CLASSE AUDIO

DR-2 (3)

PURE CLASS A

POWER AMPLIFIER

DR-2 (3)

SERVICE MANUAL

I. INTRODUCTION

The design, construction and quality control of the DR-2 provide very high reliability, MTBF, and serviceability. Beyond our control, however, lie external factors, or the hidden ill-fate of a particular component, which may cause unit failure. When failure does occur, it is limited to a few parts which are easy to find, reach and replace quickly. Some or all of the following parts may be involved (for each channel) :

MOST LIKELY →

* OUTPUT TRANSISTORS - there are four ; two NPN devices on the front heat sink and two PNP devices on the rear heat sink.

* (R29) R 5 and (R32) R 31 - on the PCB, just below the connector. They are both 75 ohms, ½ watt, 1% metal film. They feed the plus and minus supplies to the PCB circuitry. When output transistors fail, one or both may burn.

SOMETIMES →

* (R22) R 16 - the bias trimpot, ~~(directly below R 31)~~ The value is 500 ohms, 20 turn. Occasionally it may be burnt and inoperative, but this is usually NOT the case. DO NOT ASSUME THE TRIMPOT HAS FAILED IF THE PART IS MERELY CHARRED ON THE OUTSIDE ONLY, AS A RESULT OF R 31 BURNING. The trimpot can be checked by measuring resistance across PIN 2 and 3 of the PCB connector J 1. Turn the trimpot to see that its value changes normally. If it is OPEN or seized on one value, replace it.

VERY RARE →

* (C11) C 2, (C16) C 6 and (C18) C 11 - these are the three (vertical mounted) electrolytic capacitors. The value is 1000uF/35 volts (680uF in earlier units). (950/50 IN DR-3.) One to three (rare) may blow. It if has blown severely, it is obvious because it literally blows apart. Note, however, that the capacitor "vent" faces down, so look around the base of the part for a yellow residue, to see if it has blown "quietly". We have not encountered any other parts failing. The PCB transistors have never failed! The severity of damage will also depend on how long the unit has been left on after failure. A typical failure, for example, will usually include one or two output transistors and R 31. As already stated, failure of the trimpot (R 16) and the capacitors (C 2, C 6, C 11) is less common.

II. REPAIR PROCEDURE

1) Place unit (entirely disconnected) on the test bench, face front and upside down. Remove bottom plate with 5/64" Allen key.

2) REMOVE BOTH RAIL FUSES of the failed channel. Inspect closely and discard if blown. NOTE THAT THE FUSE MAY BE JUST "HALF-MELTED" (typical with amplifier failure) - DISCARD JUST THE SAME. DO NOT REPLACE THE FUSES YET.

3) Carefully pull off the block connector (J 1) to the PCB, and invert it so you can reach the gold plated pins inside the block. With a multimeter set for RESISTANCE / 2 Kohm scale, and two pointed probes, take the following four measurements. (You will now determine which output transistors are blown.) MAKE SURE THE RAIL FUSES ARE OUT! OTHERWISE FALSE READINGS WILL RESULT! REMEMBER THAT YOU ARE PROBING THE REMOVED CONNECTOR PINS, NOT THE CONNECTOR ON THE PCB.

METER PROBES		GOOD READING	FAILED READING	TRANSISTOR
- (BLACK)	+ (RED)	(±50 ohms)		Location*
PIN 1 (SMALL red wire)	PIN 9 (Orange wire)	475 ohms	open or short	NPN "N" FRONT UPPER
PIN 1 (SMALL red wire)	PIN 12 (Yellow wire)	475 ohms	open or short	NPN "N" FRONT LOWER
PIN 6 (Blue wire)	PIN 11 (Brown wire) (Small green)	500 ohms	open or short	PNP "P" REAR UPPER
PIN 6 (Blue wire)	PIN 10 (Violet wire) (blue)	500 ohms	open or short	PNP "P" REAR LOWER

* NOTE : TRANSISTOR LOCATION (upper or lower) REFERS TO UNIT IN NORMAL UPRIGHT POSITION! Do not get confused between upper or lower transistors, and left or right channels, otherwise you may replace the wrong transistors! Make note of which transistors are good or have failed.

4) If a FRONT transistor is blown, you will have to remove the faceplate to replace it. To take off the faceplate, first remove the two smaller flat head support screws (1/8" Allen key) secured to the front heat sinks, along with their corresponding spacers and nuts. Then remove the four, large, flat head screws (5/32" Allen key) which secure the plate to the chassis. The faceplate should now be free to come off.

