



# POWER AMPLIFIER SERVICE MANUAL

## ***POWER BASE-1<sup>®</sup> & 460CSL<sup>™</sup>***

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The information furnished in this manual does not include all of the details of design, production, or variations of the equipment. Nor does it cover every possible situation which may arise during installation, operation or maintenance. If you need special assistance beyond the scope of this manual, please contact the Crown Technical Support Group.

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## **CAUTION**

**TO PREVENT ELECTRIC SHOCK DO NOT REMOVE TOP OR BOTTOM COVERS. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL. DISCONNECT POWER CORD BEFORE REMOVING REAR INPUT MODULE TO ACCESS GAIN SWITCH.**

## **AVIS**

**À PRÉVENIR LE CHOC ÉLECTRIQUE N'ENLEVEZ PAS LES COUVERTURES. RIEN DES PARTIES UTILES À L'INTÉRIEUR. DÉBRANCHER LA BORNE AVANT D'OUVRIER LA MODULE EN ARRIÈRE.**

## **WARNING**

**TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE!**

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## *Introduction*

This manual contains service information on Crown power amplifiers. It is designed to be used in conjunction with the applicable Owner's Manual. However, some important information is duplicated in this Service Manual in case the Owner's Manual is not readily available.

***NOTE: THE INFORMATION IN THIS MANUAL IS INTENDED FOR USE BY AN EXPERIENCED TECHNICIAN ONLY!***

### ***SCOPE***

This Service Manual includes several sections. These sections include Parts Ordering, Specifications, Voltage Conversion, Circuit Theory, Factory Test Procedures, Mechanical Parts Lists, and Module Parts Lists. Schematics are attached. Note that component parts with circuit board comprise a complete module. Module part numbers are always associated with a specific circuit board, although an unpopulated circuit board may be built up with different parts to create different modules. Note that Crown does not sell blank (unpopulated) circuit boards.

Each of the compact audio power amplifiers are designed for professional or commercial use. Providing high power amplification from 20Hz to 20KHz with minimum distortion, they feature balanced inputs with bridged and parallel monophonic capability. Specific features vary depending on model family.

### ***WARRANTY***

Each Owner's Manual contains basic policies as related to the customer. In addition it should be stated that this service documentation is meant to be used only by properly trained service personnel. Because most Crown products carry a 3 Year Full Warranty (including round trip shipping within the United States), all warranty service should be referred to the Crown Factory or Authorized Warranty Service Center. See the applicable Owner's Manual for warranty details. To find the location of the nearest Authorized Service Center or obtain instructions for receiving Crown Factory Service please contact the Crown Technical Support Group (within North America) or your Crown/Amcron Importer (outside North America).

**Crown  
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Factory Service  
Parts Department**

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## Parts

### GENERAL INFORMATION

Later sections include both mechanical and electrical parts lists for this product. The parts listed are current as of the date printed. Crown reserves the right to modify and improve its products for the benefit of its customers.

### PART NUMBERING SYSTEMS

As of the printing of this manual, Crown is using two numbering systems. The elder system always uses eight characters. The first character is a letter. Common letters used are C, D, H, M, P, and Q. The second through sixth characters are numbers. The numbers build sequentially (for each prefix letter) as new parts are added to our parts inventory system. (In some cases there will be a space then a four character number after the prefix letter; the space is considered a character.) The seventh character is usually a hyphen, though it may be a letter to indicate a revision or special note. The last character is called a check-digit, and is useful to Crown for internal tracking.

Crown is in the process of converting to a new part number system. Length may vary from eight to twelve characters. There is still a letter prefix, then five numbers. These five numbers identify a type of part. The seventh character is a hyphen. Remaining characters identify the details of the type of part identified by the first part of the number.

### STANDARD AND SPECIAL PARTS

Many smaller electrical and electronic parts used by Crown are stocked by and available from electronic supply houses. However, some electronic parts that appear to be standard are actually special. A part ordered from Crown will assure an acceptable replacement. Structural items such as modules and panels are available from Crown only.

### ORDERING PARTS

When ordering parts, be sure to give the product model, and include a description and part number (CPN/DPN) from the parts listing. Price quotes are available on request.

### SHIPMENT

Shipment will be normally made by UPS or best other method unless you specify otherwise. Shipments are made to and from Elkhart, Indiana USA, only. Established accounts with Crown will receive shipment freight prepaid and will be billed. All others will receive

shipment on a C.O.D. or pre-payment (check or credit card) basis.

### TERMS

Normal terms are pre-paid. Net-30 Days applies to only those firms having pre-established accounts with Crown. If pre-paying, the order must be packed and weighed before a total bill can be established, after which an amount due will be issued and shipment made upon receipt of pre-payment. New parts returned for credit are subject to a 10% re-stocking fee, and authorization from the Crown Parts Department must be obtained before returning parts for credit.

Crown is not a general parts warehouse. Parts sold by the Crown Parts Department are solely for servicing Crown/Amcron products. **Part prices and availability are subject to change without notice.**

#### **Crown Parts Department**

Mailing Address:  
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Elkhart, IN USA 46515-1000

Shipping Address:  
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Phone: (219) 294-8210  
or: (219) 294-8211

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## Specifications

Unless noted otherwise, all specifications are based on driving an 8 ohm load per channel, both channels driven, the sensitivity switch in the 26dB position, the AC supply is 120VAC at 60Hz. Crown specifications are guaranteed through the warranty period (normally 3 years). Because our testing methods are more stringent than our published specifications, every Crown amplifier will exceed its published specifications.

### POWER

#### Power

8 Ohm Stereo—205W/Ch

4 Ohm Stereo—230W/Ch

8 Ohm Bridge Mono—430W

4 Ohm Parallel Mono—425W

**Load Impedances:** Rated for 16, 8, 4, and 2 (parallel mono only) Ohm operation; safe with all types of loads, even totally reactive loads.

**AC Mains:** 120VAC at 60 Hz with standard 3 wire grounded 15A connector with single voltage transformer and fan for North American units; 100VAC, 120VAC, 220VAC, and 240VAC at 50 or 60 Hz when equipped with universal transformer, applicable fan, and other applicable hardware with country specific power cord. Note that at 50 Hz fan speed is reduced.

### PERFORMANCE

**Frequency Response:**  $\pm 0.1$  dB from 20 Hz to 20 kHz at 1 Watt.

**Phase Response:**  $\pm 10^\circ$  from 10 Hz to 20 kHz at 1 Watt.

**Signal to Noise Ratio:** Better than 105 dB (A-weighted) below max. average power from 20 Hz to 20 kHz.

**Total Harmonic Distortion (THD):**  $< 0.05\%$  from 20 Hz to 1 kHz, increasing linearly to 0.1% at 20 kHz at 170W.

**I.M. Distortion:**  $< 0.05\%$  from 10 milliwatts to 170W at 26 dB gain.

**Slew Rate:**  $> 13$  V per microsecond.

**Damping Factor:**  $> 1000$  from 10 Hz to 400 Hz.

**DC Offset:**  $< 10$  millivolts.

**Input Impedance:** Nominally 20K ohms balanced; 10K ohms unbalanced.

**Output Impedance:**  $< 10$  milliohms in series with  $< 2$  microhenries.

**Protection Systems:** Output Device Emulation Protection (ODEP) limits drive in the event of dangerous dynamic thermal conditions without interrupting power. Current limiting for shorted load protection. DC/LF and common mode output current Fault circuitry to mute audio. Delay of 4 seconds from turn on mutes amplifier to prevent dangerous turn-on transients. High voltage fuse in main transformer primary and low voltage fuse in fan primary. Slew rate limiting to prevent RF burn out.

### MECHANICAL

**Input Connectors:** Balanced 1/4 inch phone jacks.

**Output Connectors:** Color-coded 5-way binding posts on 3/4 inch centers; spaced 3/4 inch apart.

**Front Panel Controls:** A rocker on/off power switch.

**Back Panel Controls:** A three-position switch which selects Stereo, Bridge-Mono, or Parallel-Mono mode; a two position input ground-lift switch, and level controls for each channel.

