

Technical Service Manual

EX Series

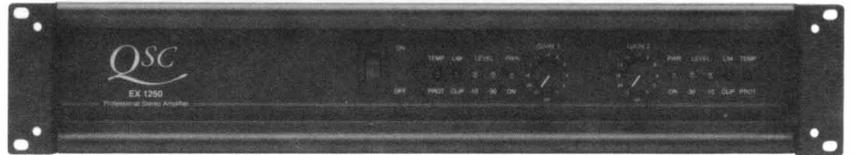
- ▲ EX 800
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- ▲ EX 2500
- ▲ EX 4000



▲ **EX 800**



▲ **EX 1250**



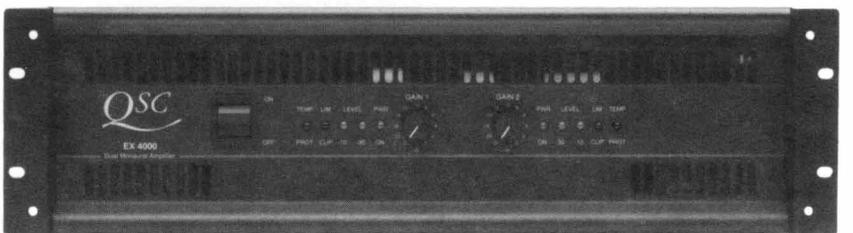
▲ **EX 1600**



▲ **EX 2500**



▲ **EX 4000**



EX SERIES AMPLIFIER SERVICE MANUAL

EX 800
EX 1250
EX 1600
EX 2500
EX 4000

QSC CUSTOMER SERVICE
1-800-QSC-AUDIO
(800-772-2834)

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Introduction and General Information

This manual has been prepared to assist technicians with the repair and calibration of the EX series Audio Power Amplifiers. The procedures described in this manual require advanced technical experience and sophisticated audio test equipment.

NOTE: There are NO user serviceable components inside this product. Opening this product or attempting the adjustments described in this manual may expose the user to electrical shock. Refer servicing to qualified service personnel.

This manual contains the Schematic, Printed Circuit Board Drawing, Parts List, and Mechanical Assembly Drawings. This information should be used in conjunction with the test procedures and to troubleshoot and adjust the amplifier.

The electrical and electronic components are identified by circuit identification numbers (on the schematics, and the parts list) and the QSC part number (on the parts list). The chassis assembly drawings are exploded-view drawings. The test procedure and troubleshooting sections refer to designations shown in the schematics.

Although many of the electronic components used in this product may be available from electronic suppliers, some components are specially tested by QSC. A product repaired with non-QSC supplied components may not meet factory specifications. The product warranty may be voided by a repair using non-QSC components.

Parts orders to QSC should include the product model number, the part description, and the QSC part number (from the parts list in this manual). Parts will be shipped via UPS, F.O.B. Costa Mesa, California. Shipping and COD charges may be added to the cost of the parts.

Product Revisions and Service Bulletins

EX Series Product Revisions

(listed by printed circuit board revision numbers)

08/01/90 PCB Revision A: Product introduction (for output PCB circuit description, schematic, and PCB layout see Service Bulletin EX001).

5/1/91 PCB Revision B: SMT modules added to the output PCB.

EX Series Service Bulletins

05/09/90 EX001: Instructions for repairing the Revision A power amplifier PCB (PC-004000-00).

08/22/91 EX002: Fan speed circuit modification. To allow the fan to be set on high at all times.

04/22/91 EX003: Reducing EX Series Input Sensitivity.

03/26/92 EX004: Rewiring 120 Vac models for correct AC power.

06/01/92 EX005: Gain modification for all EX products to 26 dB.

Please refer to additional Service Bulletins which may be attached at the end of this manual.

Required Test Equipment:

1. Distortion Analyzer with an 80 GHz filter
2. Function Generator
3. 20MHz Oscilloscope
4. Re-flow Desoldering Equipment
5. Digital Multimeter
6. Variac with Bypass
7. High Power Load Bank
8. (OPTIONAL) Thermocouple Probe

CAUTION: *Unlike most QSC products, these amplifiers cannot be serviced without the equipment listed in the "Required Test Equipment" section of this manual. The complexity of the high-efficiency design requires professional audio service equipment for repair, performance verification, and calibration. Do not attempt to calibrate or repair these products without this equipment. Any damage caused by unauthorized service attempts will void the product's warranty.*

EX Series Test & Calibration

NOTE: This test procedure will refer to the amplifier's channels as CH1 (Channel 1) & CH2 (Channel 2).

Test Equipment Requirements & Set-up

Connect a test load (capable of handling output powers of 200W-8 ohm, 300W-4 ohm, and 400W-2 ohm) to the output terminals of the amplifier.

Connect a distortion analyzer with a resolution of 0.05%, 20-20kHz (or better) to the output terminals of the amplifier.

Connect the output of the signal generator to the input terminals of the amplifier and select an output of 1.00 VRMS, 2KHz sine wave.

Connect a dual-channel oscilloscope to the following test points:

- a 10X (vertical sensitivity - 2V/cm) scope probe to the channel speaker output.
- a 1X scope probe (vertical sensitivity - .1V/cm) to the distortion analyzer output.

Lift ground on scope and distortion analyzer.

Power Up

Set the amplifier's gain controls at full clockwise.

Slowly raise the variac voltage and watch for excessive current draw (Line current greater than 3/4 amps at 120 Volts.). **NOTE:** Make sure the fan is ON when the line voltage reaches 120VAC. The fan will remain off until the amp heats up for EX 2 space units. Relay will turn on about 80VAC.

Turn the amp off and on a few times to verify the 1.5 second power-up delay.

Check CH1 & CH2 for normal output signal.

Bias Adjustment

Check 8 ohm midband power.

Apply 8 ohm loads to both channels (maintain 120VAC) and verify output RMS power for each channel is \geq spec. Verify step switching (all models except EX 800) on both channels by turning down the gain and observing on the scope's distortion trace two separate step spikes (two pairs for EX 4000) coming together toward the peak of the signal as gain is reduced.

Select an 8 ohm output load and apply a 15 kHz input signal.

Adjust the input signal or CH1 gain control for an output of 20dB below full output

Using the analyzer's distortion output, set the crossover trimpot TR3(a&b) for a crossover spike

barely protruding from the noise signal (distortion must be less than .08%THD).

Set the CH1 & CH2 output load to 4 ohms and verify that the output distortion is less than 0.1%.

NOTE: If you do not have a distortion analyzer, a less accurate distortion setting can be made by monitoring the driver transistor bias current. With the amplifier at operating temperature and no input signal, adjust TR3(a&b) to obtain a voltage of 90mVDC across the emitter resistors of the drivers.

Two-ohm Short Circuit

Select a 4-ohm load and verify even clipping on both channels. Select a 2 ohm load, which will show substantial clipping.

Adjust the GAIN control to the threshold of clipping.

Adjust trimpots TR1 (a&b) and TR2 (a&b) for a small amount of current limiting at the peaks of the output waveform.

Apply a short circuit to the output of the channel. The AC line current draw should be approximately 3-4.5 amps (RMS) per channel.

Frequency Response

Select an 8 ohm load on CH1 & CH2.

Note the output level just below output clipping.

Note the exact 2KHz level and compare it to the 20Hz and 20KHz output (20Hz -0.4dB max, 20KHz -0.5dB typical/1.0dB max).

Thermal

Set the oscillator frequency to 2KHz. and short the output of both channels and block fan intake. The AC current draw should be 5-6.5A initially and increases to 8A at thermal shutdown (one channel will normally shutdown earlier than the other).

Do not allow the test to continue if the AC current rises above 9A. See Troubleshooting, Protection / Limiting Circuit Problems.

When thermal shutdown occurs, unblock fan intake and verify an AC idle current of .75-1A. Recheck the bias setting if the current is excessive.

Allow the amplifier to cool and recover from the thermal cycle. The amplifier must be able to recover into a 4 ohm load. Return the output load to 8 ohms.

Output Noise

Set the amplifier GAIN to 0dB, with 2 kHz 1V RMS input signal level. Note the output level.

With input signal level off, measure the residual noise level (must be less than -100dB from full output, A weighted).

This completes the electronic test procedure. Inspect the amplifier for mechanical defects. Inspect the solder connections. Reassemble the amplifier and verify the amplifier's operation before returning the product to service.

Troubleshooting the EX 4000 Amplifier

Please refer to the EX4000 schematic for the component identification numbers in this troubleshooting guide. This section can be used in principal to troubleshoot other models in the EX line. You may cross-reference parts as necessary.

Dead Channel (no display lights)

When the LED are out on a channel, this usually means that an internal fuse is blown on the AC PCB. Replace this fuse with the appropriate fuse only. Be sure the AC cord is unplugged from the wall!

When a fuse is blown, then this may be an indication that excessive current draw is the real problem within the channel. The fuse blew to protect the amplifier from further damage. After the fuse is replaced, be sure to use a variac to power the amplifier up slowly. Otherwise, you may just blow the fuse again. See below for troubleshooting AC power supply problems.

Power Supply Problems

Stable, "hard" current draw (increases rapidly at only a few volts AC voltage):

The amplifier draws high current when the AC supply voltage is first applied up (with signal but no load). This symptom means there is a short in the power stages of the circuit. It is possible to lift the fuse for each channel to isolate the problem to one channel. Look for:

- A shorted main bridge rectifier(s).
- Both supply clamping diodes D908, D907 shorted.
- Either polarity of the driver transistors shorted.
- Either polarity of the main output power transistors shorted.
- A shorted power supply capacitor (C929, C930, C935, C936 a&b).

Medium-hard, fairly stable current draw (increases more slowly, can go to maybe 25 - 30 VAC before current becomes excessive.)

The amplifier draws high current when the AC supply voltage is near 120VAC, but the current increases gradually as the supply voltage is increased. This symptom indicates that the driver/output circuits are turning on because of incorrect biasing. Look for:

- A driver or output transistor short.

- A shorted single-supply clamping diode (D6-7).
- Open bias diodes (D1-2) or resistive bias components (TR3 & R38).
- Poor FET isolation from the main heatsink via the TO-220.

Soft current draw (above 60 volts AC before current begins to increase, amp may pass signal):

The amplifier draws high current when the AC supply voltage is near 120VAC, but the current increases quickly as the supply voltages passes through a breakdown point. This symptom indicates that there is a component failing from voltage breakdown (VCEO) or a low voltage component failure. Look for:

- Severely misadjusted bias circuit.
- Severe oscillation causing current drain. This might be caused by a defective feedback component.
- one or both of the pull-up resistors (R17 & R18) is open.

A "motor-boating" (slow pulsing) 2-5 amp current draw indicates a break in the bias circuit (often an open bias diode or a break in the circuit between the bias diodes).

If the high voltage power supplies are severely unbalanced, the fault may be caused by either an AC feedback defect or a DC component failure. First, remove IC1 and re-measure the power supplies. If the supplies are balanced with the opamp removed, the fault is in the feedback loop. Check the following components:

- The opamp (U901,U902)
- The FET switches (Q901-Q904, Q917-Q920).

If the DC supplies remain offset with the opamp removed, inspect the +/-15VDC supplies. If either of these low voltage power supplies is at, or very near, 0 volts, the 15V regulators or the 35V filter capacitor is shorted. If both of the +/-15VDC supplies are above 3-4 volts, check the opamp second stage output voltage and the driver transistor base voltages. For example; if the output of the opamp is +1VDC or greater and the base of Q1 is between 0 and .5VDC, check R13, D1, and Q1 (or the opposite polarity components if the opamp output voltage is -1VDC).

If the +/- 24V supplies are both near 0 volts, the power supply transformer or its connections may be defective. Inspect the AC voltage at the transformer secondary connections on the 8 pin IDC connector (J2). If 35VAC is present on the secondary connections, inspect the supply fuse. If the 35VAC is not present, the transformer or the IDC (insulation displacement connector) may be defective.

Uneven voltage rails:

- Shorted D940, D939, C954, C953
- Open FET Switches

Signal Amplification Problems**The amplifier has an unstable output.**

NOTE: Do not confuse instability with 120Hz, 100Hz noise in the signal, which evenly spreads the trace vertically. To find this signal, sync the oscilloscope to the AC line and reduce the scope sweep rate to 10mS range, to look for 60-120Hz, 50-100Hz hum frequencies.

Distinguish between instability (fuzziness), "ringing" which is momentary instability after a transition, "step" distortion, crossover distortion (both often show ringing), and "overall" distortion.

The signal is usually distorted with signs of high frequency oscillation on the waveform. (The oscillation is usually worse on a particular part of the waveform.)

If the amplifier exhibits a severe oscillation, this is often affected by a change in the output impedance. If this is the case:

- Check capacitors C914, C915, C916, & C951.
- Substitute the IC and check the IC socket for contamination (U901, U902).

If the amplifier has an excessive crossover spike or oscillation at zero crossing. Check for:

- Shorted bias diodes D903, D904.
- A defective trimpot (VR901).
- Open pull-up resistors on the output devices (R927, R955).

If the distortion is present with no output no-load, look at the feedback components. The amplifier won't provide full power into a load. Look for:

- Short circuit current limits (VR902 & VR903) that are set too low.
- Several open output transistors (Base-Emitter or Emitter-Collector).

(NOTE: Check the driver transistor gain.) To test for this, check the voltage dropped across the output transistor emitter resistors (R927, R928) with an input signal and an output load. Any resistor that has a significantly different voltage drop indicates a defect in the associated output transistor or the emitter resistor.

- Shorted D951, D965
- Shorted FETs
- Bad step SMT board

No output signal from a single channel with all power supplies balanced. This fault is often caused by a failure in the input circuitry. Look for:

- A defective U901. It is not practical to test the IC, but it is possible to check for signal presence at the input and output terminals of the IC.
- a damaged or defective resistor network RN909.
- a defective input connector or input wiring multi-conductor cable.

Protection / Limiting Circuit Problems

NOTE: The output of this amplifier is "AC coupled" through the filter capacitors. This eliminates the need for DC load protection. A "PTC" (Positive Temperature Coefficient) sensing resistor is mounted on the main heatsink. This component's resistance increases with increasing temperature. When the resistance of these temperature dependent resistors increases to approximately 10k ohms (90°C), the protection circuit will eventually disable both channels.

- Bad U901, U902, U101 (on display board).
- Bad U910.
- Shorted Q934.

U910 is a SMT board that houses most of the parts involved with the protection circuitry. Whenever there is a problem with this board, the proper solution to the problem is to change the board. This can be done, but extreme care should be given to this operation. There are delicate traces and eyelets that will be permanently damaged if this board is not removed properly with the right desoldering equipment.

The protection circuit functions within this board are muting, thermal, DC, and high frequency shutdown. Please refer to the schematic to find the connect / sense pins on U910.

The pins that are on U910 have signals that monitor and control the status of the amplifiers protect and limit features. Pin T1 is powered by an unregulated power supply through B901. If a channel is not coming out of mute, then it could be that T1 is not receiving the voltage necessary to bias the transistors within U910. Thus, leaving the channel disengaged via the output relay.

EX Series Parts Lists for all Amplifiers

EX Display Board Assembly

Part Number	Description	Reference
CA-110100-BM	100PF, 100V, 5%, MICA	C101, 102 C201, 202 C103, 203 C107, 207 C1, 2, 105 C106, 108 C109, 205, C206, 208 C209
CA-233100-BP	.0033UF, 100V, 10%, MYLAR	
CA-547016-BN	4.7UF, 16V, RADIAL, NON-POLAR	
CA-610035-BE	10UF, 35V, ELEC., RADIAL, 10%	
CA-747010-BE	470uF, 16V, ELEC., RADIAL, 20%	C104, 204
CO-000008-IC	8 PIN IC SOCKET	REF: U101 U102
CO-000043-CO	.100X.100 BOX HEADER 26 PIN	J1
CO-000044-CO	HEADER 14 PIN .100 X .100	J101, 201
IC-000001-IC	LED VU METER DRIVER	U102, 202
IC-005532-OP	5532 OP-AMP	U101, 201
PC-004001-00	EX SERIES DISPLAY PCB FAB	
PL-905385-SP	BIVAR 905-385 SPACER	LD102-105 LD201-205 REF: LD101
PT-310000-CR	10K OHM DETENTED POTENTIOMETER	VR101, 201
QD-000134-LR	RED T-1 3/4 LED, XC 4655	LD101, 102 LD201, 202
QD-000134-LY	YELLOW T-1 3/4 LED, XC 4555	LD103, 104 LD203, 204
QD-000135-QD	GREEN DIFFUSED LED, T 1 3/4"	LD105, 205
QD-004004-DX	1N4004 DIODE	D101, 201
QD-004410-TX	2N4410, TRANSISTOR, NPN, TO-92	Q102-104 Q202-204
QD-008599-TX	MPS 8599 TRANSISTOR, PNP	Q101, 201
RE-010005-BC	100 OHM, 1/4 WATT, CARBON, 5%	R101, 105 R201, 205 R104, 108 R204, 208 R102, 103 R202, 203 R111, 112 R211, 212 R109, 209 R110, 210 R106, 206 R107, 207
RE-053601-BM	536 OHM, 1/4 WATT, MET.FLM 1%	
RE-053601-BM	536 OHM, 1/4 WATT, MET.FLM 1%	
RE-110005-BC	1K OHM, 1/4 WATT, CARBON, 5%	
RE-115005-BC	1.5K OHM, 1/4 WATT, CARBON 5	
RE-139005-BC	3.9K OHM, 1/4 WATT, CARBON 5%	
RE-147005-BC	4.7K OHM, 1/4 WATT, CARBON, 5%	
RE-210001-BM	10.0K OHM, 1/4W., MET. FLM. 1%	
RE-333005-BC	330K OHM, 1/4 WATT, CARBON 5%	
RN-110002-BM	1K OHM SIP 8 PIN	RN103, 104 RN203, 204 RN101, 102 RN201, 202
RN-210002-BM	10K OHM, 8 PIN, SIP	
WC-000014-01	CABLE ASSY, 14 COND RIBBON, STD	J201 REF: J101
WC-000026-01	CABLE ASSY, 26 COND RIBBON, STD	REF: J1

CA-310100-BP	.01UF, 100V, 10%, MYLAR	C57, 504 C604
CA-410100-BP	.1UF, 100V, 10%, MYLAR	C506, 507 C521, 606 C607, 621
CA-610035-BE	10UF, 35V, ELEC., RADIAL, 10%	C516, 616
CA-647010-BN	47UF, 10V, RADIAL, NON-POLAR	C52, 524 C624
CA-647050-BE	47UF, 50V, ELEC., RADIAL, 10%	C514, 515 C614, 615
CA-710035-BE	100UF, 35V, ELEC., RADIAL, 10%	C55, 56, 51
CA-722010-BN	220UF, 10V, RADIAL, NON-POLAR	C517, 617
CA-747010-BE	470uF, 16V, ELEC., RADIAL, 20%	C513, 518 C613, 618
CA-822035-AE	220OUF, 35V, ELEC., RADIAL, 20%	C53, 54
CA-882080-BE	8200uF 80V ELEC SNAP IN 20%	C510, 511 C610, 611
CH-000624-AX	CLAMP TO-3 PL 6 FINGER	E ETC
CH-400003-00	CLAMP TO-220 6 FINGER	ETC, Q601 REF. Q501 ETC, Q605 REF. Q505
CH-410008-00	EX/MX 2 SPACE HEATSINK	
CO-000008-IC	8 PIN IC SOCKET	REF: U506 U606
CO-000033-CO	4 PIN HEADER, METER	J502 2 PL J602 2 PL
CO-000046-CO	.156 HEADER 5 PIN	J51
CO-000047-CO	HEADER, VERTICAL PIN, PCB, 6PIN	J501, 601 J52
CO-000055-CO	14 PIN HEADER/LOCKING STD.	J503, 603
HW-000007-HW	5MM FUSE CLIP	F503, 601 F603 REF: F501
IC-000010-00	SMT MODULE, HOUSEKEEPING	U503, 603
IC-005532-OP	5532 OP-AMP	U506, 606
LB-100007-PC	PRODUCTION CONTROL LABEL LARGE	
MS-000048-HS	HEAT SINK, ISOL TO-220	REF: Q51
MS-001220-HS	TO-220 HEATSINK AAVID 5939B	REF: U51 U52
MS-15.125-MS	15A 125V 5MM X 20MM FUSE	F501, 503 F601, 603
PL-000039-PL	TO-220 X 6 INSULATOR	ETC ETC, Q601 REF. Q501
PL-903125-SP	BIVAR 903-125 SPACER	R599, 699
PL-905100-SP	BIVAR 905-100 SPACER	D505, 506 D605, 606
PL-905156-SP	SPACER, BIVAR 905-156	BR51 L501, 506
PT-110000-AT	100 OHM TRIMPOT	VR501, 601
PT-250000-AT	5K OHM TRIMPOT	VR502, 503 VR602, 603
QD-000009-VT	VACTEC VTL 5C4	U504, 604
QD-000018-QD	2SC3298B DRIVER TRANSISTOR	Q51, 502 Q602
QD-000019-QD	2SA1306B DRIVER TRANSISTOR	Q501, 601
QD-000022-QD	IN4746, 18V ZENER, 1W	D52, 53
QD-000024-QD	IN4735, 6.2V ZENER, 1W	D511, 513 D611, 613

EX 800 Main Board Assembly

Part Number	Description	Reference
CA-015100-BD	15pF, 100V, 10%, DISK	C526, 626
CA-027100-BM	27PF, 100V, 10%, MICA	C522, 622
CA-068100-BD	68PF, 100V, 10%, DISK	C525, 625
CA-222200-BP	.0022UF, 200V, 10%, MYLAR	C520, 620
CA-233100-BP	.0033UF, 100V, 10%, MYLAR	C512, 612

EX 800 Main Board Assembly (cont.)

