a single, bipolar DC rail (power supply voltage) configuration, one positive (+) and one negative (-). The positive rail supplies a DC voltage for the positive swing (NPN) power transistors, and the negative rail supplies a DC voltage for the negative swing (PNP) power transistors.

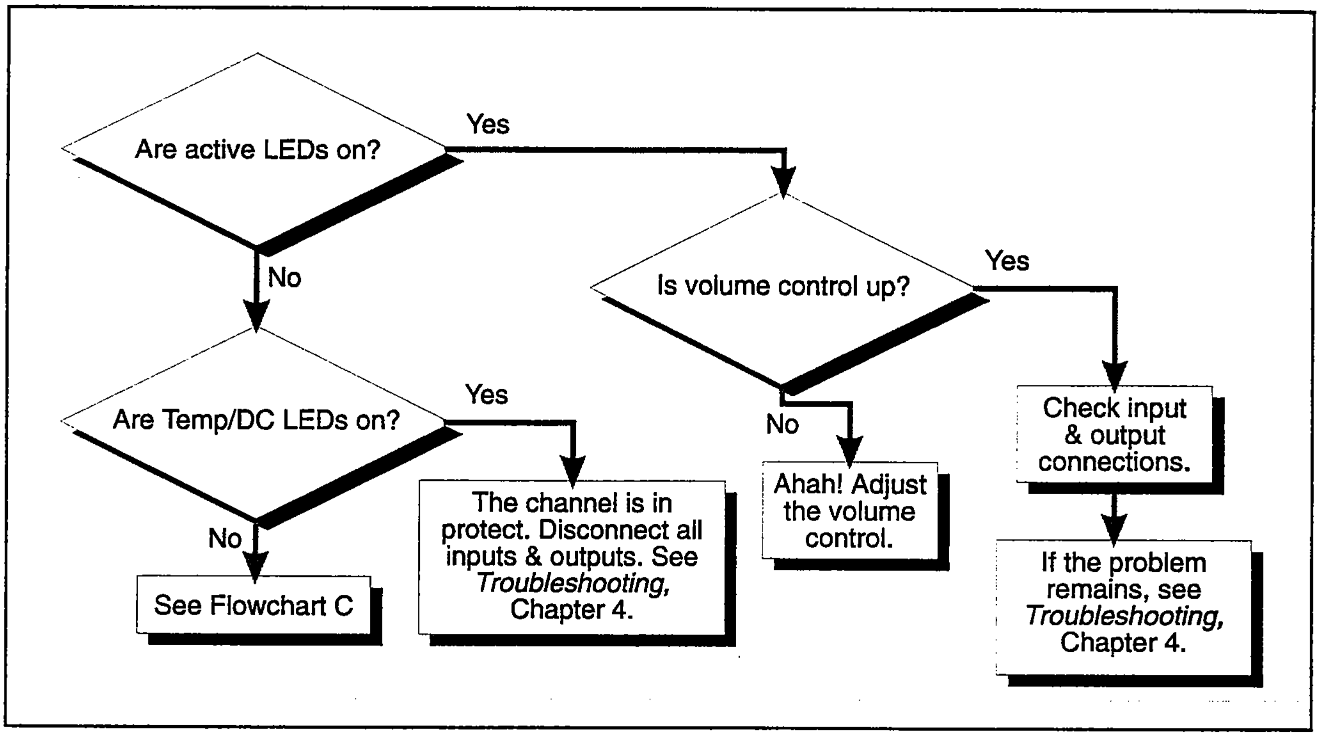
In *class AB*, the base-emitter junction of the transistors must be forward biased with a small DC voltage in order to reduce crossover distortion. When the bias voltage is applied, the transistors conduct allowing them to pass the full half of their respective portion of the waveform (positive or negative), thus reducing crossover distortion. In the Crest Audio CA Series amplifiers, trimpot VR1, located on the heatsink board, is used to set the bias point (30 mVDC emitter to emitter).

Crest Audio CA Series amplifiers operate in *class H*. The *Crest class H* power supply utilizes a dual, bipolar DC rail configuration with low and high voltages; one positive (+) and one negative (-) low rail and one positive and one negative high rail.

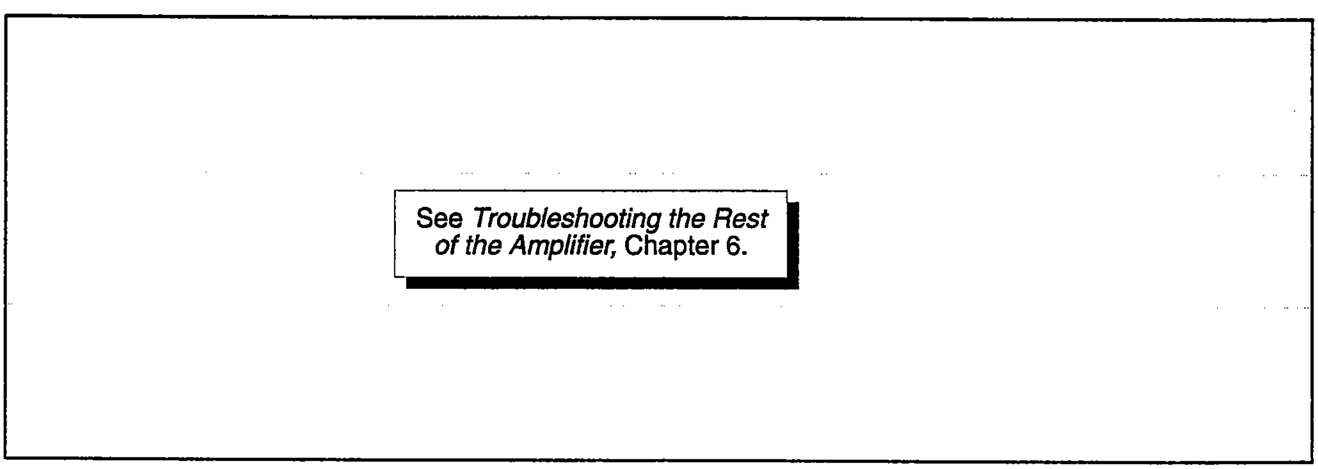
Until approximately the 1/3 power point the *class H* amplifier operates as *class AB*. Beyond this output level the high rail transistors conduct, thus modulating the low rails. This increases the efficiency of the amplifier as each transistor only "sees" the high rail DC voltage when the output is high enough (greater than 1/3rd power). See Fig 4-2 for a visual reference of an output signal showing the *Class H* modulated rails.

3 FLOWCHARTS FOR TROUBLESHOOTING

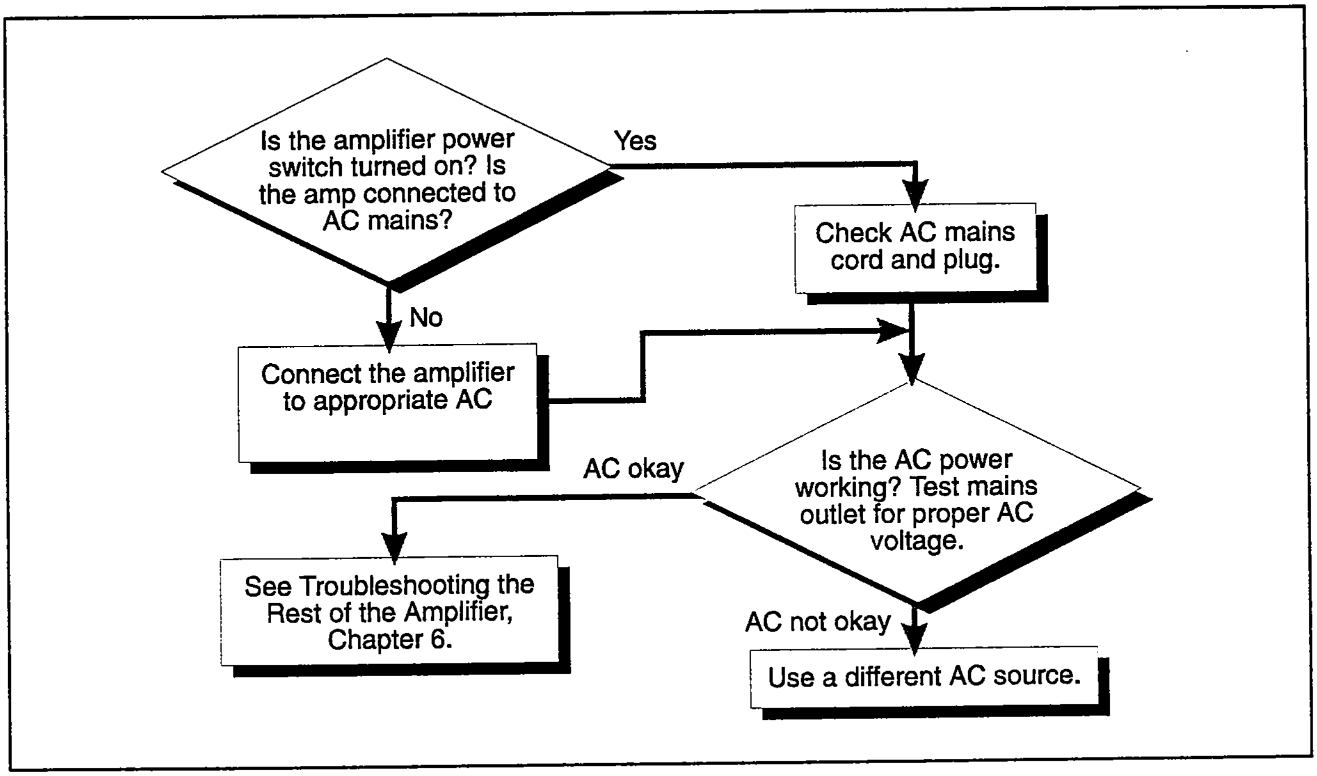
Flowchart A. Problem: No Sound



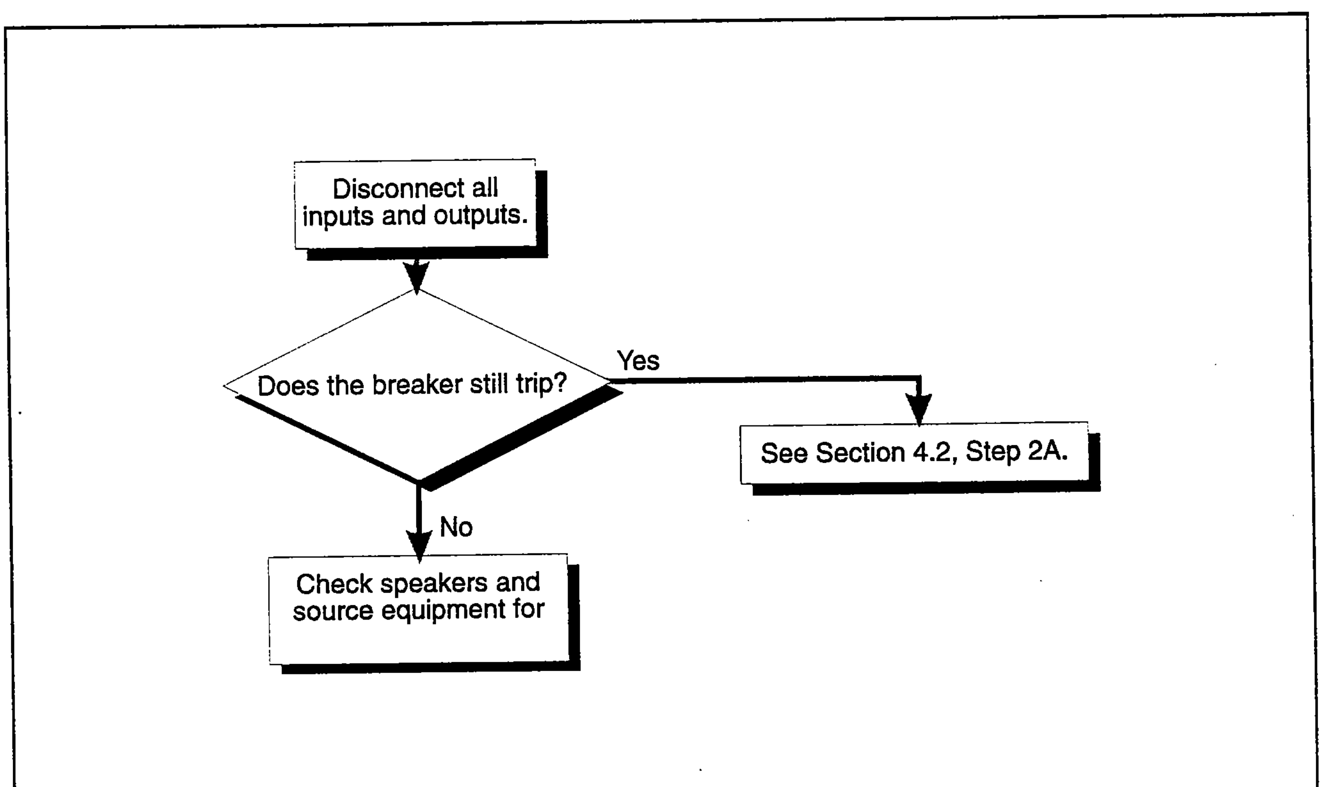
Flowchart B. Non Functioning Fan



Flowchart C. Problem: No LEDs on either channel



Flowchart D. Problem: Breaker trips at turn on



4 TROUBLESHOOTING & REPAIRING THE OUTPUT MODULES

4.1 Visual inspection

Tools & materials needed:

*Phillips #1 and #2 screwdrivers.
*Low or medium pressure compressed air, water vapor removed, or compressed air in a can.
*Short, medium-bristled artists brush or horsehair brush.
*Methanol alcohol or a non-corrosive, non-lubricant solvent.

Setup:

*Amplifier disconnected from AC mains

Procedure:

1. Remove all of the Phillips-head top cover screws. Remove the top cover.

   Note: Visual inspection is essential! Keep in mind that repairs may have been attempted by non-qualified persons. Also, debris may have entered the chassis through the ventilation holes during use.

2. Check for dirt and debris within the amplifier. Use compressed air (water vapor removed) or compressed air in a can to clear dust from the heatsink fins and anywhere else in the amplifier chassis.

3. Check for any type of conductive debris inside the amplifier chassis. Be thorough! A stray piece of metal or wire can cause intermittent short circuits or even seriously damage components.

4. Check the wiring harnesses for broken or pinched wires, loose connectors, intermittent short circuits, damaged insulation, etc.

5. Make sure the breaker/power switch, transformer, fans, and all modules and circuit boards are securely mounted in the chassis.

6. Check for burn marks, especially on printed circuit boards. If you find any, investigate the severity of the damage. Using a short, medium-bristled artists or horsehair brush, carefully clean the area with methanol alcohol or a non-corrosive, non-lubricant solvent. If a circuit board has a hole burned in it or a foil trace lifted or destroyed, it must be replaced.

   If the burn mark can be cleaned away and you find no damage to the printed circuit board, the board need not be replaced; only the damaged components need to be replaced.

   Always check the continuity of any questionable foil traces.

7. Inspect the power supply capacitors and relays; damage to these components is usually visually apparent. If you suspect that one or more relays or capacitors are defective see Chapter 6.

4.2 Removing or replacing one or both output modules

Tools & materials needed:

*Phillips #1 screwdriver
*Pen or marker for labeling modules
*Clamp-on current probe (Fluke RS-1 or equivelent)
*Variac

Setup:

*Amplifier disconnected from AC mains

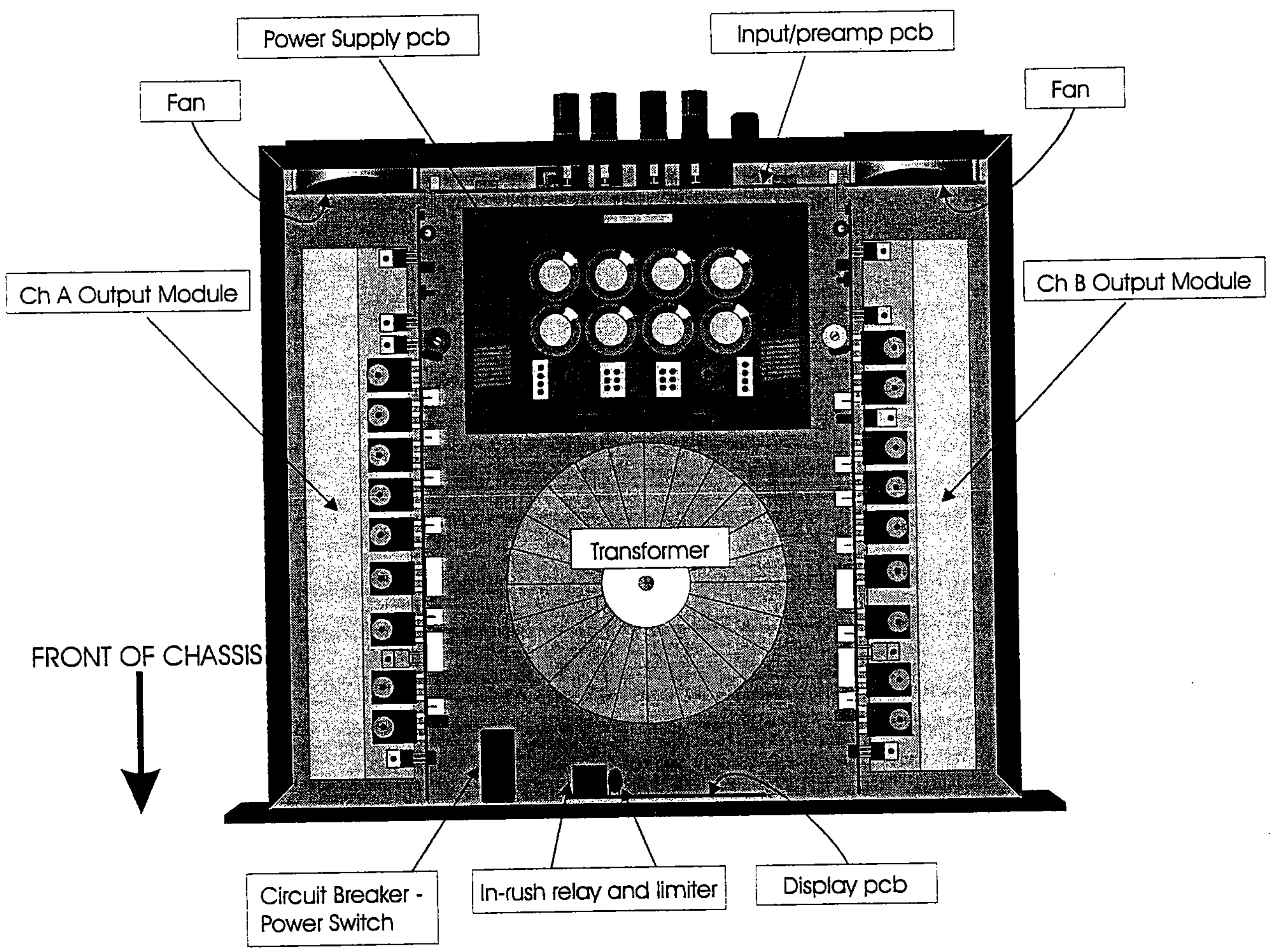


Figure 4-1. CA-9 Amplifier, view with top off

Procedure:

1. The output modules are mounted, on their side, with channel A on the left and channel B on the right side of the chassis as shown in Fig 4-1. Each heatsink is fastened to the bottom of the chassis with 3 screws. *Bypass step 2a unless your breaker is tripping at turn-on.*

2a. Referred from Flowchart B: Breaker trips at turn-on.

a. Isolate the Problem

In most cases when the breaker trips as you try to power up the amplifier, the problem is a fault on an output module or the power supply. The result is usually shorted power transistors on the output module(s) or a power supply component failure/short. Shorted transistors will cause excessive current, in turn, tripping the breaker as will a shorted bridge rectifier or a shorted power supply capacitor (cap) in the power supply. The first step is to determine which channel is defective.

b. Locate the power supply/output connectors (Figure 4-1).

c. Be sure that the amplifier is disconnected from AC mains. Disconnect Channel A's power supply/output connector.

d. Connect the clamp-on current probe across either wire connected to the circuit breaker.

e. Set the Variac at zero volts.

f. With the amplifier's circuit breaker in the "on" position, plug the amplifier into the Variac. *Note*: ***While increasing the Variac, monitor your current probe reading. The maximum, no load, quiescent current draw should be 1.5 amperes AC. If you are seeing a steady increase in current beyond this level, there is a short circuit somewhere in the amplifier; if not, continue.***

g. Bring the Variac up to 60 volts. Does the breaker still trip? If not, you know that the problem is located on Channel A's output module. If the breaker still trips, bring the Variac down to zero volts and repeat steps 3-7, this time reconnect Channel A and disconnect Channel B's power supply/output connector.