**Internal Controls:** A three-position switch selects 0.775V, 1.4V, or 26 dB voltage gain input sensitivity (all units manufactured with D 7911-7 main module or later; earlier models only allowed for 0.775V or 26 dB gain).

**Indicators:** Red Enable indicator shows on/off status of low-voltage power supply.

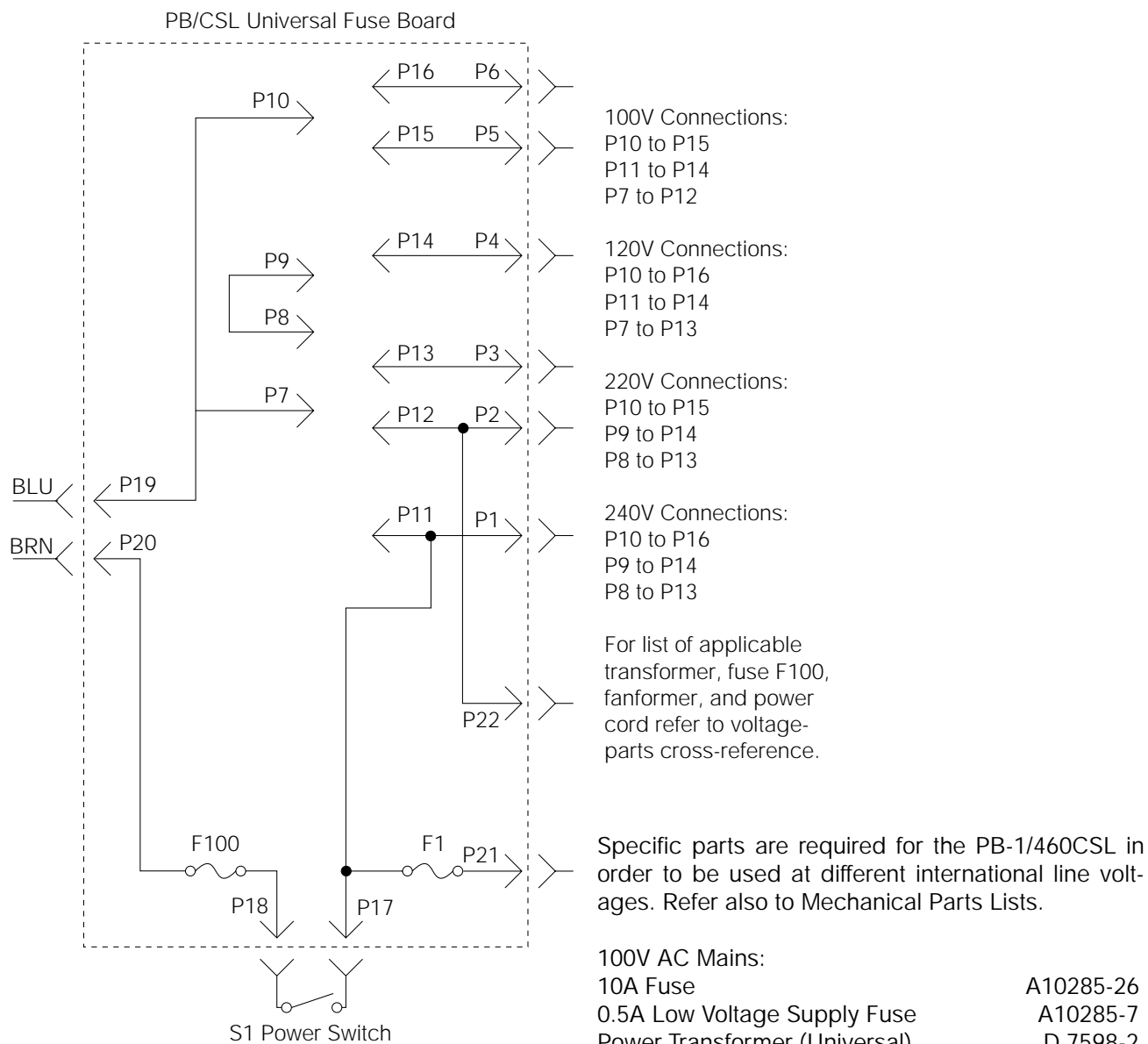
**Construction:** Black splatter-coat steel chassis with specially designed flow-through ventilation system.

**Mounting:** Standard EIA 310 front-panel rack mount with supports for supplemental rear corner mounting.

**Dimensions:** 19 inches wide, 3.5 inches high, 16 inches deep behind front mounting surface.

**Weight:** 30 lbs.

## Voltage Conversion



## Theory

### OVERVIEW

It should be noted from the outset that the PB-1 and 460CSL amplifiers are electrically and mechanically identical products. The only differences, from a service perspective, are cosmetic. For the purposes of servicing the products, it should also be known that the CSL version has been on the market since 1992. Since the PB amplifiers have been in production since the mid-1980's there are a number of electrical and mechanical parts associated with the older PB models only. It is also important to realize that over time Crown has introduced numerous improvements to PB/CSL amplifiers. Though often changes are minor, and are made for a variety of reasons, a few changes have had a significant impact on the operation of the circuitry. This manual is up to date as of the time of writing. For additional information regarding these amplifiers, refer to the applicable Technical Notes provided by Crown for this product.

This section of the manual explains the general operation of a typical Crown power amplifier. Topics covered include Front End, Grounded Bridge, and ODEP. Due to variations in design from vintage to vintage (and similarities with other products Crown) the theory of operation remains simplified.

### FEATURES

Power Base/CSL amplifiers utilize numerous Crown innovations including grounded bridge and ODEP technologies. Cooling techniques make use of the what is essentially air conditioner technology. Air flows bottom to top, and front to side. Air flows a short distance across a wide heatsink. This type of air flow provides significantly better cooling than the "wind tunnel" technology used by many other manufacturers. Output transistors are of the metal can type rather than plastic case. This allows for a significantly higher thermal margin for the given voltage and current ratings. All devices used are tested and graded to ensure maximum reliability. Another electronic technique used is negative feedback. Almost all power amplifiers utilize negative feedback to control gain and provide stability, but Crown uses multiple nested feedback loops for maximum stability and greatly improved damping. Most Crown amplifiers have damping in excess of 1000 in the bass frequency range. This feedback, along with our compensation and ultra-low distortion output topology, make Crown amplifiers superior.

Features specific to the Power Base/CSL Series' in-

clude a single core transformer (one primary with two independent ungrounded secondaries), a full time full speed fan which also serves as the low voltage transformer, slew rate limiting, and audio muting for delay or protective action. This amplifier can operate in either a Bridged or Parallel Mono mode as well as dual (stereo). A sensitivity switch allows selection of input voltage required for rated output. Level controls are rear mounted. The only indicator provided tells the operator that the low voltage supply is energized. In general, the packaging of this model is designed for maximum watt/price/weight/size value. It is the most basic grounded bridge amplifier now available from Crown.

For additional details refer to the specification section, or to the applicable Owner's Manual.

### FRONT END OPERATION

The front end is comprised of three stages: Balanced Gain Stage (BGS), Variable Gain Stage (VGS), and the Error Amp. Figure 1 shows a simplified diagram of a typical front end with voltage amplification stages.

#### Balanced Gain Stage (BGS)

Input to the amplifier is balanced. The shield may be isolated from chassis ground by an RC network to interrupt ground loops (early models did not have the Ground Lift feature) via the Ground Lift Switch. The non-inverting (hot) side of the balanced input is fed to the non-inverting input of the first op-amp stage. The inverting (negative) side of the balanced input is fed to the inverting input of the first op-amp stage. A potentiometer is provided for common mode rejection adjustment. Electrically, the BGS is at unity gain. (From an audio perspective, however, this stage actually provides +6dB gain if a fully balanced signal is placed on its input.) The BGS is a non-inverting stage. It's output is delivered to the Variable Gain Stage.