Part Number	Description	Reference
QD-001302-PN	180V 12A TO3P TRANSISTOR	Q508-Q510 Q608-Q610
QD-003281-NP	180V 12A TO3P TRANSISTOR	Q505-Q507 Q605-Q607
QD-004004-DX	1N4004 DIODE	D51, 512 D612
QD-004004-VP	VERTICAL PREP IN4004 DIODE	D505, 506 D605, 606
QD-004148-DX	DIODE 1N4148	D509, 510 D609, 610
QD-004410-TX	2N4410, TRANSISTOR, NPN, TO-92	Q53
QD-005402-DX	1N5402 DIODE	D507, 508 D607, 608
QD-007815-QD	15V REGULATOR, POSITIVE	U52
QD-007915-QD	15V REGULATOR, NEGATIVE	U51
QD-008599-TX	MPS 8599 TRANSISTOR, PNP	Q52
QD-1.5200-BX	1.5A 200 VOLT BRIDGE RECTIFIER	BR51
QD-400400-BX	40 AMP, 400 VOLT, BR. RECTIFIER	BR501, 601
RE-.02205-FW	.22 OHM, 3WATT, WIREWOUND, 10%	R515, 516 R517, 520 R521, 522 R615, 616 R617, 620 R621, 622
RE-.33005-DM	3.3 OHM, 1 WATT, METL OXIDE 5%	R53
RE-.39005-EM	3.9 OHM, 2WATT METAL OXIDE 5%	R524, 624
RE-.47005-DM	4.7 OHM, 1 WATT METAL OXIDE 5%	R502, 504 R602, 604
RE-.56005-EM	5.6 OHM, 2 WATT METAL OXIDE 5%	R523, 525 R623, 625
RE-000006-VP	60 C PTC RESISTOR VERT. PREP.	R598, 698
RE-000050-NR	SC-50 NTC RESISTOR	R599, 699
RE-002205-DM	22 OHM, 1 WATT, METAL OXIDE 5%	R518, 519 R618, 619
RE-004705-BC	47 OHM, 1/4 WATT, CARBON, 5%	R539, 639
RE-039005-BC	390 OHM, 1/4 WATT CARBON, 5%	R507, 508 R607, 608
RE-046401-BM	464 OHM, 1/4 WATT, MET. FLM, 1%	R537, 637
RE-047005-DM	470 OHM, 1 W, MET. OXIDE, 5%	R530, 531 R630, 631
RE-059001-BM	590 OHM, 1/4 WATT, MET. FILM 1%	R541, R641
RE-147005-BC	4.7K OHM, 1/4 WATT, CARBON, 5%	R536, 636
RE-147005-DM	4.7K OHM, 1 WATT MET OXIDE 5%	R528, 628
RE-210005-EM	10K OHM, 2 WATT, MET. OXIDE 5%	R527, 529 R627, 629
RE-212101-CM	12.1K OHM, 1/2 WATT, MET.FM 1%	R540, 640
RE-227005-BC	27K OHM, 1/4W, CARBON, 5%	R544, R644
RE-247005-BC	47K OHM, 1/4 WATT, CARBON 5%	R51, 532 R632
RE-247005-DM	47K OHM, 1W, 5% METAL OXIDE	R533, 542 R633, 642
RE-275001-BM	75K OHM, 1/4 WATT, MET. FLM 1%	R538, 638
RE-318005-BC	180K OHM, 1/4 WATT, CARBON 5%	R52, 543
RE-318005-BC	180K OHM, 1/4 WATT, CARBON 5%	R643
RN-127002-BM	2.7K SIP	RN51
RN-210002-BM	10K OHM, 8 PIN, SIP	RN501, 601
SC-081101-SP	#8-18, AB, 5/8, TYPE 1 (PHIL) PH	
SW-000029-SW	SPKR PROTECT RELAY, T-90 STYLE	K501, 601

WC-0.2020-JW	.2", 20GA, SOLID, NO SLEEVE	D501, 502 D601, 602
WC-0.5018-JW	.5" JUMPER, WHT., 18 GA, SOLID	W1
WC-0.6022-JW	.6" JUMPER, WHITE, 22 GA, SLD	W7, 8, 9
WC-1.2518-JW	1.25" JUMPER, WHITE 18 GA, SLD	W6, 10, 11
WC-2.0018-JW	2.00", 18GA, JUMPER	W2, 3
XF-200014-CR	2UH, 14 GA, COIL/VERTICAL	L501, 601

EX 800 Chassis Assembly

Part Number	Description
CH-004113-00	INPUT PANEL, LOWER EX SERIES
CH-140210-BX	1400 KNOB FABRICATION
CH-400016-00	BLANK UPPER INPUT PANEL
CH-410000-00	CHASSIS, 2 SPACE, EX/MXA SERIES
CH-410010-00	RACK EAR EX/MX 2 SPACE
CO-000001-DB	DUAL BINDING POST
HW-060090-SO	#6-32 X 9/16" HEX STANDOFF
HW-060150-SO	#6-32 X 29/32" STANDOFF
HW-100001-HW	#10-32 X .7" HEX S/O, NIC PLTD
LB-004001-00	LBL, INPUT PNL, LWR, EX SERIES
LB-080220-00	EX-800 FACEPLATE LABEL
LB-100000-CT	CHASSIS CONTROL TAG
LB-160221-00	EX SERIES OUTPUT LABEL
LB-160225-00	SERIAL NUM GEN W OUTPUT PWR
MS-000052-MS	3.5" FAN, 24 VDC
NW-040401-FW	#4 FLAT WASHER
NW-060010-IT	#6 INTERNAL TOOTH LOCKWASHER
NW-060410-ET	#6 EXTERNAL TOOTH LOCKWASHER
NW-080500-KP	#8-32 KEPS NUT
NW-100700-NW	#10 FLAT WASHER, NICKEL PLATED
NW-100710-NW	#10EXT LOCKWASHER, NICKEL PLTD
PL-000000-AF	ADHESIVE FEET
PL-000003-CP	AC CORD PROTECTOR
PL-000032-PL	MX1500 FAN FINGER GUARD
PL-000035-PL	NYLATCH STNDOFF 1/4 TURN .25LG
PL-000040-PL	POT COVERS
PL-000042-PL	BUSHING, STRAIN RELIEF, INT., RD
PL-000043-PL	STNDOFF, 1/4TURN, .75LG, PCB MTG
PL-000045-PL	RIVET, PLASTIC, SCREW TYPE
PL-040601-PL	FLAT CABLE CLIPS
SC-030000-SC	3mm x 8mm, P/P, TYPE 1, BLK. OX.
SC-060042-PP	6-32 X 1/4" P/P ZINC, SEMS, IT
SC-060081-PP	#6-32 X 1/2" P/P BLACK
SC-080051-PS	#8-32 X 5/16" P/P SEMS BLACK
SC-082051-PL	SCREW, TAP, PAN PH#8X5/16" "B"BK
SC-100000-SC	#10-32 X 1/4, TYPE I (PHILLIPS)
SC-100061-PS	#10-32 X 3/8" P/P SEMS BLACK
SW-000016-SW	SPST SNAP IN POWER SWITCH
WC-003069-00	A/C POWER CORD ASSEMBLY EXPORT
WC-003070-00	AC POWER CORD ASSY EX/MX 2 SP
WC-003071-00	WIRE ASSY, AC SWITCH
WC-003074-00	WIRE ASSY, OUTPUT EX/MXA 2 SP
WC-003075-00	WIRE ASSY (RED), FAN EX SERIES
WC-003075-01	WIRE ASSY (BLK), FAN EX SERIES
XF-000800-00	EX 800 TRANSFORMER

EX 1250 Main Board Assembly

Part Number	Description	Reference
CA-015100-BD	15pF, 100V, 10%, DISK	C526, 626
CA-018100-BM	18PF, 100V, 10%, MICA	C522, 622
CA-068100-BD	68PF, 100V, 10%, DISK	C525, 625
CA-168100-BD	680PF, 100V, 10%, DISK	C519, 619

EX 1250 Main Board Assembly (cont.)

Part Number	Description	Reference		
CA-222200-BP	.0022UF, 200V, 10%, MYLAR	C520, 523 C620, 623	PL-903125-SP PL-905100-SP	BIVAR 903-125 SPACER BIVAR 905-100 SPACER
CA-233100-BP	.0033UF, 100V, 10%, MYLAR	C512, 612	PL-905156-SP	SPACER, BIVAR 905-156
CA-310100-BP	.01UF, 100V, 10%, MYLAR	C57, 504 C604	PT-110000-AT PT-250000-AT	100 OHM TRIMPOT 5K OHM TRIMPOT
CA-410100-BP	.1UF, 100V, 10%, MYLAR	C501, 503 C506, 507 C601, 603 C606, 607	QD-000009-VT QD-000018-QD	VACTEC VTL 5C4 2SC3298B DRIVER TRANSISTOR
CA-415100-CP	.15UF, 100V, 5%, MYLAR	C521, 621	QD-000019-QD	2SA1306B DRIVER TRANSISTOR
CA-610035-BE	10UF, 35V, ELEC., RADIAL, 10%	C516, 616	QD-000022-QD	IN4746, 18V ZENER, 1W
CA-647010-BN	47UF, 10V, RADIAL, NON-POLAR	C52, 524 C624	QD-000024-QD	IN4735, 6.2V ZENER, 1W
CA-647050-BE	47UF, 50V, ELEC., RADIAL, 10%	C502, 514 C515, 602 C614, 615	QD-000031-QD	FET SWITCH, 60V, 50A
CA-710035-BE	100UF, 35V, ELEC., RADIAL, 10%	C55, 56, 51	QD-0007.5-ZT	7.5V TESTED ZENER
CA-722010-BN	220UF, 10V, RADIAL, NON-POLAR	C517, 617	QD-000810-DX	TO-220 8A/100V DIODE, FAST
CA-747010-BE	470uF, 16V, ELEC., RADIAL, 20%	C505, 513 C518, 605 C613, 618	QD-001302-PN	180V 12A TO3P TRANSISTOR
CA-822035-AE	2200UF, 35V, ELEC., RADIAL, 20%	C53, 54	QD-003281-NP	180V 12A TO3P TRANSISTOR
CA-915050-AE	15000 UF, 50V, ELEC. RAD. 20%	C508-C511 C608-C611	QD-004004-DX	1N4004 DIODE
CH-000624-AX	CLAMP TO-3 PL 6 FINGER	ETC Q601 REF. Q501	QD-004004-VP	VERTICAL PREP 1N4004 DIODE
CH-400003-00	CLAMP TO-220 6 FINGER	ETC Q605 REF. Q505	QD-004148-DX	DIODE 1N4148
CH-410008-00	EX/MX 2 SPACE HEATSINK	REF: U505	QD-004410-TX	2N4410, TRANSISTOR, NPN, TO-92
CO-000008-IC	8 PIN IC SOCKET	U506, 605 U606	QD-005402-DX	1N5402 DIODE
CO-000033-CO	4 PIN HEADER, METER	J502 2 PL J602 2 PL	QD-007815-QD	15V REGULATOR, POSITIVE
CO-000046-CO	.156 HEADER 5 PIN	J51	QD-007915-QD	15V REGULATOR, NEGATIVE
CO-000047-CO	HEADER, VERTICAL PIN, PCB, 6PIN	J501, 601 J52	QD-008599-TX	MPS 8599 TRANSISTOR, PNP
CO-000055-CO	14 PIN HEADER/LOCKING STD.	J503, 603	QD-1.5200-BX	1.5A 200 VOLT BRIDGE RECTIFIER
HW-000007-HW	5MM FUSE CLIP	F502, 503 F504, 601 F602, 603 F604	QD-400400-BX	40 AMP, 400 VOLT, BR. RECTIFIER
HW-000007-HW	5MM FUSE CLIP	REF: F501	RE-.02205-FW	.22 OHM, 3WATT, WIREWOUND, 10%
IC-000008-00	SMT MODULE, POS. STEP DRIVER	U501, 601	RE-.02205-FW	.22 OHM, 3WATT, WIREWOUND, 10%
IC-000009-00	SMT MODULE, NEG STEP DRIVER	U502, 602	RE-.27005-EM	2.7 OHM, 2 WATT, METAL OX, 5%
IC-000010-00	SMT MODULE, HOUSEKEEPING	U503, 603	RE-.33005-DM	3.3 OHM, 1 WATT, METL OXIDE 5%
IC-005532-OP	5532 OP-AMP	U505, 506 U605, 606	RE-.39005-EM	3.9 OHM, 2WATT METAL OXIDE 5%
LB-100007-PC	PRODUCTION CONTROL LABEL LARGE	REF: Q51	RE-.47005-DM	4.7 OHM, 1 WATT METAL OXIDE 5%
MS-000048-HS	HEAT SINK, ISOL TO-220	REF: U51	RE-.56005-EM	5.6 OHM, 2 WATT METAL OXIDE 5%
MS-001220-HS	TO-220 HEATSINK AAVID 5939B	U52	RE-000006-VP	60 C PTC RESISTOR VERT. PREP.
MS-15.125-MS	15A 125V 5MM X 20MM FUSE	F501-F504 F601-F604	RE-000050-NR	SC-50 NTC RESISTOR
PL-000039-PL	TO-220 X 6 INSULATOR	ETC Q601 REF. Q501	RE-002205-DM	22 OHM, 1 WATT, METAL OXIDE 5%
			RE-004705-BC	47 OHM, 1/4 WATT, CARBON, 5%

EX 1250 Main Board Assembly (cont.)

Part Number	Description	Reference
RE-033201-BM	332 OHM, 1/4 WATT, MET.FILM, 1%	R507, 508 R607, 608
RE-047005-DM	470 OHM, 1 W, MET. OXIDE, 5%	R531, 631
RE-059001-BM	590 OHM, 1/4 WATT, MET. FILM 1%	R530, R537 R541, R641 R630, R637
RE-115005-BC	1.5K OHM, 1/4 WATT, CARBON 5	R505, 605 R506, 606 R536, 636
RE-127005-BC	2.7K OHM, 1/4 WATT, CARBON, 5%	R534, 634
RE-130005-EM	3K OHM, 2 WATT, MET. OXIDE 5%	R514, 526 R614, 626
RE-175005-EM	7.5K OHM, 2 WATT, MET. OXIDE	R528, 628
RE-210005-EM	10K OHM, 2 WATT, MET. OXIDE 5%	R527, 529 R627, 629
RE-215001-BM	15.0K OHM, 1/4 WATT, MET. FILM 1%	R535, 635
RE-221501-CM	21.5K OHM, 1/2 WATT, MET.FM 1%	R540, 640
RE-222006-BM	22K OHM, 1 WATT, METAL OXIDE, 5%	R513, 613
RE-227005-BC	27K OHM, 1/4W, CARBON, 5%	R544, R644
RE-247005-BC	47K OHM, 1/4 WATT, CARBON 5%	R51, 532 R632
RE-247005-DM	47K OHM, 1W, 5% METAL OXIDE	R533, 542 R633, 642
RE-275001-BM	75K OHM, 1/4 WATT, MET. FLM 1%	R538, 638
RE-318005-BC	180K OHM, 1/4 WATT, CARBON 5%	R52, 543 R643
RE-375005-BM	750K OHM, 1/2W, METAL FLM, 5%	R501, 503 R601, 603
RN-110002-BM	1K OHM SIP 8 PIN	RN502, 602
RN-127002-BM	2.7K SIP	RN51
RN-210002-BM	10K OHM, 8 PIN, SIP	RN501, 601
SC-081101-SP	#8-18, AB, 5/8, TYPE 1 (PHIL) PH	
SW-000029-SW	SPKR PROTECT RELAY, T-90 STYLE	K501, 601
WC-0.5018-JW	.5" JUMPER, WHT., 18 GA, SOLID	W1
WC-0.6022-JW	.6" JUMPER, WHITE, 22 GA, SLD	W7, 8, 9
WC-1.2518-JW	1.25" JUMPER, WHITE 18 GA, SLD	W6, 10, 11
WC-2.0018-JW	2.00", 18GA, JUMPER	W2, 3, 4, 5
XF-200014-CR	2UH, 14 GA, COIL/VERTICAL	L501, 601

EX 1250 Chassis Assembly

Part Number	Description
CH-004113-00	INPUT PANEL, LOWER EX SERIES
CH-140210-BX	1400 KNOB FABRICATION
CH-400016-00	BLANK UPPER INPUT PANEL
CH-410000-00	CHASSIS, 2 SPACE, EX/MXA SERIES
CH-410010-00	RACK EAR EX/MX 2 SPACE
CO-000001-DB	DUAL BINDING POST
HW-060090-SO	#6-32 X 9/16" HEX STANDOFF
HW-060150-SO	#6-32 X 29/32" STANDOFF
HW-100001-HW	#10-32 x .7" HEX S/O, NIC PLTD
LB-004001-00	LBL, INPUT PNL, LWR, EX SERIES
LB-100000-CT	CHASSIS CONTROL TAG
LB-125220-00	EX-1250 FACEPLATE LABEL
LB-160221-00	EX SERIES OUTPUT LABEL
LB-160225-00	SERIAL NUM GEN W OUTPUT PWR
MS-000052-MS	3.5" FAN, 24 VDC
NW-040401-FW	#4 FLAT WASHER
NW-060010-IT	#6 INTERNAL TOOTH LOCKWASHER
NW-060410-ET	#6 EXTERNAL TOOTH LOCKWASHER

NW-080500-KP	#8-32 KEPS NUT
NW-100700-NW	#10 FLAT WASHER, NICKEL PLATED
NW-100710-NW	#10EXT LOCKWASHER, NICKEL PLTD
PL-000000-AF	ADHESIVE FEET
PL-000003-CP	AC CORD PROTECTOR
PL-000018-00	SHROUD, FAN
PL-000032-PL	MX1500 FAN FINGER GUARD
PL-000035-PL	NYLATCH STNDOFF 1/4 TURN .25LG
PL-000040-PL	POT COVERS
PL-000042-PL	BUSHING, STRAIN RELIEF, INT., RD
PL-000043-PL	STNDOFF, 1/4TURN, .75LG, PCB MTG
PL-000045-PL	RIVET, PLASTIC, SCREW TYPE
PL-040601-PL	FLAT CABLE CLIPS
SC-030000-SC	3mm x 8mm, P/P, TYPE 1, BLK. OX.
SC-060042-PP	6-32 X 1/4" P/P ZINC, SEMS, IT
SC-060081-PP	#6-32 X 1/2" P/P BLACK
SC-080051-PS	#8-32 X 5/16" P/P SEMS BLACK
SC-082051-PL	SCREW, TAP, PAN PH#8X5/16" "B"BK
SC-100000-SC	#10-32 X 1/4, TYPE I (PHILLIPS)
SC-100061-PS	#10-32 X 3/8" P/P SEMS BLACK
SW-000016-SW	SPST SNAP IN POWER SWITCH
WC-003069-00	A/C POWER CORD ASSEMBLY EXPORT
WC-003070-00	AC POWER CORD ASSY EX/MX 2 SP
WC-003071-00	WIRE ASSY, AC SWITCH
WC-003074-00	WIRE ASSY, OUTPUT EX/MXA 2 SP
WC-003075-00	WIRE ASSY (RED, FAN EX SERIES
WC-003075-01	WIRE ASSY (BLK), FAN EX SERIES
XF-001000-00	EX 1250 TRANSFORMER

EX 1600 Main Board Assembly

Part Number	Description	Reference
CA-015100-BD	15pF, 100V, 10%, DISK	C526,626
CA-018100-CM	18PF, 100V, 5%, MICA	C522, 622
CA-068100-BD	68PF, 100V, 10%, DISK	C525, 625
CA-168100-BD	680PF, 100V, 10%, DISK	C519, 619
CA-222200-BP	.0022UF, 200V, 10%, MYLAR	C520, 523 C620, 623
CA-233100-BP	.0033UF, 100V, 10%, MYLAR"	C512, 612
CA-310100-BP	.01UF, 100V, 10%, MYLAR	C57, 504 C604
CA-410100-BP	.1UF, 100V, 10%, MYLAR	C501, 503 C506, 507 C601, 603 C606, 607
CA-412100-CP	.12UF, 100V, 5%, MYLAR	C521, 621
CA-610035-BE	10UF, 35V, ELEC., RADIAL, 10%	C516, 616
CA-647010-BN	47UF, 10V, RADIAL, NON-POLAR	C52, 524 C624
CA-647050-BE	47UF, 50V, ELEC., RADIAL, 10%	C502, 514 C515,602 C614, 615
CA-710035-BE	100UF, 35V, ELEC., RADIAL, 10%	C55, 56, 51
CA-722010-BN	220UF, 10V, RADIAL, NON-POLAR	C517, 617
CA-747010-BE	470uF, 16V, ELEC., RADIAL, 20%	C505, 513 C518, 605 C613, 618
CA-822035-AE	2200UF, 35V, ELEC., RADIAL,20%	C53, 54
CA-912063-AE	12,000UF, 63V, ELEC; RAD, 20%	C508-C511 C608-C611
CH-000624-AX	CLAMP TO-3 PL 6 FINGER	ETC
CH-000624-AX	CLAMP TO-3 PL 6 FINGER	ETC, Q601 REF.Q501

EX 1600 Main Board Assembly (cont.)

Part Number	Description	Reference			
CH-004111-00	HEATSINK, EXTRUSION EX/MXA 2 SP		QD-004004-VP	VERTICAL PREP IN4004 DIODE	D505, 506
CH-400003-00	CLAMP TO-220 6 FINGER	ETC			D605, 606
		ETC, Q605	QD-004148-DX	DIODE 1N4148	D509, 510
		REF: Q505			D609, 610
CO-000008-IC	8 PIN IC SOCKET	REF: U505	QD-004410-TX	2N4410, TRANSISTOR, NPN, TO-92	Q53
		U506, 605	QD-005402-DX	1N5402 DIODE	D507, 508
		U606			D607, 608
CO-000033-CO	4 PIN HEADER, METER	J502 2 PL	QD-007815-QD	15V REGULATOR, POSITIVE	U52
		J602 2 PL	QD-007915-QD	15V REGULATOR, NEGATIVE	U51
CO-000046-CO	.156 HEADER 5 PIN	J51	QD-008599-TX	MPS 8599 TRANSISTOR, PNP	Q52
CO-000047-CO	HEADER, VERTICAL PIN, PCB, 6PIN	J501, 601	QD-1.5200-BX	1.5A 200 VOLT BRIDGE RECTIFIER	BR51
		J52	QD-400400-BX	40 AMP, 400 VOLT, BR. RECTIFIER	BR501, 502
CO-000055-CO	14 PIN HEADER/LOCKING STD.	J503, 603			BR601, 602
HW-000007-HW	5MM FUSE CLIP	F502, 503	RE-.02205-FW	.22 OHM, 3WATT, WIREWOUND, 10%	R515, 516
		F504, 601			R517, 520
		F602, 603			R521, 522
		F604	RE-.27005-EM	2.7 OHM, 2 WATT, METAL OX, 5%	R615, 616
		REF: F501			R617, 620
IC-000008-00	SMT MODULE, POS. STEP DRIVER	U501, 601	RE-.33005-DM	3.3 OHM, 1 WATT, METL OXIDE 5%	R621, 622
IC-000009-00	SMT MODULE, NEG STEP DRIVER	U502, 602	RE-.39005-EM	3.9 OHM, 2WATT METAL OXIDE 5%	R509, 512
IC-000010-00	SMT MODULE, HOUSEKEEPING	U503, 603	RE-.47005-DM	4.7 OHM, 1 WATT METAL OXIDE 5%	R509, 512
IC-005532-OP	5532 OP-AMP	U505, 506			R523, 525
		U605, 606	RE-.56005-EM	5.6 OHM, 2 WATT METAL OXIDE 5%	R623, 625
LB-100007-PC	PRODUCTION CONTROL LABEL LARGE		RE-000006-VP	60 C PTC RESISTOR VERT. PREP.	R598, 698
MS-000048-HS	HEAT SINK, ISOL TO-220	REF: Q51	RE-000050-NR	SC-50 NTC RESISTOR	R599, 699
MS-001220-HS	TO-220 HEATSINK AAVID 5939B	REF: U51	RE-002205-DM	22 OHM, 1 WATT, METAL OXIDE 5%	R510, 511
		U52			R518, 519
MS-15.125-MS	15A 125V 5MM X 20MM FUSE	F501-F504			R610, 611
		F601-F604			R618, 619
PL-000039-PL	TO-220 X 6 INSULATOR	ETC	RE-004705-BC	47 OHM, 1/4 WATT, CARBON, 5%	R539, 639
		ETC, Q601	RE-033201-BM	332 OHM, 1/4 WATT, MET.FILM, 1%	R507, 508
		REF: Q501			R607, 608
PL-903125-SP	BIVAR 903-125 SPACER	R599, 699	RE-046401-BM	464 OHM, 1/4 WATT, MET.FLM, 1%	R537, 637
PL-905100-SP	BIVAR 905-100 SPACER	D505, 506	RE-047005-DM	470 OHM, 1 W, MET. OXIDE, 5%	R530, 531
		D605, 606			R630, 631
PL-905156-SP	SPACER, BIVAR 905-156	BR51	RE-059001-BM	590 OHM, 1/4 WATT, MET.FILM 1%	R541, R641
		L501, 506	RE-115005-BC	1.5K OHM, 1/4 WATT, CARBON 5	R505, 506
PT-110000-AT	100 OHM TRIMPOT	VR501, 601			R536, 636
PT-250000-AT	5K OHM TRIMPOT	VR502, 503			R605, 606
		VR602, 603	RE-127005-BC	2.7K OHM, 1/4 WATT, CARBON, 5%	R534, 634
QD-000009-VT	VACTEC VTL 5C4	U504, 604	RE-130005-EM	3K OHM, 2 WATT, MET. OXIDE 5%	R514, 526
QD-000018-QD	2SC3298B DRIVER TRANSISTOR	Q51, 502			R614, 626
		Q602	RE-175005-EM	7.5K OHM, 2 WATT, MET. OXIDE	R528, 628
QD-000019-QD	2SA1306B DRIVER TRANSISTOR	Q501, 601	RE-210005-EM	10K OHM, 2 WATT, MET. OXIDE 5%	R527, 529
QD-000022-QD	IN4746, 18V ZENER, 1W	D52, 53			R627, 629
QD-000024-QD	IN4735, 6.2V ZENER, 1W	D511, 513	RE-215001-BM	15.0K OHM, 1/4 WATT, MET.FILM 1%	R535, 635
		D611, 613	RE-221501-CM	21.5K OHM, 1/2 WATT, MET.FM 1%	R540, 640
QD-000031-QD	FET SWITCH, 60V, 50A	Q503, 504	RE-222006-BM	22K OHM, 1 WATT, METAL OXIDE, 5%	R513, 613
		Q603, 604	RE-227005-BC	27K OHM, 1/4W, CARBON, 5%	R544, R644
QD-0007.5-ZT	7.5V TESTED ZENER	D503, 504	RE-247005-BC	47K OHM, 1/4 WATT, CARBON 5%	R51, 532
		D603, 604			R632
QD-000810-DX	TO-220 8A/100V DIODE, FAST	D501, 502	E-247005-DM	47K OHM, 1W, 5% METAL OXIDE	R533, 542
		D601, 602			R633, 642
QD-001302-PN	180V 12A TO3P TRANSISTOR	Q508-Q510	RE-275001-BM	75K OHM, 1/4 WATT, MET. FLM 1%	R538, 638
		Q608-Q610	RE-318005-BC	180K OHM, 1/4 WATT, CARBON 5%	R52, 543
QD-003281-NP	180V 12A TO3P TRANSISTOR	Q505-Q507			R643
		Q605-Q607	RE-375005-BM	750K OHM, 1/2W, METAL FLM, 5%	R501, 503
QD-004004-DX	1N4004 DIODE	D51, 512			R601, 603
		D612			

EX 1600 Main Board Assembly (cont.)