If the current level is acceptable and the breaker no longer trips with Channel B's output module disconnected, then you know that the problem is located on Channel B's output circuitry. Also, check the bridge rectifiers, the output relays and power caps for shorts which will also cause excessive current thus, tripping the breaker (Chapter 6).

h. Continue with section 4.2 to remove the modules from the chassis- then see section 4.4.3 "Troubleshooting Defective Output Modules" for tips.

i. Tip the amplifier up onto its left side and remove the six module screws on the bottom of the amplifier. Do not turn the amplifier upside-down to reach the screws, because the output modules will drop and possibly damage the preamp board and the wiring harness.

2. Lay the amplifier back down.

3. Label the channel A and B heatsinks for isolation purposes and so you can reinstall to their original position.

4. Unplug the temperature wires and disconnect the modules from the preamp by sliding them toward the front of the chassis. This will disconnect the 17-pin header on the modules from the preamp sockets. (See Fig. 4-1)

5. Remove the modules from the chassis.

6. Before continuing, visually inspect the heatsink boards for any obvious defects, burns, damaged components, etc.

7. If you find that you cannot repair the board, please call Crest Audio's Technical Services Department.

8. If you are replacing or reinstalling the modules, reassembly is the reverse of disassembly.

4.3 Locating and Isolating a Problem

If one channel is not functioning, determine whether the problem exists on the output module or elsewhere in the amplifier.

Procedure:

1. Use the procedure in Section 4.2 for removing the output modules from the chassis.

The next step is to swap the two output modules to see if the problem stays on the same channel.

2. Because the modules will be turned over, what was originally the top side of each module will become the bottom and vice-versa.

3. Reinstall the modules into the chassis, with the module that was originally Channel A now on the right and the one that was Channel B now on the left. Reconnect the power supply/output connectors. Be sure connectors are oriented properly and securely.

4. Connect the amplifier's AC mains cable to the apppropriate line voltage. Turn the amplifier on.

5. If the problem has moved over to the other channel, you have isolated the problem to that module. See Section 4.4, "Troubleshooting Output Modules".

   If the problem stays on the same channel after swapping, then you can assume that the problem lies elsewhere in the amplifier. See Chapter 6.

4.4 Troubleshooting Output Modules

If you have a spare output module that you know is good, ie: a factory replacement, you should use it as a reference for troubleshooting a defective one. If you do not have a spare, but one amplifier channel appears to work properly, you can confirm it's operation by performing a full module test (Sections 4.4.1 and 4.4.2) and use it as a reference. Use the chassis as a test fixture.

REPAIRS SHOULD BE ATTEMPTED ONLY BY QUALIFIED TECHNICIANS!!

4.4.1 Preparation for full module test

Tools and materials needed:

*Phillips #1 screwdriver
*Dual trace oscilloscope
*Audio generator
*Variac
*Digital multimeter (Fluke 87 or equivalent 20kHz bandwidth meter)
*Distortion analyzer
*4 and 2-ohm resistor (1000 watt non-inductive Millwaukee or equivalent). Load resistors are available through Crest.

Setup:

*Variac set to zero (0) VAC.
*Amplifier turned off and disconnected from AC mains.

Procedure:

1. Install a "good" module into the "good" channel of the preamp. *Note: you can test one module at a time. Remember that if a channel's module is disconnected, that amplifier channel will stay in "protect" mode.*

2. Set up the oscilloscope for viewing both channels of the scope. Use the "DC" settings for each channel.Use the horizontal and vertical position controls to set the oscilloscope channel's A & B to the 0 position, so the traces run horizontally across the screen.

3. Locate the two 390-ohm, 5 watt resistors at the back end (opposite the 17-pin header) of the heatsink board (R140, R141 See schematic). Keep in mind that the positive rail reference point is the outside lead of the 390-ohm resistor located on the left (positive, NPN) side of the heatsink board. The negative rail reference point is the outside lead of the 390-ohm resistor located on the right (negative, PNP) side of the heatsink board.

   Connect oscilloscope channel A to the negative (-) rail reference point. This connects directly to the emitters of the negative (-) rail output transistors.

   Connect oscilloscope channel B's probe to the output section at either lead of any fo the .33-ohm, 5 watt emitter resistors (R124, R126 etc).

Note: During this test, Channel B's oscilloscope probe should remain connected to the output section of the module under test. Channel A's oscilloscope probe will be moved from the positive rail to the negative rail reference points as the test progresses.

Continue with Subsection 4.4.2

4.4.2 Full module test

Tools and materials needed

*As in subsection 4.4.1
*Clamp-on current probe

Setup:

*Perform procedure in subsection 4.4.1.
*Set the digital multimeter to AC volts and connect it across the Variac output
*Connect the clamp-on current probe around either wire connected to the circuit breaker

Procedure:

1. Familiarize yourself with the heatsink board. Examine the positive and negative rail circuitry and compare it to the respective schematic. Notice that the positive rail uses 2SC3281 NPN power transistors and the negative rail uses 2SA1302 PNP power transistors.

2. Set the Variac to zero (0) volts AC. Connect the amplifier AC mains cable to the Variac receptacle and turn the amplifier power switch on.

3. Slowly increase the Variac to 40 volts output while monitoring the current probe reading. The maximum, no load, quiescent current draw should be 1.5 amperes AC. If you see a steady increase in current beyond 1.5A, there is a short circuit somewhere in the amplifier, go to Section 4.2, Step 2a. If not, continue (or get coffee!).

4. Carefully observe the oscilloscope screen. Channel B on the oscilloscope should remain at 0 volts (in the center of the screen).

   Channel A on the oscilloscope should show an increasing negative (-) DC voltage. If so, continue to step 5. If not, see "Symptoms nd Solutions", Subsection 5.1.1.

5. Carefully remove Channel A's oscilloscope probe from the negative rail reference point and connect it to the positive rail reference point (Subsection 4.4.1 step 4). At this time, Channel A on the oscilloscope should show an increase in positive (+) DC voltage. Channel B's oscilloscope channel should always remain at 0 volts (in the center of the screen). If this is so, continue to step 6. If not, see "Symptoms and Solutions", Chapter 5.

Step 6 is known as the "Heatsink Board Test"

6. Turn the Variac off to zero (0) volts. Wait a minute before you continue to let the power supply capacitors fully discharge.

Set the signal generator for a 2kHz, 10 VAC sine wave.

Bring the Variac up to 40 volts while carefully monitoring the oscilloscope screen.

Channel B on the oscilloscope will remain connected to the output section of the heatsink board therefore, if this board is operating correctly you should see a smooth, undistorted 2 kHz sine wave on oscilloscope Channel B.

Channel A on the oscilloscope should show an increase in negative (-) or positive (+) DC voltage (depending on which reference point you are connected to). At this time, the rails should be modulating in sequence with the respective positive or negative peak of the output sine wave (Figure 4-2). If everything is ok, turn the Variac off, and wait a full minute for the psu caps to discharge.

If any changes other than those described occur, see "Symptoms and Solutions", Subsection 5.1.2.

Steps 7 and 8 are a ***"Signal Flow Test".***

7. With a known good preamp, set the audio signal generator for a 2 kHz sine wave with a 1 volt balanced output. Use a male XLR input connector with pin-2 as (+) non-inverting (hot), pin 3 as (-) inverting and pin-1 as ground. For use with an unbalanced signal source, short the inverting pin-3 to the ground pin-1 inside the XLR plug. Apply the input signal to the appropriate input XLR on the rear panel of the amplifier.

   Set the mode select jumper (on the input/preamp) to the STEREO position and the appropriate attenuator control to 0 dB (fully clockwise).

8. Slowly increase the Variac output to 40 VAC while carefully observing the oscilloscope screen.

   Channel B on the oscilloscope should always remain at zero (0) in the center of the screen.

   Channel A on the oscilloscope should show an increasing positive DC voltage if it is connected to the positive rail reference point or an increasing negative DC voltage if it is connected to the negative rail reference point. If this is so, bring the Variac up to the proper line voltage (120VAC/220/240VAC).

   As you near full line voltage, the relays should close, turning the amplifier on and passing the 2kHz sine wave onto oscilloscope Channel B. At this time, Channel A on the oscilloscope should show the positive (+) or negative (-) high rails turning on synchronously with the signal (depending on which reference point you are observing). This is Class H operation (Figure 4-2).

If any changes other than described occur, see "Symptoms and Solutions", Chapter 5, subsection 5.1.3.

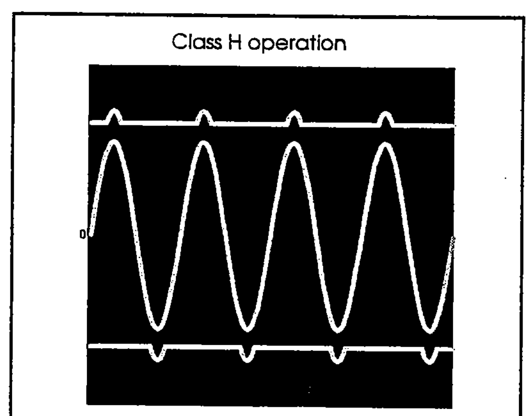


Figure 4-2. Class H

Steps 9 - 11 are the setting of the output "Transistor Bias".

The bias must be set while the amplifier is at room temperature, with no load and no signal applied.

9. Set the front panel attenuator control completely counter-clockwise.

10. Connect a DC voltmeter across the outside lead of the .33-ohm, 5 watt emitter resistors closest to the front end of the heatsink board (Figure 4-3).

11. Adjust trimpot VR1 to obtain 30mVDC for all CA Series amplifiers.

If you cannot obtain the correct bias voltage, see "Symptoms and Solutions", subsection 5.1.4.

Steps 12 through 16 test the module's ***"THD"*** as well as it's ability to deliver ***"power into a load".***

12. Set the attenuator control to 0dB.

Connect the load for a maximum of 30 seconds.

13. Adjust the input level so that the output of the amplifier is just below clipping. Measure THD with and without the 4-ohm load applied at the various frequencies listed in the THD Table. **Make sure the output is not visibly clipping!**

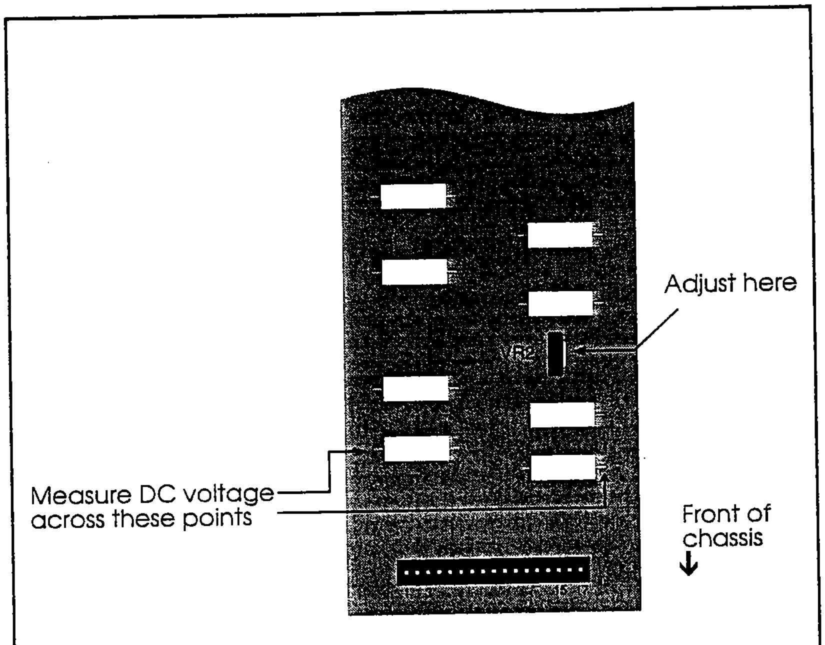


Figure 4-3. Bias adjust

If everything is ok, continue. If not, see "Symptoms and Solutions", subsection 5.1.5.

14. Connect an AC voltmeter acrodss Channel B's output. Apply a 2-ohm load across the output at the rear panel binding posts for a maximum of 30 seconds, and measure the output voltage. Check your measurements against the Power Table.

Observe the oscilloscope, the sine wave should not clip during this test.

THD TABLE

Frequency	THD with no load	THD with a 4Ω load
20Hz	.015%	.030%
2kHz	.025%	.035%
10kHz	.050%	.060%
20kHz	.065%	.070%

POWER TABLE

Model	Voltage @ LOAD	
CA2	30-32Vrms	250W @ 4Ω
CA4	33-34Vrms	600W @ 2Ω
CA6	35-38Vrms	700W @ 2Ω
CA9	40-43Vrms	850W @ 2Ω
CA12	50-52Vrms	1300W @ 2Ω

To calculate power, use the formula: $\textit{POWER} = \textit{RMS Voltage}^2 / \textit{Load Resistance}$

If the module passes this test, continue. If not, see Symptoms and Solutions, Section 5.1.6.

Steps 15 through 20 check for "Voltage on the Heatsink and for DC offset".

15. Connect the voltmeter between the module's heatsink and a suitable ground on the chassis.

16. Check for both DC and AC voltages. There should be no voltage between the heatsink and the chassis. If you measure voltage on the heatsink, see "Symptoms and Solutions", Subsection 5.1.7.

17. Turn the variac down to zero (0) volts output. Wait a minute before you continue to let the power supply caps discharge.

18. Disconnect the output load and the input signal. Turn the variac back up to full line voltage. Measure the DC voltage across Channel B's rear panel outputs. You should measure less than 10mVDC.

If more than 10mVDC is measured, try swapping the output modules as in section 4.3. If the offset follows the output module, the module needs troubleshooting. If the problem remains on the same channel of the amplifier, the problem is most likely on the surface mount preamp. It may need to be replaced.

If the module passes all of these tests, then it is in good working order. Now it can be used as a reference in troubleshooting a bad one. The procedures are detailed in the following chapter.

5 SYMPTOMS AND SOLUTIONS

5.1 Troubleshooting a defective output module

Tools and Materials Needed:

*Dual-trace oscilloscope
*Audio generator
*Variac
*Digital multimeter (20kHz bandwidth or greater)
*Distortion analyzer
*4 and 2-ohm load resistor (1000w non-inductive Milwaukee or equivalent)
*Output module, tested and in good working order for comparison

Setup:

*Variac set at zero (0) VAC
*Amplifier turned off and disconnected from AC mains
*Good output module installed and connected in the chassis as Channel A
*Defective module installed and connected in the chassis as Channel B

Procedure:

Again, you will use the chassis as a test fixture. Channel A is the reference, and Channel B is the device under test.

1. Use set up and procedure steps from subsection 4.4.1.

Continue the test on the defective module by following the procedure in subsection 4.4.2. If you encounter any problems, the instructions will direct you to the appropriate troubleshooting guide.

In the tests described in subsections 4.4.1 through 4.4.3, you identified any symptoms and performed visual inspections. The following instructions help you isolate the problems and correct them by replacement or component-level repair.

5.1.1 Referred from 4.4.2, Step 4-voltage on output

1. If Channel B's oscilloscope trace shows an offset (ie: not staying in the center at zero), the problem is most likely located on one of the power supply rails.

   If the trace appears to be attached to the positive (+) rail or is rising in positive DC voltage, then the problem exists somewhere in the circuitry of the positive rail on the heatsink board.

2. Troubleshoot the circuit at component level.

   Turn the variac off to zero VAC and wait a minute for the power supply to discharge.

   Remove the output module from the chassis.

Locate the problem area of circuitry on the board's positive or negative rail (as determined in step 1). Reference the heatsink board schematic.

Use an ohm-meter or diode/transistor tester to test the components.