#### Variable Gain Stage (VGS)

Note: Older models only had two front end stages. The functions of this stage were combined, primarily, with those of the third.

From the output of the BGS, the signal goes to the VGS where gain is determined by the position of the Sensitivity Switch, and level is determined by the level control. VGS is an inverting stage with the input being fed to its op-amp stage. Because gain after this stage is fixed at 26dB (factor of 20), greater amplifier sensi-



## Theory

tivity is achieved by controlling the ratio of feedback to input resistance. The Sensitivity Switch sets the input impedance to this stage and varies the gain such that the overall amplifier gain is 26 dB, or is adjusted appropriately for 0.775V or 1.4V input to attain rated output. Note that earlier models (before main modules built with D 7911-7 board) did not support the 1.4V sensitivity.

### Error Amp

The inverted output from the VGS is fed to the non-inverting input of the Error Amp op-amp stage through an AC coupling capacitor and input resistor. Amplifier output is fed back via the negative feedback (NFB) loop resistor. The ratio of feedback resistor to input resistor fixes gain from the Error Amp input to the output of the amplifier at 26 dB. Diodes prevent overdriving the Error Amp. Because the Error Amp amplifies the difference between input and output signals, any difference in the two waveforms will produce a near open loop gain condition which in turn results in high peak output voltage. The output of the Error Amp, called the Error Signal (ES) drives the Voltage Translators.

### VOLTAGE AMPLIFICATION

The Voltage Translator stage separates the output of the Error Amp into balanced positive and negative drive voltages for the Last Voltage Amplifiers (LVAs), translating the signal from ground referenced  $\pm 15V$  to  $\pm V_{CC}$  reference. LVAs provide the main voltage amplification and drive the High Side output stages. Gain from Voltage Translator input to amplifier output is a factor of 25.2.

### Voltage Translators

A voltage divider network splits the Error Signal (ES) into positive and negative drive signals for the balanced voltage translator stage. These offset reference voltages drive the input to the Voltage Translator transistors. A nested NFB loop from the output of the amplifier mixes with the inverted signal riding on the offset references. This negative feedback fixes gain at the offset reference points (and the output of the Error Amp) at a factor of -25.2 with respect to the amplifier output. The Voltage Translators are arranged in a common base configuration for non-inverting voltage gain with equal gain. They shift the audio from the  $\pm 15V$  reference to VCC reference. Their outputs drive their respective LVA.

Also tied into the Voltage Translator inputs are ODEP limiting transistors and control/protection transistors. The ODEP transistors steal drive as dictated by the ODEP circuitry (discussed later). The control/protection transistors act as switches to totally shunt audio to ground during the turn-on delay, or during a DC/LF or Fault protective action.

### Last Voltage Amplifiers (LVAs)

The Voltage Translator stage channels the signal to the Last Voltage Amplifiers (LVA's) in a balanced configuration. The +LVA and -LVA, with their push-pull effect through the Bias Servo, drive the fully complementary output stage. The LVAs are configured as common emitter amplifiers. This configuration provides sufficient voltage gain and inverts the audio. The polarity inversion is necessary to avoid an overall polarity inversion from input jack to output jack, and it

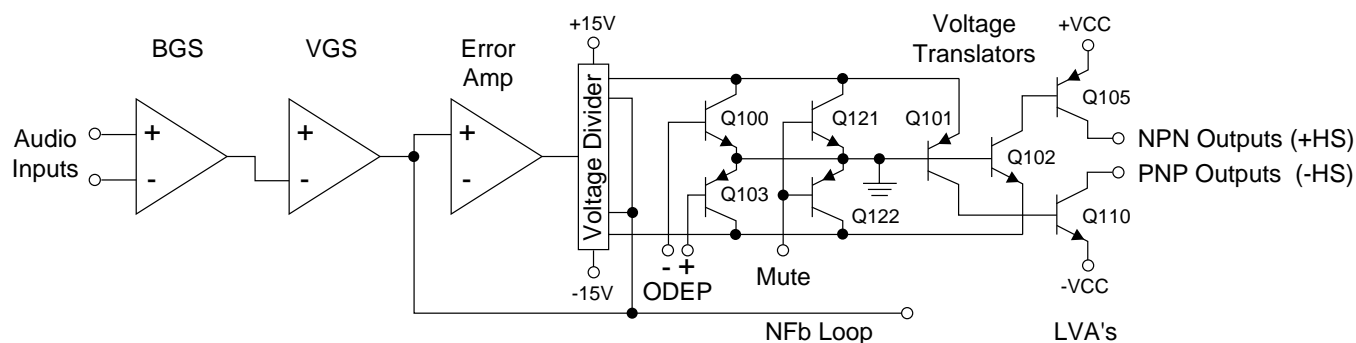


Figure 1. Typical Amplifier Front End and Voltage Amplification Stages.

## Theory

allows the NFB loop to control Error Amp gain by feeding back to its non-inverting input (with its polarity opposite to the output of the VGS). With the added voltage swing provided by the LVAs, the signal then gains current amplification through the Darlington emitter-follower output stage.

### GROUNDING BRIDGE TOPOLOGY

Figure 2 is a simplified example of the grounded bridge output topology. It consists of four quadrants of three deep Darlington (composite) emitter-follower stages per channel: one NPN and one PNP on the High Side of the bridge (driving the load), and one NPN and one PNP on the Low Side of the bridge (controlling the ground reference for the rails). The output stages are biased to operate class AB+B for ultra low distortion in the signal zero-crossing region and high efficiency.

#### High Side (HS)

The High Side (HS) of the bridge operates much like a conventional bipolar push-pull output configuration. As the input drive voltage becomes more positive, the HS NPN conducts and delivers positive voltage to the load. Eventually the NPN devices reach full conduction and +Vcc is across the load. At this time the HS PNP is biased off. When the drive signal is negative going, the HS PNP conducts to deliver -Vcc to the load and the HS NPN stage is off.

The output of the +LVA drives the base of predriver device. Together, the predriver and driver form the first two parts of the three-deep Darlington and are biased class AB. They provide output drive through the bias resistor, bypassing the output devices, at levels below about 100mW. An RLC network between the predriver and driver provide phase shift compensation and limit driver base current to safe levels. Output devices are biased class B, just below cutoff. At about 100mW output they switch on to conduct high current to the load. Together with predriver and driver, the output device provide an overall class AB+B output.

The negative half of the HS is almost identical to the positive half, except that the devices are PNP. One difference is that the PNP bias resistor is slighter greater in value so that PNP output devices run closer to the cutoff level under static (no signal) conditions. This is because PNP devices require greater drive current.

HS bias is regulated by Q18, the Bias Servo. Q18 is a Vbe multiplier which maintains approximately 3.3V Vce under static conditions. The positive and negative halves of the HS output are in parallel with this 3.3V. With a full base-emitter on voltage drop across predrivers and drivers, the balance of voltage results in approximately .35V drop across the bias resistors in