Part Number	Description	Reference
RN-110002-BM	1K OHM SIP 8 PIN	RN502, 602
RN-127002-BM	2.7K SIP	RN51
RN-210002-BM	10K OHM, 8 PIN, SIP	RN501, 601
SC-081101-SP	#8-18, AB, 5/8, TYPE 1 (PHIL) PH	
SW-000029-SW	SPKR PROTECT RELAY, T-90 STYLE	K501, 601
WC-0.5018-JW	.5" JUMPER, WHT., 18 GA, SOLID	W1
WC-0.6022-JW	.6" JUMPER, WHITE, 22 GA, SLD	W7, 8, 9
WC-1.2518-JW	1.25" JUMPER, WHITE 18 GA, SLD	W6, 10, 11
WC-2.0018-JW	2.00", 18GA, JUMPER	W2, 3, 4, 5
XF-200014-CR	2UH, 14 GA, COIL/VERTICAL	L501, 601

EX 1600 Chassis Assembly

Part Number	Description
CH-004113-00	INPUT PANEL, LOWER EX SERIES
CH-140210-BX	1400 KNOB FABRICATION
CH-400016-00	BLANK UPPER INPUT PANEL
CH-410000-00	CHASSIS, 2 SPACE, EX/MXA SERIES
CH-410010-00	RACK EAR EX/MX 2 SPACE
CO-000001-DB	DUAL BINDING POST
HW-060090-SO	#6-32 X 9/16" HEX STANDOFF
HW-060150-SO	#6-32 X 29/32" STANDOFF
HW-100001-HW	#10-32 X .7" HEX S/O, NIC PLTD
LB-004001-00	LBL, INPUT PNL, LWR, EX SERIES
LB-100000-CT	CHASSIS CONTROL TAG
LB-160220-00	EX-1600 FACEPLATE LABEL
LB-160221-00	EX SERIES OUTPUT LABEL
LB-160225-00	SERIAL NUM GEN W OUTPUT PWR
MS-000052-MS	3.5" FAN, 24 VDC
NW-040401-FW	#4 FLAT WASHER
NW-060010-IT	#6 INTERNAL TOOTH LOCKWASHER
NW-060410-ET	#6 EXTERNAL TOOTH LOCKWASHER
NW-080500-KP	#8-32 KEPS NUT
NW-100700-NW	#10 FLAT WASHER, NICKEL PLATED
NW-100710-NW	#10EXT LOCKWASHER, NICKEL PLTD
PL-000000-AF	ADHESIVE FEET
PL-000003-CP	AC CORD PROTECTOR
PL-000018-00	SHROUD, FAN
PL-000032-PL	MX1500 FAN FINGER GUARD
PL-000035-PL	NYLATCH STNDOFF 1/4 TURN .25LG
PL-000040-PL	POT COVERS
PL-000042-PL	BUSHING, STRAIN RELIEF, INT., RD
PL-000043-PL	STNDOFF, 1/4TURN, .75LG, PCB MTG
PL-000045-PL	RIVET, PLASTIC, SCREW TYPE
PL-040601-PL	FLAT CABLE CLIPS
SC-030000-SC	3mm x 8mm, P/P, TYPE 1, BLK. OX.
SC-060042-PP	6-32 X 1/4" P/P ZINC, SEMS, IT
SC-060081-PP	#6-32 X 1/2" P/P BLACK
SC-080051-PS	#8-32 X 5/16" P/P SEMS BLACK
SC-082051-PL	SCREW, TAP, PAN PH#8X5/16" "B"BK
SC-100000-SC	#10-32 X 1/4, TYPE I (PHILLIPS)
SC-100061-PS	#10-32 X 3/8" P/P SEMS BLACK
SW-000016-SW	SPST SNAP IN POWER SWITCH
WC-003069-00	A/C POWER CORD ASSEMBLY EXPORT
WC-003070-00	AC POWER CORD ASSY EX/MX 2 SP
WC-003071-00	WIRE ASSY, AC SWITCH
WC-003074-00	WIRE ASSY, OUTPUT EX/MXA 2 SP
WC-003075-00	WIRE ASSY (RED), FAN EX SERIES
WC-003075-01	WIRE ASSY (BLK), FAN EX SERIES
XF-001600-00	EX 1600 TRANSFORMER

EX 2500 Main Board Assembly

Part Number	Description	Reference
CA-015100-BD	15pF, 100V, 10%, DISK	C962
CA-018100-CM	18PF, 100V, 5%, MICA	C914
CA-068100-BD	68PF, 100V, 10%, DISK	C957
CA-168100-BD	680PF, 100V, 10%, DISK	C956
CA-222200-BP	.0022UF, 200V, 10%, MYLAR	C915,955
CA-233100-BP	.0033UF, 100V, 10%, MYLAR	C961
CA-310100-BP	.01UF, 100V, 10%, MYLAR	C911
CA-410100-BP	.1UF, 100V, 10%, MYLAR	C902, C912
		C913, C916
		C917
CA-610035-BE	10UF, 35V, ELEC., RADIAL, 10%	C941
CA-647010-BN	47UF, 10V, RADIAL, NON-POLAR	C951
CA-647050-BE	47UF, 50V, ELEC., RADIAL, 10%	C904, C943
		C944
CA-710035-BE	100UF, 35V, ELEC., RADIAL, 10%	C953, 954
CA-722010-BN	220UF, 10V, RADIAL, NON-POLAR	C952
CA-747010-BE	470uF, 16V, ELEC., RADIAL, 20%	C924, 959
		C960
CA-822035-AE	220OUF, 35V, ELEC., RADIAL, 20%	C945, 946
CA-912063-AE	12,000UF, 63V, ELEC; RAD, 20%	C929-932
		C935-938
CH-000624-AX	CLAMP TO-3 PL 6 FINGER	
CH-400003-00	CLAMP TO-220 6 FINGER	
CH-400008-00	EX-4000 EXTRU & FAB HEATSINK	
CO-000008-IC	8 PIN IC SOCKET	U901, 902
CO-000033-CO	4 PIN HEADER, METER	J905
CO-000041-CO	PCB MOUNT 12 PIN HEADER ASSY	J901
CO-000045-CO	.156 HEADER 4 PIN	J902
CO-000046-CO	.156 HEADER 5 PIN	J904
CO-000055-CO	14 PIN HEADER/LOCKING STD.	J903
IC-000008-00	SMT MODULE, POS. STEP DRIVER	U907
IC-000009-00	SMT MODULE, NEG STEP DRIVER	U908
IC-000010-00	SMT MODULE, HOUSEKEEPING	U910
IC-005532-OP	5532 OP-AMP	U901, 902
LB-100007-PC	PRODUCTION CONTROL LABEL LARGE	
MS-000054-MS	TO-220 HEATSINK, HIGHER POWER"	Q934
		REF. Q933
MS-001220-HS	TO-220 HEATSINK AAVID 5939B	REF. U904
		U905
NW-040010-IT	#4 INTERNAL TOOTH LOCKWASHER	Q934
		REF: Q933
NW-040400-HN	#4-40 X 1/4" HEX NUT	Q934
		REF: Q933
PC-004200-00	EX-4000 POWER AMP PCB	
PL-000039-PL	TO-220 X 6 INSULATOR	
PL-903125-SP	BIVAR 903-125 SPACER	D903, 904
		REF: R931
PL-905156-SP	"SPACER, BIVAR 905-156	B901
		L901, 901
PT-110000-AT	100 OHM TRIMPOT	VR901
PT-250000-AT	5K OHM TRIMPOT	VR902, 903
QD-000009-VT	VACTEC VTL 5C4	U903
QD-000014-QD	DIODE, FAST, 100V, 15 AMP	D902, 905
QD-000018-QD	2SC3298B DRIVER TRANSISTOR	Q933
QD-000019-QD	2SA1306B DRIVER TRANSISTOR	Q934
QD-000022-QD	IN4746, 18V ZENER, 1W	D939, 940
QD-000023-QD	IN5955, 180V ZENER, 1.5W	D921, 924
QD-000024-QD	IN4735, 6.2V ZENER, 1W	D952, 955

EX 2500 Main Board Assembly (cont.)

Part Number	Description	Reference
QD-000030-QD	FET SWITCH, 100V, 25 AMPS	Q903, 904 Q917, 918 D951, 965 Q905-910 Q911-916 D936-938 D941, 942 D947 1/4W OR 8500-7 9T 400-35 D903, 904 DIE P/N: D922, 923 D953, 954 D907, 908 U904 U905 B901 R924-926 R928-930 R949-954 R910, 958 R932 R937-939 DIE:9610C R1007 R931 R933-936 R906, 907 R927, 955 R959, 960 R941 R947, 948 R993 R982,992 R991 R945, R946 R990 R995 R956, 976 R988 R994 R1000 R1001 R940 R917 R996 R923 R942, 989 R987 R943, 944 R910 RN909 Q934 REF: Q933 W901, 905 W902-904
QD-0007.5-ZT	7.5V TESTED ZENER	
QD-001302-PN	180V 12A TO3P TRANSISTOR	
QD-003281-NP	180V 12A TO3P TRANSISTOR	
QD-004004-DX	1N4004 DIODE	
QD-004004-DX	1N4004 DIODE	
QD-004004-VP	VERTICAL PREP 1N4004 DIODE	
QD-004148-DX	DIODE 1N4148	
QD-005402-DX	1N5402 DIODE	
QD-007815-QD	15V REGULATOR, POSITIVE	
QD-007915-QD	15V REGULATOR, NEGATIVE	
QD-1.5200-BX	1.5A 200 VOLT BRIDGE RECTIFIER	
RE-.02205-FW	.22 OHM, 3WATT, WIREWOUND, 10%	
RE-.27005-EM	2.7 OHM, 2 WATT, METAL OX, 5%	
RE-.39005-EM	3.9 OHM, 2 WATT METAL OXIDE 5%	
RE-.47005-DM	"4.7 OHM, 1 WATT METAL OXIDE 5%	
RE-000006-VP	60 C PTC RESISTOR VERT. PREP.	
RE-000050-NR	SC-50 NTC RESISTOR	
RE-001005-EM	10 OHM, 2 WATT, METAL OXIDE 5%	
RE-002205-DM	"22 OHM, 1 WATT, METAL OXIDE 5%	
RE-004705-BC	47 OHM, 1/4 WATT, CARBON, 5%	
RE-033201-BM	332 OHM, 1/4 WATT, MET.FILM,1%	
RE-041201-BM	412 OHM, 1/4W, MET. FLM., 1%	
RE-047005-DM	470 OHM, 1 W, MET. OXIDE, 5%	
RE-059001-BM	590 OHM, 1/4 WATT, MET.FILM 1%	
RE-110005-BC	1K OHM, 1/4 WATT, CARBON, 5%	
RE-114001-BM	1.40K OHM,1/4 WATT, MET.FLM 1%	
RE-127005-BC	2.7K OHM, 1/4 WATT, CARBON, 5%	
RE-130005-EM	3K OHM, 2 WATT, MET. OXIDE 5%	
RE-182005-EM	8.2K OHM, 2W, MET. OXIDE 5%	
RE-210005-EM	10K OHM, 2 WATT, MET. OXIDE 5%	
RE-215001-BM	15.0K OHM,1/4 WATT,MET.FILM 1%	
RE-221501-CM	21.5K OHM, 1/2 WATT, MET.FM 1%	
RE-222006-BM	22K OHM,1 WATT,METAL OXIDE,5%	
RE-227005-BC	27K OHM, 1/4W, CARBON, 5%	
RE-247005-DM	47K OHM, 1W, 5% METAL OXIDE	
RE-275001-BM	75K OHM, 1/4 WATT, MET. FLM 1%	
RE-318005-BC	180K OHM, 1/4 WATT, CARBON 5%	
RE-375005-BM	750K OHM, 1/2W, METAL FLM, 5%	
RN-110002-BM	1K OHM SIP 8 PIN	
RN-210002-BM	10K OHM, 8 PIN, SIP	
SC-040061-PT	#4-40 X 3/8" P/T BLACK	
SC-081101-SP	#8-18, AB, 5/8, TYPE 1 (PHIL) PH	
WC-0.2020-JW	.2", 20GA, SOLID, NO SLEEVE	
WC-0.5018-JW	.5" JUMPER, WHT., 18 GA, SOLID	

XF-200014-CR 2UH, 14 GA, COIL/VERTICAL

L901

EX 2500 Chassis Assembly

Part Number	Description
CH-004113-00	INPUT PANEL, LOWER EX SERIES
CH-140210-BX	1400 KNOB FABRICATION
CH-400010-00	EX-4000 RACK EAR
CH-400012-00	DISPLAY PCB SHIELD
CH-400016-00	BLANK UPPER INPUT PANEL
CH-400018-00	SOB-PLATE,EXPORT STRAIN RELIEF
CH-420000-00	CHASSIS 3 SPACE, EX/MX SERIES
CO-000001-DB	DUAL BINDING POST
HW-060000-HW	#6-32 x 9/16", NYLON STANDOFF
HW-060080-HW	#6-32 X 1/2" HEX M/F STANDOFF
HW-060090-SO	#6-32 X 9/16" HEX STANDOFF
HW-060150-SO	#6-32 X 29/32" STANDOFF
HW-080002-HW	#8-32 x 2.5", HEX STANDOFF
HW-100001-HW	#10-32 x .75" HEX S/O,NIC PLTD
LB-004001-00	LBL,INPUT PNL,LWR,EX SERIES
LB-100000-CT	CHASSIS CONTROL TAG
LB-160221-00	EX SERIES OUTPUT LABEL
LB-160225-00	SERIAL NUM GEN W OUTPUT PWR
LB-250220-00	EX-2500 FACEPLATE LABEL
MS-100005-FG	MX 2000 FAN GUARD
NW-040401-FW	#4 FLAT WASHER
NW-060010-IT	#6 INTERNAL TOOTH LOCKWASHER
NW-060410-ET	#6 EXTERNAL TOOTH LOCKWASHER
NW-080001-NW	#8 EXT TOOTH LOCKWASHER, ZINC
NW-080500-KP	#8-32 KEPS NUT
NW-100700-NW	#10 FLAT WASHER, NICKEL PLATED
NW-100710-NW	#10 EXT LOCKWASHER, NICKEL PLTD
PL-000000-AF	ADHESIVE FEET
PL-000003-CP	AC CORD PROTECTOR
PL-000037-PL	SOB-STRAIN RELIEF, EXPORT
PL-000038-PL	INSULATOR AC PCB
PL-000044-PL	BUSHING, STRAIN RELIEF
PL-905156-SP	SPACER, BIVAR 905-156
QD-250400-BX	BR-254, 25A 400 VOLT BR. RECT.
SC-030000-SC	3mm x 8mm,P/P,TYPE 1,BLK. OX.
SC-060042-PP	6-32 X 1/4" P/P ZINC, SEMS, IT
SC-060081-PP	#6-32 X 1/2" P/P BLACK
SC-080051-PS	#8-32 X 5/16" P/P SEMS BLACK
SC-080121-PP	#8-32X3/4" TYPE 1 P/P BLACK
SC-082051-PL	SCREW, TAP, PAN PH#8X5/16" "B"BK
SC-100000-SC	#10-32 X 1/4, TYPE I (PHILLIPS)
SC-100061-PS	#10-32 X 3/8" P/P SEMS BLACK
SW-000027-SW	DPST AC SWITCH
WC-003053-00	AC CORD, PREPPED
WC-003056-00	12 PIN MATE N LOC ASSY, BLACK
WC-003057-00	CABLE ASSY, RELAY/THERMAL
WC-003059-00	12 PIN MATE N LOC ASSY, GREY
WC-003060-00	AC SWITCH WIRE, RED/BLACK
WC-003061-00	AC SWITCH WIRE, RED, 13.62"
WC-003062-00	AC SWITCH WIRE, RED. 6.12"
WC-003069-00	A/C POWER CORD ASSEMBLY EXPORT
WP-004012-00	FAN ASSEMBLY
XF-002501-00	EX 2500 TRANSFORMER

EX 4000 Main Board Assembly

Part Number	Description	Reference			
CA-015100-BD	15pF, 100V, 10%, DISK	C918, 919	QD-000025-QD	OBS-IN5817, 15V MIN	D963, 964
CA-018100-CM	18PF, 100V, 5%, MICA	C914	QD-000031-QD	FET SWITCH, 60V, 50A	Q901, 902
CA-033100-CM	OBS-33PF, 100V, 5%, MICA	C905, 908	QD-0007.5-ZT	7.5V TESTED ZENER	Q903, 904
CA-068100-BD	68PF, 100V, 10%, DISK	C925, 928	QD-001302-PN	180V 12A TO3P TRANSISTOR	Q917, 918
		C950, 957			Q919, 920
CA-110100-BM	100PF, 100V, 5%, MICA	C923, 927	QD-001340-LR	RED T-1 3/4 LED, UTILITY	LD901-913
CA-122100-BD	220PF, 100V, 10%, DISK	C906, 910	QD-003281-NP	180V 12A TO3P TRANSISTOR	Q911, 912
CA-168100-BD	680PF, 100V, 10%, DISK"	C956			Q913, 914
CA-222200-BP	.0022UF, 200V, 10%, MYLAR	C915, 955			Q915, 916
CA-233100-BP	.0033UF, 100V, 10%, MYLAR	C961	QD-004004-DX	1N4004 DIODE	D935, 936
CA-310100-BP	.01UF, 100V, 10%, MYLAR	C911			D937, 938
CA-410050-AD	OBS -.1VF, 50V, 20%, DISK	C947, 948			D941, 942
		C949, 958			D944, 945
CA-410100-BP	.1UF, 100V, 10%, MYLAR	C901, 902			D946, 947
		C913, 912			D959, 966
		C917, 920	QD-004004-VP	VERTICAL PREP IN4004 DIODE	1/4W OR 9T
CA-412100-CP	.12UF, 100V, 5%, MYLAR	C916			400-35
CA-415100-CP	.15UF, 100V, 5%, MYLAR	C907, 909			8500-7
		C922, 926			D903,904
CA-610035-BE	10UF, 35V, ELEC., RADIAL, 10%	C903, 904			DIE P/N:
		C941, 942	QD-004148-DX	DIODE 1N4148	D909, 910
CA-647010-BN	47UF, 10V, RADIAL, NON-POLAR	C951			D913, 914
CA-647050-BE	47UF, 50V, ELEC., RADIAL, 10%	C943, 944			D922, 923
CA-710035-BE	100UF, 35V, ELEC., RADIAL, 10%	C953, 954			D925, 926
CA-722010-BN	220UF, 10V, RADIAL, NON-POLAR	C952			D930, 933
CA-747010-BE	470uF, 16V, ELEC., RADIAL, 20%	C921, 924			D948, 949
		C959, 960			D953, 954
CA-822035-AE	2200UF, 35V, ELEC., RADIAL,20%	C945, 946			D956, 957
CA-915050-AE	15000 UF, 50V, ELEC. RAD. 20%	C929, 930			D958, 960
		C931, 932			D961, 962
		C933, 934	QD-004410-TX	2N4410, TRANSISTOR, NPN, TO-92	Q925, 931
		C935, 936			Q936, 940
		C937, 938			Q944, 945
		C939, 940			Q949, 950
CO-000008-IC	8 PIN IC SOCKET	U901, 902			Q951, 952
CO-000038-CO	OBS-14 PIN HEADER	J903			Q953, 956
CO-000041-CO	PCB MOUNT 12 PIN HEADER ASSY	J901			Q957
CO-000042-CO	OBS-PCB TEST POINT	T1-T21	QD-004934-DX	1N4934 DIODE	D915, 917
CO-000045-CO	.156 HEADER 4 PIN	J902			D918, 919
CO-000046-CO	.156 HEADER 5 PIN	J904			D927, 932
IC-005532-OP	5532 OP-AMP	U901, 902	QD-005402-DX	1N5402 DIODE	D907, 908
MS-000048-HS	HEAT SINK, ISOL TO-220	Q933,934	QD-007815-QD	15V REGULATOR, POSITIVE	U904
MS-001220-HS	TO-220 HEATSINK AAVID 5939B	U904, 905	QD-007915-QD	15V REGULATOR, NEGATIVE	U905
PC-004000-00	OBS-EX-4000 POWER AMP PCB		QD-008599-TX	MPS 8599 TRANSISTOR, PNP	Q921, 922
PL-903125-SP	BIVAR 903-125 SPACER	REF. R931			Q924, 930
PL-905156-SP	SPACER, BIVAR 905-156	L901			Q935, 939
		LD901-913			Q943, 946
PT-110000-AT	100 OHM TRIMPOT	VR901			Q947, 948
PT-250000-AT	5K OHM TRIMPOT	VR902, 903	QD-008599-TX	MPS 8599 TRANSISTOR, PNP	Q954, 955
QD-000009-VT	VACTEC VTL 5C4	U903	QD-1.5200-BX	1.5A 200 VOLT BRIDGE RECTIFIER	B901, 902
QD-000014-QD	DIODE, FAST, 100V, 15 AMP	D901, 902	RE-.02205-FW	.22 OHM, 3WATT, WIREWOUND, 10%	R924, 925
QD-000014-QD	DIODE, FAST, 100V, 15 AMP	D905, 906			R926, 928
QD-000018-QD	2SC3298B DRIVER TRANSISTOR	Q934			R929, 930
QD-000019-QD	2SA1306B DRIVER TRANSISTOR	Q933			R949, 950
QD-000022-QD	IN4746, 18V ZENER, 1W	D939, 940			R951, 952
		D943			R953, 954
QD-000023-QD	IN5955, 180V ZENER, 1.5W	D921, 924	RE-.27005-EM	2.7 OHM, 2 WATT, METAL OX, 5%	R903, 910
QD-000024-QD	IN4735, 6.2V ZENER, 1W	D950, 952			R958, 961
		D955			

EX 4000 Main Board Assembly (cont.)