   If only REAR transistors are blown, you need not remove the faceplate.

5) To replace an OUTPUT TRANSISTOR, first pry off the black cover with a sharp screwdriver. The cover is a pressure fit only and should come off without difficulty, exposing the transistor.

   Remove the two screws from the transistor along with their split lockwashers. DO NOT LOSE THE SPLIT LOCKWASHERS. They are essential for maintaining tight pressure over many heat-up and cool-down cycles.

   Remove the blown transistor (AND the mica washer.) -OR 2 only.

   Take the replacement transistor, ensure the pins are straight, (and place a new pre-greased mica washer over the transistor.) -OR-2 only As usual on a TO-3 package, note that the pins are slightly off center -(be sure to place the washer correctly over the transistor.) SLOWLY AND CAREFULLY insert the new transistor (Orientate correctly, as just noted.) down the heat sink holes until you feel it is properly aligned with the socket holes. Then push in firmly.

   Replace the screws and lockwashers, tightening evenly. Then tighten very firmly, but do not strip the threads.

   Place the transistor cover over the device and push firmly so it snaps into place flat against the heat sink.

   Repeat this procedure for each output transistor that is blown. WHEN YOU HAVE REPLACED ALL THE BLOWN TRANSISTORS, REPEAT THE MEASUREMENTS IN STEP 3. IF ALL THE READINGS ARE GOOD YOU HAVE SUCCESSFULLY REPAIRED THE OUTPUT STAGE.

6) Replace any PCB parts that have burned. (Suspect parts have been outlined above in the INTRODUCTION). The PCB can be removed by the five buttonhead screws (5/64" Allen key).

Remove bad parts carefully, so as not to damage the plated pads on the PCB. Clear the holes with solderwick or a solder sucker, and replace with new parts and fresh solder.

7) After all repairs have been effected, be sure to plug in the PCB connectors.

8) Now, you may replace the RAIL FUSES.

III. CALIBRATION

Calibration consists of two parts. First, you start up the amplifier to see if it is functioning normally. Second, you will adjust the BIAS and OFFSET.

1) Connect the A.C. line cord to a VARIAC (variable transformer) and set to zero.

2) Connect a signal generator to the input, set for a 1 khz sinewave of approximately 0.75 Volt RMS. Connect an oscilloscope to the output, set at 10 Volts/div.

   NOTE : If both channels were blown, remove the A.C. line fuse of one of them, and start up the unit one channel at a time. Do NOT connect a load to the output yet.

3) Set the bias trimpot (R 16) (R 22) to zero. (Turn counterclockwise until clicking is heard.)

4) Turn on the variac and slowly turn up voltage, watching the scope for a sinewave or clipped sinewave, to develop. Continue turning up voltage to 120 V.A.C.

5) After approximately 30 seconds, connect an 8 ohm resistive load to the output. Increase input signal to observe normal clipping; then reduce signal to below the clipping point.

   NOTE : Crossover notch distortion may be present because the bias is set at minimum.

6) Remove the input signal.

7) With a multimeter set for D.C. VOLTAGE / 200 mV scale, measure the D.C. offset at the output terminals. Note the reading. Adjust the offset trimpot (R 24) (R 17) for 0 offset voltage, as follows : Each full revolution (360°) of the trimpot is equivalent to 20 mV. If, for example, you have a reading of - 40 mV, then turn R 24 two full revolutions clockwise.

   NOTE : Adjusting the offset has large overshoot; after making the first reading and adjustment, let it settle for a few minutes. In the meantime, go on to the next step.

8) With the meter now set for 2 Volts D.C., place the probes across the rear, large, black, (25 watt power resistor) (which is mounted to the chassis with brackets) (It is located between two power supply capacitors and the circuit board ; there are blue wires coming off it.) the reading will be very low at first.

OR-3: 10 W resist on PCB 3R

9) Now begin turning up the bias trimpot R 16 (R 22), so that the reading increases. Continue turning up the trimpot until the reading hits 0.8 volts.

10) Return now to the offset. Take a reading and adjust R 24 (R 11) if necessary.

11) Return to the bias, leaving the probes across the power supply resistor. Allow the amplifier to heat up until the bias reading hits 1.0 volt. Now turn DOWN to 0.95 volt.

12) Place the bottom plate on (slots closer to the front) and secure with a few screws. Turn the unit right side up. (You may disconnect the output load and scope.)

13) After approximately 15 minutes, take an offset reading and make note of it.