If the output has a positive offset or is latched to the positive rail, start by checking for forward bias readings on the power transistors 2SC3281, NPN. If the offset or latch is on the negative rail, first check the 2SA1302 PNP power transistors.

The legs of the transistors mounted on the heatsink are base, collector, and emitter, from left to right (Fig 5-1). If there is a shorted device on either rail, all of the devices will show either a short or a very low resistance, because all of the emitters of the low rail are connected through 0.33 ohm, 5 watt resistors. All of the bases are connected through 2.2 ohm, 1 watt resistors, and all of the collectors are connected together on the board.

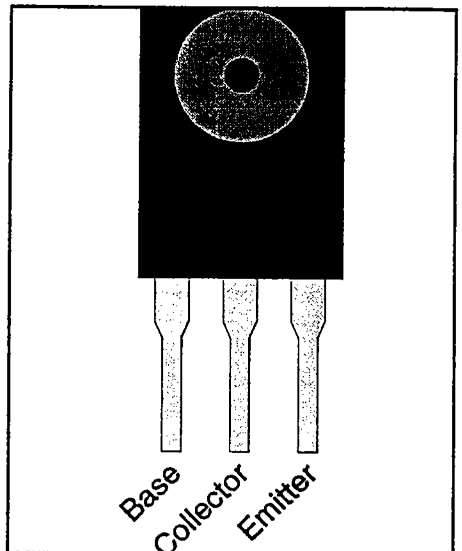


Fig 5-1

The high rail transistor emitters are connected through 0.2 ohm, 5 watt resistors and the bases and collectors are connected together on the board; therefore, if one device is shorted, they will all measure very low or zero ohms.

3. If there is a short from emitter to collector:

To determine which devices are bad, use a soldering iron to lift one leg of each emitter resistor. This removes each device from the circuit. Measure the emitter-collector resistance on each device to check for forward bias.

If the emitter-collector resistance on an out-of-circuit transistormeasures a short circuit, then it is damaged and must be replaced. Check each transistor out-of-circuit and remove all defective ones by unscrewing the torque screws and unsoldering the transistors from the top of the pcb. If you find shorted devices, be sure to check the value of all emitter resistors.

4. If there is a short from collector to base:

Use a soldering iron to lift one leg of each 2.2 ohm base resistor. This removes the base of each transistor from the circuit and allows you to locate any bad device(s). Check the base-collector resistance of each transistor and replace any that measure as a short or reverse bias.

Check the board for open foil traces.

Remember, if you have found shorted transistor(s), be sure to check the values of the emitter and base resistors.

Voltage on the heatsink will also cause high and low rail problems.

5.1.2 Referred from 4.4.2, step 6 - failed the "heatsink Board Test"

1. If the output sine wave (Ch B on the scope) appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive low rail and vice-versa. Reference heatsink board schematic.

REMEMBER! THE CLASS H OSCILLOSCOPE DRAWING IN FIGURE 4-3 SHOWS THE OUTPUT SINE WAVE AS WELL AS BOTH OF THE VOLTAGE RAILS. YOU ARE MONITORING THE OUTPUT BUT ONLY ONE OF THE RAILS AT AT TIME.

2. If the high rails appear distorted or are not modulating as shown in Fig 4-3, then the problem most likely exists somewhere in the circuitry of the respective (+ or -) defective high rail.

See subsection 5.1.1, steps 2 - 6 for tips.

5.1.3 Referred from 4.4.2, Step 7 - failed "signal flow test"

If Channel B's trace on the oscilloscope (module output) shows a latch or DC offset with the preamp board attached (and you have confirmed with a good preamp channel that the module is good), the problem is most likely on the preamp board.

1. Turn the variac off to zero (0) VAC.

2. Replace the suspect preamp with a known good preamp. Make sure it is connected properly to the modules.

3. Perform steps 7 and 8 from subsection 4.4.2. If the problem no longer exists, then the "bad" preamp needs to be replaced. If the problem still exists, recheck the module as in subsection 4.4.2, step 6.

   NOTE: IF YOU FIND THAT THE PREAMP BOARD IS DEFECTIVE IT IS BEST TO REPLACE IT. ATTEMPTING TO SERVICE THIS SURFACE MOUNT BOARD MAY DO MORE HARM THAN GOOD.

If you turn the variac up to full mains voltage and the channel stays in protect but the module output shows no latch, check for voltage between the chassis and the heatsink. If there is no voltage on the heatsink, go back and thoroughly check the suspect board. Something may have been overlooked.

5.1.4 Referred from 4.4.2, Step9 - cannot "bias" properly

2. Using an ohmmeter or in-circuit transistor tester, check Q25, a TIP117 Darlington Pair transistor, replace it if necessary. Remember that as a Darlington pair, the transistor has two base-emitter junctions in series between the base and emitter.

3. Connect the amplifier to the Variac and slowly turn up the voltage to approximately 40VAC. Check f voltage between the heatsink and the amplifier chassis. There should be no AC or DC voltage on the module's heatsink. If you find voltage on the heatsink, see subsection 5.1.7.

5.1.5 Referred from 4.4.2, Step 12 -excessive THD + N

1. First make sure the module is biased properly, see subsection 4.4.2 steps 9 - 11.

Note: If your distortion analyzer has a 400Hz high-pass filter, use it. If the THD + N drops to an acceptable level with the 400Hz filter in, then you have determined that the distortion is below 400Hz, most likely caused by line related hum. You can first assume that there is an open ground somewhere in the harness or on a pcb. If not, continue.

Distortion can have a number of causes. To help track down its source, observe the analyzer output (the distortion product) on one oscilloscope channel and the same amplifier channel's output signal on the other. Excessive distortion products that are synchronous with either the positive halves of the waveform or the negative halves, and not both, indicate a problem in the respective positive or negative circuitry of the module. For example, Fig 5-4 shows an excessive distortion product that occurs simultaneously with the positive peaks, but not the negatives; this indicates a problem in the positive circuitry in either the preamp or the module. You must investigate further to isolate the THD problem to either board.

Note: Be sure that the amplifier is getting the proper line voltage. Starving or overloading the supply will cause high THD.

2. Turn the Variac off and swap the preamp with one that is known to be good.

3. Bring the Variac back up to full mains. If the distortion problem remains, then the heatsink board is defective. If the excessive distortion dissappears, the problem lies on the preamp board.

4. Turn the Variac off and return the original preamp board to the module under test. Continue below with the appropriate measures. Step 5 if the preamp board is defective or step 6 if the heatsink board (module) is defective.

5. Tracing excessive THD in the heatsink board:

With the Variac turned off and the board disconnected from the amplifier, check all components starting with resistors & diodes on the suspect problem area of circuitry (ie: positive or negative). An open or shorted resistor can cause high THD, as can a faulty diode, cap, or transistor. Be thorough.

Reconnect the heatsink board, bring the Variac up to full mains voltage. Check for voltage on the heatsink. Voltage on heatsink will also cause high THD, see subsection 5.1.7.

Does the excessive THD occur only with a load on the channel's output? Premature clipping on either the positive or the negative waveform peaks (Fig 5-3) that disappears when the load is disconnected indicates a likely power supply problem, a zener diode problem, or output transistor problem. Turn off the variac and check the power supply bridge rectifiers. All four diode junctions should measure properly in forward bias only. Replace If necessary, see Chapter 6 step 17.

Bring the Variac back up to full mains and check the voltage drop across the zener diodes Z8 and Z9 on the heatsink board. The voltage drop across these two 1N5927 diodes must be 12VDC, +/- 1%. Replace any failed or out-of-tolerance zeners. Check the affected output transistors, see subsection 5.1.1, steps 2 - 5.

5.1.6 Referred from 4.4.2, Step 16 - insufficient output power

1. If the channel will not produce enough output power into 2-ohms with reference to the power chart, observe the output waveform as you apply the load.

2. Does the signal clip prematurely? If so, check the power transistors associated with that rail (one or more may be defective) as well as zener diodes Z8 and Z9 on the heatsink board and the bridge rectifiers on the power supply board. Follow tips from subsetion 5.1.5, step 6.

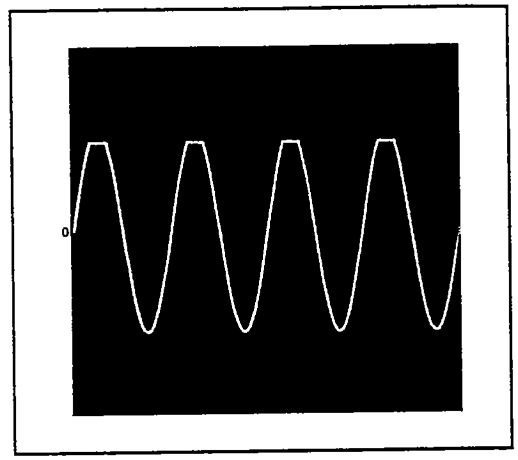


Fig5-2

5.1.7 Referred from 4.4.2, Step 17 -voltage on heatsink

1. Turn the Variac off. Make sure the heatsink of the module under test is not touching the chassis

2. Set the Variac to 40VAC.

The transistors are fastened to the heatsink for heat dissipation. The bottom surface of each transistor's flat case connects to the collector of the device. To insulate the collector voltage from the grounded heatsink, individual mica washers with silicone thermal grease are used. Sometimes, these insulators become damaged with age, through repeated expansion and contraction, causing collector current leakage onto the heatsink.

3. Connect the voltmeter between the amplifier chassis ground and the heatsink. If you find the heatsink ha a positive DC voltage with respect to chassis ground, the problem lies with the NPN transistors, which a associated with the positive rail. If it has a negative voltage, the problem is with the PNP transistors.

4. Leave the Variac set to 40VAC. Using a 3/32" (2.4 mm) hex driver with an INSULATED HANDLE, begin loosening the mounting screws of the suspect transistors one by one while observing the voltmeter reading. Once you unscrew the transistor that is shorting to the heatsink, the voltage between ground and the heatsink will dissappear.

5. Turn the Variac off. Wait a minute before you continue to let the powere supply caps discharge (are you sick of reading this line?...I'm sick of typing it!!).

6. Completely remove the mounting screw of the suspect transistor. Carefully lift the transistor away from the heatsink.

7. Check the insulator underneath the transistor for rips, holes or debris. Clear away anything that may hav caused a puncture in the insulator.

8. Replace the mica. Coat both the heatsink area and the device with a thin film of silicone thermal grease first. Use care.

9. Replace the transistor's mounting screw. Tighten the mounting screws of the large power transistors to 15 lb-in (1.7N-m). Over-tigtening will damage the mica and cause a short circuit. Carefully hand-tighten the mounting screws of the smaller T0220 devices enough to hold firmly without crushing the nylon shoulder washer, wich would also short the device to the heatsink. Replace the shoulder washer if necessary. See Fig 5-4.

Step 10 is necessary because more than one transistor may be shorted to the heatsink.

10. Repeat steps 2 and 3 to test for voltage on the heatsink. Repeat this procedure as necessary until no voltage is on the heatsink.

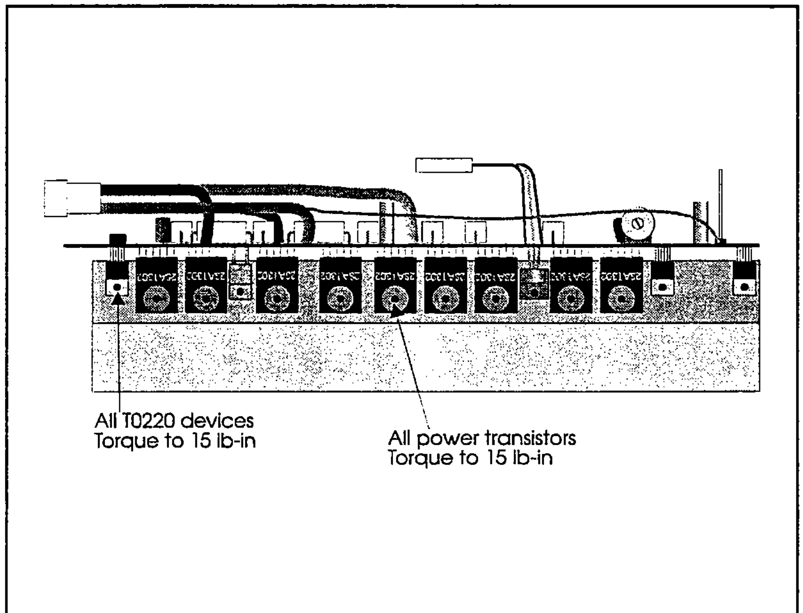


Fig 5-3

6 TROUBLESHOOTING THE REST OF THE AMPLIFIER

Tools and materials needed:

*Phillips #1 & #2 screwdrivers
*Multimeter (with a bandwidth of 20k or greater)
*Variac

6.1 Symptom: No audio, LEDs not lit on one/both channels (Steps 1–8) One or both channels stays in "protect" (Step 1)

Setup:

*Variac set to 0VAC
*Amplifier turned off
*Top cover removed from the amplifier
*Voltmeter ground connected to black binding post (ground).

First check the power supply rails.

1. Connect the amplifier to the Variac output. Turn on the amplifier and adjust the Variac output to **40 volts AC.**

2. Measure the DC voltage Hi and Lo rails, with respect to the amplifier chassis ground (connect DC voltmeter ground to the black output binding post), at the points specified in the following table. See Fig 6-1.

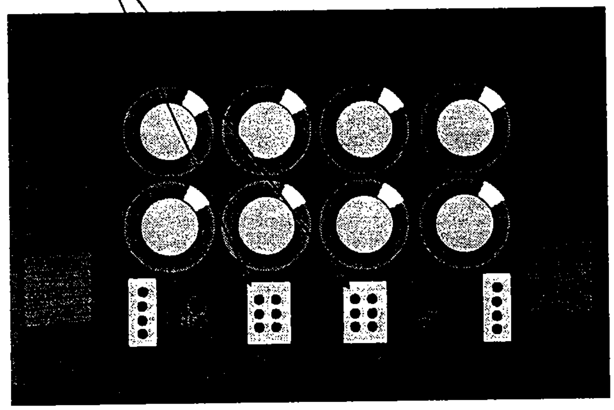
   If the power supply is functioning properly, you should measure approximate voltages as listed in the following table:

	120-VOLT AMPLIFIERS				240-VOLT AMPLIFIERS			
@40 VAC / Model	RED	RED/B	GRN	GRN/B	RED	RED/B	GRN	GRN/B
CA-6	+32V	+16V	-32V	-16V	+17V	+8V	-17V	-8V
CA-9	+39V	+19V	-39V	-19V	+20V	+10V	-20V	-10V
CA-12	+42V	+21V	-42V	-21V	+22V	+11V	-22V	-11V

If the power supply voltages measure correctly, continue. If not, go to Step 11.

Next, check the In-rush limiter circuitry. Reference display board schematic.

CH A & B POWER SUPPLY / OUTPUT CONNECTOR



POWER SUPPLY PCB

3. Disconnect the amplifier from AC mains.

4. The in-rush limiter circuitry is located on the display board. Visually inspect the SG328 in-rush limiter and in-rush relay for burns or cracks etc.. If these components appear to be damaged, replace them. See Fig 4-1. NOTE: THE CA2, 4, 6, & 9 USE 1 x SG328 IN-RUSH LIMITER ON THE DISPLAY BOARD. THE CA12 USES 2 x SG328 CONNECTED TOGETHER IN SERIES. IF THIS IS NOT SO, YOU MUST UPGRADE.

5. Check the resistance of the SG333, it should measure greater than 10-ohms and less than 100-ohms. If it measures less than 10-ohms, the in-rush relay is most likely shorted and needs to be replaced. If it measures greater than 100-ohms, the SG333 in-rush limiter is open and needs to be replaced.

NOTE: If the in-rush limiter circuitry has failed, the amplifier is disconnected from the AC line.

Next, check for proper LED auxiliary voltage. Reference power supply board schematic.

6. With respect to ground, check for 5VDC on the aluminum power supply heatsink which is mounted to the power supply board (Fig 6-1). Remember, your variac is still at 40 VAC. ***NOTE: At full line voltage, this auxiliary voltage should be 35VDC.*** If there is no voltage at this point, continue to step 7, if so go to step 8.

7. If no auxiliary voltage is present on the power supply heatsink, turn the variac to 0 VAC (off). Check fuse F1, a 3-amp mini-fuse located on the power supply board. If this fuse is open, replace it and try bringing the variac back up to 40VAC. Repeat step 6 above. If the fuse opens up again, there is a short somewhere causing excessive current draw. Check BR3 an RS202 bridge rectifier, located right after the fuse in the auxiliary supply circuit on the power supply board, as it may be shorted.

8. Set the variac to 40 VAC, check the display board ribbon cable for +27VDC at pin 1. If no voltage is present, check the continuity of the ribbon cable, it may be damaged.

   If the LEDs work on both channels and neither channel remains in protect after the amplifier is turned on, check the amplifier's audio performance to see if it requires any further repair.

   If the LEDs work on both channels but one or both channels remain in protect when the amplifier is turned on, go to Chapter 4, Troubleshooting and Repairing the Output Modules, to test and, if necessary, repair the output modules.

Next, check the fan driver and power supply circuitry located on the power supply board (Fig 6-1), schematic.

If a channel is staying in protect, observe the fan's operation.

9. If the fan is running at a slow speed, do the following;

    a. Disconnect the amplifier from the AC mains and disconnect the preamp ribbon cable J2.

    b. Power the amplifier up to full line voltage.

If the defective channel comes out of protect, replace the preamp.
If the defective channel remains in protect, continue.

    c. Measure the voltage at Q9 for Channel A, and/or Q10 for Channel B for approximately 11VDC when the amplifier is in "active" mode.

If the voltage is less than +11VDC, check IC1B, pin-7 for Channel A and/or IC2A, pin-1 for +24VDC.
If this voltage is low, replace the IC.

10. If the fan is running at high speed, do the following;

    a. With the amplifier powered to full line voltage, check the temperature sensor wire harness to the power supply board for the proper voltages:
    RED = +8VDC, YELLOW = 0.25VDC, BLACK = gnd.

    b. Check for 0.25VDC (25 degrees C) on IC1B, pin-6 and IC2A, pin-2 right after turn on, when modules are cool. Replace any IC you find defective.