Part Number	Description	Reference
RE-.39005-EM	3.9 OHM, 2WATT METAL OXIDE 5%	R932
RE-.47005-DM	4.7 OHM, 1 WATT METAL OXIDE 5%	R937, 938 R939
RE-000050-NR	SC-50 NTC RESISTOR	R931
RE-000060-PT	OBS-60 C PTC RESISTOR	R1007
RE-001005-EM	10 OHM, 2 WATT, METAL OXIDE 5%	R933, 934 R935, 936
RE-002205-DM	22 OHM, 1 WATT, METAL OXIDE 5%	R927, 955
RE-004705-BC	47 OHM, 1/4 WATT, CARBON, 5%	R941
RE-010005-BC	100 OHM, 1/4 WATT, CARBON, 5%	R901, 902 R906, 907 R959, 960 R963, 964 R997
RE-033201-BM	332 OHM, 1/4 WATT, MET.FILM,1%	R947, 948 R993
RE-047005-DM	470 OHM, 1 W, MET. OXIDE, 5%	R982, 983 R987, 992 R998
RE-060401-BM	604 OHM, 1/4 WATT, MET.FILM, 1%	R916, 919
RE-078701-BM	787 OHM, 1/4 WATT, MET FILM, 1%	R970, 980
RE-110004-DM	OBS-1K OHM 1W, METAL OXIDE, 5%	R984
RE-110005-BC	1K OHM, 1/4 WATT, CARBON, 5%	R1006 R945, 946 R965, 972 R991, 1002
RE-120006-BM	OBS-2K OHM, 1 WATT, MET. OX.5%	R962
RE-127005-BC	2.7K OHM, 1/4 WATT, CARBON, 5%	R995
RE-130005-EM	3K OHM, 2 WATT, MET. OXIDE 5%	R956
RE-147005-BC	4.7K OHM, 1/4 WATT, CARBON, 5%	R967, 975 R986, 990
RE-210001-BM	10.0K OHM, 1/4W., MET. FLM. 1%	R1005 R985, 1004
RE-210005-EM	10K OHM, 2 WATT, MET. OXIDE 5%	R1000 R911, 917 R988, 994
RE-212005-BC	12K OHM, 1/4 WATT 5% CARBON	R914, 922
RE-215001-BM	15.0K OHM, 1/4 WATT, MET.FILM 1%	R913, 921 R989, 1001
RE-221501-CM	21.5K OHM, 1/2 WATT, MET.FM 1%	R940
RE-222006-BM	22K OHM, 1 WATT, METAL OXIDE,5%	R904, 905
RE-224005-BC	24K OHM, 1/4 WATT, CARBON, 5%	R968, 978
RE-247005-BC	47K OHM, 1/4 WATT, CARBON 5%	R969, 979
RE-247005-DM	47K OHM, 1W, 5% METAL OXIDE	
RE-275001-BM	75K OHM, 1/4 WATT, MET. FLM 1%	R942
RE-310005-BC	100K OHM, 1/4 WATT. CARBON 5%	R1003 R908, 920 R966, 973 R981
RE-339005-BC	390K OHM, 1/4 WATT, CARBON 5%	
RE-375005-BM	750K OHM, 1/2W, METAL FLM, 5%	R943, 944
RN-110002-BM	1K OHM SIP 8 PIN	RN901, 903 RN910, 913
RN-147002-BM	4.7K OHM, 8 PIN, SIP	RN908
RN-210002-BM	10K OHM, 8 PIN, SIP	RN902, 904 RN905, 906 RN909, 911 RN914
RN-222002-BM	22K OHM, 8 PIN, SIP	RN907, 912
WC-0.5018-JW	.5" JUMPER, WHT., 18 GA, SOLID	W901-905

WC-200010-SQ
XF-200014-CR

OBS-.40X .062 INSULATING SLV.
2UH, 14 GA, COIL/VERTICAL

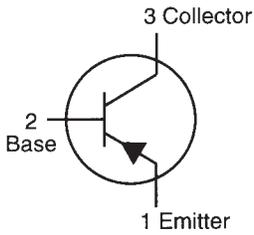
REF. R1007
L901

EX 4000 Chassis Assembly

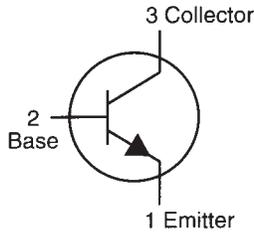
Part Number	Description
CH-004113-00	INPUT PANEL, LOWER EX SERIES
CH-140210-BX	1400 KNOB FABRICATION
CH-400010-00	EX-4000 RACK EAR
CH-400012-00	DISPLAY PCB SHIELD
CH-400016-00	BLANK UPPER INPUT PANEL
CH-420000-00	CHASSIS 3 SPACE, EX/MX SERIES
CO-000001-DB	DUAL BINDING POST
HW-060000-HW	#6-32 x 9/16", NYLON STANDOFF
HW-060080-HW	#6-32 X 1/2" HEX M/F STANDOFF
HW-060090-SO	#6-32 X 9/16" HEX STANDOFF
HW-060150-SO	#6-32 X 29/32" STANDOFF
HW-080002-HW	#8-32 x 2.5", HEX STANDOFF
HW-100001-HW	#10-32 x .75" HEX S/O,NIC PLTD
LB-004001-00	LBL, INPUT PNL,LWR,EX SERIES"
LB-100000-CT	CHASSIS CONTROL TAG
LB-160221-00	EX SERIES OUTPUT LABEL
LB-160225-00	SERIAL NUM GEN W OUTPUT PWR
LB-400220-00	EX-4000 FACEPLATE LABEL
MS-100005-FG	MX 2000 FAN GUARD
NW-040401-FW	#4 FLAT WASHER
NW-060010-IT	#6 INTERNAL TOOTH LOCKWASHER
NW-060410-ET	#6 EXTERNAL TOOTH LOCKWASHER
NW-080001-NW	#8 EXT TOOTH LOCKWASHER, ZINC
NW-080500-KP	#8-32 KEPS NUT
NW-100700-NW	#10 FLAT WASHER, NICKEL PLATED
NW-100710-NW	#10EXT LOCKWASHER, NICKEL PLTD
PL-000000-AF	ADHESIVE FEET
PL-000003-CP	AC CORD PROTECTOR
PL-000037-PL	SOB-STRAIN RELIEF, EXPORT
PL-000038-PL	INSULATOR AC PCB
PL-000044-PL	BUSHING, STRAIN RELIEF
PL-905156-SP	SPACER, BIVAR 905-156
QD-250400-BX	BR-254, 25A 400 VOLT BR. RECT.
SC-030000-SC	3mm x 8mm, P/P,TYPE 1,BLK. OX.
SC-060042-PP	6-32 X 1/4" P/P ZINC, SEMS, IT"
SC-060081-PP	#6-32 X 1/2" P/P BLACK
SC-080051-PS	#8-32 X 5/16" P/P SEMS BLACK
SC-080121-PP	#8-32X3/4" TYPE 1 P/P BLACK
SC-082051-PL	SCREW, TAP, PAN PH#8X5/16" "B"BK
SC-100000-SC	#10-32 X 1/4, TYPE I (PHILLIPS)
SC-100061-PS	#10-32 X 3/8" P/P SEMS BLACK
SW-000027-SW	DPST AC SWITCH
WC-003053-00	AC CORD, PREPPED
WC-003056-00	12 PIN MATE N LOC ASSY, BLACK
WC-003057-00	CABLE ASSY, RELAY/THERMAL
WC-003059-00	12 PIN MATE N LOC ASSY, GREY
WC-003060-00	AC SWITCH WIRE, RED/BLACK
WC-003061-00	AC SWITCH WIRE, RED, 13.62"
WC-003062-00	AC SWITCH WIRE, RED. 6.12"
WC-003069-00	A/C POWER CORD ASSEMBLY EXPORT
WP-004012-00	FAN ASSEMBLY
XF-004000-00	EX 4000 TRANSFORMER

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MPS8598
MPS8599
PNP



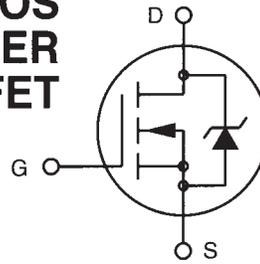
2N4409
2N4410
NPN



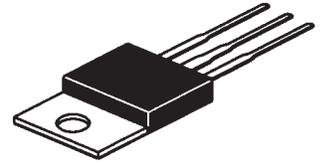
SMALL SIGNAL TRANSISTORS



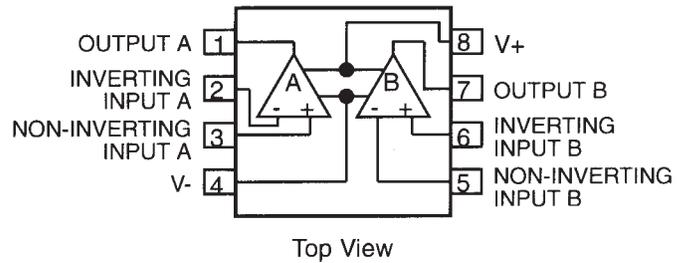
TMOS POWER FET



MTP50N6E

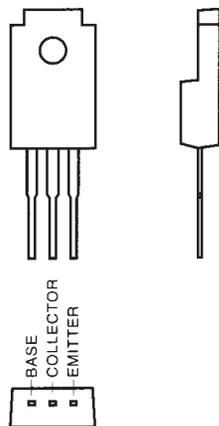


NE5532AN OP AMP



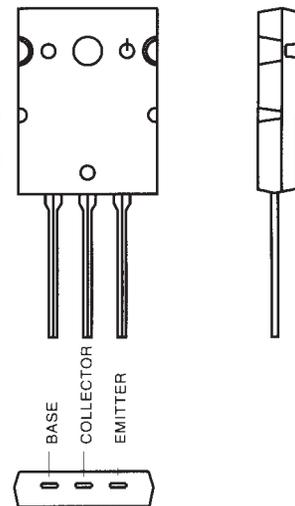
DRIVER TRANSISTORS

2SA1306 PNP
2SC3298 NPN

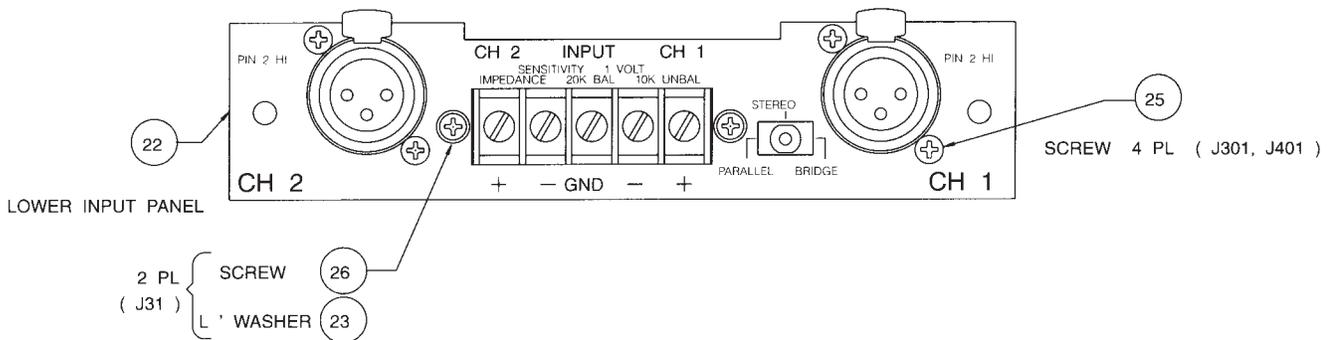
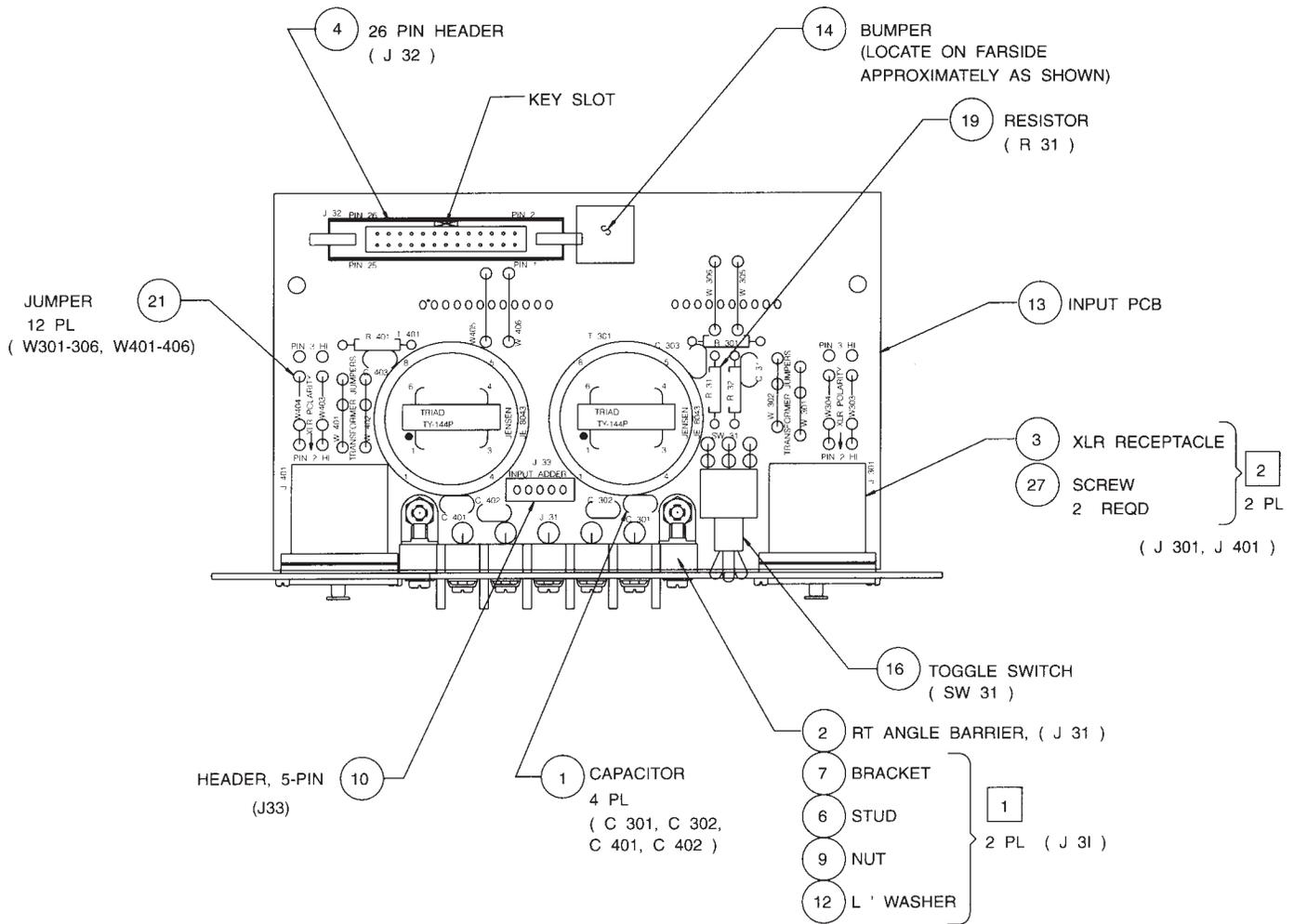


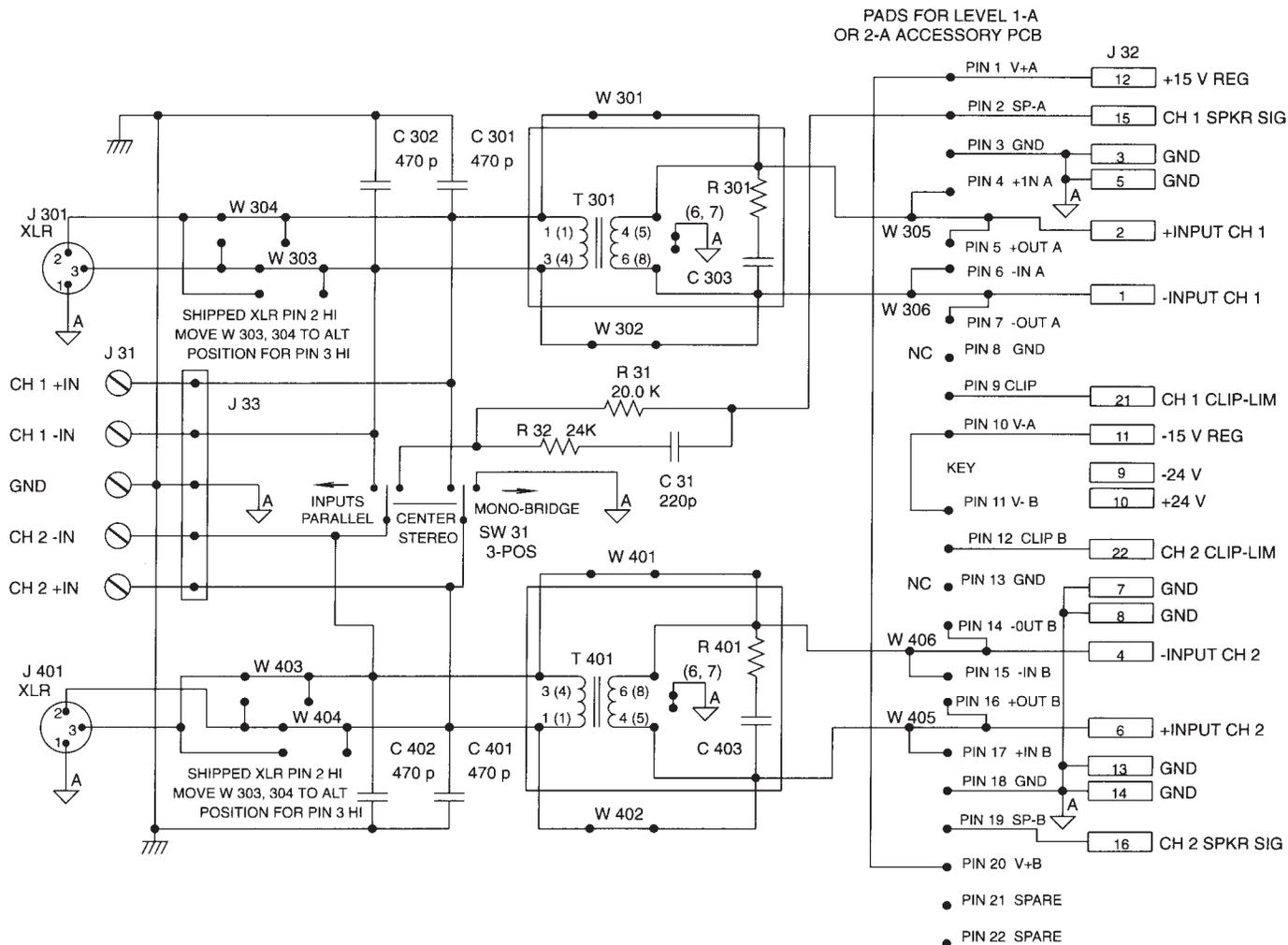
POWER TRANSISTORS

2SA1302 PNP
2SC3281 NPN



Lower Input PCB Assembly



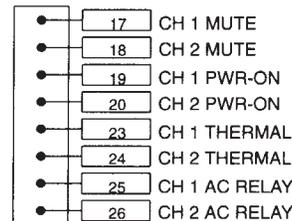


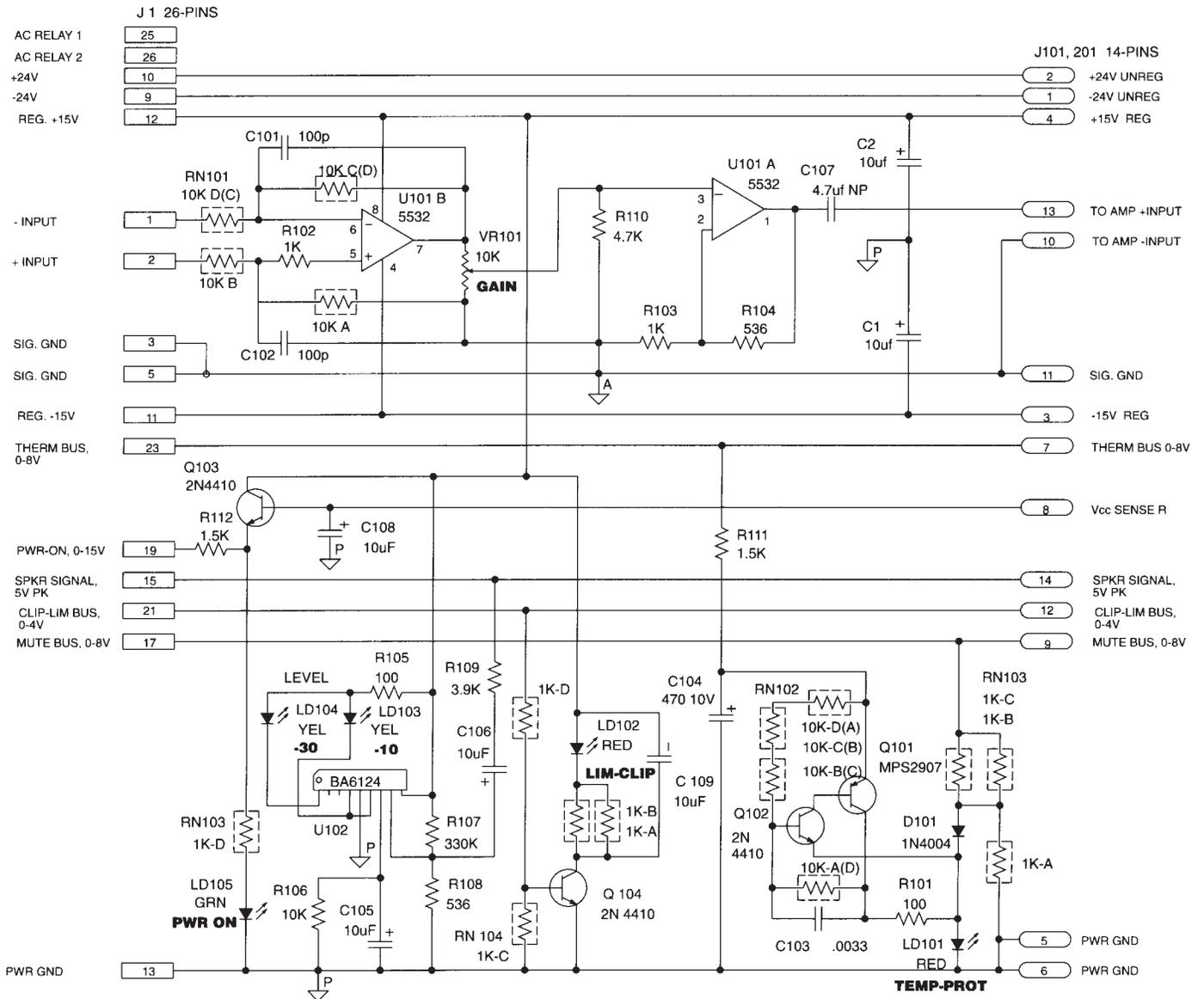
NOTES, ALL REV LEVELS

1. ALL RESISTORS 1/4W, 5%.
2. ALL CAPACITORS 100V
3. J 32, 26-PIN CONNECTOR, TO J 1 ON FRONT DISPLAY BOARD PC-004001-00.
4. PARTS FOR CH 1 NUMBERED 301-399.
5. PARTS FOR CH 2 NUMBERED 401-499.
6. PARTS IN COMMON TO BOTH CHANNELS NUMBERED 31-49.
7. BOARD SHIPPED WITH W 301-304, W 401-404 MOUNTED AS SHOWN.
8. PARTS WITHIN DOTTED OUTLINE FOR USER MODIFICATION. SEE MANUAL.

NOTES, REV LEVELS A-B

1. THE FIRST YEAR OF PRODUCTION EX AMPLIFIERS SHIPPED WITH PC-004002-00 REV A OR B
2. FOR PC-004005-00 REV A, ADDED PADS 1-20 FOR LEVEL 1-A, 2-A INPUT ACCESSORY PCB
3. ADDED J33, 5-PIN INPUT EXTENDER HEADER AND W305,306,405 & 406.
4. NO CHANGE IN PINOUT OF J32, PINS 1-26
5. SW-31 WAS REVISED ON PC-004005-00 REV A, BUT WILL NOT AFFECT FUNCTION OF UPPER SLOT PCB.