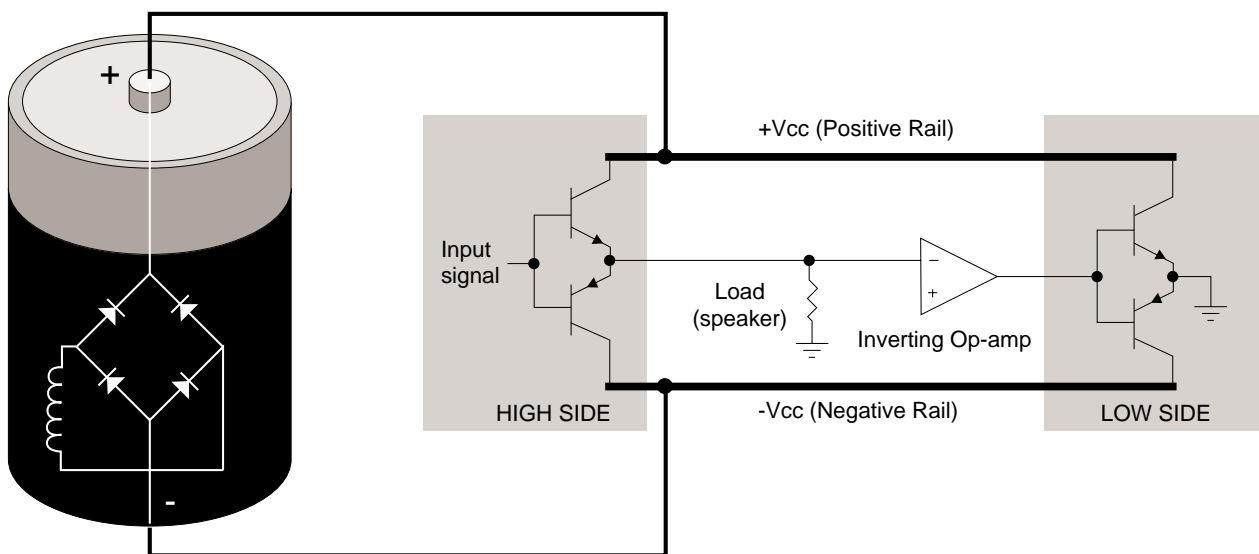


Figure 2. Crown Patented Grounded Bridge Topology

## Theory

the positive half, and about .5V across the bias resistor in the negative half. Q18 conduction (and thus bias) is adjustable.

A diode string prevents excessive charge build up within the high conduction output devices when off. Flyback diodes shunt back-EMF pulses from reactive loads to the power supply to protect output devices from dangerous reverse voltage levels. An output terminating circuit blocks RF on output lines from entering the amplifier through its output connectors.

### **Low Side (LS)**

The Low Side (LS) operates quite differently. The power supply bridge rectifier is not ground referenced, nor is the secondary of the main transformer. In other words, the high voltage power supply floats with respect to ground, but  $\pm V_{cc}$  remain constant with respect to each other. This allows the power supply to deliver  $+V_{cc}$  and  $-V_{cc}$  from the same bridge rectifier and filter as a total difference in potential, regardless of their voltages with respect to ground. The LS uses inverted feedback from the HS output to control the ground reference for the rails ( $\pm V_{cc}$ ). Both LS quadrants are arranged in a three-deep Darlington and are biased AB+B in the same manner as the HS.

When the amplifier output swings positive, the audio is fed to an op-amp stage where it is inverted. This inverted signal is delivered directly to the bases of the positive (NPN) and negative (PNP) LS predrivers. The negative drive forces the LS PNP devices on (NPN off). As the PNP devices conduct,  $V_{ce}$  of the PNP Darlington drops. With LS device emitters tied to ground,  $-V_{cc}$  is pulled toward ground reference. Since the power supply is not ground referenced (and the total voltage from  $+V_{cc}$  to  $-V_{cc}$  is constant)  $+V_{cc}$  is forced higher above ground potential. This continues until, at the positive amplifier output peak,  $-V_{cc} = 0V$  and  $+V_{cc}$  equals the total power supply potential with a positive polarity. If, for example, the power supply produced a total of 70V from rail to rail ( $\pm 35V_{DC}$  measured from ground with no signal), the amplifier output would reach a positive peak of +70V.

Conversely, during a negative swing of the HS output where HS PNP devices conduct, the op-amp would output a positive voltage forcing LS NPN devices to conduct. This would result in  $+V_{cc}$  swinging toward ground potential and  $-V_{cc}$  further from ground potential. At the negative amplifier output peak,  $+V_{cc} = 0V$  and  $-V_{cc}$  equals the total power supply potential with

a negative polarity. Using the same example as above, a 70V supply would allow a negative output peak of -70V. In summary, a power supply which produces a total of 70VDC rail to rail (or  $\pm 35V_{DC}$  statically) is capable of producing 140V peak-to-peak at the amplifier output when the grounded bridge topology is used. The voltage used in this example are relatively close to the voltages of the PB-1/460CSL.

The total effect is to deliver a peak to peak voltage to the speaker load which is twice the voltage produced by the power supply. Benefits include full utilization of the power supply (it conducts current during both halves of the output signal; conventional designs require two power supplies per channel, one positive and one negative), and never exposing any output device to more than half of the peak to peak output voltage (which does occur in conventional designs).

Low side bias is established by a diode string which also shunts built up charges on the output devices. Bias is adjustable via potentiometer. Flyback diodes perform the same function as the HS flybacks. The output of the LS is tied directly to chassis ground via ground strap.

### **OUTPUT DEVICE EMULATION PROTECTION (ODEP)**

To further protect the output stages, a specially developed ODEP circuit is used. It produces a complex analog output signal. This signal is proportional to the always changing safe-operating-area margin of the output transistors. The ODEP signal controls the Voltage Translator stage by removing drive that may exceed the safe-operating-area of the output stage.

ODEP senses output current by measuring the voltage dropped across LS emitter resistors. LS NPN current (negative amplifier output) and  $+V_{cc}$  are sensed, then multiplied to obtain a signal proportional to output power. Positive and negative ODEP voltages are adjustable via two potentiometers. Across  $\pm ODEP$  are a PTC and a thermal sense (current source). The PTC is essentially a cutoff switch that causes hard ODEP limiting if heatsink temperature exceeds a safe maximum, regardless of signal level. The thermal sense causes the differential between  $+ODEP$  and  $-ODEP$  to decrease as heatsink temperature increases. An increase in positive output signal output into a load will result in  $-ODEP$  voltage dropping; an increase in negative output voltage and current will cause  $+ODEP$  voltage to drop. A complex RC network between the

# Theory

±ODEP circuitry is used to simulate the thermal barriers between the interior of the output device die (immeasurable by normal means) and the time delay from heat generation at the die until heat dissipates to the thermal sensor. The combined effects of thermal history and instantaneous dynamic power level result in an accurate simulation of the actual thermal condition of the output transistors.