Next, check the power supply board.

11. Turn the amplifier on and bring the Variac up to full line voltage. Check the positive and negative Hi and Lo rail voltages as in the following table (see Figure 6-1,) .

POWER SUPPLY VOLTAGE RAILS

@Full Line. Model	RED	RED/B	GRN	GRN/B
CA-6	+104V	+52V	-104V	-52V
CA-9	+122V	+61V	-122V	-61V
CA-12	+135V	+67V	-135V	-67V

12. If the negative and positive voltages do not match to within approximately one volt, the power supply has a problem. Turn off the amplifier and the Variac and wait a minute to allow the power supply capacitors to discharge.

    If a rail voltage is lagging, check the suspect bridge rectifier, using an ohmmeter or diode tester. Replace any that are faulty.

    Below are the power supply bridge rectifiers and capacitors used for the CA models;

	CA-6	CA-9	CA-12
BR1/BR2	MB352W	MP14020W	ED2478

	CA-6	CA-9	CA-12
C3 thruC10	17000u/55V	10000u/67V	15000u/70V

To replace a defective rectifier, you must remove the power supply board.

13. Remove Channel A and B's power supply/output connectors. Remove the 2 phillips head screws from the top of the PSU rectifiers. To remove the power supply board, you must slide it toward the front of the chassis in order to disengage the locking pins.

14. Carefully Lift the board up and out of the chassis.

15. Unsolder the damaged bridge rectifier from the bottom of the board, then remove and replace with new. Be sure to apply a sufficient amount of solder to each terminal, remember, the solder must flow through the pcb. Fit the board back into the chassis, observing the locking pins. Re-connect the power supply/output connectors.

If the power supply capacitors are defective or appear to be defective...

16. Be sure that the amplifier is disconnected from the AC mains!

    Use the procedure described in step 13 above to remove the power supply board.

17. Desolder the defective capacitor(s) from the bottom of the board and replace with new. Be sure to observe polarity.

18. Re-test rail voltages.

Check the output relays

19. Turn the amplifier and variac off and wait a minute for the power supply capacitors to discharge.

20. With the output modules connected to the power supply board, use an ohmmeter to measure the resistance between ground and each output module's white wire (output). A short to ground at either white wire indicates a shorted output relay on the respective channel.

    To replace an output relay, remove the power supply board (see step #13) and unsolder it from the board. Solder the new relay in its place and reinstall the board.

Thanks for your continued support!

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CA SERIES MODULE KIT DOMESTIC

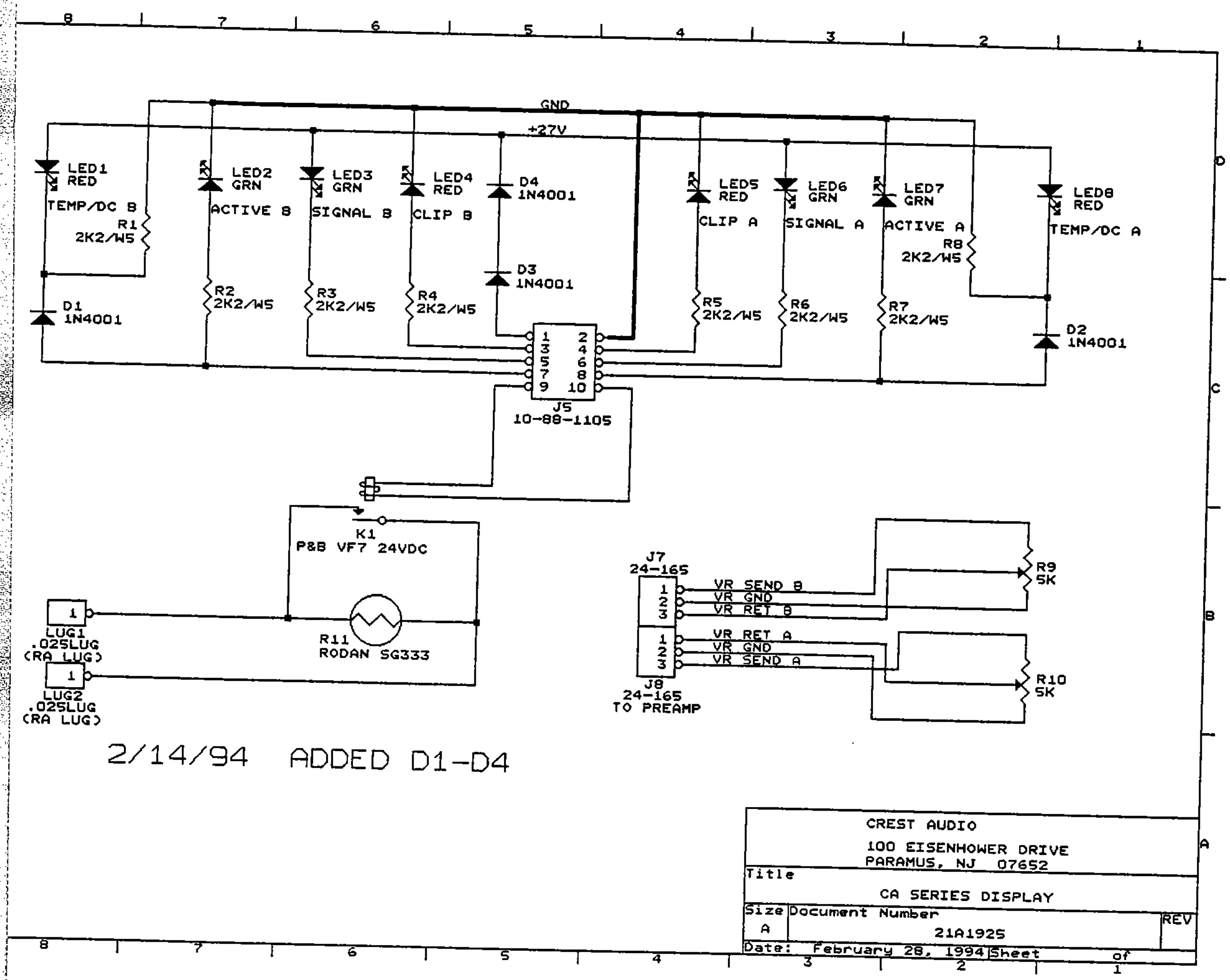
MODULES	PART NO.	DOMESTIC $
CA4 Output Module	CA05	200.00 ea.
CA6 Output Module	CA04	220.00 ea.
CA9 Output Module	CA06	220.00 ea.
CA12 Output Module	CA14	320.00 ea.
CA4 Power Supply	CA01-CA4	140.00 ea.
CA6 Power Supply	CA01-CA6	150.00 ea.
CA9 Power Supply	CA01-CA9	160.00 ea.
CA12 Power Supply	CA01-CA12	180.00 ea.
CA4 Input/Preamp	CA07-CA4	150.00 ea.
CA6 Input/Preamp	CA07-CA6	150.00 ea.
CA9 Input/Preamp	CA07-CA9	150.00 ea.
CA12 Input/Preamp	CA15	150.00 ea.
CA4/6/9 Display	CA09	60.00 ea.
CA12 Display	CA18	70.00 ea.

CA SERIES PARTS KIT B

PARTS	PART NO.	DOMESTIC $
CA 6/9 Domestic breaker 21-amp	21000014	19.00 ea.
CA12 Domestic breaker 30-amp	21000016	19.00 ea.
CA6/9/12 Capacitor 17000uf 55v	18000015	12.00 ea.
CA9/12 Capacitor 10000uf 67v	18000006	12.00 ea.
CA12 Capacitor 15000uf 70v	18000004	13.00 ea.
CA6/9 MP14020 Rectifier	70000008	5.00 ea.
CA12 ED2478 Rectifier	70000031	16.00 ea.
CA6/9/12 Relay 24v	72000003	8.00 ea.
CA12 Fan 24 vdc	28000015	35.00 ea.
CA6/9 Fan 24 vdc	28000003	35.00 ea.
Transistor 2N5401	94000002	1.00 ea.
Transistor 2N5551	94000003	1.00 ea.
Transistor 2SA1006	94000005	3.00 ea.
Transistor 2SA1302	94000006	7.00 ea.
Transistor 2SC2336	94000058	3.00 ea.
Transistor 2SC3281	94000010	7.00 ea.
Transistor TIP117	94000026	2.00 ea.
Rectifier MR2406	70000009	5.00 ea.
Rectifier SF14	70000011	2.00 ea.
Diode FR204	27000006	1.00 ea.
Diode IN4004	27000008	1.00 ea.
Diode IN4148	27000009	1.00 ea.
Diode IN5927	27000014	2.00 ea.
Diode IN5938	27000016	2.00 ea.
Sensor LM35DP	83000006	4.00 ea.
Screw 6 32x1/4 Top Cover	38000001	0.20 ea.
Screw 10 32x1/2 Transistor Mount	39000001	0.20 ea.
Nylon Shoulder Washer	52000003	0.20 ea.
Fuses GMA	30000005	1.00 ea.
Resistor 51ohm 1/2W	75000004	0.50 ea.
Resistor 2.2ohm 1W	76500001	0.75 ea.
Resistor 4.7ohm 1W	76500002	0.75 ea.
Resistor 10ohm 1W	76500003	0.75 ea.
Resistor 150ohm 1W	76500006	0.75 ea.
Resistor 30ohm 2W	77000005	0.95 ea.
Resistor 51ohm 2W	77000008	0.95 ea.
Resistor 200ohm 2W	77000011	0.95 ea.
Resistor .33ohm 5W	77500003	1.50 ea.
Resistor 390ohm 5W	77500007	1.50 ea.
Resistor 1ohm 10W	79500001	1.50 ea.
Resistor 15ohm 25W	81000001	5.00 ea.
Resistor 50ohm 10W	80000011	1.50 ea.
Resistor 100ohm 10W	80000001	1.50 ea
Resistor 100ohm 1/2W	75000005	0.50 ea
Resistor 20K 1W	76500010	0.75 ea.
Resistor 47ohm 1/4W	74000007	0.25 ea.
Pot 5K	68000010	6.00 ea.
Regulator LM317	71000001	2.00 ea.

CA SERIES PARTS KIT B

PARTS	PART NO.	DOMESTIC $
CA4 Front Panel Decal	64300006	3.00 ea
CA6 Front Panel Decal	64300001	3.00 ea.
CA9 Front Panel Decal	64300002	3.00 ea.
CA12 Front Panel Decal	64300003	3.00 ea.


GND
+27V
LED1 RED
TEMP/DC B
R1 2K2/W5
D1 1N4001
LED2 GRN
ACTIVE B
R2 2K2/W5
LED3 GRN
SIGNAL B
R3 2K2/W5
LED4 RED
CLIP B
R4 2K2/W5
D4 1N4001
D3 1N4001
J5 10-88-1105
LED5 RED
CLIP A
R5 2K2/W5
LED6 GRN
SIGNAL A
R6 2K2/W5
LED7 GRN
ACTIVE A
R7 2K2/W5
R8 2K2/W5
LED8 RED
TEMP/DC A
D2 1N4001
K1
P&B VF7 24VDC
LUG1 .025LUG (RA LUG)
LUG2 .025LUG (RA LUG)
R11 RODAN SG333
J7 24-165
VR SEND B
VR GND
VR RET B
VR RET A
VR GND
VR SEND A
J8 24-165 TO PREAMP
R9 5K
R10 5K
2/14/94 ADDED D1-D4
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PARAMUS, NJ 07652
Title
CA SERIES DISPLAY
Size A
Document Number 21A1925
REV
Date: February 28, 1994
Sheet of 1

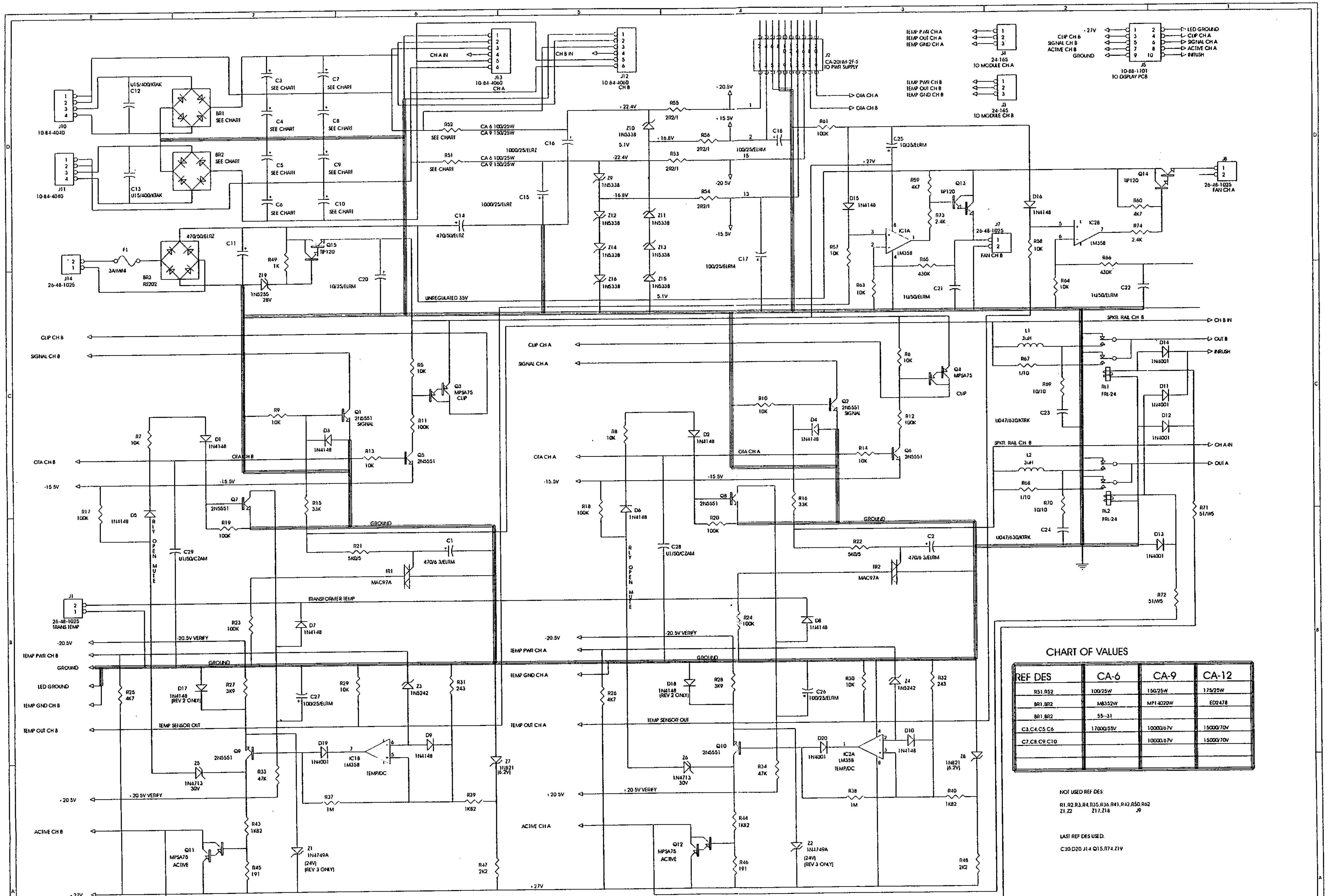

CHART OF VALUES

REF DES	CA-6	CA-9	CA-12
R51,R52	100/25W	150/25W	175/25W
BR1,BR2	MB352W	MP1-4020W	ED2478
BR1,BR2	55--31		
C3,C4,C5,C6	17000/55V	10000/67V	15000/70V
C7,C8,C9,C10		10000/67V	15000/70V

NOT USED REF DES:

R1,R2,R3,R4,R35,R36,R41,R42,R50,R62
Z1,Z2 Z17,Z18 J9

LAST REF DES USED:

C30,D20 J14 Q15,R74,Z19

REV NOTE 2/14/94 CHANGED C21, C22 TO 10/50V
REV NOTE 2/24/94 CHANGE Z17,Z18 FROM 1N5230 TO 1N5927
REV NOTE 2/24/94 CHANGE C21,C22 FROM 10/50V TO 0.1/50V
REV NOTE 2/24/94 CHANGE R65,R66 FROM 390K TO 430K
REV NOTE 2/24/94 CHANGE R35,R36 FROM 100R TO D19,D20 1N4001
REV NOTE 2/24/94 CHANGE IC1,IC2 FROM LM393 TO LM358
REV NOTE 2/24/94 DELETED R73, R74
REV NOTE 2/28/94 REV 3 ONLY DELETE D17, D18 AND ADD Z1,Z2

REV NOTE 3/28/94 CHANGED C21,C22 TO 1UF/50V
REV NOTE 3/28/94 CHANGED Z17,Z18 TO R73,R74 2.4K
REV NOTE 6/8/94 CHANGED C21, C22 FROM 1UF/50V TO 0.47UF/100V

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Title: CA SERIES POWER SUPPLY