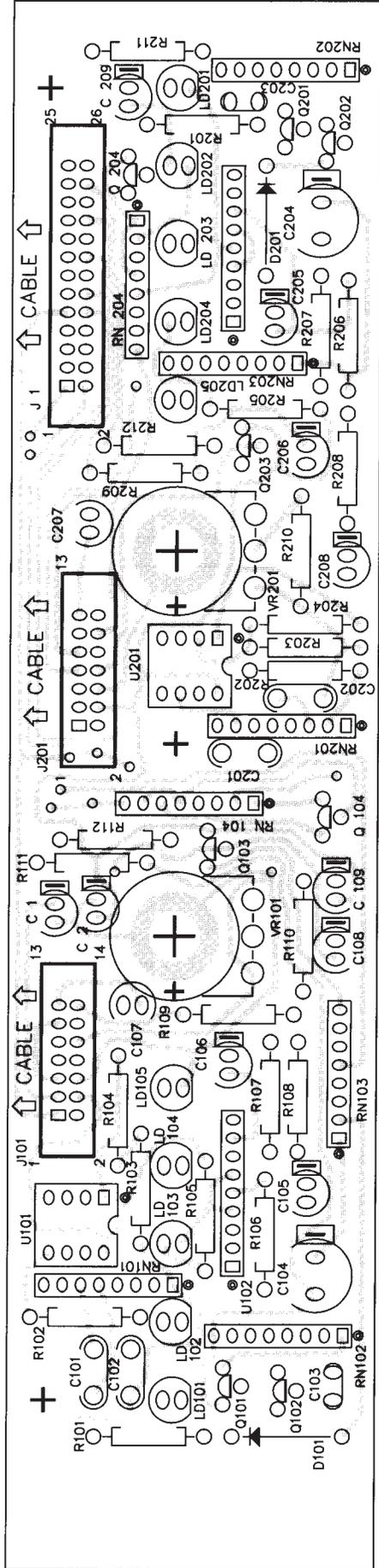
CH 2 PINS

- INPUT	4
+ INPUT	6
SIG. GND	7
SIG. GND	8
THERM BUS, 0-8V	24
PWR-ON, 0-15V	19
SPKR SIGNAL, 5V PK	16
CLIP-LIM BUS, 0-4V	22
MUTE BUS, 0-8V	18
PWR GND	14

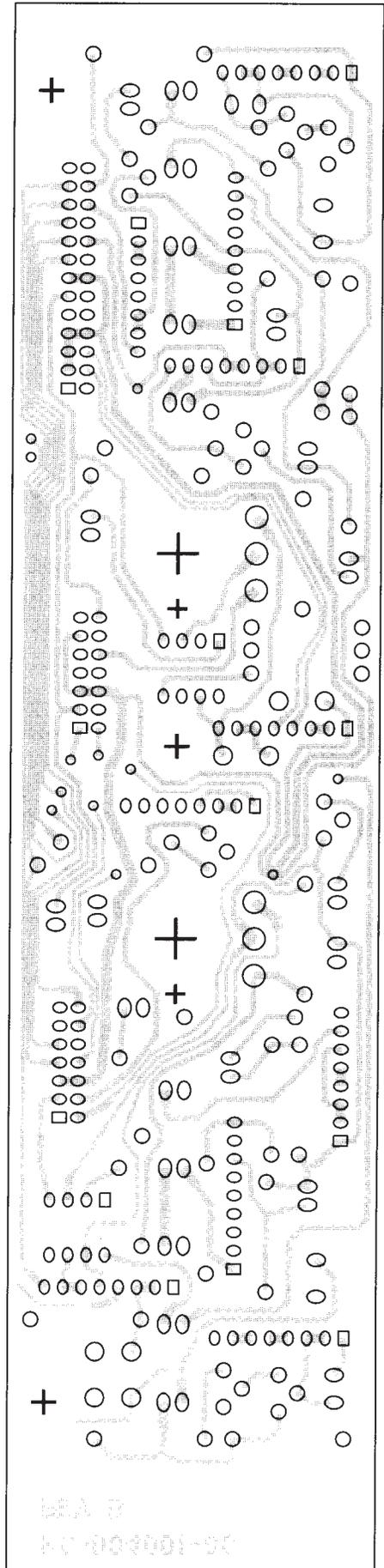
- NOTES**
1. ALL RESISTORS 1/4 WATT UNLESS SPECIFIED.
 2. ALL CAPACITORS 25V UNLESS SPECIFIED.
 3. CH 2 RESISTOR NETWORK SECTIONS () WHEN DIFFERENT.
 4. CH 1 COMPONENTS NUMBERED 101-199
 5. CH 2 COMPONENTS NUMBERED 201-299.
 6. PARTS IN COMMON TO BOTH CHANNELS NUMBERED 1-99.
 7. U102, 202 ROHM BA6124 OR SAMSUNG KA2284/85
 8. LD 101, 102, HIGH-EFFICIENCY RED LED.
 9. LD 103, 104, HIGH-EFFICIENCY YELLOW LED.
 10. LD 105, HIGH-EFFICIENCY GREEN LED.

Display Circuit Board Component and Solder Side

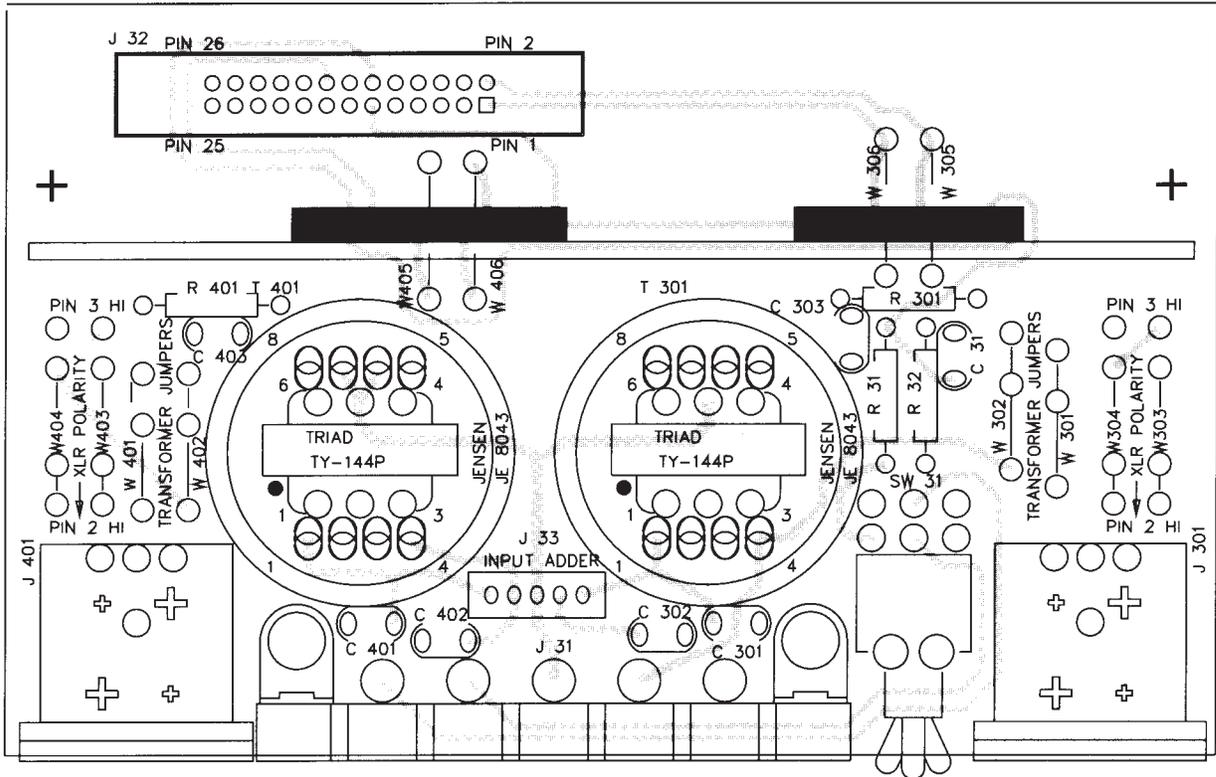
Component Side



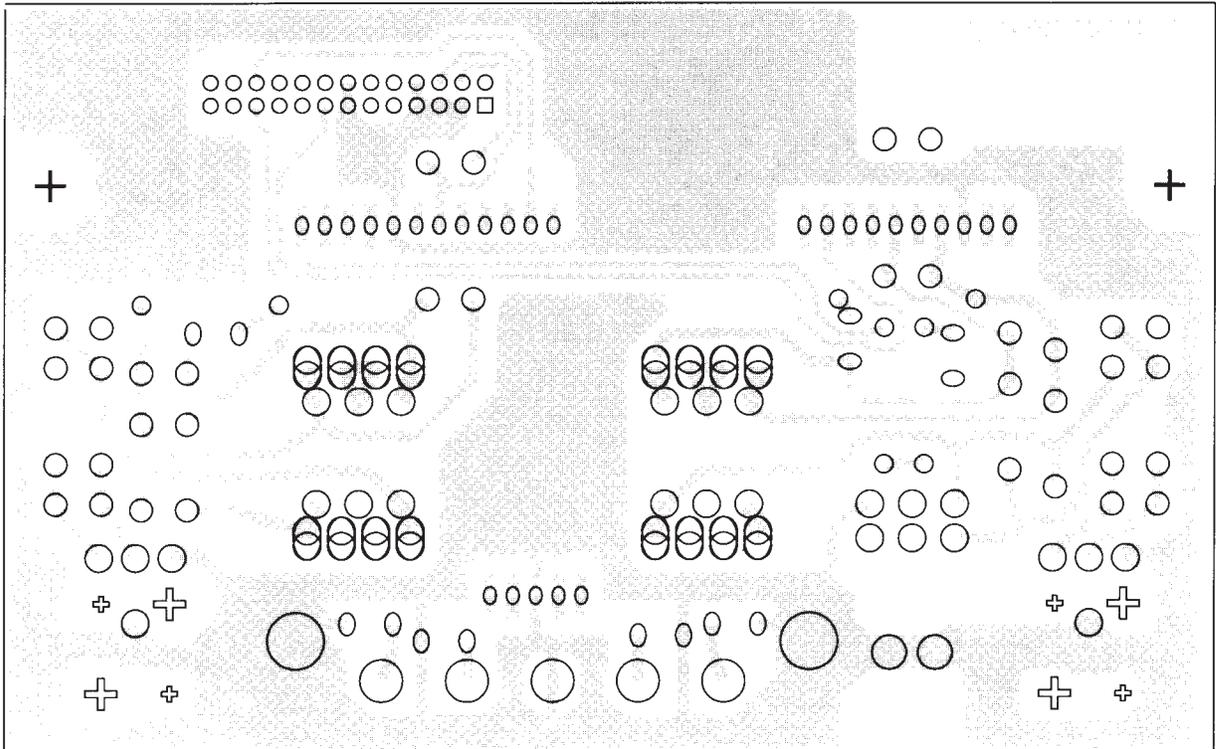
Solder Side (viewed through component side)



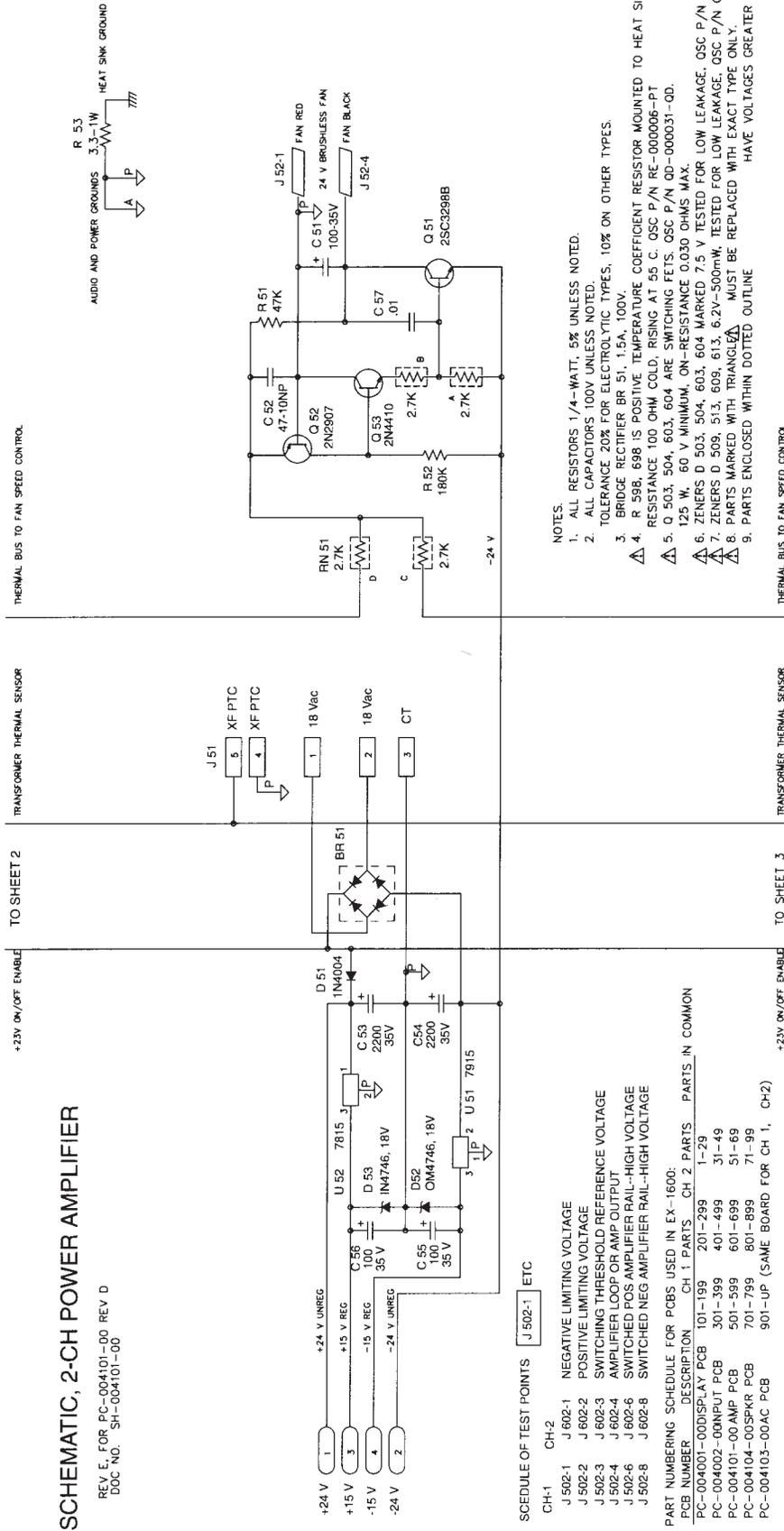
Component Side



Solder Side (viewed through Component Side)



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SCHEMATIC, 2-CH POWER AMPLIFIER

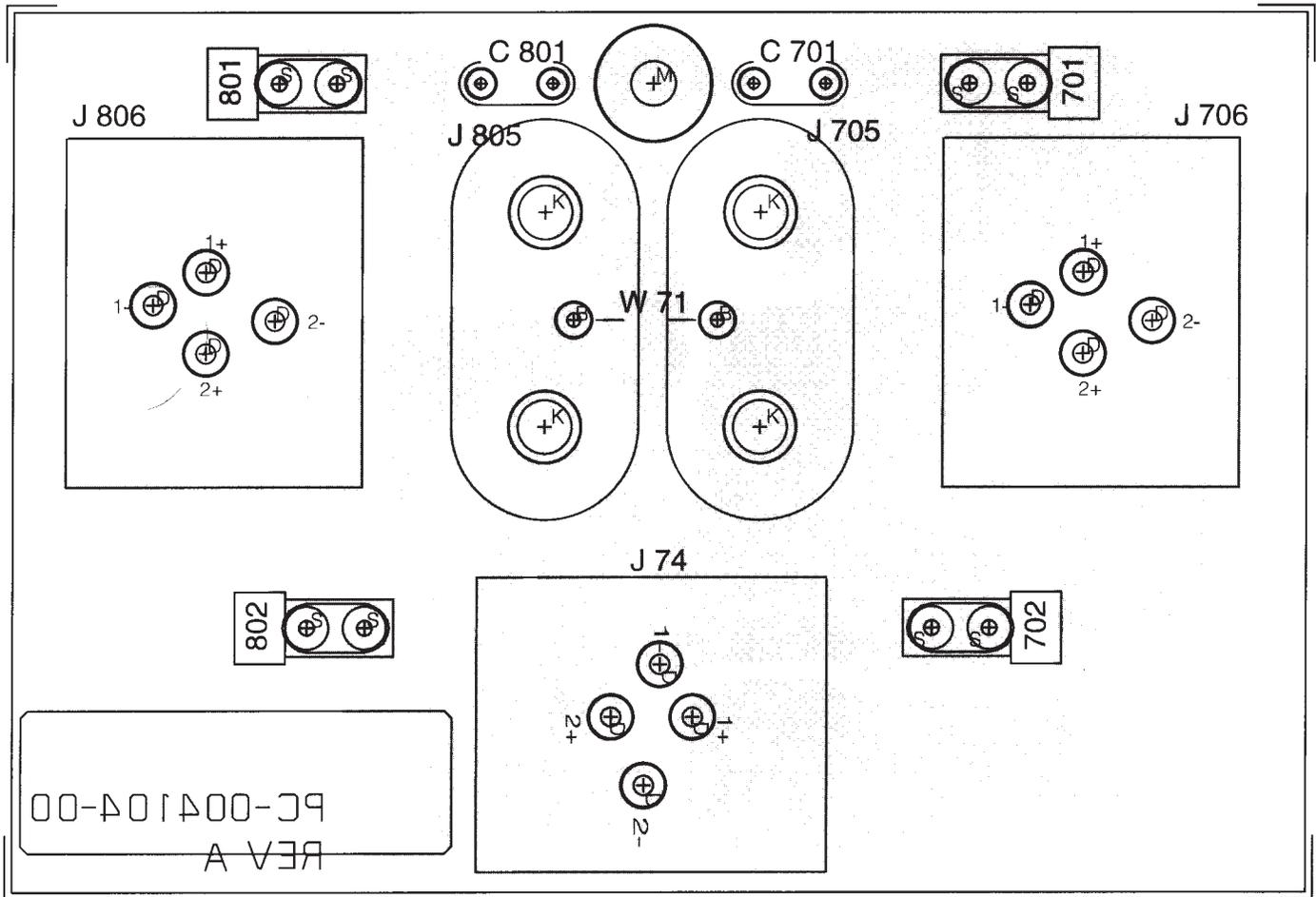
REV. E, FOR PC-004101-00 REV D
DOC NO. SH-004101-00

SCHEDULE OF TEST POINTS J 502-1 ETC

CH-1	CH-2	CH 1 PARTS	CH 2 PARTS	PARTS IN COMMON
J 502-1	J 602-1	101-199	201-299	1-29
J 502-2	J 602-2	301-399	401-499	31-49
J 502-3	J 602-3	501-599	601-699	51-69
J 502-4	J 602-4	701-799	801-899	71-99
J 502-5	J 602-5	901-UP	(SAME BOARD FOR CH 1, CH2)	

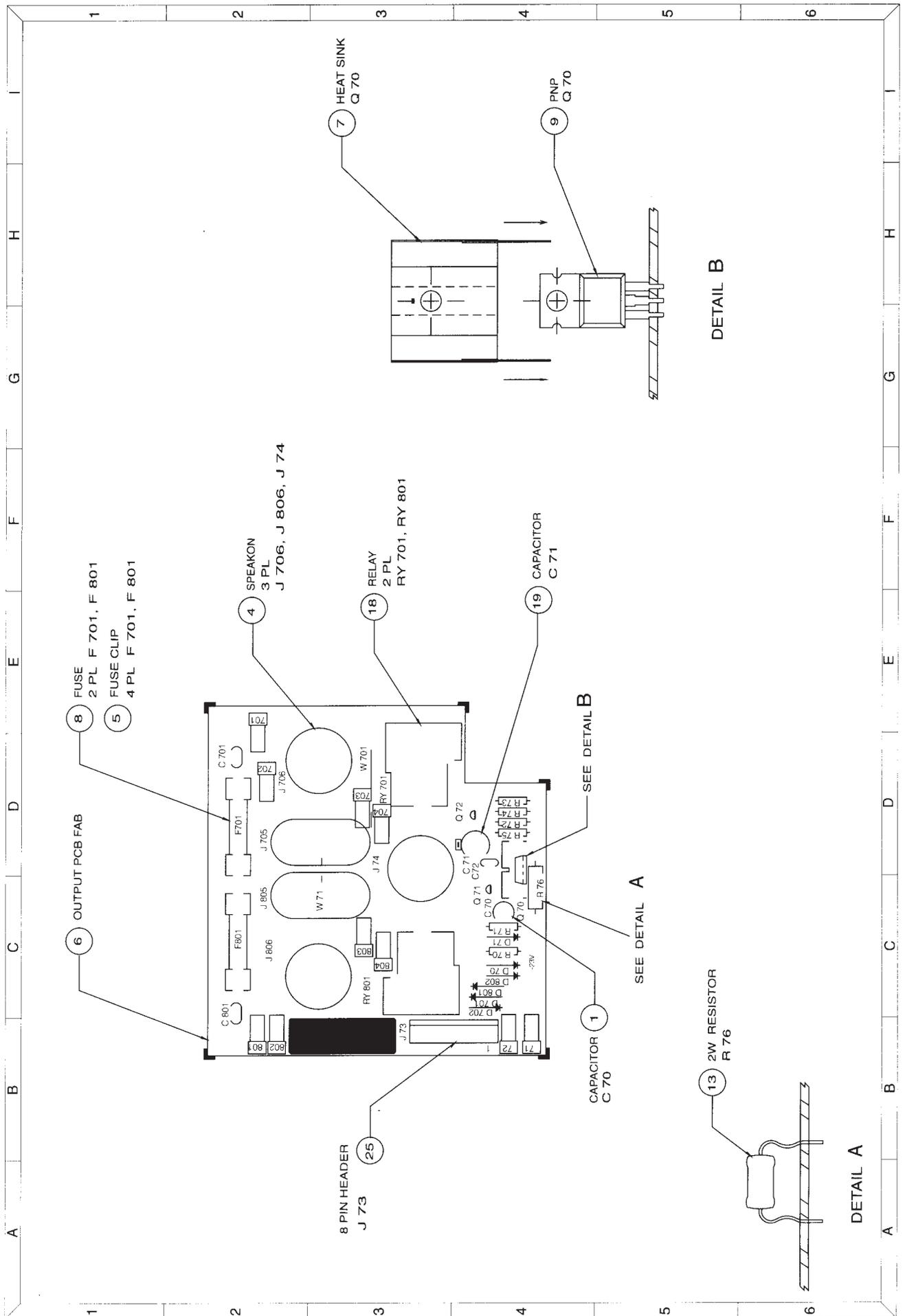
- NOTES:**
1. ALL RESISTORS 1/4-WATT, 5% UNLESS NOTED.
 2. ALL CAPACITORS 100V UNLESS NOTED.
 3. TOLERANCE 20% FOR ELECTROLYTIC TYPES, 10% ON OTHER TYPES.
 4. BRIDGE RECTIFIER BR 51, 1.5A, 100V.
 5. Q 503, 504, 603, 604 ARE SWITCHING FETS. OSC P/N QD-000006-PT RESISTANCE 100 OHM COLD, RISING AT 55 C. OSC P/N QD-000031-QD.
 6. ZENERS D 503, 504, 603, 604 MARKED 0.030 OHMS MAX.
 7. ZENERS D 509, 513, 609, 613, 6.2V-500mW. TESTED FOR LOW LEAKAGE. OSC P/N QD-000024-QD.
 8. PARTS MARKED WITH TRIANGLE MUST BE REPLACED WITH EXACT TYPE ONLY.
 9. PARTS ENCLOSED WITHIN DOTTED OUTLINE HAVE VOLTAGES GREATER THAN 42V.