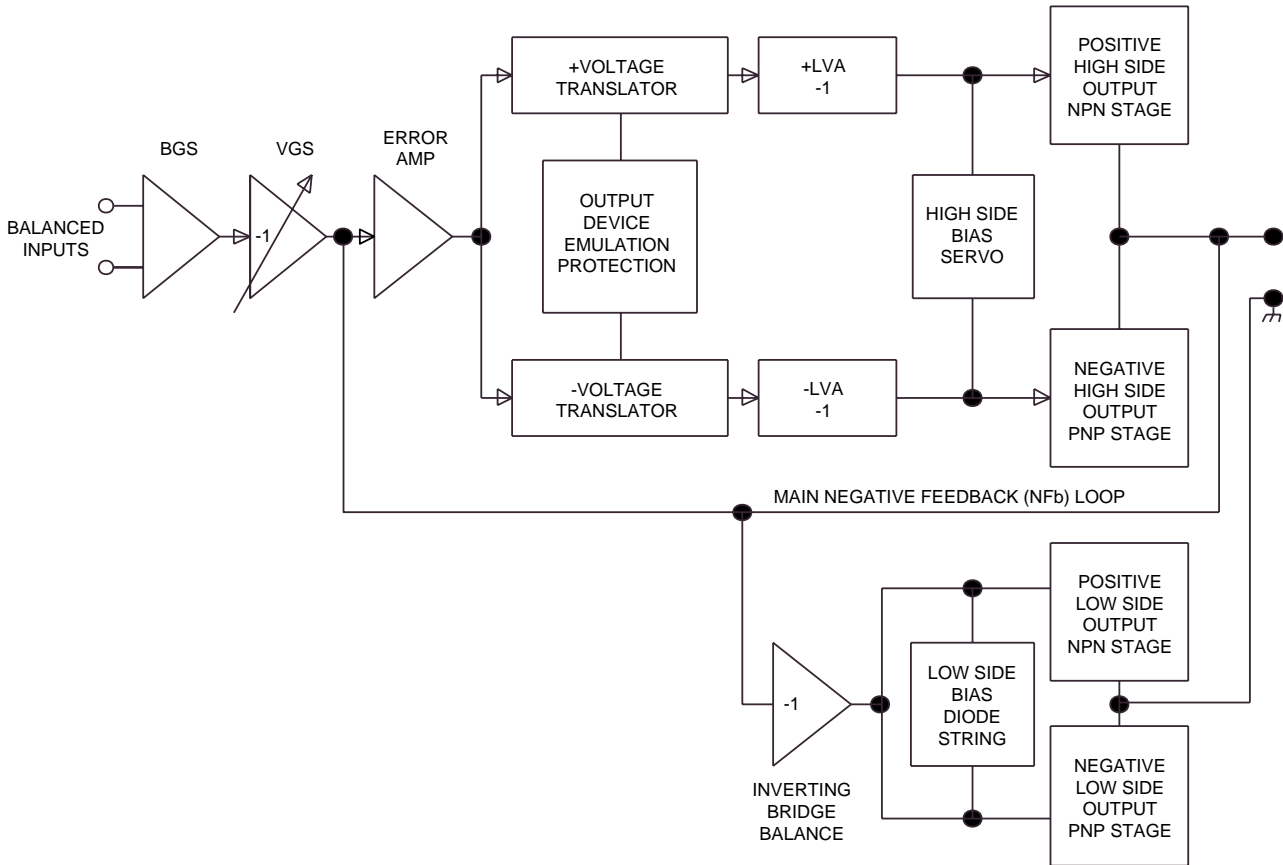


Figure 3. Typical Crown Amplifier Basic Block Diagram (One Channel Shown)

## Checkout Procedures

### GENERAL INFORMATION

The following test procedures are to be used to verify operation of this amplifier. DO NOT connect a load or inject a signal unless directed to do so by the procedure. These tests, though meant for verification and alignment of the amplifier, may also be very helpful in troubleshooting. For best results, tests should be performed in order.

All tests assume that AC power is from a regulated 120 VAC source. Test equipment includes an oscilloscope, a DMM, a signal generator, loads, and I.M.D. and T.H.D. noise test equipment.

### STANDARD INITIAL CONDITIONS

Level controls fully clockwise.

Stereo/Mono switch in Stereo.

Sensitivity switch in 26 dB fixed gain position.

It is assumed, in each step, that conditions of the amplifier are per these initial conditions unless otherwise specified.

### TEST 1: DC OFFSET

**Spec:** 0 VDC,  $\pm 10$  mV.

**Initial Conditions:** Controls per standard, inputs shorted.

**Procedure:** Measure DC voltage at the output connectors (rear panel). There is no adjustment for output offset. If spec is not met, there is an electrical malfunction. Slightly out of spec measurement is usually due to U104/U204 out of tolerance.

### TEST 2: OUTPUT BIAS ADJUSTMENT

**Spec:** 300 to 310 mVDC.

**Initial Conditions:** Controls per standard, heatsink temperature less than 40°C.

**Procedure:** Measure DC voltages on the output module across R31, adjust R26 if necessary. Measure DC voltages on the output module across R32, adjust R23 if necessary. Repeat for second channel.

### TEST 3: ODEP VOLTAGE ADJUSTMENT

**Spec:** Cold Bias Per Charts Below  $\pm 0.1$ V DC.

**Initial Conditions:** Controls per standard, heatsink at room temperature 20 to 30°C (68 to 86°F). Note: This adjustment should normally be performed within 2 minutes of turn on from ambient (cold) conditions. If possible measure heatsink temperature, if not measure ambient room temperature. Use this information when referencing the chart below.

The following is a list of ODEP Bias Voltages VS. Temperature.

°F	°C	V <sub>-ODEP</sub>	V <sub>+ODEP</sub>
66	18.9	-10.31	11.41
68	20.0	-10.26	11.36
70	21.1	-10.20	11.30
72	22.2	-10.14	11.24
74	23.3	-10.09	11.19
76	24.4	-10.03	11.13
77	25.0	-10.00	11.10
78	25.6	-9.97	11.07
80	26.7	-9.91	11.01
82	27.8	-9.86	10.96
84	28.9	-9.80	10.90
86	30.0	-9.74	10.84
88	31.1	-9.69	10.79
90	32.2	-9.63	10.73
92	33.3	-9.57	10.67
94	34.4	-9.51	10.61

**-ODEP Procedure:** Measure pin 6 of U100 and, if necessary, adjust R121 to obtain V<sub>-ODEP</sub> as specified above. Measure pin 6 of U200 and, if necessary, adjust R221 to obtain V<sub>-ODEP</sub> as specified above.

**+ODEP Procedure:** Measure pin 6 of U103 and, if necessary, adjust R132 to obtain V<sub>+ODEP</sub> as specified above. Measure pin 6 of U203 and, if necessary, adjust R232 to obtain V<sub>+ODEP</sub> as specified above.

## Checkout Procedures

### TEST 4: AC POWER DRAW

**Spec:** 90 Watts maximum quiescent.

**Initial Conditions:** Controls per standard.

**Procedure:** With no input signal and no load, measure AC line wattage draw. If current draw is excessive, check for high AC line voltage or high bias voltage.

### TEST 5: COMMON MODE REJECTION

**Spec at 100 Hz:** -70 dB.

**Spec at 20 kHz:** -50 dB.

**Initial Conditions:** Controls per standard.

**Procedure:** No load. Inject a 0 dBu 100 Hz sine wave into each channel, one channel at a time, with inverting and non-inverting inputs shorted together. At the output measure less than -44 dBu. Inject a 0 dBu 20 kHz sine wave into each channel, one channel at a time, with inverting and non-inverting inputs shorted together. At the output measure less than -24 dBu. Adjust R921 or R1021, if necessary, to obtain the required measurements. (In older units the adjustments are done using N100/N200.)

### TEST 6: VOLTAGE GAIN

**Spec:**  $\pm 3\%$  when the Sensitivity Switch is set for 26dB gain,  $\pm 6\%$  when the Sensitivity Switch is set for 0.775V or 1.4V sensitivity.

**Initial Conditions:** Controls per standard.

**Procedure:** No load connected. Inject a 0.775 VAC 1 kHz sine wave with the Sensitivity Switch in the 26 dB position. Measure 15.5 VAC  $\pm 0.07$  VAC at the amplifier output. Inject a 0.775 VAC 1 kHz sine wave with the Sensitivity Switch in the 0.775V position. Measure 39.9 VAC  $\pm 1.2$  VAC at the amplifier output. Inject a 1.4 VAC 1 kHz sine wave with the Sensitivity Switch in the 1.4V position. Measure 39.9 VAC  $\pm 1.2$  VAC at the amplifier output. Return the Sensitivity Switch to the 26 dB position.

### TEST 7: PHASE RESPONSE

**Spec:**  $\pm 10^\circ$  at 1 Watt.

**Initial Conditions:** Controls per standard, 8 ohm load on each channel.

**Procedure:** Inject a 1 kHz sine wave and adjust for 1 Watt output (2.8 VAC). Check input and output signals against each other, input and output signals must be within  $10^\circ$  of each other.

### TEST 8: LEVEL CONTROLS

**Spec:** Level controlled by level controls.

**Initial Conditions:** Controls per standard.

**Procedure:** No Load. Inject a 1 kHz sine wave. With level controls fully clockwise you should see full gain. As controls are rotated counterclockwise, observe similar gain reduction in each channel. When complete, return level controls to fully clockwise position.

### TEST 9: CURRENT LIMIT

**Spec:** Current Limit at 13  $\pm 2$  Amps

**Initial Conditions:** Controls per standard.

**Procedure:** Load each channel to 1 Ohm. Inject a 1 kHz differentiated (or 10% duty cycle) square wave and increase output level until current limit occurs. Current limit should occur at 11  $\pm 1$  Amps. Observe clean (no oscillations) current clipping.