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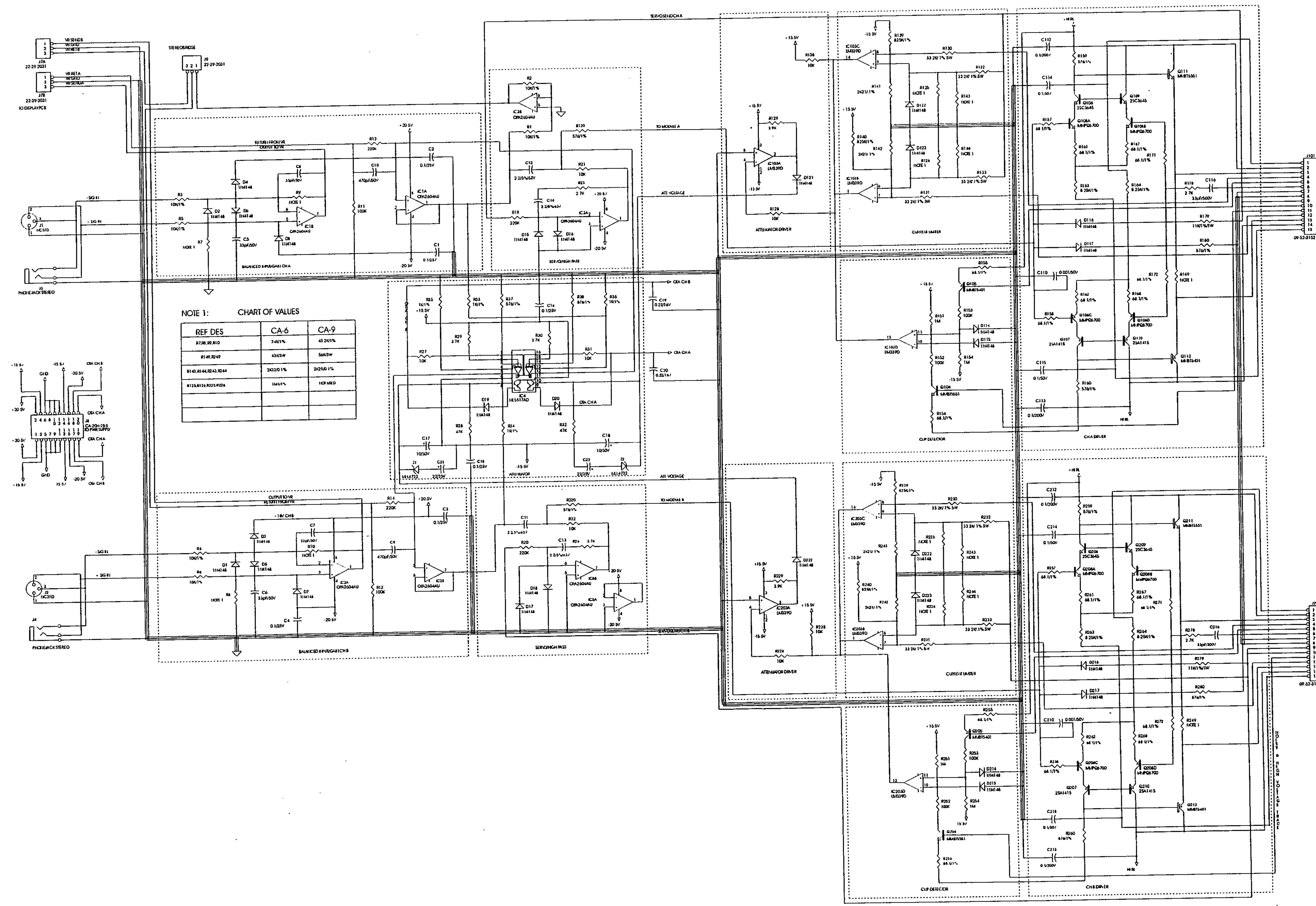

NOTE 1: CHART OF VALUES

REF DES	CA-6	CA-9
R7,R8,R9,R10	34K/1%	43.2K/1%
R149,R249	43K/3W	56K/3W
R143,R144,R243,R244	2K32/0.1%	2K29/0.1%
R125,R126,R225,R226	1M1/1%	NOT USED

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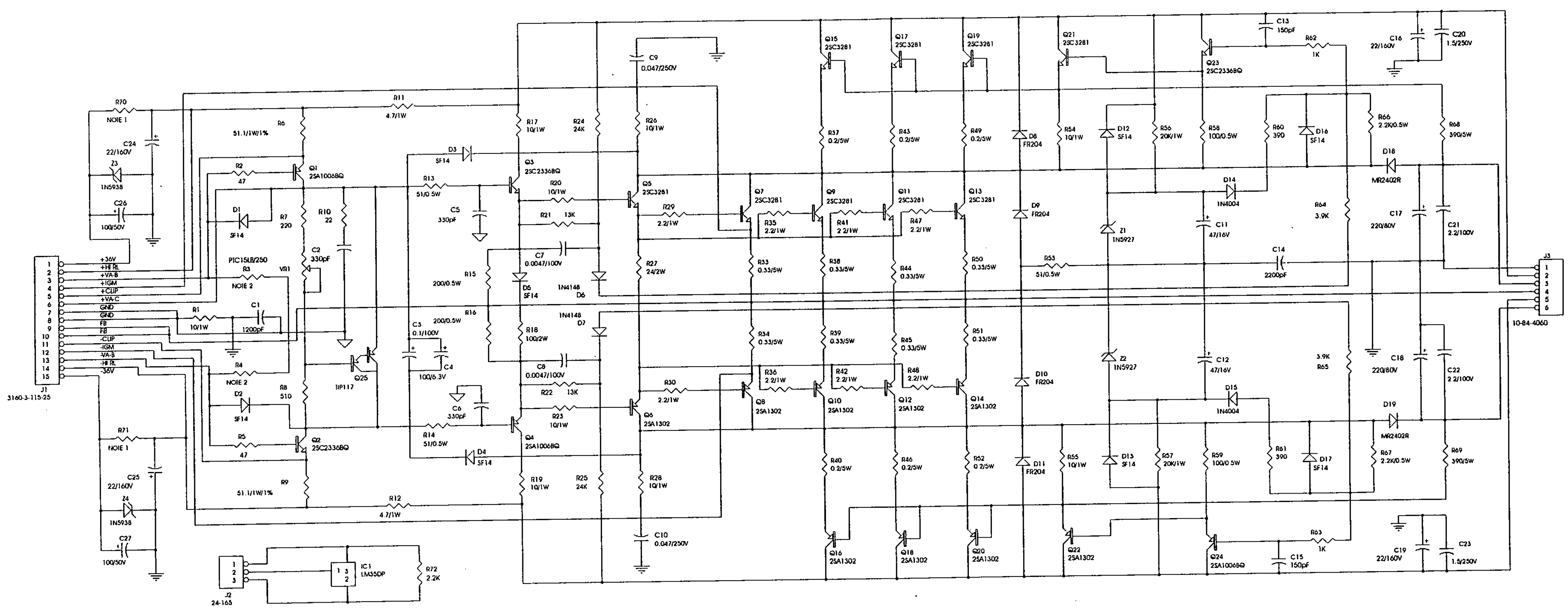
D	PREAMPCA	02

Date: June 4, 1996 Sheet of



NOTE 1: 8.2K 2W ON MODEL CA-9

6.8K 2W ON MODEL CA-6

NOTE 3: Q9, Q12, NOT USED ON MODEL CA-6

01-05-94

DELETE R31,R32

CHANGE R27 FROM 51R/2W TO 25R/2W

CHANGE R18 FROM 200R/2W TO 100R/2W

CHANGE R15,R16 FROM 150R/1W TO 200R/0.5W

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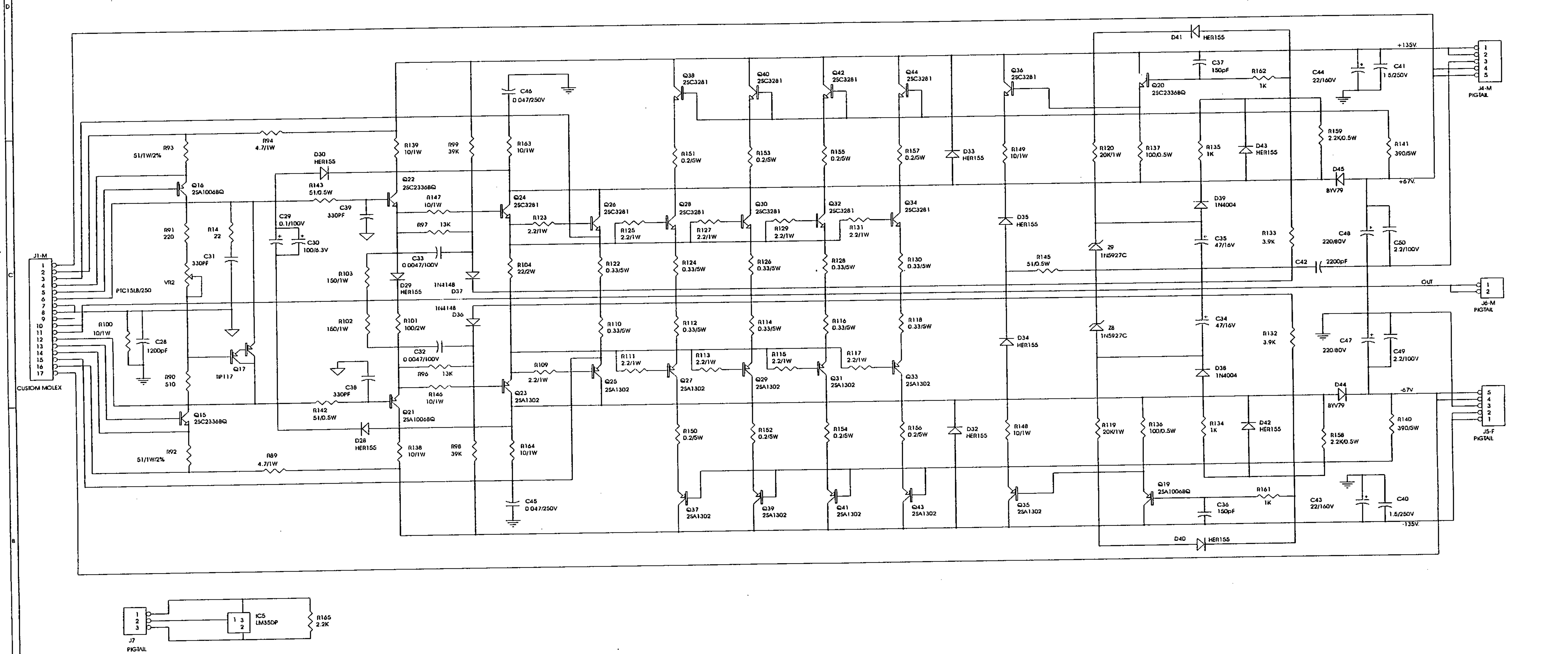
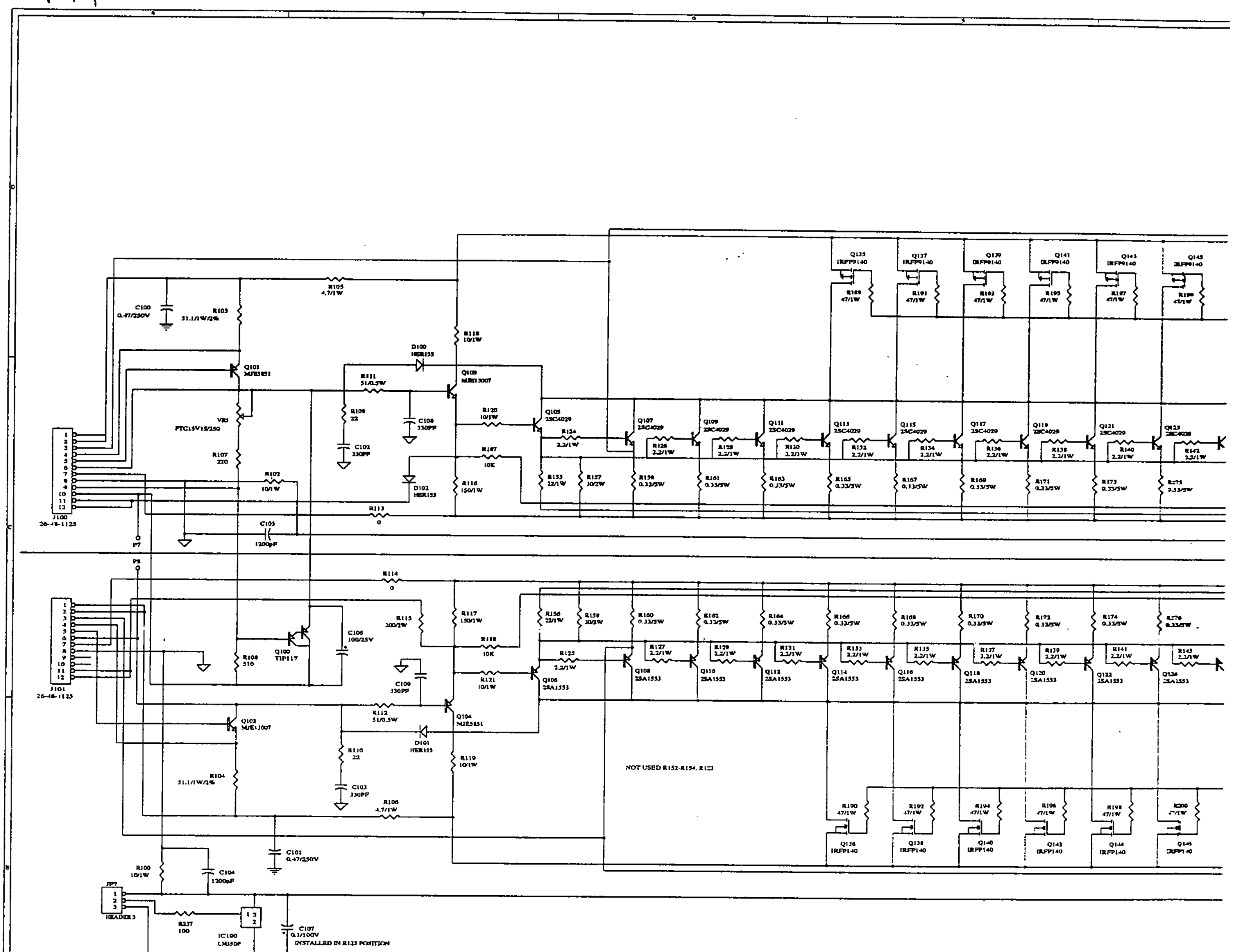
Title

OUTPUT CA-6 / CA-9



CREST AUDIO 100 Eisenhower Dr. Paramus, NJ 07652		
Title: CA-12 OUTPUT PCB		
Size: C	Document Number: 21C0929	REV
Date: April 7, 1994	Sheet	of 1