Output Circuit Board Component Side

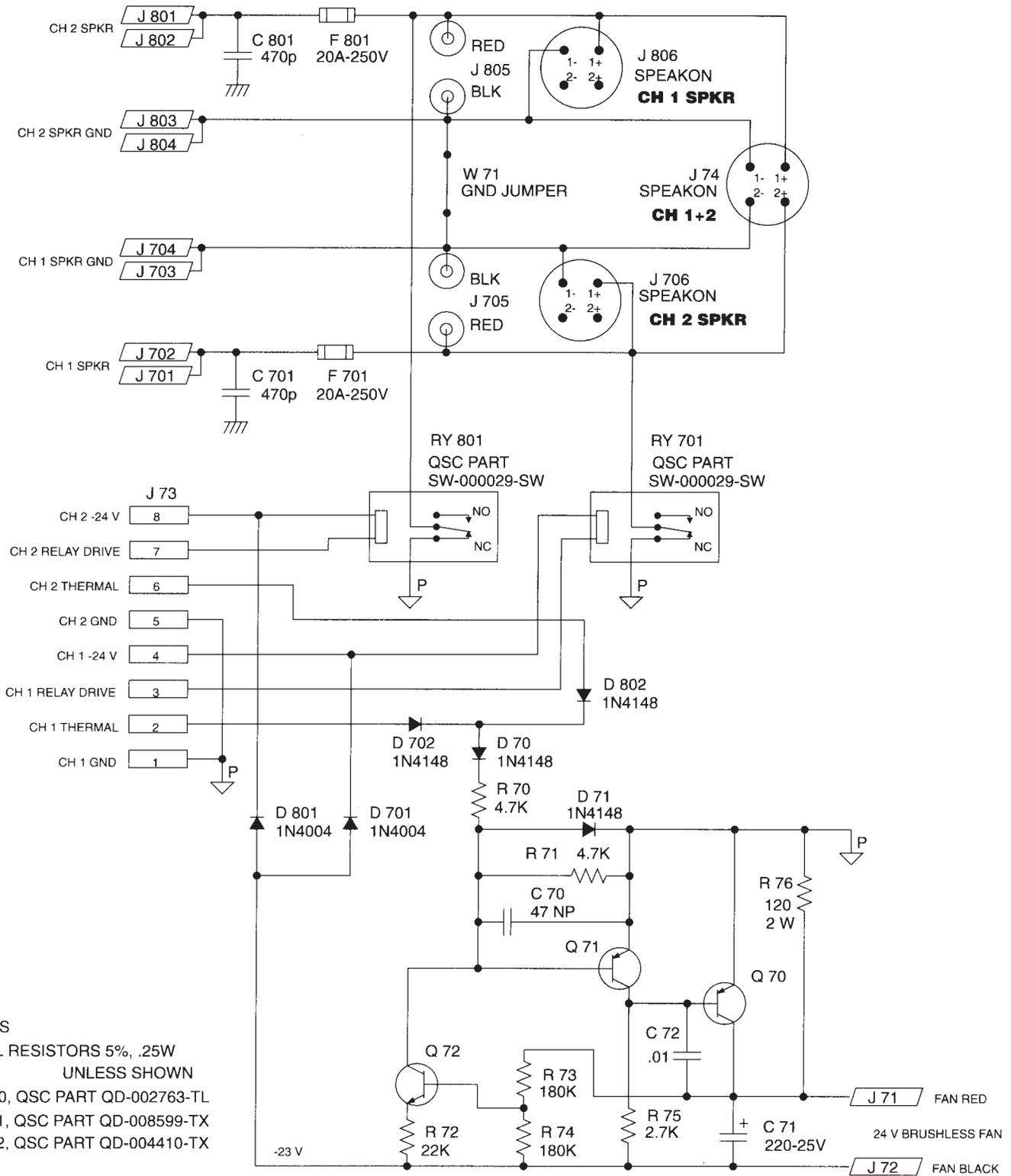


SOLDER SIDE

OUTPUT PCB

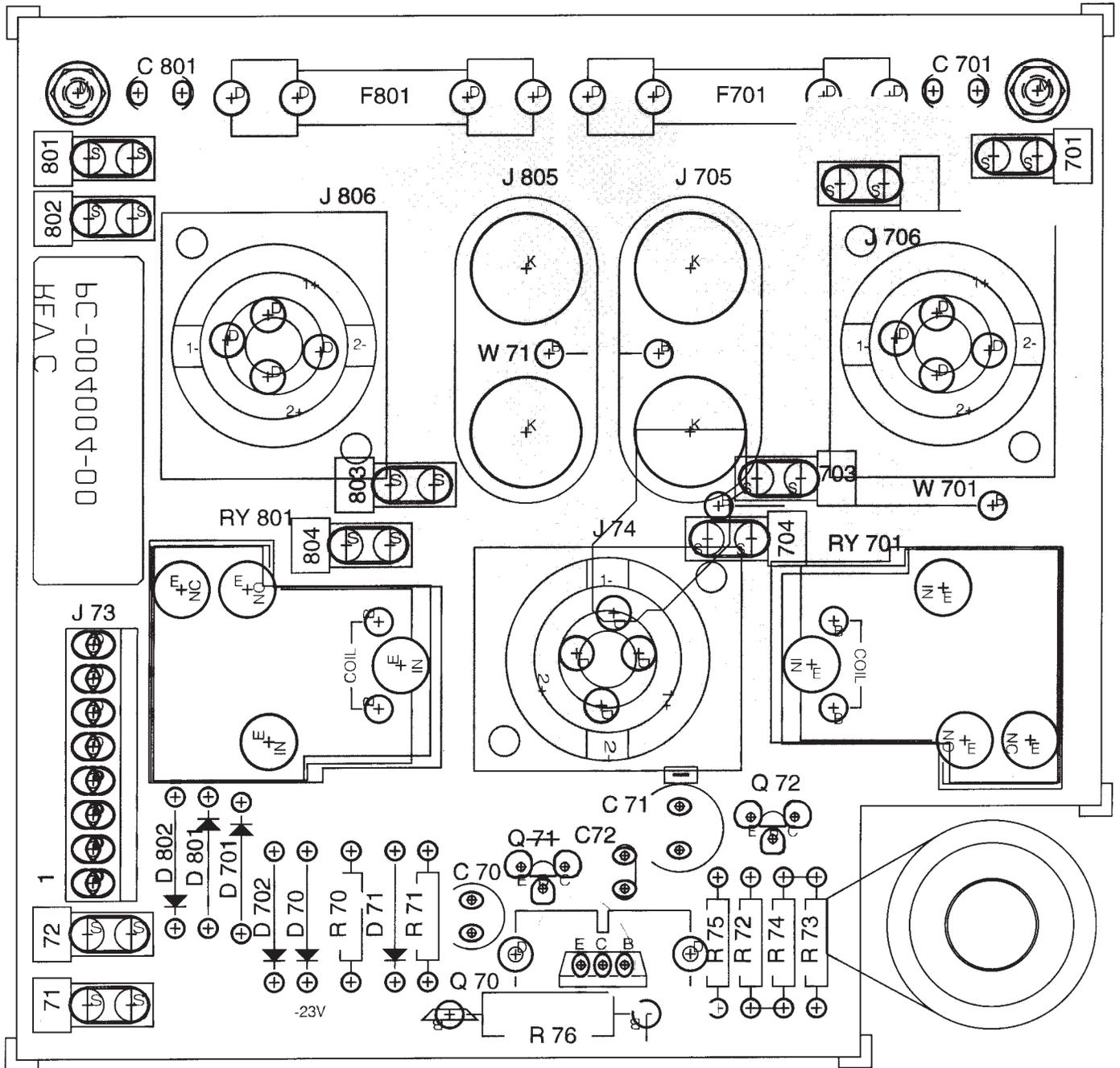


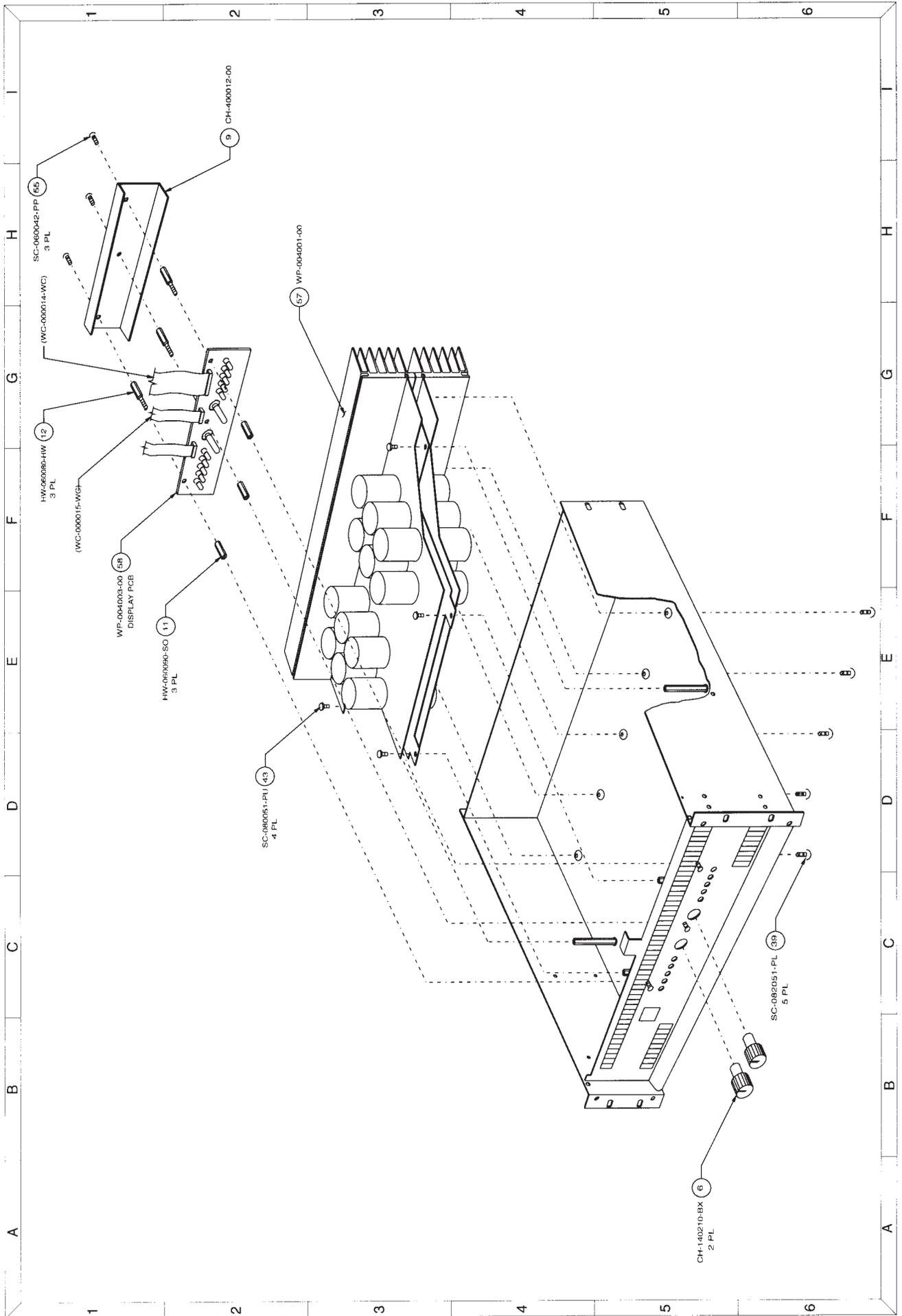
Output PCB Schematic

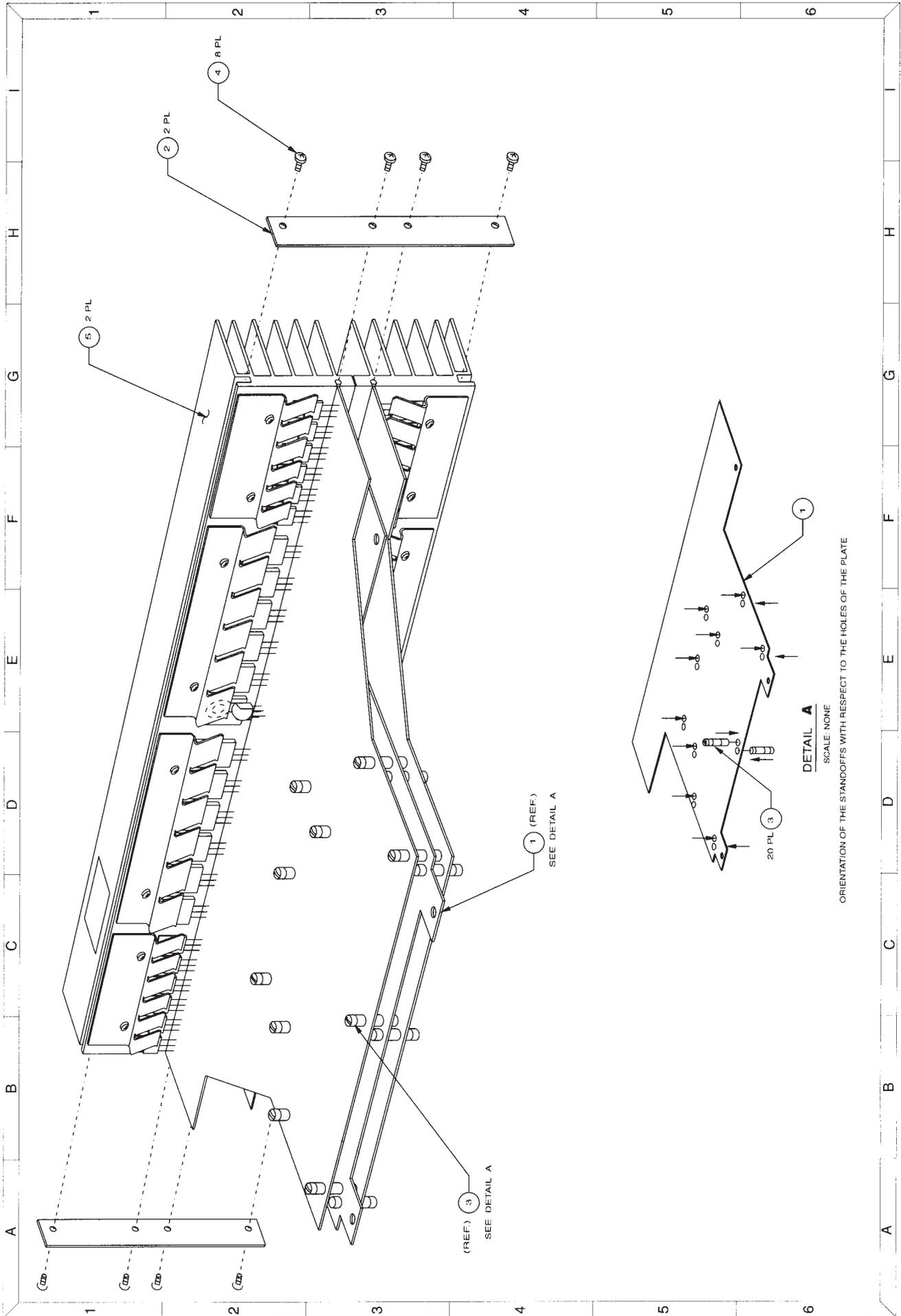


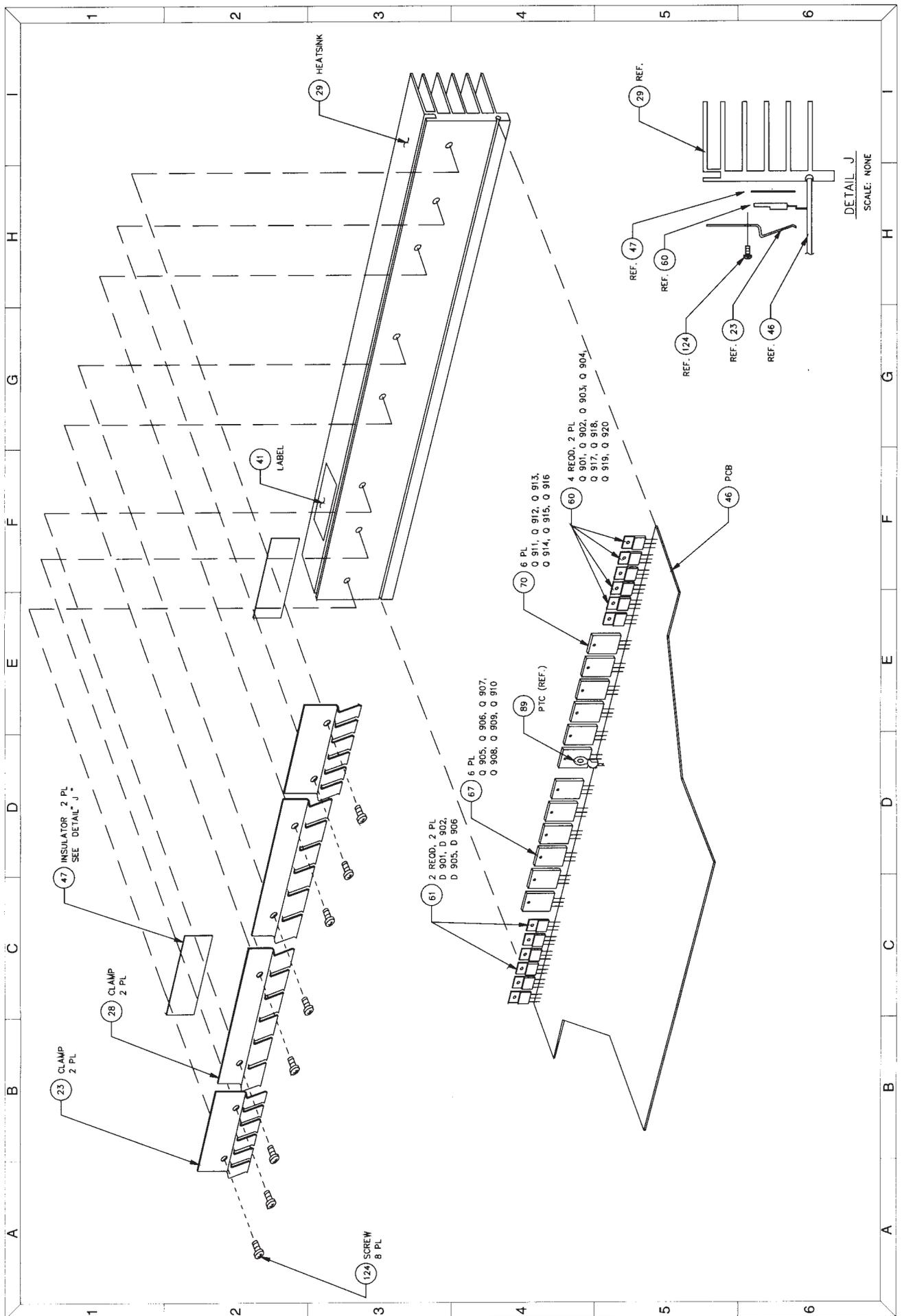
NOTES

1. ALL RESISTORS 5%, .25W UNLESS SHOWN
2. Q 70, QSC PART QD-002763-TL
3. Q 71, QSC PART QD-008599-TX
4. Q 72, QSC PART QD-004410-TX

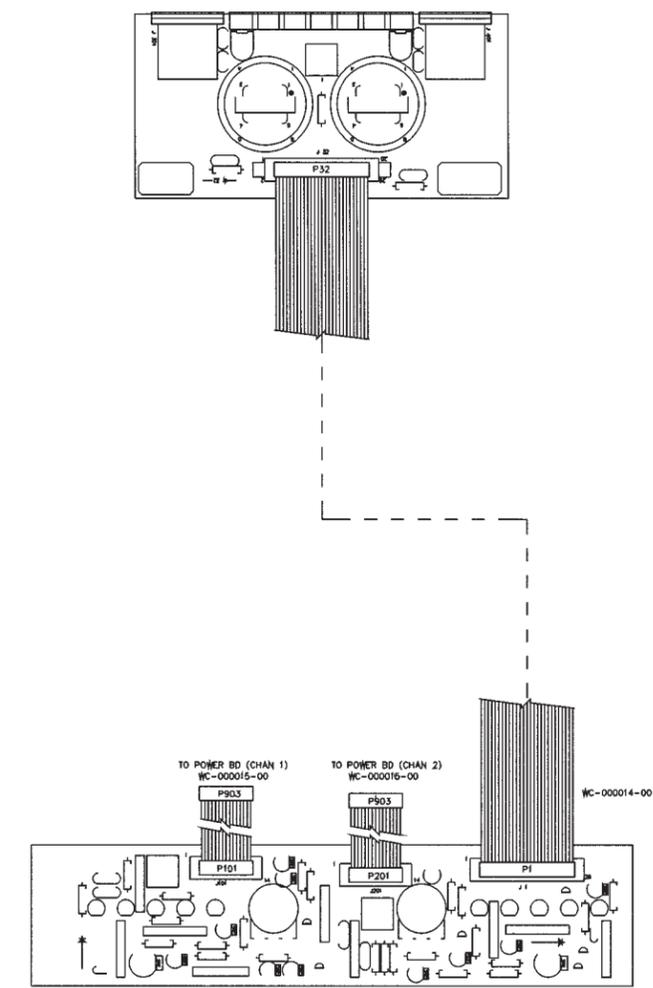
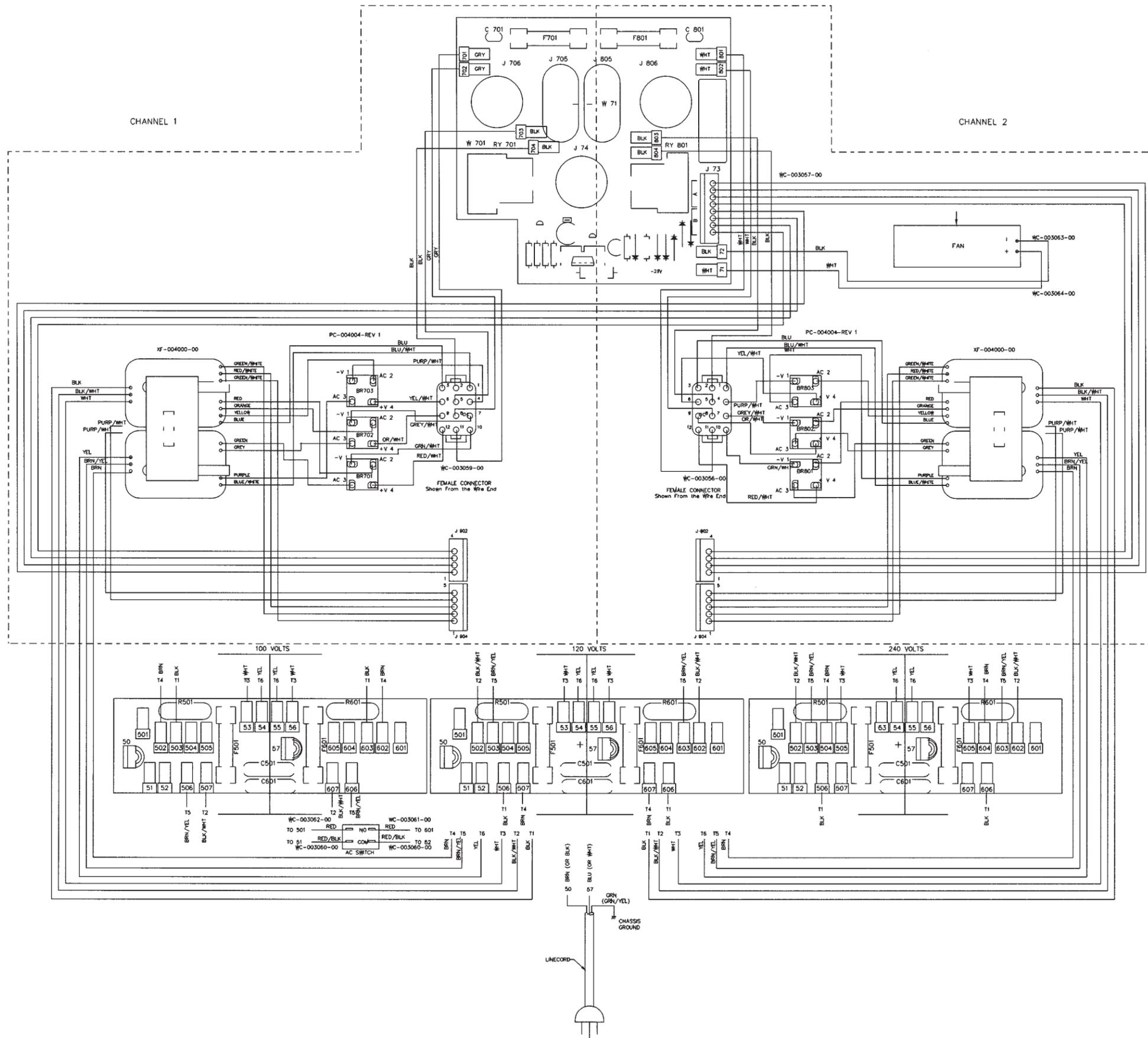


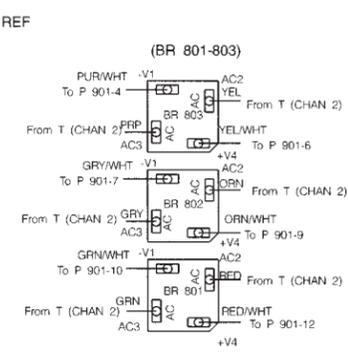
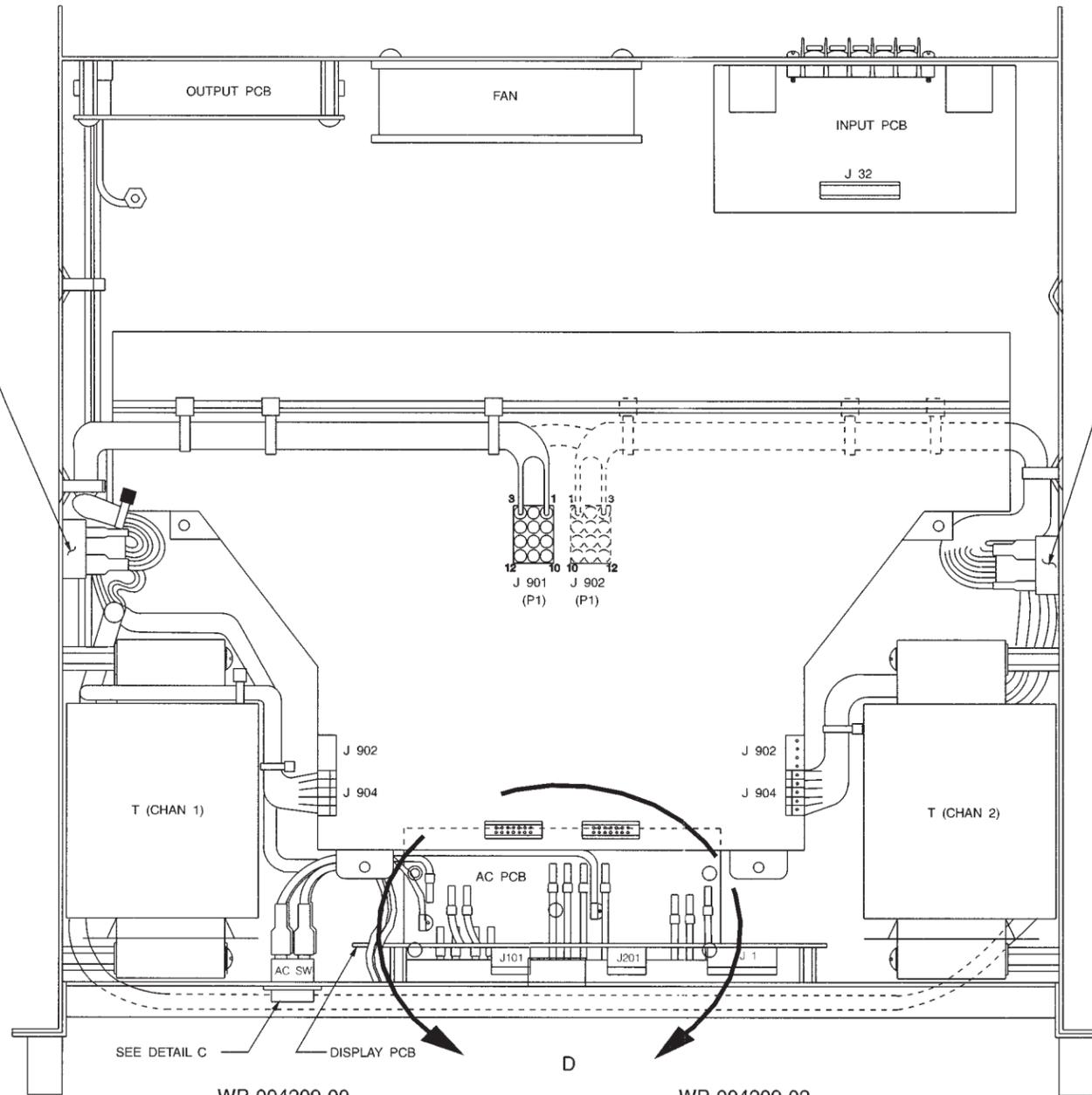
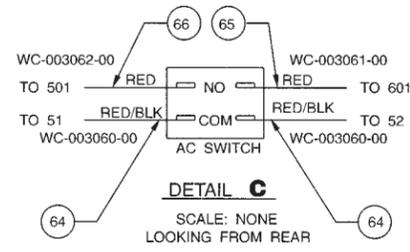