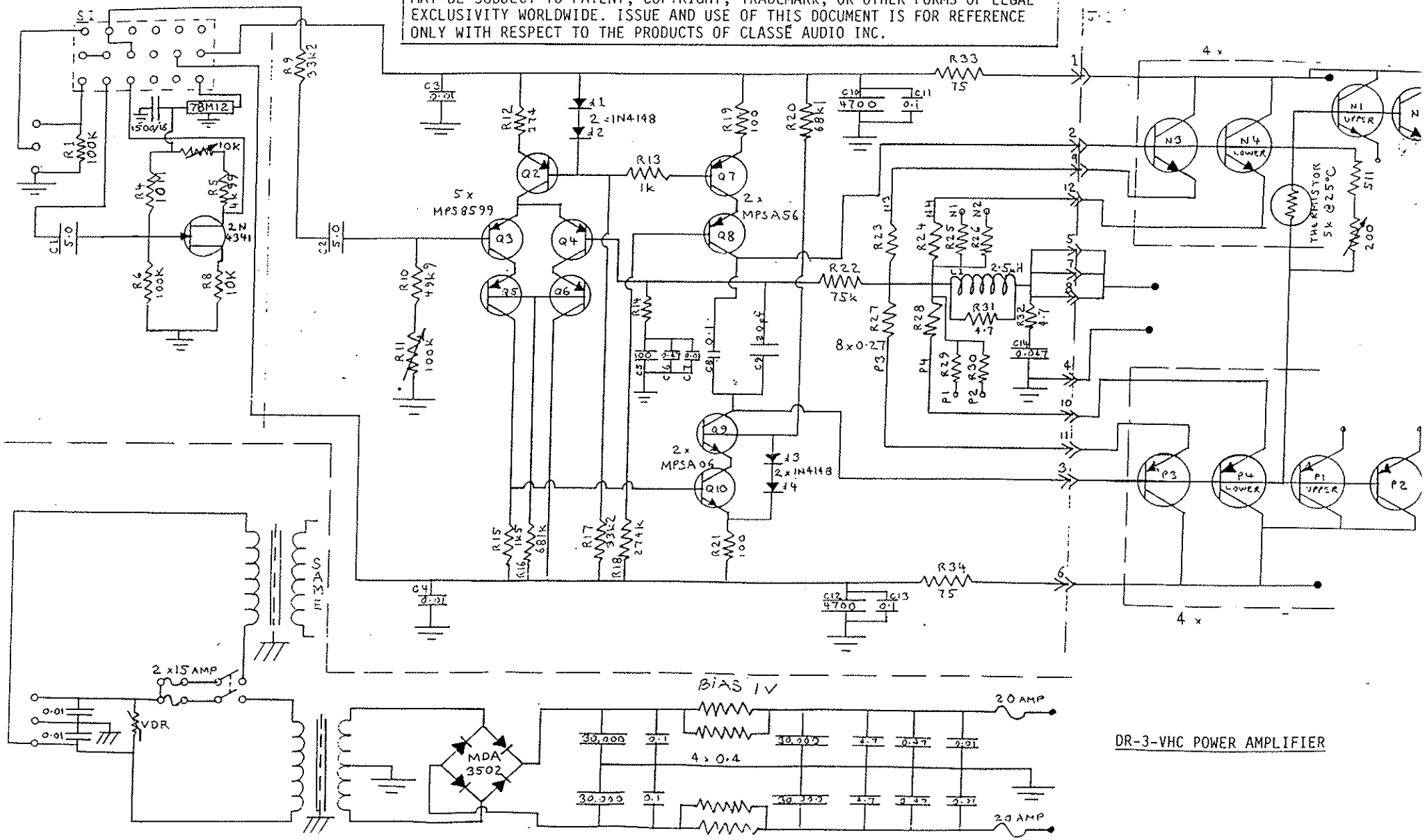
14) Then, without taking too much time, turn the unit upside down, remove the bottom plate, and take a bias reading. Adjust, if necessary, to 0.80 volts.

15) Adjust, if necessary, the offset, according to the reading taken in the upright position. Replace the cover with a few screws and set the unit right side up again.

16) Repeat this procedure until the offset is 0 ± 5mV and the bias is 0.8 ± 0.05 V. When you are satisfied with readings, replace the bottom plate with all its screws.

17) Finally, connect the scope, load and signal generator, and check the sinewave and squarewave across the audio spectrum.

NOTE: IF OFFSET CANNOT BE ZEROED, REPLACE BOTH INPUT TRANSISTORS Q 3 AND Q4.



DR-3-VHC POWER AMPLIFIER