10K1



8/17/92 C107 CHANGED VALUE AND WAS CONNECTED TO SUPPLY END OF LM35

3/8/93 ADDED 2 MOSFETS AND RESISTORS

4/1/93 ADDED C208,C209

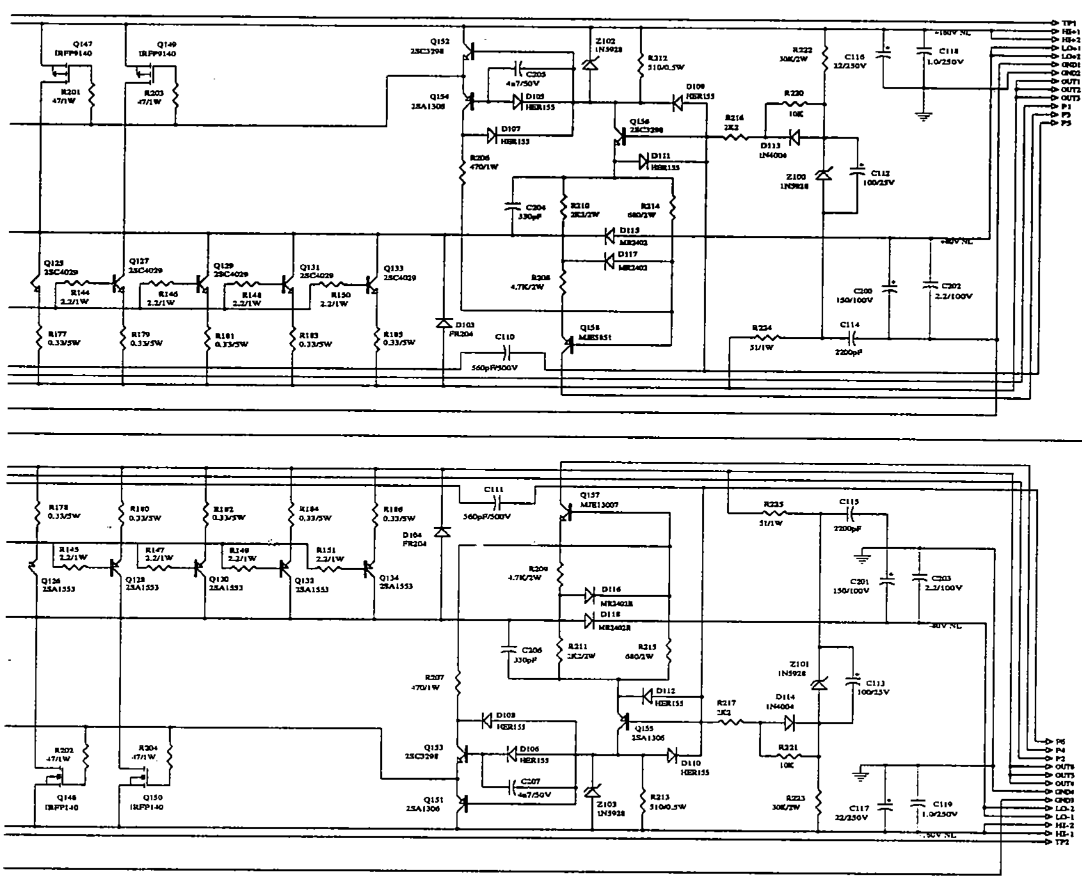
5/12/93 DELETED C208 AND C209

5/14/93 ADDED R237

11/30/93

1. CHANGED VALUES OF R210,R211,R212,R213,R214,R215,R216,R217

2. ADDED ZENAR Z102,Z103



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Title		
10K1 OUTPUT		
Size	Document Number	REV
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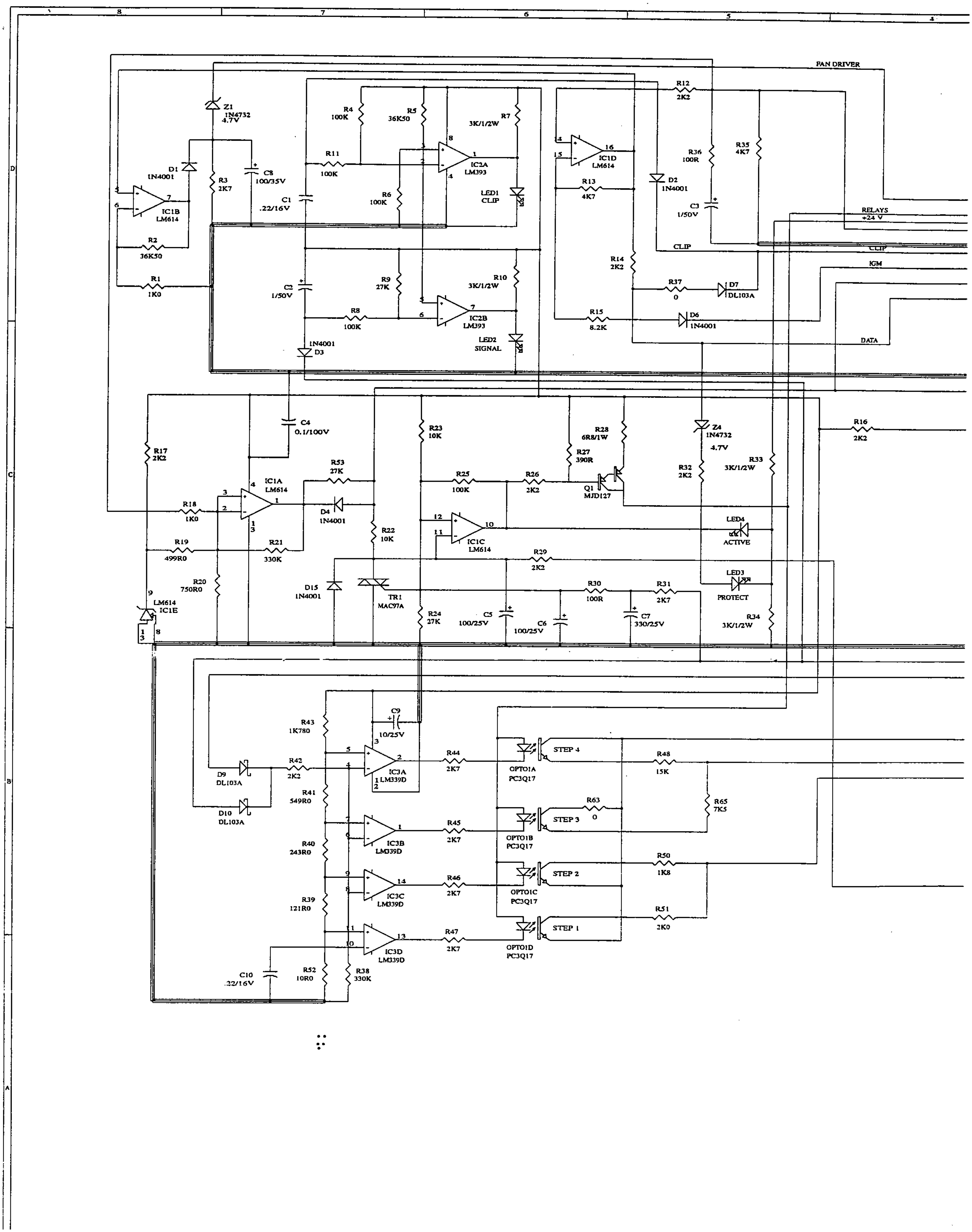
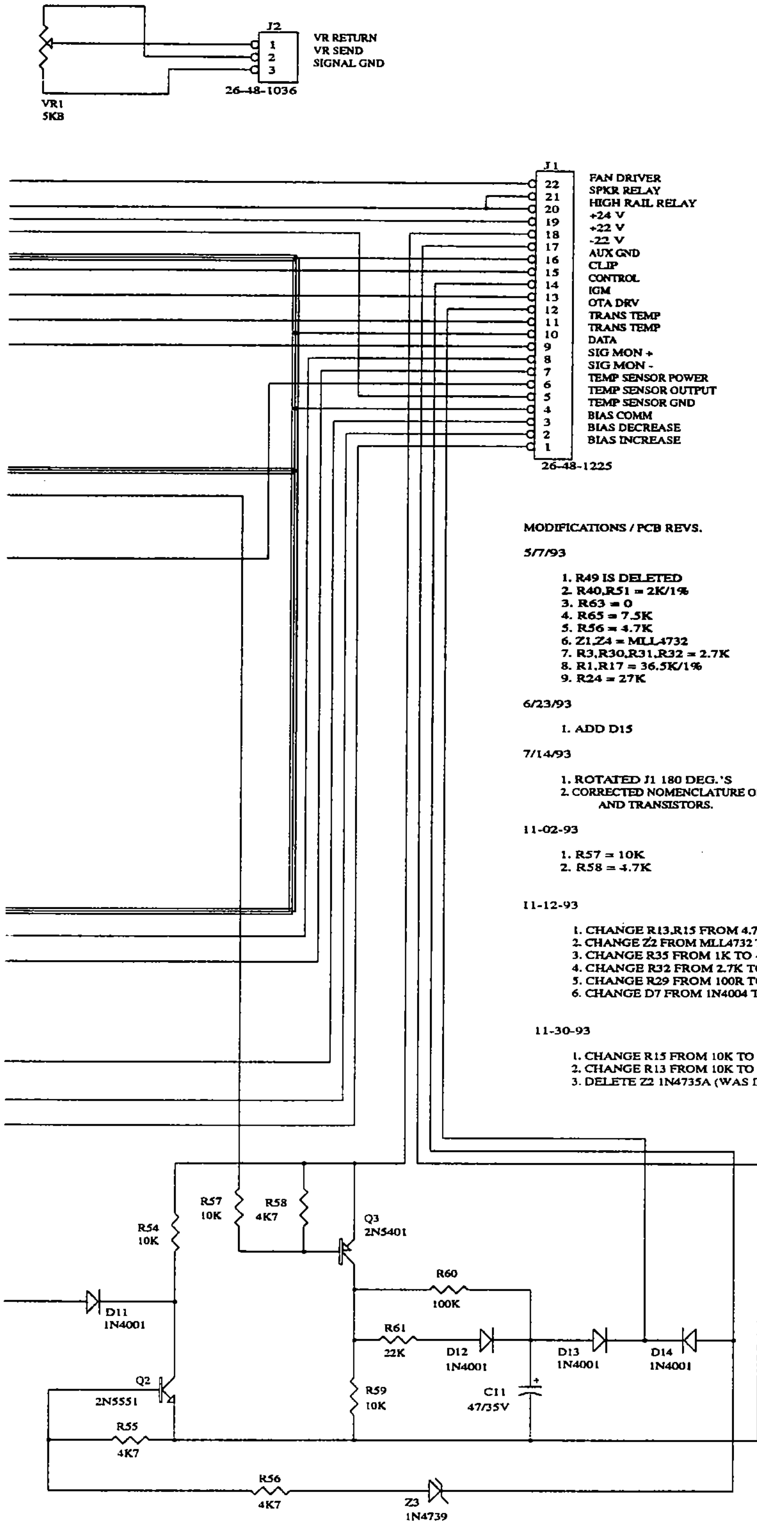


8
7
6
5
4
D
C
B
A
FAN DRIVER
Z1
1N4732
4.7V
R4
100K
R5
36K50
R7
3K/1/2W
R12
2K2
R36
100R
R35
4K7
D1
1N4001
R3
2K7
C8
100/35V
R11
100K
IC2A
LM393
IC1D
LM614
R13
4K7
D2
1N4001
C3
1/50V
IC1B
LM614
C1
.22/16V
R6
100K
LED1
CLIP
RELAYS
+24 V
R2
36K50
CLIP
R14
2K2
IGM
R1
1K0
C2
1/50V
R9
27K
R10
3K/1/2W
R37
0
D7
DL103A
R8
100K
IC2B
LM393
R15
8.2K
D6
1N4001
1N4001
D3
LED2
SIGNAL
DATA
C4
0.1/100V
R23
10K
R28
6R8/1W
Z4
1N4732
4.7V
R16
2K2
R17
2K2
R27
390R
R32
2K2
R33
3K/1/2W
R53
27K
R25
100K
R26
2K2
IC1A
LM614
Q1
MJD127
R18
1K0
D4
1N4001
LED4
ACTIVE
IC1C
LM614
R19
499R0
R21
330K
R22
10K
R29
2K2
R20
750R0
D15
1N4001
LED3
PROTECT
R30
100R
R31
2K7
TR1
MAC97A
LM614
IC1E
R24
27K
C5
100/25V
C6
100/25V
C7
330/25V
R34
3K/1/2W
C9
10/25V
R43
1K780
STEP 4
R48
15K
R44
2K7
D9
DL103A
R42
2K2
IC3A
LM339D
OPTO1A
PC3Q17
R41
549R0
R63
0
R65
7K5
D10
DL103A
IC3B
LM339D
R45
2K7
STEP 3
OPTO1B
PC3Q17
R40
243R0
R50
1K8
IC3C
LM339D
R46
2K7
STEP 2
OPTO1C
PC3Q17
R39
121R0
R51
2K0
R47
2K7
STEP 1
IC3D
LM339D
OPTO1D
PC3Q17
C10
.22/16V
R52
10R0
R38
330K



MODIFICATIONS / PCB REVS.

5/7/93

1. R49 IS DELETED
2. R40,R51 = 2K/1%
3. R63 = 0
4. R65 = 7.5K
5. R56 = 4.7K
6. Z1,Z4 = MLL4732
7. R3,R30,R31,R32 = 2.7K
8. R1,R17 = 36.5K/1%
9. R24 = 27K

6/23/93

1. ADD D15

7/14/93

1. ROTATED J1 180 DEG.'S
2. CORRECTED NOMENCLATURE ON RESISTORS AND TRANSISTORS.

11-02-93

1. R57 = 10K
2. R58 = 4.7K

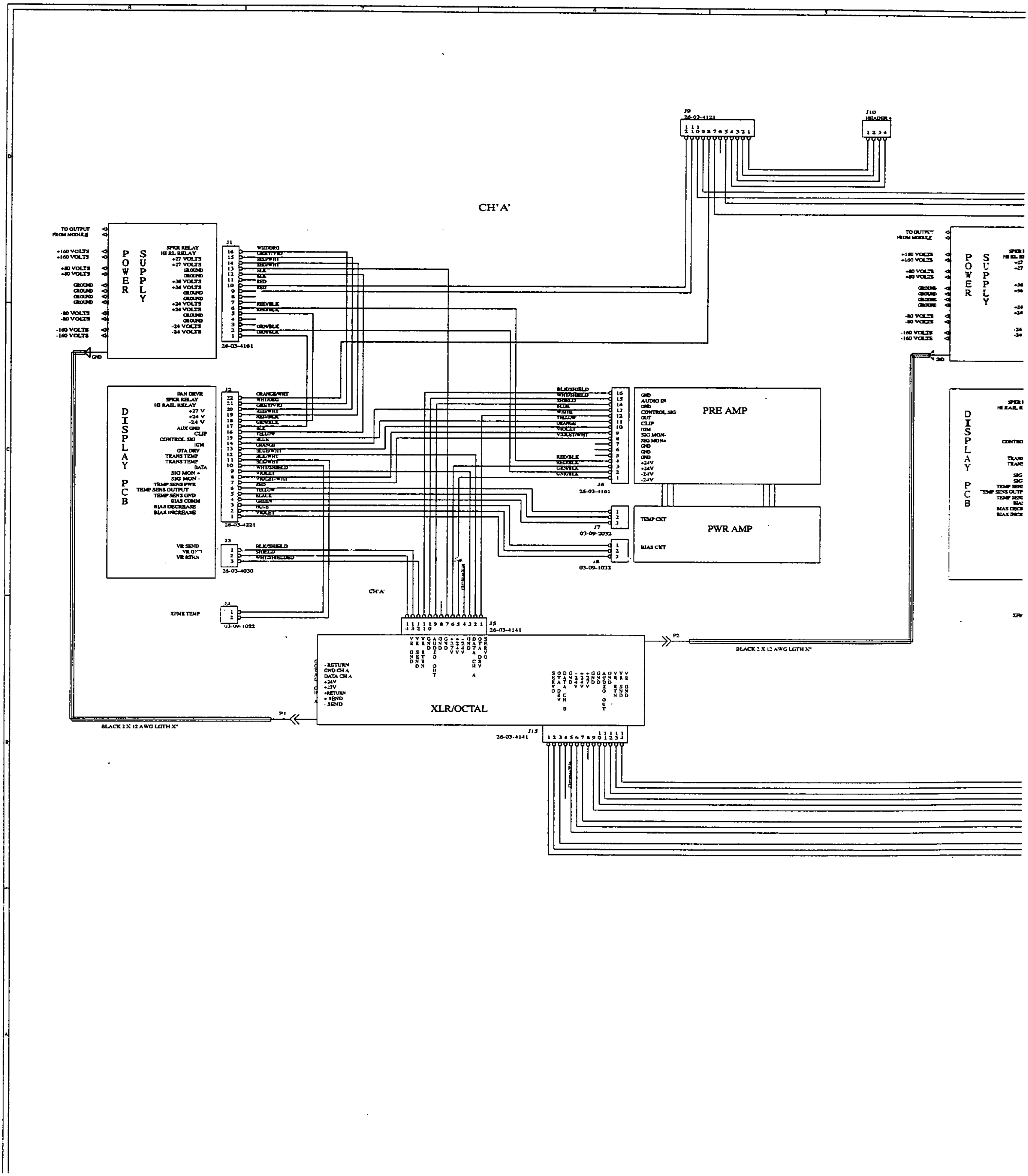
11-12-93

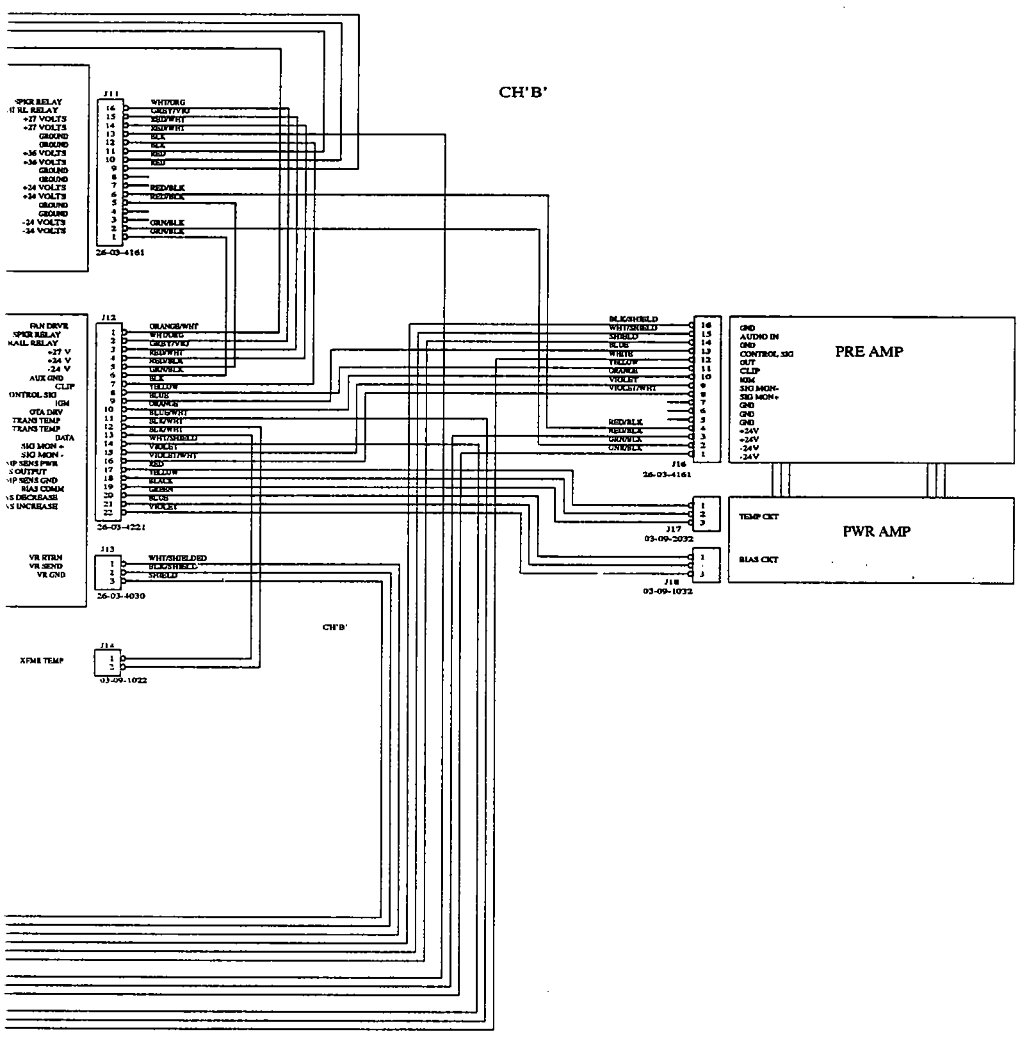
1. CHANGE R13,R15 FROM 4.7K TO 10K.
2. CHANGE Z2 FROM MLL4732 TO MLL4735A.
3. CHANGE R35 FROM 1K TO 4.7K.
4. CHANGE R32 FROM 2.7K TO 2.2K.
5. CHANGE R29 FROM 100R TO 2.2K.
6. CHANGE D7 FROM 1N4004 TO DL103.