### TEST 10: SLEW RATE & 10 KHZ SQUARE WAVE

**Spec:**  $> 13\text{V}/\mu\text{S}$ .

**Initial Conditions:** Controls per standard.

**Procedure:** Load each channel to 8 ohms. Inject a 10 kHz square wave to obtain 40 volts peak-to-peak at each output. Observe the slope of the square wave. It should typically measure 17 to 25  $\text{V}/\mu\text{S}$ . Also, the square wave must not include overshoot, ringing, or any type of oscillation.

### TEST 11: CROSSTALK

**Spec:**  $< 33$  mVAC at 20 kHz.

**Initial Conditions:** Controls per standard. Short input of channel not driven.

**Procedure:** 8 ohm load on each channel. Inject a 20 kHz sine wave into the Channel 1 input and increase output level to 37.4 VAC. Measure less than 33 mVAC at the output of Channel 2. Inject a 20 kHz sine wave into the Channel 2 input and increase output level to 37.4 VAC. Measure less than 33 mVAC at the output of Channel 1.

### TEST 12: OUTPUT POWER

**Spec at 8 Ohm Stereo:** 205W at 0.1% THD.

**Spec at 4 Ohm Stereo:** 230W at 0.1% THD.

**Initial Conditions:** Controls per standard.

**Procedure:** Load each channel to 8 ohms. Inject a 1 kHz sine wave and measure at least 40.5 VAC at the output of each channel. Load each channel to 4 ohms. Inject a 1 kHz sine wave and measure at least 30.3 VAC. All power measurements must be at less than 0.1% THD.

### TEST 13: REACTIVE LOADS

**Spec:** No oscillations. Safe with all types of loads.

**Initial Conditions:** Controls per standard.

## Checkout Procedures

**Procedure Capacitive:** Load each channel to 8 ohms in parallel with 2  $\mu$ F. Inject a 20 kHz sine wave with 30 VAC output for 10 seconds.

**Procedure Inductive:** Load each channel to 8 ohms in parallel with 159  $\mu$ Henries. Inject a 1 kHz sine wave with 15 VAC output for 10 seconds.

**Procedure Torture:** Load each channel with the primary (red and black leads) of a DC-300A transformer (D 5781-6). Inject a 10 Hz sine wave at sufficient output level to cause 3 to 5 flyback pulses, for 10 seconds.

**Procedure Short:** Inject a 60 Hz sine wave at 5 VAC. After establishing signal, short the output for 10 seconds.

### TEST 14: ODEP LIMITING

**Spec:** No oscillation on ODEP Limiting wave form; either channel controls limiting in Parallel Mono Mode.

**Initial Conditions:** Controls per standard; rag or other obstruction blocking fan so that it does not turn.

**Procedure:** Load the amplifier to 2 ohms on each channel. Inject a 60 Hz sine wave and adjust for 15 Vrms at the output. After a few minutes observe a wave form similar to Figure 4. Remove the input signal from both channels and allow the amplifier to cool for a few minutes. Switch the amplifier to Parallel Mono and remove the load from Channel 1. Inject the signal into Channel 1 and observe that ODEP limiting occurs at the output of both channels. Remove the load from Channel 2, and install the load on Channel 1. Again, observe that both channels limit. Return all amplifier controls to standard initial conditions. Remove the fan obstruction.

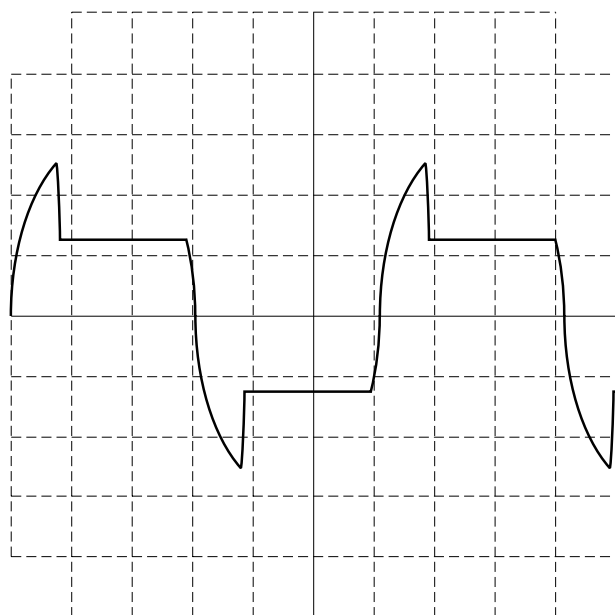


Figure 4. ODEP Limiting Wave Form

### TEST 15: LF PROTECTION

**Spec:** Amplifier mutes for low frequency.

**Initial Conditions:** Controls per standard.

**Procedure:** No load. Inject a 0.5 Hz 6 volt peak-to-peak square wave into each channel and verify that each channel cycles into mute.

### TEST 16: SIGNAL TO NOISE RATIO

**Spec:** 100 dB (105 dB A-weighted) below rated 8 ohm power.

**Initial Conditions:** Controls per standard. Short inputs.

**Procedure:** Load each channel to 8 ohms. Measure less than 400  $\mu$ V at the output of each channel (or -100 dB from reference of +34.25 dBu).

### TEST 17: TURN ON TRANSIENTS

**Spec:** No dangerous transients.

**Initial Conditions:** Controls per standard.

**Procedure:** From an off condition, turn on the amplifier and monitor the output noise at the time of turn on. Note: Turn on noise may increase significantly if the amplifier is cycled off and on.

### TEST 18: TURN OFF TRANSIENTS

**Spec:** No dangerous transients.

**Initial Conditions:** Controls per standard.

**Procedure:** From an on condition, turn off the amplifier and monitor the output noise at the time of turn off. Note: Turn off noise may increase significantly if the amplifier is cycled off and on.

### TEST 19: INTERMODULATION DISTORTION

**Spec at 0 dB Output:** 0.01%.

**Spec at -35 dB Output:** 0.05%.

**Initial Conditions:** Controls per standard.

**Procedure:** Load each channel to 8 ohms. Inject a SMPTE standard IM signal (60 Hz and 7 kHz sine wave mixed at 4:1 ratio) at 200 Watts (32.4 VAC). With an IM analyzer measure less than 0.01% IMD. Repeat test at -35 dB (reference 200 Watts or 32.4 VAC) and measure less than 0.05% IMD.

### TEST 20: CLIPPING

**Spec:** No protective action during test.

**Initial Conditions:** Controls per standard.

**Procedure:** Load each channel to 8 ohms. Inject a 1 kHz sine wave at each input and drive output 6 dB into clip for 10 seconds. The amplifier should not activate any protective circuits (ODEP, Fault, or LF Protection).

### POST TESTING

After completion of testing, if all tests are satisfactory, the amplifier controls should be returned to the positions required by customer. If conditions are unknown or unspecified, factory settings are as follows:

## *Checkout Procedures*

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## *Mechanical (Non-Module) Parts*

### **SUPPLIMENTAL ITEMS**

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
D 4137-2	Nylon Thumbscrew Washer	4
C 3342-0	Feet, Black Self-Stick	4
A10087-71012	10-32 .75 Machine (Rack Screw)	4

### **120VAC/60HZ NORTH AMERICA PRODUCT ONLY**

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
A10285-26	Fuse, 10A 3AB (120V Units)	1
A10285-7	Fuse, .5A AGC 1.25x.25 (LVPS)	1
D 6589-2	PB-1 Power Transformer	1
A10101-19	Washer, Fiber (XFMR Assby)	2
H42873-2	Fanformer Assembly	1
P10391-4	Fuse Board (U.S. Only)	1
P10426-6	Fuse Board (International Only)	1

### **FANFORMER MECHANICAL ASSEMBLY**

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
C 7062-0	Screw, 6-32-5/16 Flat Mach	2
C 9939-7	Fan Blade, 4 inch CCW	1
D 8439-8	Fan Bracket	1

### **FILTER CAPACITOR MOUNTING ASSEMBLY (ONE PER CHANNEL)**

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
A10095-4	Washer, #10 Ext. Lock	2
A10098-5	Belleville Spring Washer	2
C 7015-8	C126/C226 7800 $\mu$ F 90V	1
C 8752-5	D117/D217 35A 400V Bridge Rectifier	1
C 9870-4	Screw, 10-32-.38 Pan	2
D 6764-1	Washer, Shoulder	2
D 8438-0	Bracket, Capacitor Mounting	1