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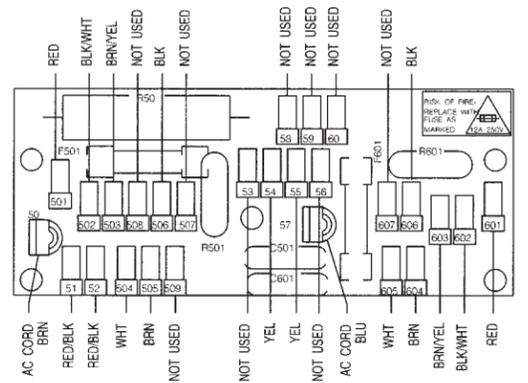
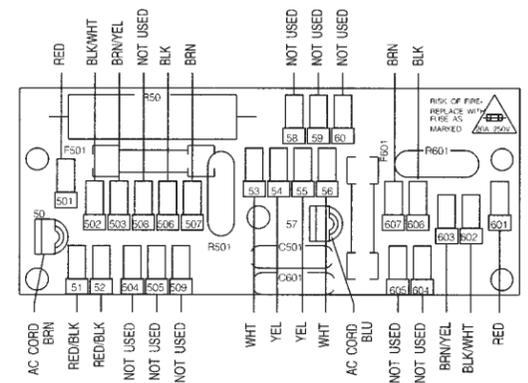
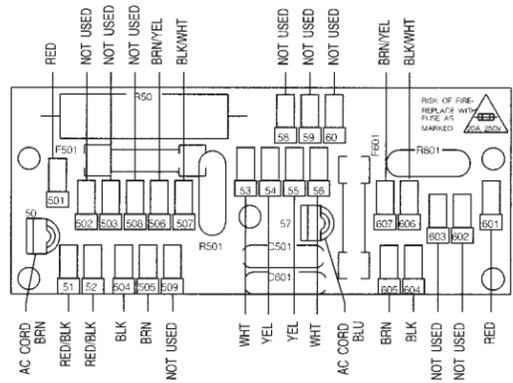




WP-004209-01
100 VOLTS

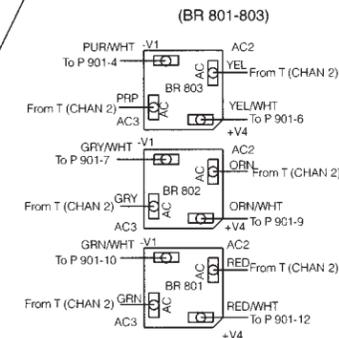
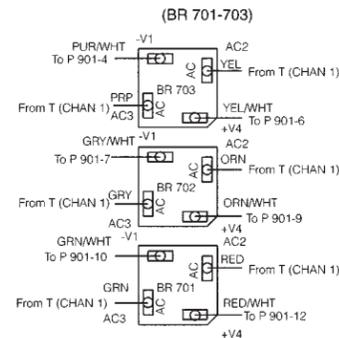
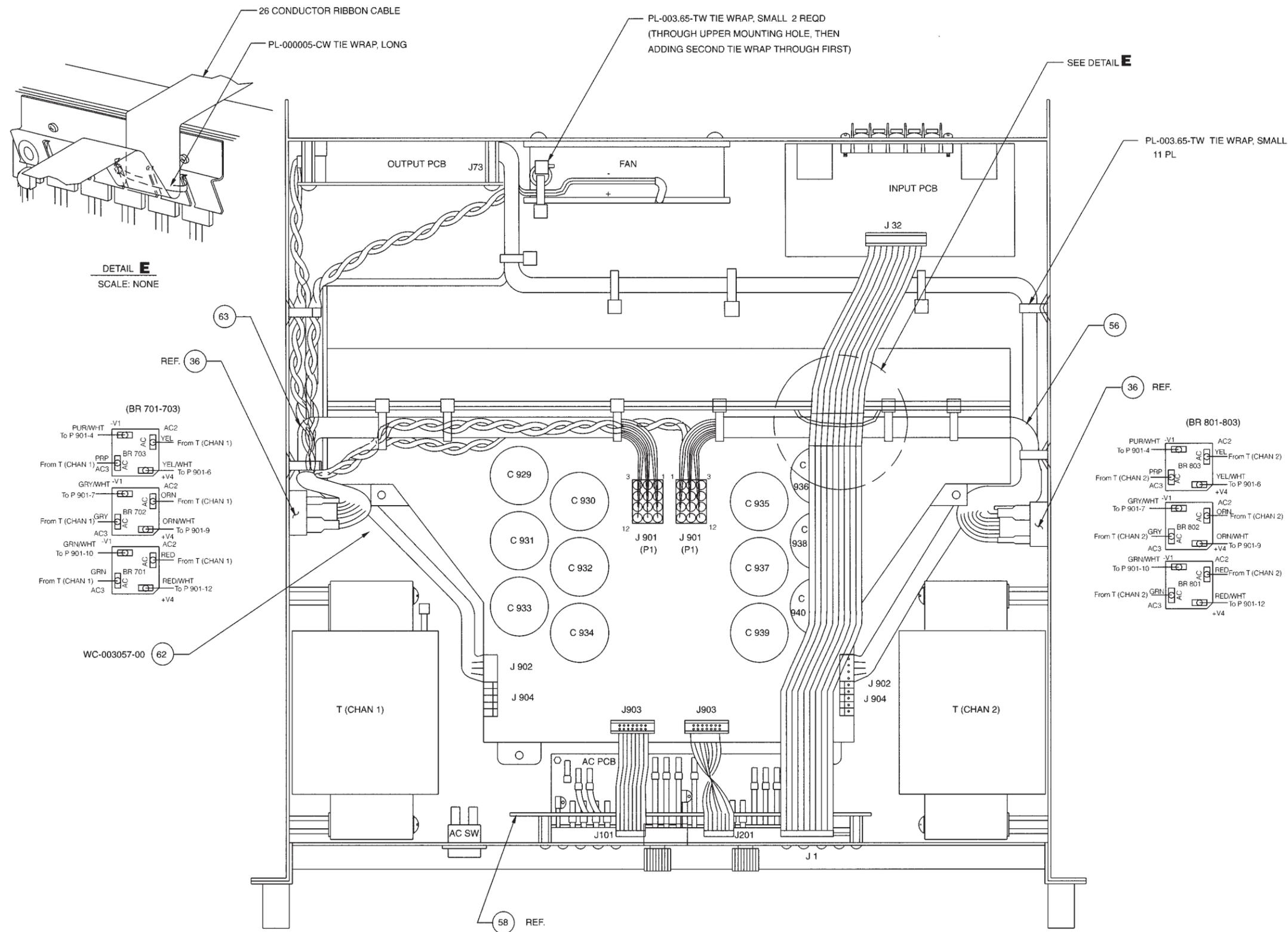
WP-004209-00
120 VOLTS

WP-004209-02
230 VOLTS



DETAIL D
SCALE: NONE

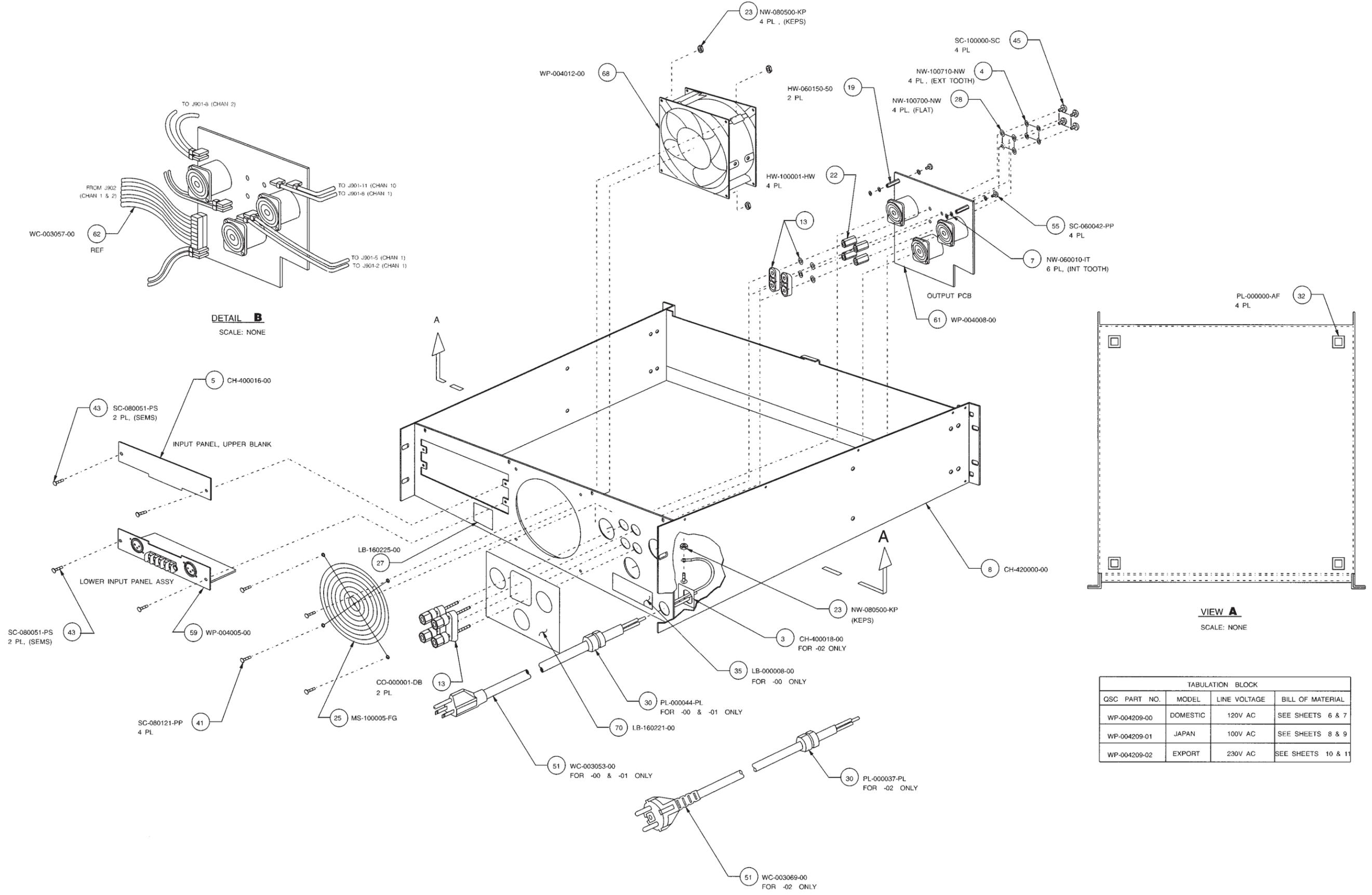
WIRE COLOR	FROM	WIRE LIST					
		CHANNEL 1			CHANNEL 2		
		100 VOLT	120 VOLT	240 VOLT	100 VOLT	120 VOLT	240 VOLT
BLACK	T-1	AC-503	AC-506	AC-506	AC-603	AC-606	AC-606
BLK/WHT	T-2	AC-507	AC-502	AC-502	AC-607	AC-602	AC-602
WHITE	T-3	AC-53	AC-53	AC-505	AC-56	AC-56	AC-605
BROWN	T-4	AC-502	AC-507	AC-504	AC-602	AC-607	AC-604
BRN/YEL	T-5	AC-506	AC-503	AC-503	AC-606	AC-603	AC-603
YELLOW	T-6	AC-54	AC-54	AC-54	AC-55	AC-55	AC-55
RED	T-7	BR701 AC2	BR701 AC2	BR701 AC2	BR801 AC2	BR801 AC2	BR801 AC2
ORANGE	T-8	BR702 AC2	BR702 AC2	BR702 AC2	BR802 AC2	BR802 AC2	BR802 AC2
YELLOW	T-9	BR703 AC2	BR703 AC2	BR703 AC2	BR803 AC2	BR803 AC2	BR803 AC2
BLUE	T-10	P1-3	P1-3	P1-3	P1-3	P1-3	P1-3
BLU/WHT	T-11	P1-1	P1-1	P1-1	P1-1	P1-1	P1-1
PURPLE	T-12	BR703 AC3	BR703 AC3	BR703 AC3	BR803 AC3	BR803 AC3	BR803 AC3
GRAY	T-13	BR702 AC3	BR702 AC3	BR702 AC3	BR802 AC3	BR802 AC3	BR802 AC3
GREEN	T-14	BR701 AC3	BR701 AC3	BR701 AC3	BR801 AC3	BR801 AC3	BR801 AC3
GRN/WHT	T-15	J904-1	J904-1	J904-1	J904-1	J904-1	J904-1
RED/WHT	T-16	J904-3	J904-3	J904-3	J904-3	J904-3	J904-3
GRN/WHT	T-17	J904-2	J904-2	J904-2	J904-2	J904-2	J904-2
PURPLE	T-18	J904-4	J904-4	J904-4	J904-4	J904-4	J904-4
PURPLE	T-19	J904-5	J904-5	J904-5	J904-5	J904-5	J904-5
BLUE	AC CORD	57 (AC PCB)	57	57	57	57	57
BROWN	AC CORD	50 (AC PCB)	50	50	50	50	50
GRN/YEL	AC CORD	GND	GND	GND	GND	GND	GND
RED	AC SW PIN 11	501 (AC PCB)	501	501	501	501	501
RED/BLK	AC SW PIN 12	52 (AC PCB)	52	52	52	52	52
RED	AC SW PIN 24	601 (AC PCB)	601	601	601	601	601
RED/BLK	AC SW PIN 25	51 (AC PCB)	51	51	51	51	51



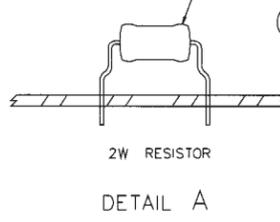
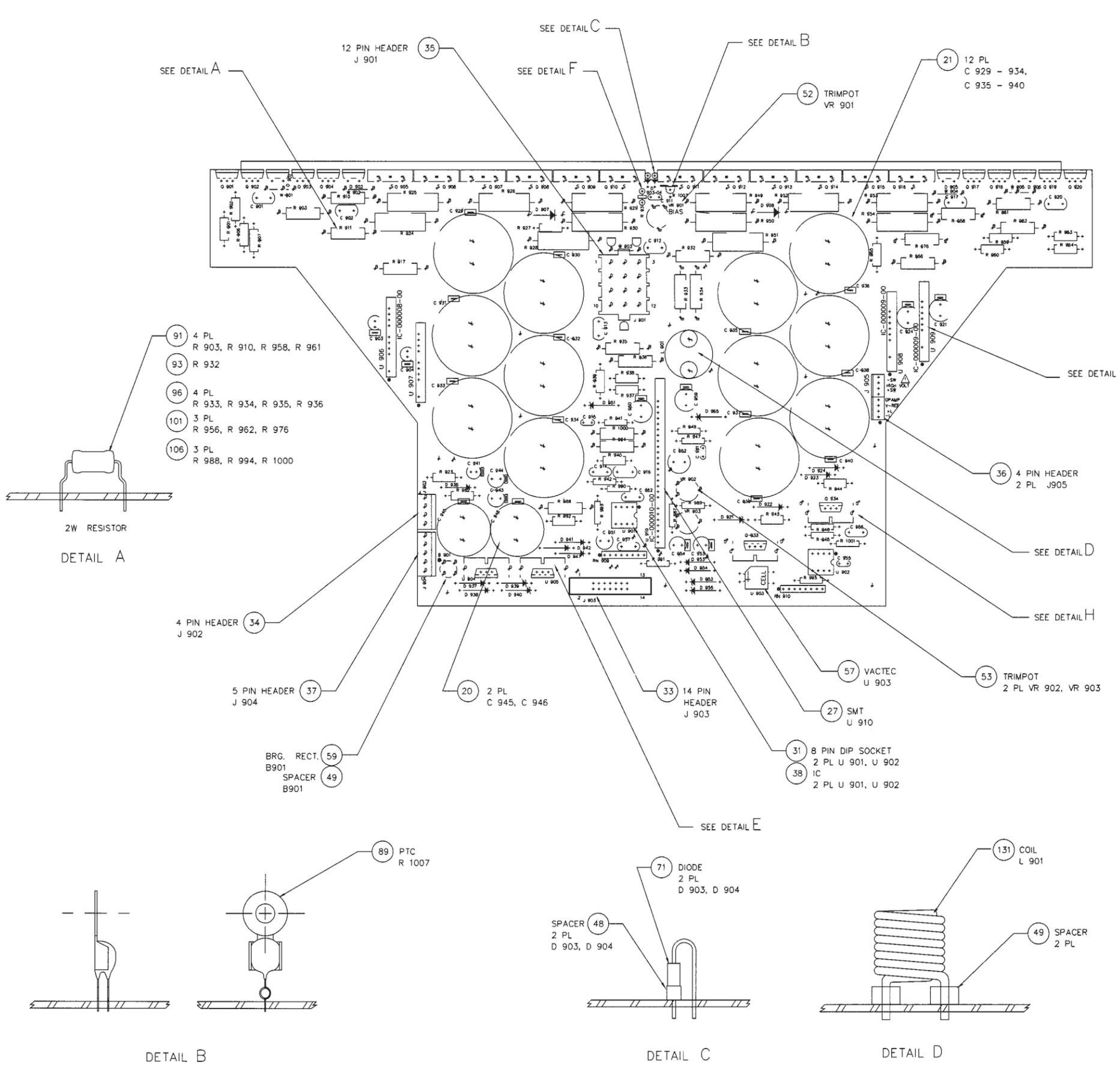
WIRE LIST (CHAN 1)		
FROM	COLOR	TO
P1-2	BLK	J704
P1-6	YEL/WHT	BR703 +V 4
P1-5	BLK	J703
P1-4	PRP/WHT	BR703 -V 1
P1-9	ORN/WHT	BR702 +V 4
P1-8	GRY	J702
P1-7	GRY/WHT	BR702 -V 1
P1-12	RED/WHT	BR701 +V 4
P1-11	GRY	J701
P1-10	GRN/WHT	BR701 -V 1
J902-1	BRN	J73-5
J902-2	RED	J73-6
J902-3	YEL	J73-7
J902-4	ORN	J73-8
J101	GRY	J903
T11	BLU/WHT	P1-1
T10	BLU	P1-3

WIRE LIST (CHAN 2)		
FROM	COLOR	TO
P1-2	BLK	J804
P1-6	YEL/WHT	BR803 +V 4
P1-5	BLK	J803
P1-4	PRP/WHT	BR803 -V 1
P1-9	ORN/WHT	BR802 +V 4
P1-8	WHT	J802
P1-7	GRY/WHT	BR802 -V 1
P1-12	RED/WHT	BR801 +V 4
P1-11	WHT	J801
P1-10	GRN/WHT	BR801 -V 1
J902-1	BRN	J73-1
J902-2	RED	J73-2
J902-3	YEL	J73-3
J902-4	ORN	J73-4
J201	GRY	J903
T11	BLU/WHT	P1-1
T10	BLU	P1-3

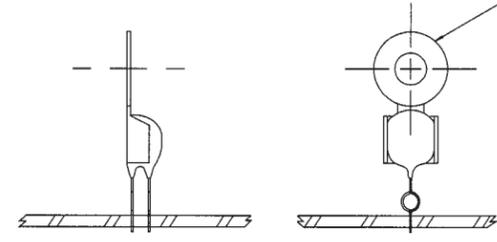
WIRE LIST (CHAN 1 & CHAN 2)		
FROM	COLOR	TO
J1	GRY	J32



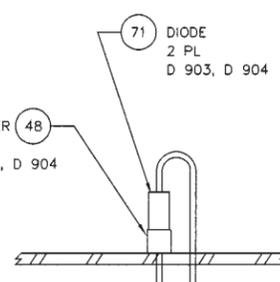
TABULATION BLOCK			
QSC PART NO.	MODEL	LINE VOLTAGE	BILL OF MATERIAL
WP-004209-00	DOMESTIC	120V AC	SEE SHEETS 6 & 7
WP-004209-01	JAPAN	100V AC	SEE SHEETS 8 & 9
WP-004209-02	EXPORT	230V AC	SEE SHEETS 10 & 11



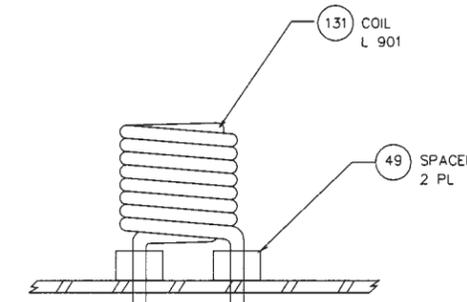
- 91 4 PL R 903, R 910, R 958, R 961
- 93 R 932
- 96 4 PL R 933, R 934, R 935, R 936
- 101 3 PL R 956, R 962, R 976
- 106 3 PL R 988, R 994, R 1000