11-30-93

1. CHANGE R15 FROM 10K TO 8.2K
2. CHANGE R13 FROM 10K TO 4.7K
3. DELETE Z2 1N4735A (WAS IN PARALLEL W/R13)

CREST AUDIO 100 EISENHOWER DRIVE PARAMUS, NJ 07652		
Title 10001 SURFACE MOUNT DISPLAY		
Size C	Document Number 26C1528	REV 07


CH'A'
POWER SUPPLY
TO OUTPUT FROM MODULE
+160 VOLTS
+80 VOLTS
GROUND
-80 VOLTS
-160 VOLTS
GND
SPKR RELAY
HI RL RELAY
+27 VOLTS
+36 VOLTS
+24 VOLTS
-24 VOLTS
J1
26-03-4161
DISPLAY PCB
J2
26-03-4221
J3
26-03-4030
VR SEND
VR GND
VR RTRN
J4
XFMR TEMP
03-09-1022
J5
26-03-4141
J6
26-03-4161
PRE AMP
J7
03-09-2032
J8
03-09-1032
TEMP CKT
BIAS CKT
PWR AMP
J9
26-03-4121
J10
HEADER 4
XLR/OCTAL
P1
P2
BLACK 2 X 12 AWG LGTH X"
J15
26-03-4141
- RETURN
GND CH A
DATA CH A
+24V
+27V
+RETURN
+ SEND
- SEND
CH 'A'



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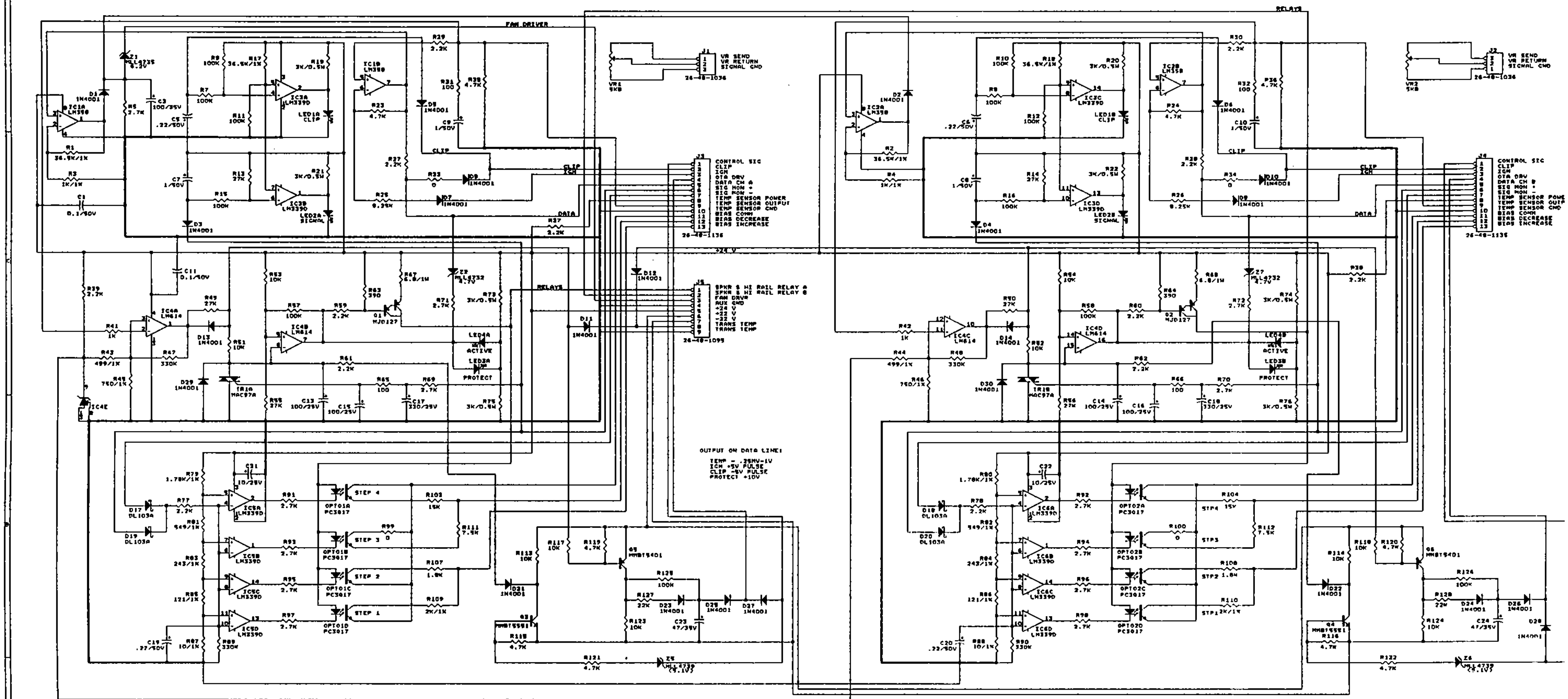
Title		
	10001.HRN	
Size	Document Number	REV



THE FOLLOWING TABLE & INFO SHOULD NOT BE PUBLISHED OUTSIDE CREST
(WE LIKE TO KEEP OUR SECRETS!)

BIAS SETTING REFERED TO AMPLIFIER RMS OUT:

20 VOLTS RMS AT AMPLIFIER OUT = 30mV EMITTER TO EMITER
CHECK FOR APPROX. 150mV E TO E AT STEP 3 (7 VOLTS OUT)

STEP 1: 200 mV OUTPUT SHOULD READ 3.5 mV EMITTER TO EMITER
STEP 2: 800 mV OUTPUT SHOULD READ 140 TO 150 mV EMITTER TO EMITER
STEP 3: 2 V OUTPUT SHOULD READ 90 mV EMITTER TO EMITER
STEP 4: 5 V OR GREATER OUTPUT SHOULD READ 30 mV EMITTER TO EMITER
(USE 20 V OUT FOR SETTING 4)

REV NOTES FOR 28C1840-02 & 28C1720-01

6/23/93 ADDED D11, D12 EFFECTIVE REV 01.

8/30/93 ADDED D29, D30 ON BACK OF PCB. THEY WILL BE ON PCB EFFECTIVE PCB REV-01

9/13/93 CHANGED C5, C6, C19, C20 FROM 16 VOLTS TO 50 VOLTS

9/15/93 CHANGED R5 FROM 4.7K TO 2.7K
CHANGED R71, R72 FROM 2.2K TO 2.7K
CHANGED R35, R36 FROM 1K TO 4.7K
CHANGED R61, R62 FROM 100 TO 2.2K
CHANGED R119, R120 FROM 1K TO 4.7K
CHANGED Z1 FROM MLL4732 (4.7V) TO MLL4735 (6.2V)
CHANGED R25, R26 FROM 4.7K TO 2.7K
CHANGED Z3, Z4 FROM MLL4732 (4.7V) MLL4733 (5.1V)

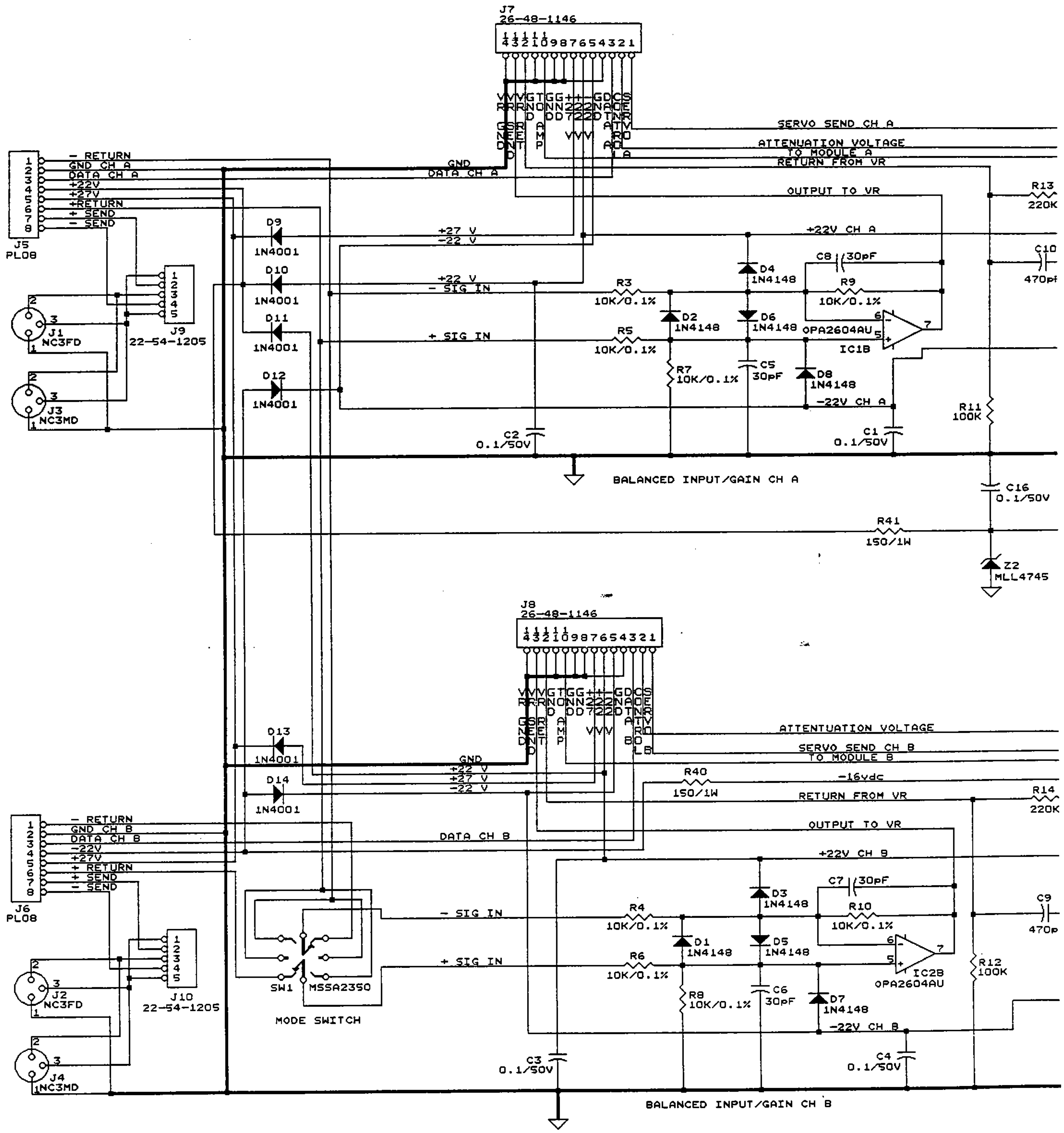
11/02/93 CHANGED R117, R118 FROM 4.7K TO 10K

11/30/93 CHANGED R25, R26 FROM 2.2K TO 8.25K
DELETED Z3, Z4 (WERE IN PARALLEL WITH R23, R24)

VERIFY THAT C5, C6, C19, C20 ARE THE SAME TYPE (CONFIRM CERAMIC IS CHEAPER & USE
CHANGE C15, C16 TO 330/25V IF SPACE PERMITS (& FOLLOW THRU ON ECO)

9K 10K 4
DISPLAY

10001 input 3/95, 1



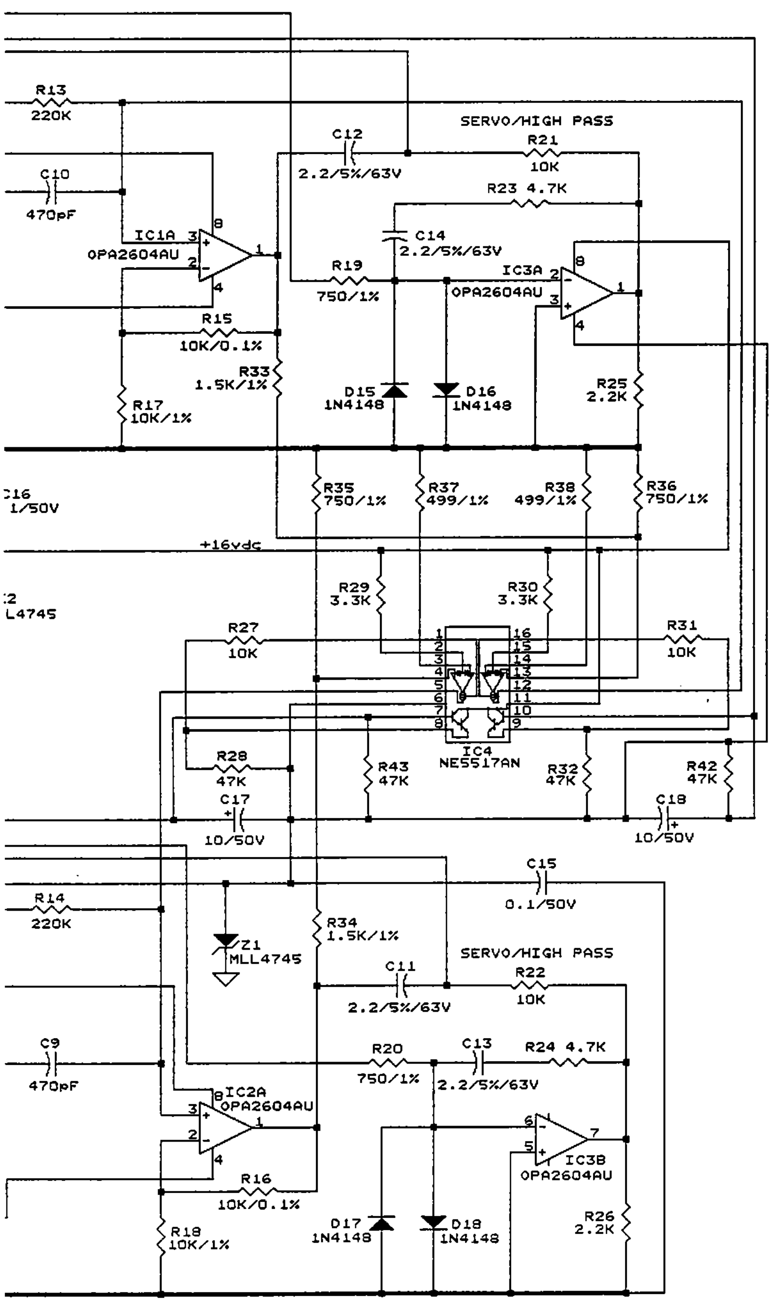
PCB REV NOTES:

CHANGE 1N4004 TO SMALLER FOOTPRINT 1N4001
ADDED Z1, Z2, R39, R40
ADDED Z1, Z2
DELETED D19-D22

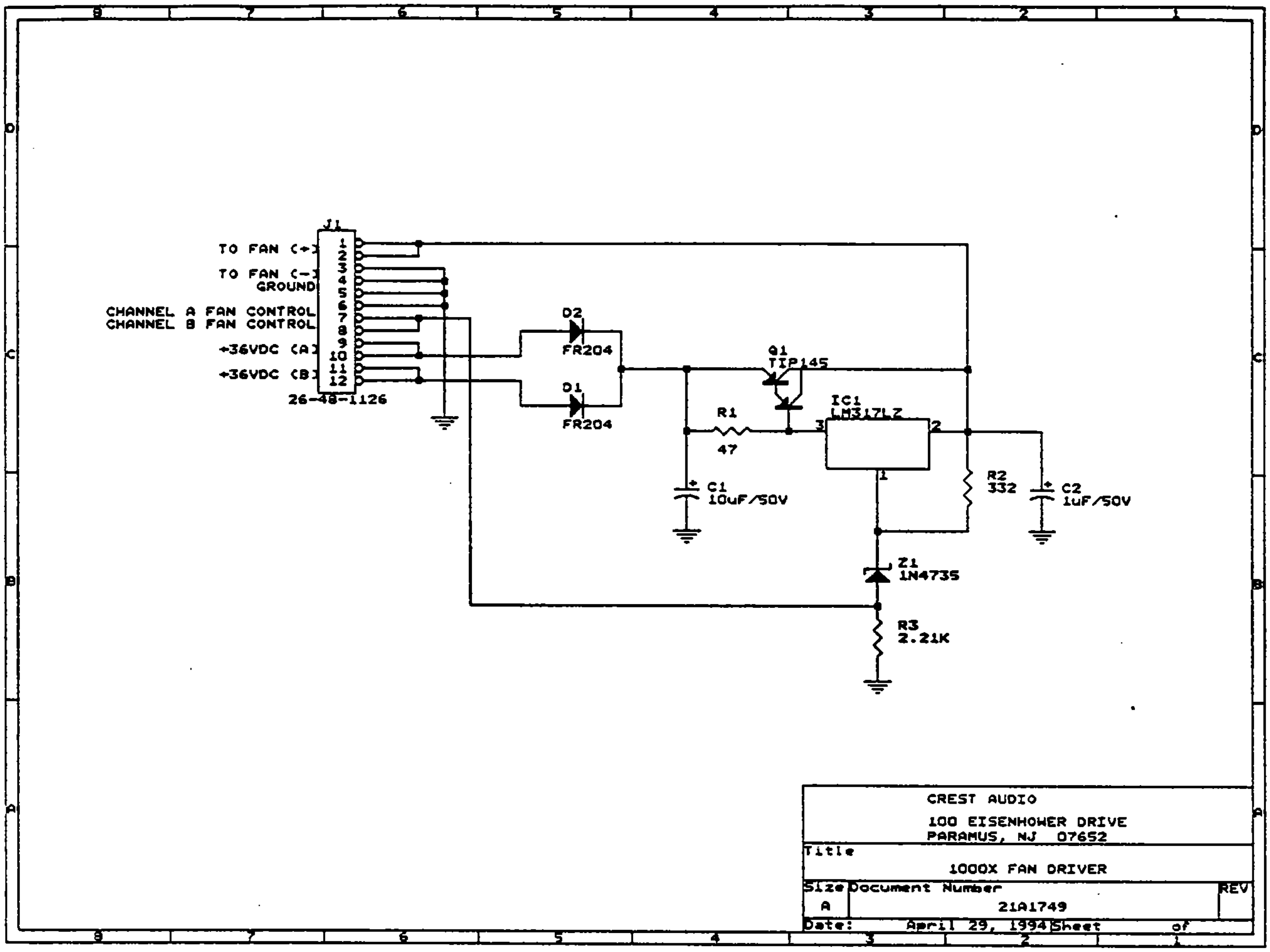
ADD R42,R43 DT 2/8/93
ADD GND PIN ADJACENT TO PIN J7(3) & J8(3) 5/10/93
CHANGE Z1,Z2 FROM 4746-18V TO 4745-16V ZENER 6-3-93