### **FUSE BOARD ASSEMBLY**

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
C 5060-6	Fuse Clip, PC Mount #926	4
P10391-4	Fuse Board	1

### **LED ASSEMBLY**

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
C 4342-9	Enable LED, Amber	1
P10068B4	LED Board	1

## *Mechanical (Non-Module) Parts*

### ***OUTPUT ASSEMBLY (ONE PER CHANNEL)***

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
A10100-4	Washer, #6 Flat Zinc	2
A10315-1	Screw, 6-32-.56 Hex Washer Head	12
C 4751-1	NPN Output Device	2
C 5826-0	S100/S200 Thermal Sense LM334Z	1
C 6492-0	PNP Output Device	2
C 7326-9	Solder Lug, #6 Tin	2
C 8573-5	PNP Driver Device TO-3P	2
C 8574-3	NPN Driver Device TO-3P	2
C 8813-5	Q318/Q418 Bias Servo MPSA18/MPS8097	1
C 9491-9	Screw, 6-32-.312 Taptite Pan Ph	13
D 7665-9	Clip, TO-3P Mounting	2
D 7666-7	Bracket, TO-3P Heatsink	2
D 7796-2	Silpad Insulator	1
D 7797-0	Output Thru-Hole Pad Insulator	1
D 8264-0	PTC Thermal Sensor	1
F12019-0	Diode Heatsink Slug	1
F12469-7	Heatsink, Aluminum	2
	Output Module (See Module List)	1

### ***BACK PANEL ASSEMBLY***

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
A10214-7	Strain Relief (Power Cord)	1
C 2823-0	Dual Binding Post Assembly	1
D 7074-4	Power Cord (3-14 15A USA)	1
M21208J9	Back Panel	1
A10019-8	Nut, #8 32-2 Captive	2

### ***CHASSIS FRONT ASSEMBLY***

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
A10031-1	Nut, 8-32 Captive	4
A10090-70806	Screw, 8-32-.375 Mach Ph Oval (Grille)	3
A10090-70808	Screw, 8-32-.5 Mach Ph Oval	4
A10101-5	Washer, Nylon (Grille)	3
A10110-70605	Screw, 6-32-.312 Taptite Ph (Cover)	20
A10173-1	Clip, Grille Filter	3
D 6944-9	Air Filter	1
D 8465J2	End Cap	2
D 8501-5	Cover, Top	1
D 8548-6	Cover, Bottom	1
F10962-3	Front Panel Overlay PB-1	1
F11978J7	Front Panel Overlay 460CSL	1
F12435J7	Grille	1

## *Mechanical (Non-Module) Parts*

### **MAIN CHASSIS ASSEMBLY**

<b>CPN</b>	<b>ITEM</b>	<b>QTY</b>
A10086-11008	Screw, 10-32-.5 Mach Rd Ph	4
A10086-70806	Screw, 8-32-.37 Mach Rd Ph	2
A10089-11032	Screw, 10-32-2 Mach Pan Ph	4
A10094-3	Washer, #6 Black Star	3
A10094-6	Washer, #8 Black Star	4
A10094-8	Washer, #10 Tooth Lock	10
A10099-7	Washer, #10 Nylon Shoulder	4
A10100-16	Washer	4
A10102-8	Nut, 10-32 Hex Zinc	6
A10109-10822	Screw, 8-18-1.375 Pan Ph	2
A10110-70812	Screw, 8-32-.75 Taptite Pan Ph	2
A10192-1	Snap Bushing .5	4
C 1811-6	Tie Wrap	4
C 3163-0	Solder Lug #6 505	1
C 6487-0	Power Switch 22A Rocker 2 Pole	1
C 6912-7	Tension Retainer Board Support	2
C 6913-5	Spacer Nut, 1 inch	2
C 6914-3	Spacer Nut, .75 inch	2
C 9491-9	Screw, 6-32-.312 Taptite Pan	4
C 9953-8	Screw, 6-20-.312 Taptite Pan Black	6
D 7340-9	Label, F1 Fuse Replacement	1
D 7600-6	Ground Strap (DBP to Chassis)	1
D 7784-8	Label, Sensitivity Switch	1
D 8003-2	Label, F200 Fuse Replacement	1
D 8069-4	Insulator, Fuse Board	1
F10787J3	Back Panel Plate	1
F10963-1	Transformer Plate	1
M21059J6	Chassis	1
	Main Module (See Module List)	1

## **Module Information**

### **MODULE HISTORY**

Since its introduction in 1986, the PB-1 has gone through a number of updates and revisions. Over the course of its history some of these changes have resulted in upgrading to newer modules. What follows is a historical breakdown of PB-1 modules. It should also be noted that the 460CSL was introduced in 1992 and therefore modules obsoleted before that time were never used in the CSL version.

### **OUTPUT MODULES:**

Q42576-1

Original output module. No longer available.

Q42661-1

Through hole output module. No longer available.

Q42718-9

Output module: 4 resistor small predriver. PB-1 Only. Last output module for PB-1 for use with TO-220 package driver transistors.

Q42885-6

TO-3P Driver Output module. Not for use in THC units, not retrofittable into TO-220 driver transistor units.

Q42967-2

THC Output module with TO-3P drivers. Not retrofittable to any older units. Does not require special main module for THC ODEP recompensation. Also improved bias stability.

Q43200-7

THC #2 Output Module. Replaces Q42967-2 only. Electrically identical, but larger screw head plates prevent shorting which could occur with the first THC output module.

### **MAIN MODULES:**

Q42552A0

This was the original main board. It offered 2 front end gain stages and was also used in the PB-1, MT-600/LX, MT-1200/LX. It did not include ground lift, but did offer a choice of .775V or 26 dB voltage gain sensitivities. No longer available.

Q42664-5

Service replacement for Q42552A0 for PB-1. No longer available.

Q42682-7

Main #2. Upgraded board from Q42552A0 for PB-1. No longer available.

Q42776-7

Universally usable PC board, finished module used in MT-600/1200, MA-600/1200, and PB-1. Added third gain stage and ground lift switch. For use in the PB-1 install two level pots (C 7409-3) and remove R187 and R287. Can replace all older modules. Use this module to replace this or any previous module. This module can also be used to replace the Q42953-2 module put into production later. Note that if this module is being used to replace an older module, you may have to slide the ground lift switch to the left (ground lift position) and clip off the plastic switch protrusion in order for the module to properly fit in the unit.

Q42953-2

PB-1 main module to replace Q42776-7. This or the Q42776-7 module may be used with TO-3P driver transistor output modules, and with or without Through Hole Chassis (THC) in this amplifier.

Q43060-5

THC main module built on D 7993-5 circuit board. On this module the boost circuit has been deleted, the third position (1.4V) is added to the Sensitivity Switch, and additional fault circuitry has been added to the module. Although it is possible to modify any older unit to accept this module, it is recommended that the Q42776-7 be used to replace main modules in all older units, and this module be used only as a replacement for itself.