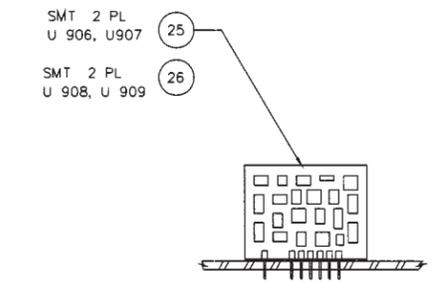
DETAIL B



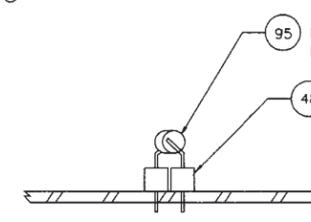
DETAIL C



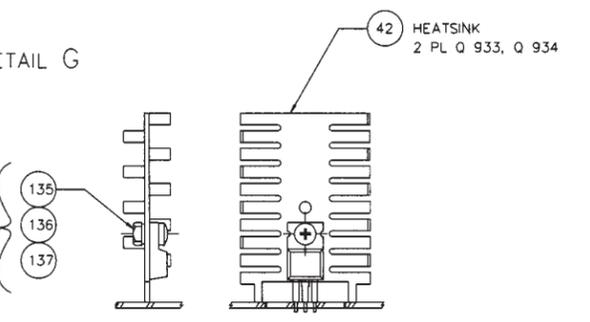
DETAIL D



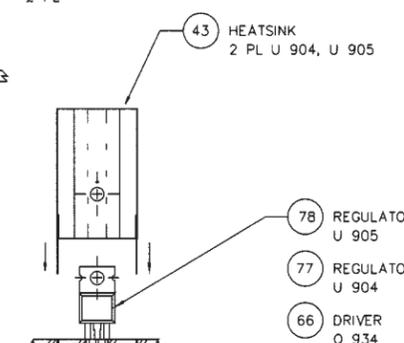
DETAIL G



DETAIL F

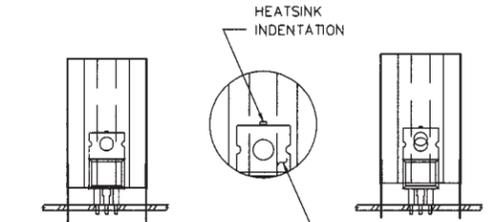


DETAIL H



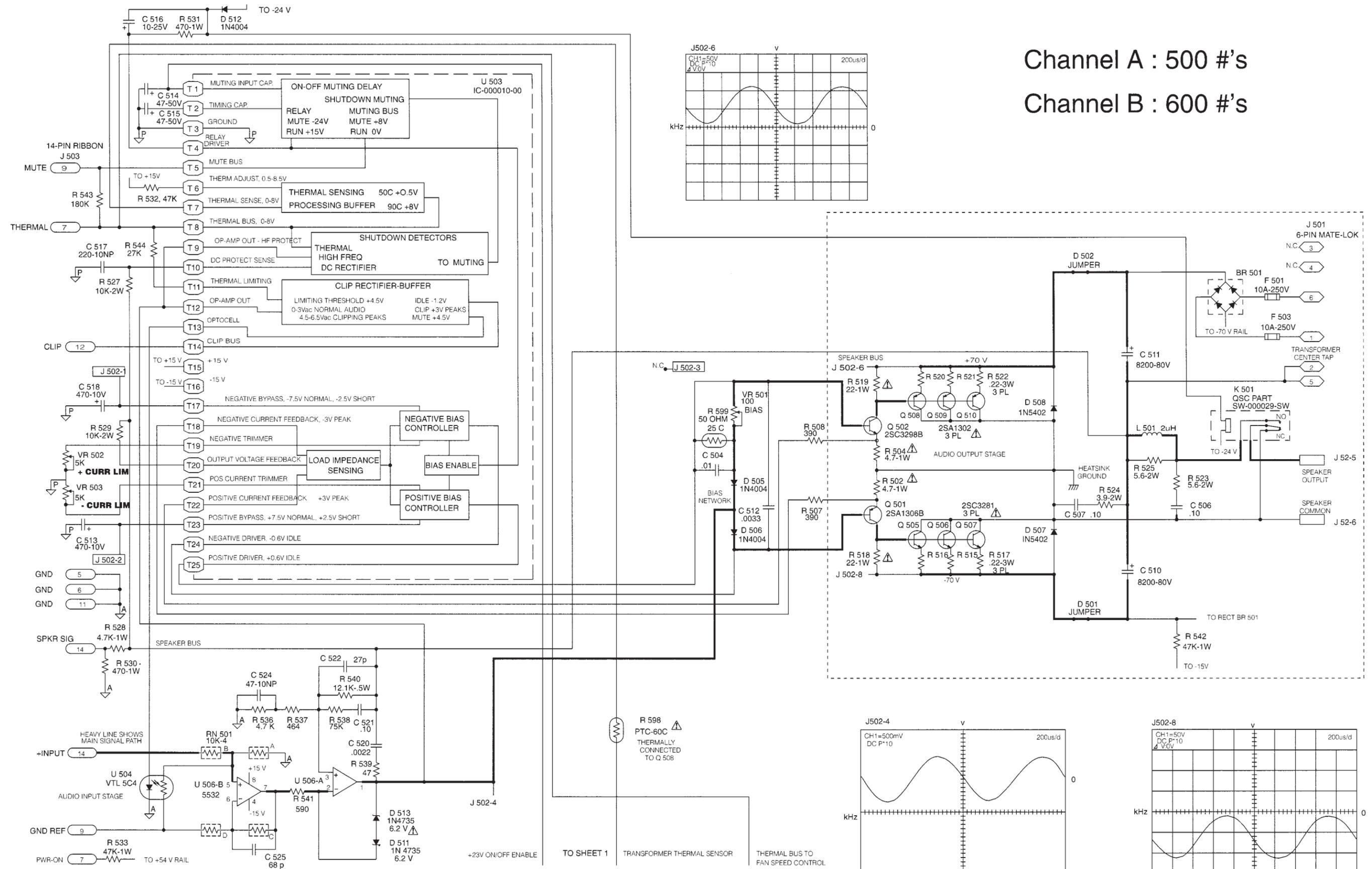
DETAIL E

NOTE: SLIDE HEATSINK OVER COMPONENT UNTIL INDENTATION CONTACTS TOP OF COMPONENT. COMPONENT AND HEATSINK STACK-UP WILL VARY DEPENDING ON SUPPLIER. SEE ILLUSTRATIONS BELOW.

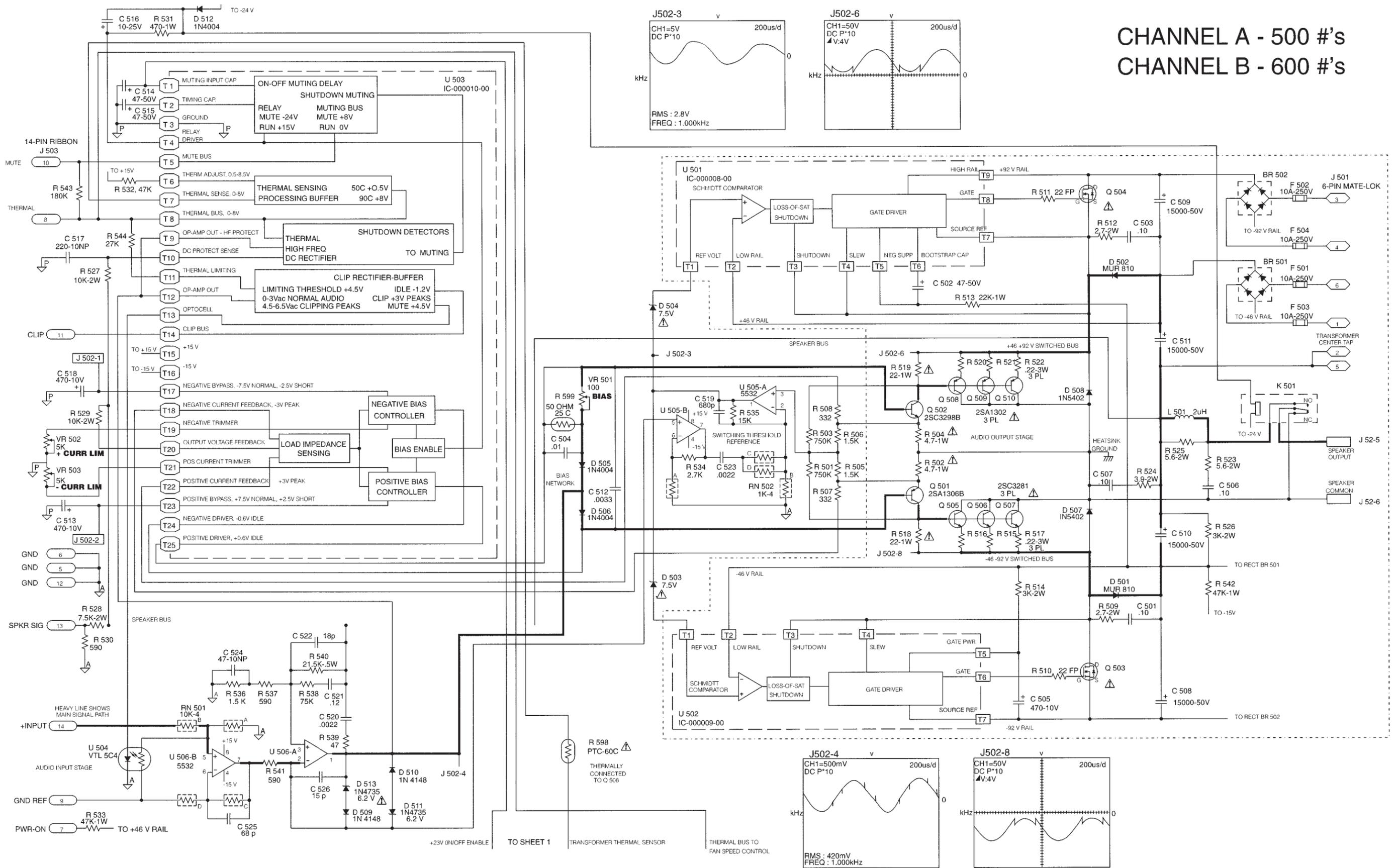


DETAIL E

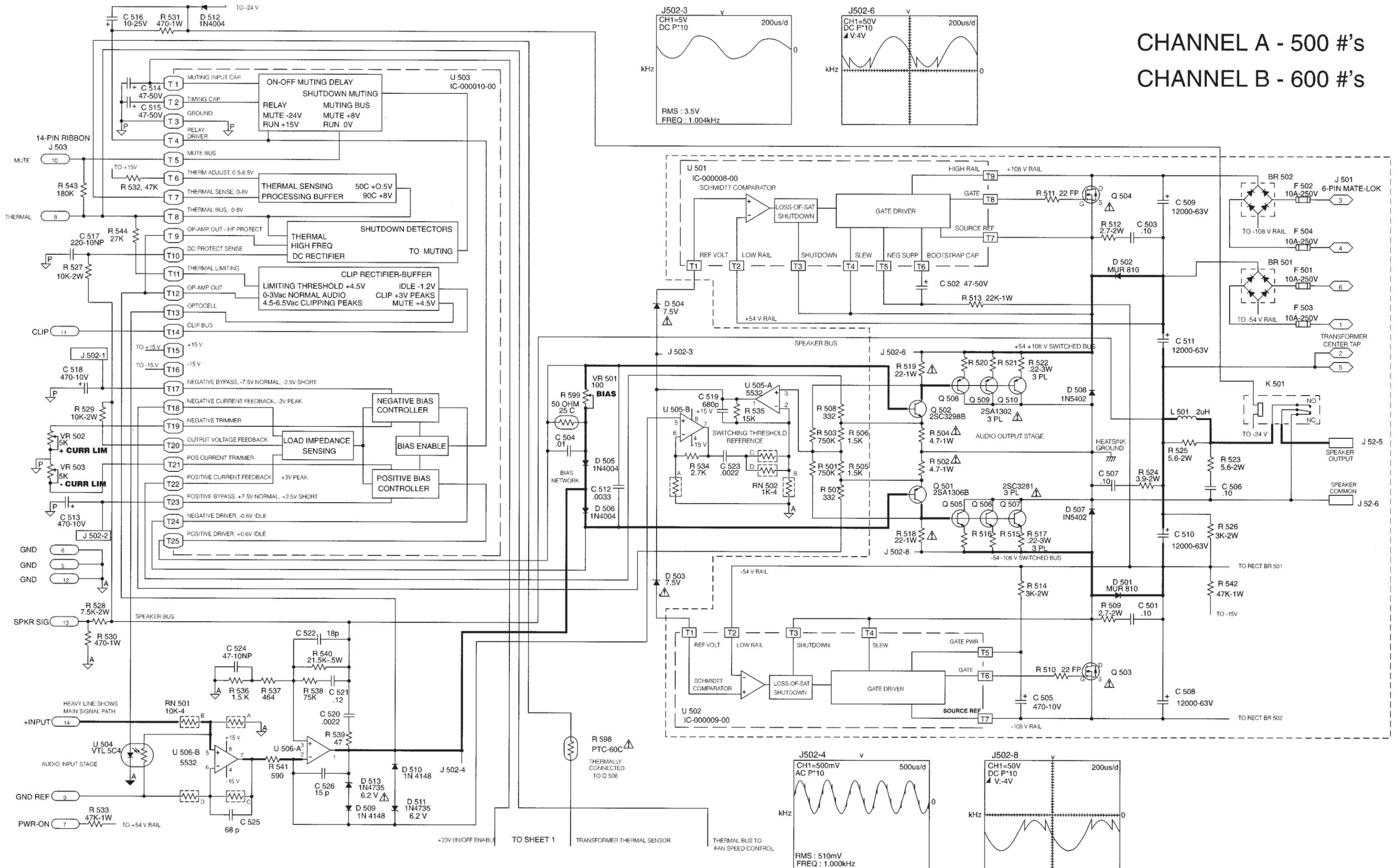
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Channel A : 500 #'s
 Channel B : 600 #'s



CHANNEL A - 500 #'s
 CHANNEL B - 600 #'s



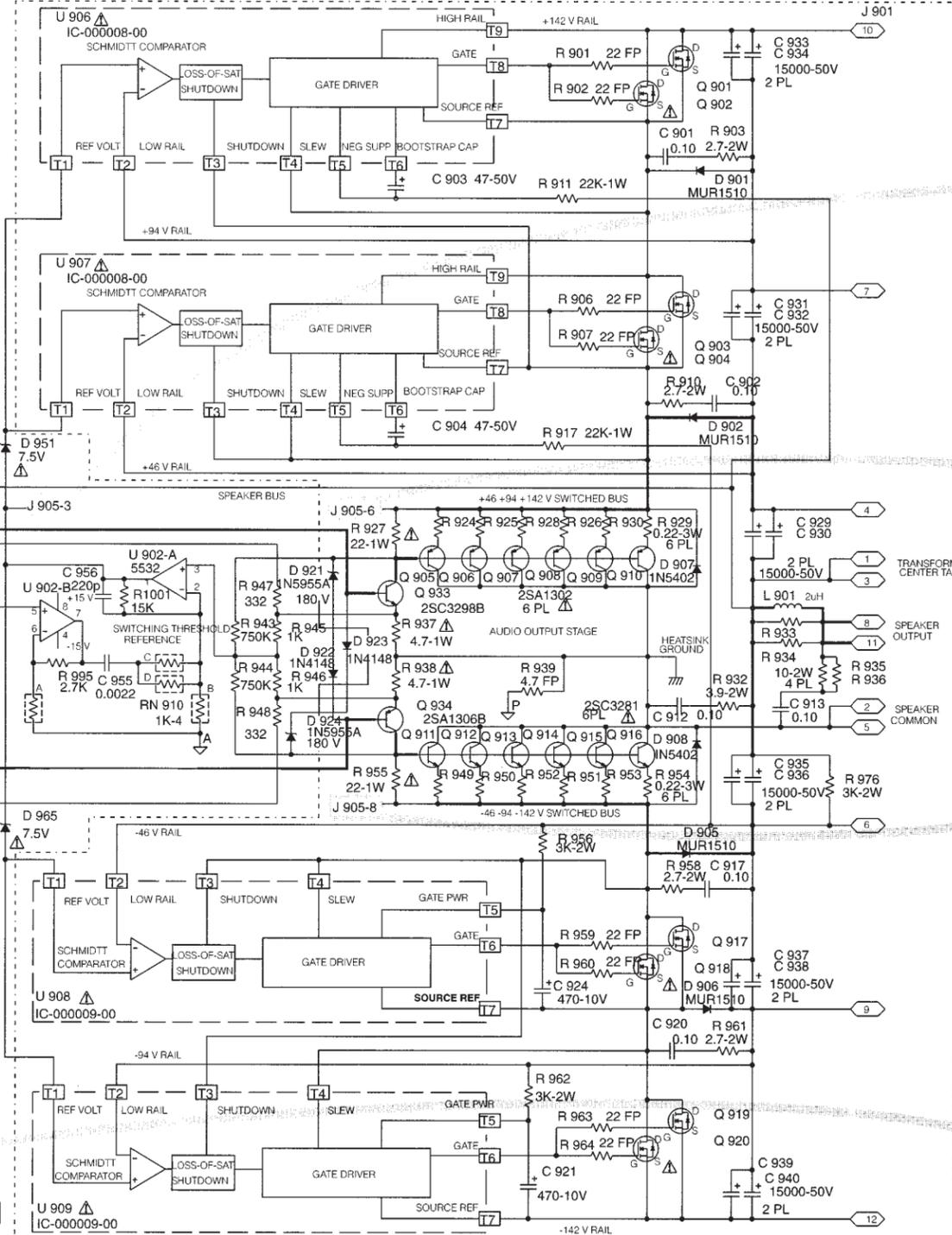
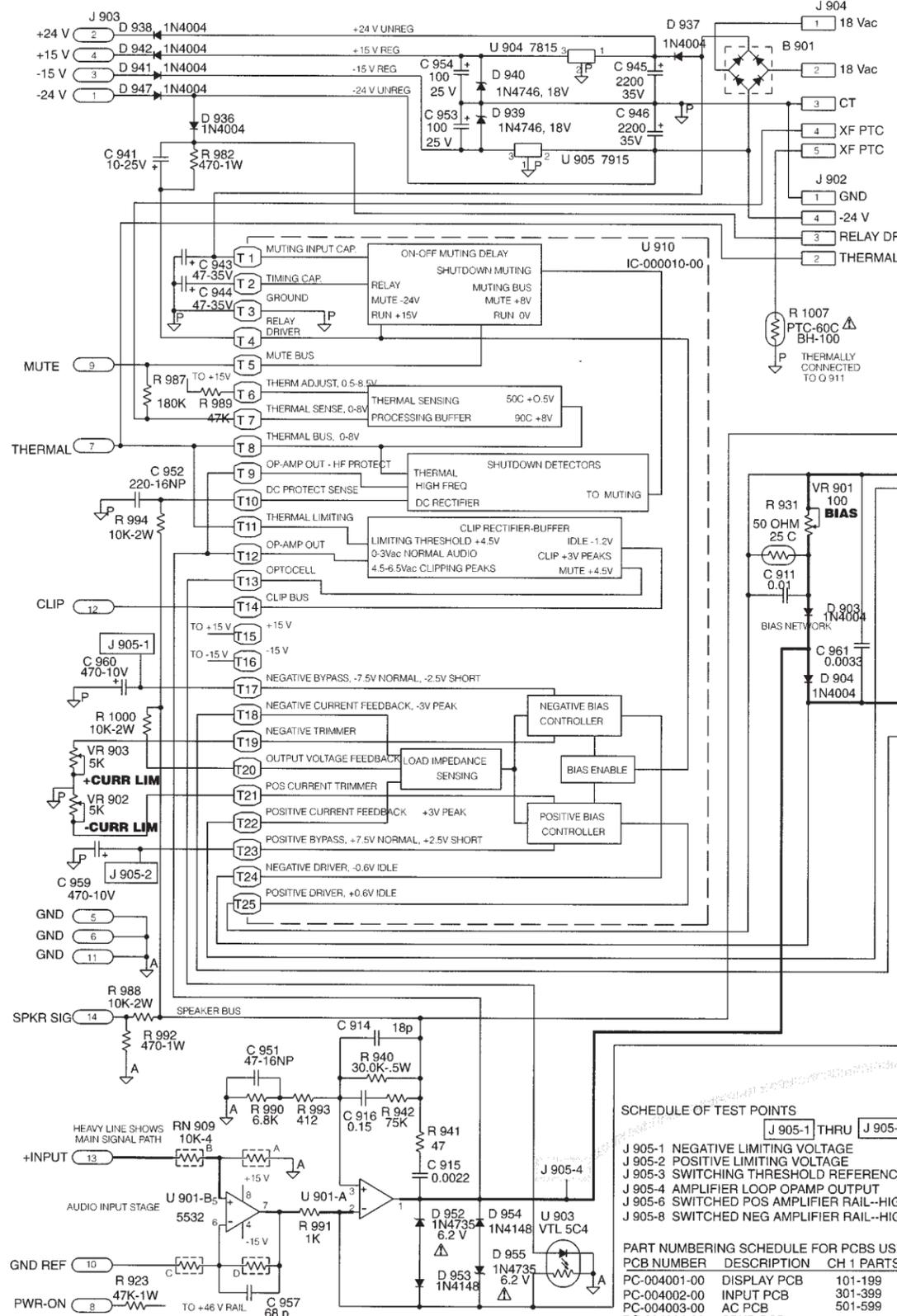
CHANNEL A - 500 #'s
 CHANNEL B - 600 #'s

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REV J, 1-27-92, FOR PC-004200-00 REV D

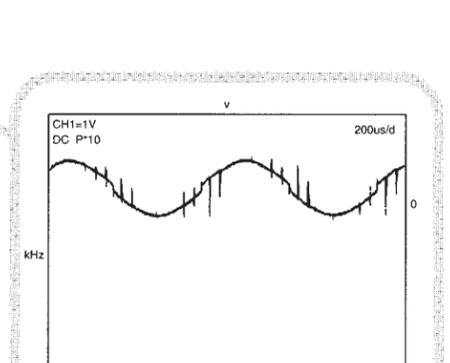
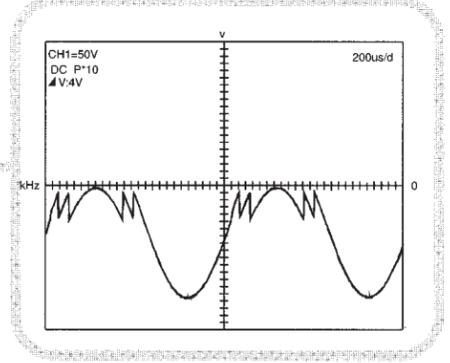
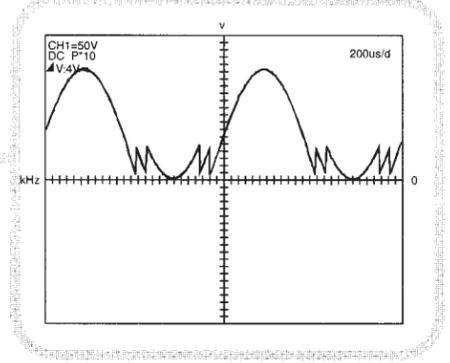
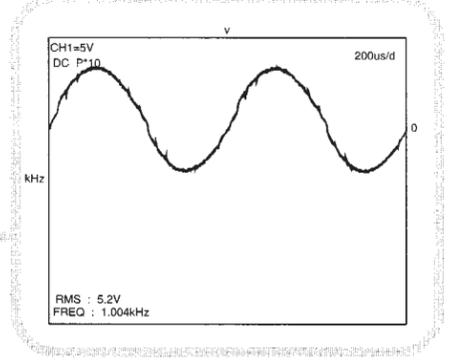


SCHEDULE OF TEST POINTS
 J 905-1 THRU J 905-8
 J 905-1 NEGATIVE LIMITING VOLTAGE
 J 905-2 POSITIVE LIMITING VOLTAGE
 J 905-3 SWITCHING THRESHOLD REFERENCE VOLTAGE
 J 905-4 AMPLIFIER LOOP OPAMP OUTPUT
 J 905-5 SWITCHED POS AMPLIFIER RAIL-HIGH VOLTAGE
 J 905-8 SWITCHED NEG AMPLIFIER RAIL-HIGH VOLTAGE

PART NUMBERING SCHEDULE FOR PCBs USED IN EX-4000:

PCB NUMBER	DESCRIPTION	CH 1 PARTS	CH 2 PARTS	PARTS IN COMMON
PC-004001-00	DISPLAY PCB	101-199	201-299	1-29
PC-004002-00	INPUT PCB	301-399	401-499	31-49
PC-004003-00	AC PCB	501-599	601-699	51-69
PC-004004-00	SPKR PCB	701-799	801-899	71-99
PC-004200-00	AMP CHANNEL	901-UP (SAME BOARD FOR CH 1, CH2)		

- NOTES:**
- ALL RESISTORS 1/4-WATT, 5% UNLESS NOTED.
 - ALL CAPACITORS 100V UNLESS NOTED. TOLERANCE 20% FOR ELECTROLYTIC TYPES, 10% ON OTHER TYPES.
 - BRIDGE RECTIFIER B 901, 1.5A, 100V.
 - R 1007 IS POSITIVE TEMPERATURE COEFFICIENT RESISTOR MOUNTED TO HEAT SINK. RESISTANCE 100 OHM COLD, RISING AT 55 C. QSC P/N RE-000006-PT
 - Q 901-904, 917-920 ARE SWITCHING FETS. QSC P/N QD-000013-QD OR QD-000031-QD. 125 W, 60 V MINIMUM, ON-RESISTANCE 0.030 OHMS MAX.
 - ZENERS D 951, 965 MARKED 7.5 V TESTED FOR LOW LEAKAGE, QSC P/N QD-00007-5-ZT.
 - ZENERS D 952, 955, 6.2V-500mW, TESTED FOR LOW LEAKAGE, QSC P/N QD-000024-QD.
 - PARTS MARKED WITH TRIANGLE Δ MUST BE REPLACED WITH EXACT TYPE ONLY.
 - PARTS ENCLOSED WITHIN DOTTED OUTLINE HAVE VOLTAGES GREATER THAN 42V.



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