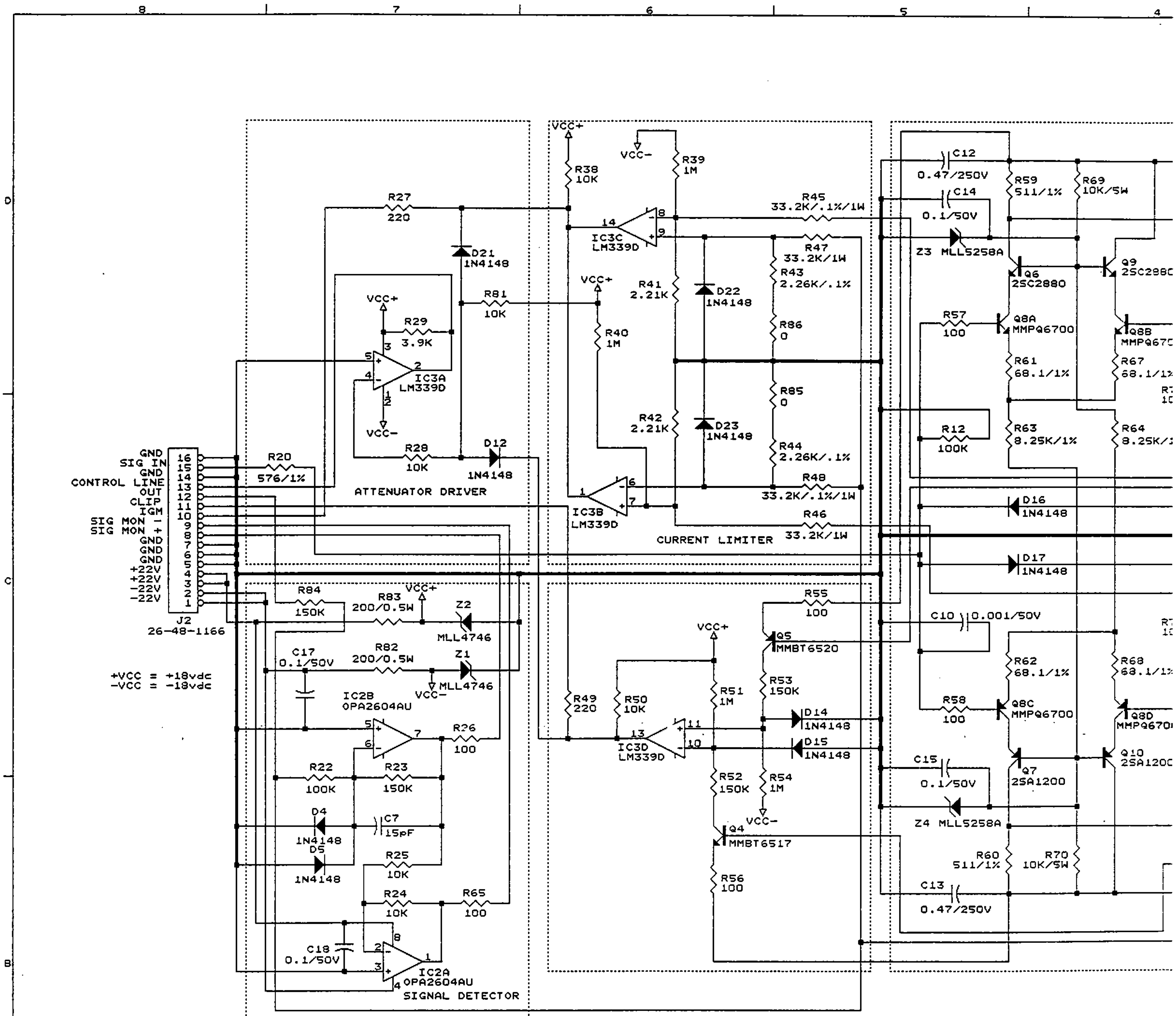
EXTENDED LOW FREQ MODS:

10001 input 3/95, 2



CREST AUDIO


J1
TO FAN (+)
TO FAN (-)
GROUND
CHANNEL A FAN CONTROL
CHANNEL B FAN CONTROL
+36VDC (A)
+36VDC (B)
26-48-1126
D2
FR204
D1
FR204
Q1
TIP145
IC1
LM317LZ
R1
47
C1
10uF/50V
R2
332
C2
1uF/50V
Z1
1N4735
R3
2.21K
CREST AUDIO
100 EISENHOWER DRIVE
PARAMUS, NJ 07652
Title
1000X FAN DRIVER
Size
A
Document Number
21A1749
REV
Date: April 29, 1994
Sheet of



R84, R85 USED REV -04
D11 NOT USED TILL REV 0?

01-25-94 CHANGED R29 FROM 2.2K TO 3.9K

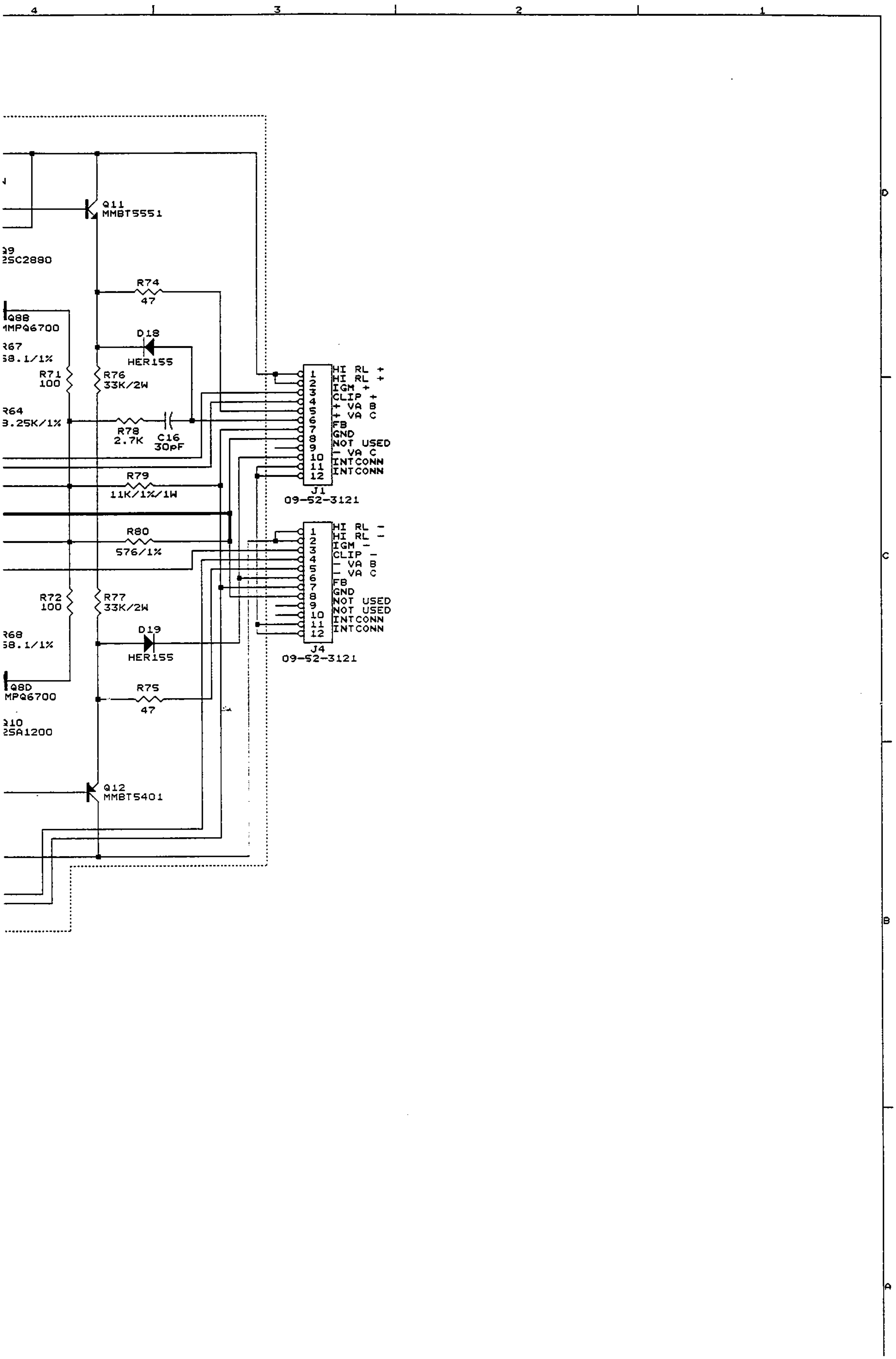
5/7/96 UPDATED SCHEMATIC I.F.

CHANGED Q6,Q9 FROM MMBT5551 TO 2SC2880

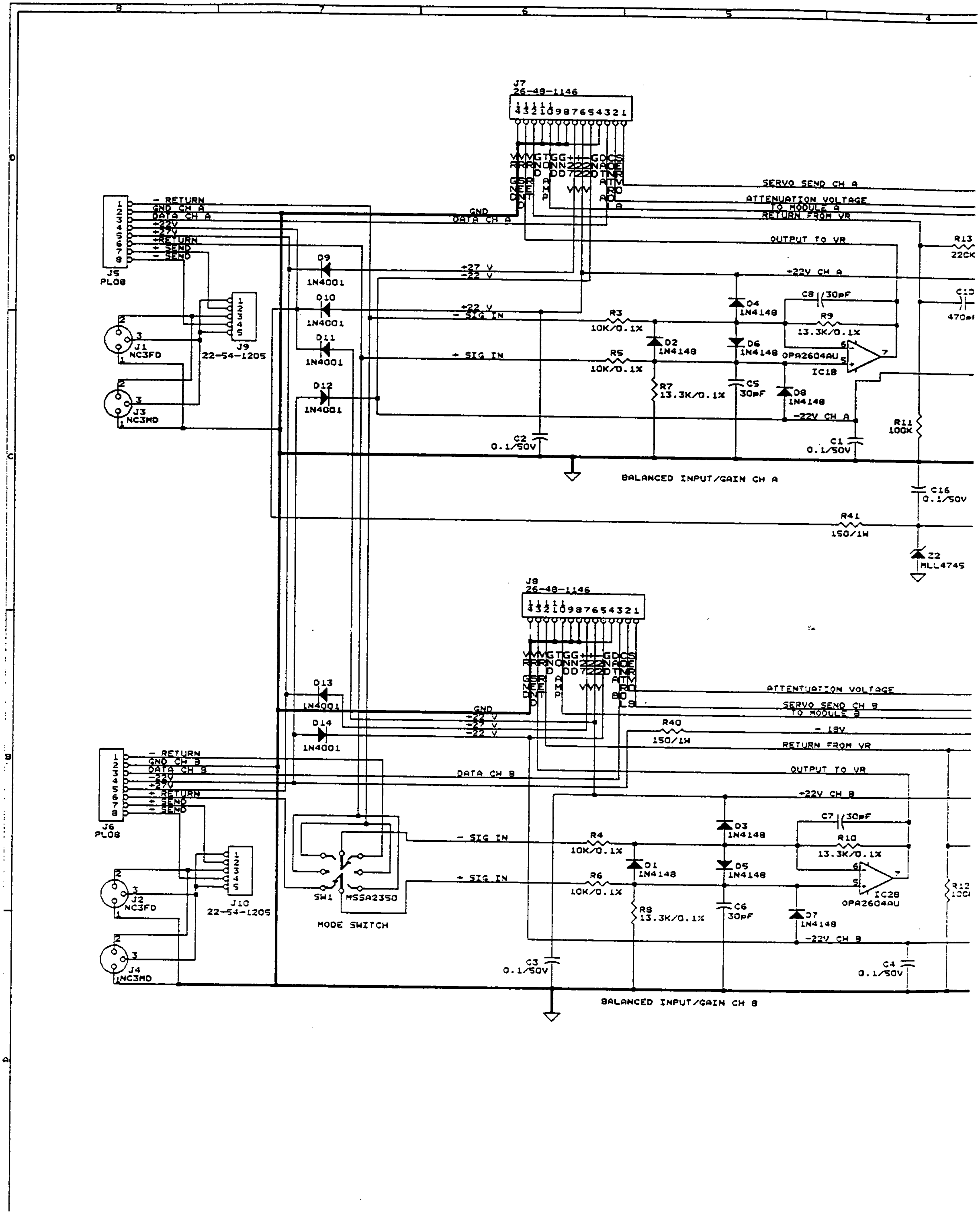
CHANGED Q7,Q10 FROM MMBT5401 TO 2SA1200

CHANGED Q4 FROM MMBT5551 TO MMBT6517

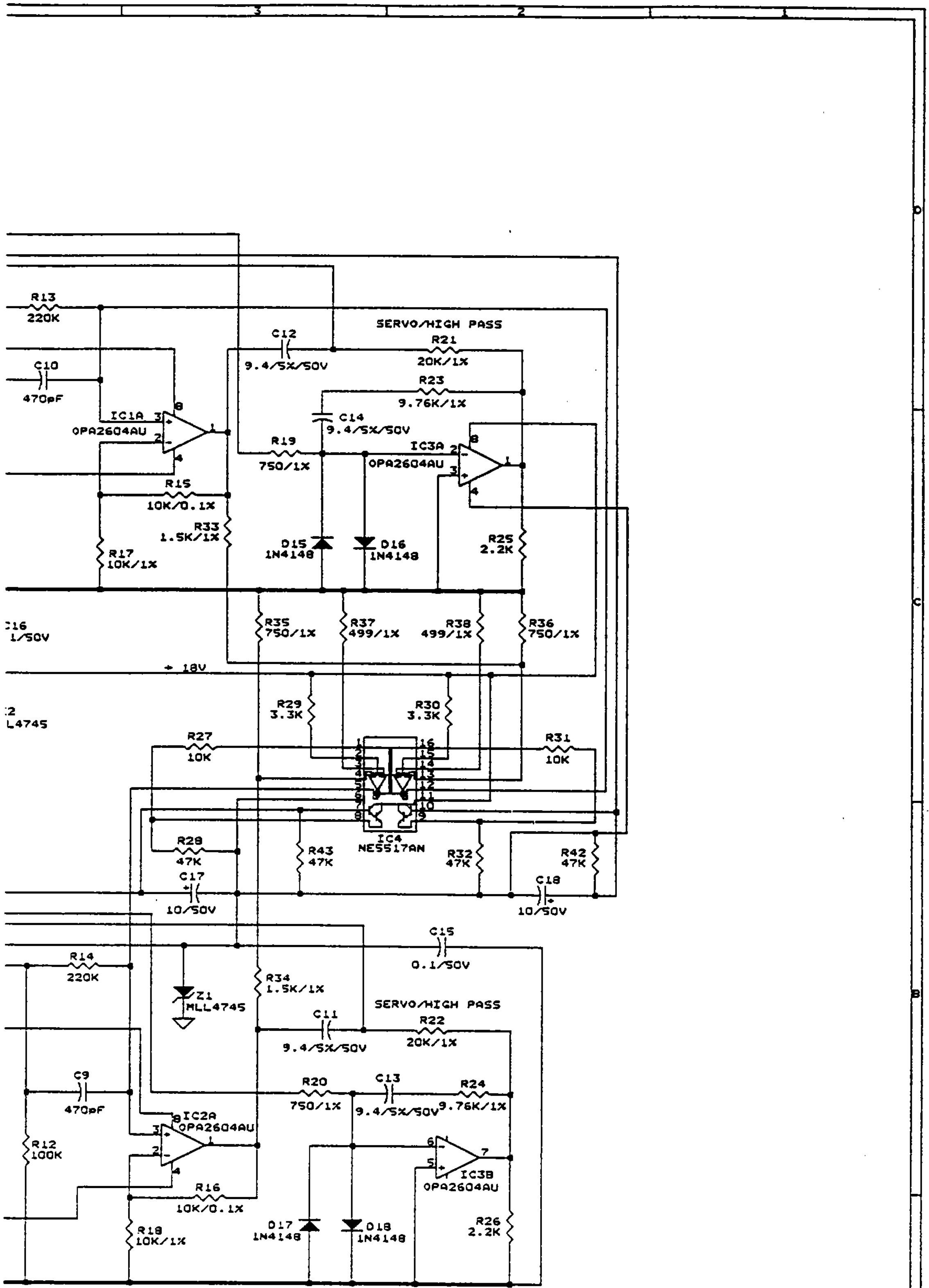
CHANGED Q5 FROM MMBT5401 TO MMBT6520



4
3
2
1
D
C
B
A
Q11
MMBT5551
Q9
2SC2880
R74
47
Q8B
MPQ6700
D18
HER155
R67
58.1/1%
R71
100
R76
33K/2W
R64
3.25K/1%
R78
2.7K
C16
30pF
HI RL +
HI RL +
IGM +
CLIP +
+ VA B
+ VA C
FB
GND
NOT USED
- VA C
INTCONN
INTCONN
J1
09-52-3121
R79
11K/1%/1W
R80
576/1%
HI RL -
HI RL -
IGM -
CLIP -
- VA B
- VA C
FB
GND
NOT USED
NOT USED
INTCONN
INTCONN
J4
09-52-3121
R72
100
R77
33K/2W
D19
HER155
R68
58.1/1%
Q8D
MPQ6700
R75
47
Q10
2SA1200
Q12
MMBT5401



J7
26-48-1146
SERVO SEND CH A
ATTENUATION VOLTAGE
TO MODULE A
RETURN FROM VR
OUTPUT TO VR
- RETURN
GND CH A
DATA CH A
+22V
+27V
+RETURN
+ SEND
- SEND
J5
PL08
GND
DATA CH A
D9
1N4001
+27 V
-22 V
+22V CH A
R13
22CK
D10
1N4001
+22 V
- SIG IN
R3
10K/0.1%
D4
1N4148
C8
30pF
R9
13.3K/0.1%
J9
22-54-1205
J1
NC3FD
D11
1N4001
+ SIG IN
R5
10K/0.1%
D2
1N4148
D6
1N4148
OPA2604AU
IC1B
R7
13.3K/0.1%
C5
30pF
D8
1N4148
J3
NC3MD
D12
1N4001
-22V CH A
R11
100K
C2
0.1/50V
C1
0.1/50V
BALANCED INPUT/GAIN CH A
C16
0.1/50V
R41
150/1W
Z2
MLL4745
J8
26-48-1146
ATTENUATION VOLTAGE
SERVO SEND CH B
TO MODULE B
D13
1N4001
GND
+22 V
+27 V
-22 V
D14
1N4001
R40
150/1W
- 18V
RETURN FROM VR
- RETURN
GND CH B
DATA CH B
-22V
+27V
+ RETURN
+ SEND
- SEND
J6
PL08
DATA CH B
OUTPUT TO VR
+22V CH B
D3
1N4148
C7
30pF
- SIG IN
R4
10K/0.1%
R10
13.3K/0.1%
J10
22-54-1205
J2
NC3FD
D1
1N4148
D5
1N4148
+ SIG IN
R6
10K/0.1%
IC2B
OPA2604AU
SW1
MSSA2350
MODE SWITCH
R8
13.3K/0.1%
C6
30pF
D7
1N4148
-22V CH B
J4
NC3MD
C3
0.1/50V
C4
0.1/50V
BALANCED INPUT/GAIN CH B



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Title
10K1/10K/4 XLR

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