## Q42576-1 Output Module Parts List (P10137-1 Board)

### Q42576-1 Output Module (4 Resistor Original) for PB-1:

#### CAPACITORS

C01	C 3978-1	.047 $\mu$ F
C02	C 6804-6	.1 $\mu$ F
C03	C 6804-6	.1 $\mu$ F
C04	C 3996-3	.0047 $\mu$ F
C05	C 6807-9	.001 $\mu$ F
C06	C 6806-1	.01 $\mu$ F
C07	C 6807-9	.001 $\mu$ F
C08	C 6810-3	180pF
C09	C 6809-5	220pF
C43	C 6806-1	.01 $\mu$ F

#### DIODES

D01	C 2851-1	1N4004
D02	C 2851-1	1N4004
D03	C 2851-1	1N4004
D04	C 2851-1	1N4004
D05	C 2851-1	1N4004
D06	C 2851-1	1N4004
D07	C 2851-1	1N4004
D08	C 2851-1	1N4004
D09	C 2851-1	1N4004
D10	C 2851-1	1N4004
D11	C 2851-1	1N4004
D12	C 2851-1	1N4004

#### INDUCTORS

L00	C 6592-6	Output Coil
L01	C 3510-2	470 $\mu$ H
L02	C 3510-2	470 $\mu$ H

#### TRANSISTORS

Q17	C 3810-6	NPN MPSA43
Q19	C 3578-9	PNP MPSA93

#### RESISTORS

R00	A10266-7501	75
R01	A10266-4711	470
R02	C 7778-1	5.6
R03	C 6486-2	.2 5W
R08	C 6486-2	.2 5W
R09	C 7779-9	22
R10	A10266-4711	470
R11	C 1001-4	2.7 1W
R12	C 1001-4	2.7 1W
R13	A10266-7501	75
R14	C 1001-4	2.7 1W
R15	C 6486-2	.2 5W
R20	C 6486-2	.2 5W
R21	C 7778-1	5.6
R22	C 7779-9	22
R23	C 6844-2	250 Pot LS Bias
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot HS Bias
R27	A10266-3911	390
R28	A10266-1331	13K
R30*	A10265-10201*	102*

#### MISC.

Board	P10137-1	
Jumpers	C 5868-2	0 Ohm Jumper (8)
Clips	D 6414-3	Q17/19 Hold Down
J500 J600	C 7057-0	10 Pos. Connector

Note: R30 is 102 Ohms in most units, though in some cases a different value may be used to match the installed S100/S200 LM334 (C5826-0) device grade. This is the standard value and is used with the most common LM334 grade, green. If the LM334 is marked with a blue dot, R30 should be a 107 Ohm resistor (A10265-10701); if it is marked with a yellow dot then R30 should be a 100 Ohm resistor (A10265-10001).

## Q42661-1 Output Module Parts List (P10137-1 Board)

**Q42661-1 Output Module (4 Resistor #2) for PB-1:**

**CAPACITORS**

C01	C 3978-1	.047μF
C02	C 6804-6	.1μF
C03	C 6804-6	.1μF
C04	C 3996-3	.0047μF
C05	C 6807-9	.001μF
C06	C 6806-1	.01μF
C07	C 6807-9	.001μF
C08	C 6810-3	180pF
C09	C 6809-5	220pF

**DIODES**

D01	C 2851-1	1N4004
D02	C 2851-1	1N4004
D03	C 2851-1	1N4004
D04	C 2851-1	1N4004
D05	C 2851-1	1N4004
D06	C 2851-1	1N4004
D07	C 2851-1	1N4004
D08	C 2851-1	1N4004
D09	C 2851-1	1N4004
D10	C 2851-1	1N4004
D11	C 2851-1	1N4004
D12	C 2851-1	1N4004

**INDUCTORS**

L00	C 6592-6	Output Coil
L01	C 3510-2	470μH
L02	C 3510-2	470μH

**TRANSISTORS**

Q17	C 3810-6	NPN MPSA43
Q19	C 3578-9	PNP MPSA93

**RESISTORS**

R00	A10266-7501	75
R01	A10266-4711	470
R02	C 7778-1	5.6
R07	D 6600-7	.19 5W
R09	C 7779-9	22
R10	A10266-4711	470
R11	C 1001-4	2.7 1W
R12	C 1001-4	2.7 1W
R13	A10266-7501	75
R14	C 1001-4	2.7 1W
R15	D 6600-7	.19 5W
R16	D 6600-7	.19 5W
R19	D 6600-7	.19 5W
R21	C 7778-1	5.6
R22	C 7779-9	22
R23	C 6844-2	250 Pot LS Bias
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot HS Bias
R27	A10266-3911	390
R28	A10266-1331	13K
R30*	A10265-10201*	102*

**MISC.**

Board	P10137-1	
Jumpers	C 5868-2	0 Ohm Jumper (4)
Clips	D 6414-3	Q17/19 Hold Down
J500 J600	C 7057-0	10 Pin Header

Note: R30 is 102 Ohms in most units, though in some cases a different value may be used to match the installed S100/S200 LM334 (C5826-0) device grade. This is the standard value and is used with the most common LM334 grade, green. If the LM334 is marked with a blue dot, R30 should be a 107 Ohm resistor (A10265-10701); if it is marked with a yellow dot then R30 should be a 100 Ohm resistor (A10265-10001).

## Q42718-9 Output Module Parts List (P10233-8 Board)

### Q42718-9 Output Module (4 Resistor #3) for PB-1:

#### CAPACITORS

C01	C 3978-1	.047 $\mu$ F
C02	C 3218-2	.22 $\mu$ F
C03	C 3218-2	.22 $\mu$ F
C04	C 8534-7	.0047 $\mu$ F
C05	C 6807-9	.001 $\mu$ F
C06	C 6806-1	.01 $\mu$ F
C07	C 6807-9	.001 $\mu$ F
C08	C 6810-3	180pF
C09	C 6809-5	220pF

#### DIODES

D01	C 2851-1	1N4004
D02	C 2851-1	1N4004
D03	C 2851-1	1N4004
D04	C 2851-1	1N4004
D05	C 2851-1	1N4004
D06	C 2851-1	1N4004
D07	C 2851-1	1N4004
D08	C 2851-1	1N4004
D09	C 2851-1	1N4004
D10	C 2851-1	1N4004
D11	C 2851-1	1N4004
D12	C 2851-1	1N4004

#### INDUCTORS

L00	C 6592-6	1.3 $\mu$ H Output Coil
L01	C 3510-2	470 $\mu$ H
L02	C 3510-2	470 $\mu$ H

#### TRANSISTORS

Q17	C 3810-6	NPN MPSA43/42
Q19	C 3578-9	PNP MPSA93

#### RESISTORS

R00	A10266-7501	75
R01	A10266-4711	470
R07	D 6600-7	.19 5W
R10	A10266-4711	470
R11	A10266-2R73	2.7 1W
R12	A10266-1204	12 2W
R13	A10266-7501	75
R14	A10266-1204	12 2W
R15	D 6600-7	.19 5W
R16	D 6600-7	.19 5W
R19	D 6600-7	.19 5W
R23	C 6844-2	250 Pot LS Bias
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot HS Bias
R27	A10266-3911	390
R28	A10266-1331	13K
R30*	A10265-10201*	102*
R31	C 7778-1	5.6 .5W Flame Proof
R32	C 7778-1	5.6 .5W Flame Proof
R33	C 7779-9	22 .5W Flame Proof
R34	C 7779-9	22 .5W Flame Proof
R35	A10266-1204	12 2W
R36	A10266-1204	12 2W
R37	A10266-1204	12 2W
R38	A10266-1204	12 2W
R39	A10266-1204	12 2W
R40	A10266-1204	12 2W

#### MISC.

Board	P10233-8	
Jumpers	C 5868-2	0 Ohm .25W
Clips	D 6414-3	Q17/Q19 Hold Down
J500 J600	C 7057-0	10 Pin Header

\*Note: R30 is 102 Ohms in most units, though in some cases a different value may be used to match the installed S100/S200 LM334 (C5826-0) device grade. This is the standard value and is used with the most common LM334 grade, green. If the LM334 is marked with a blue dot, R30 should be a 107 Ohm resistor (A10265-10701); if it is marked with a yellow dot then R30 should be a 100 Ohm resistor (A10265-10001).

## Q42885-6 Output Module Parts List (P10305-4 Board)

**Q42885-6 Output Module (4 Resistor TO-3P Drivers) for PB-1/460CSL:**

**CAPACITORS**

C01	C 8511-5	.047μF
C02	C 7964-7	.22μF
C03	C 7964-7	.22μF
C04	C 8534-7	.0047μF
C05	C 6807-9	.001μF
C06	C 6806-1	.01μF
C07	C 6807-9	.001μF
C08	C 6810-3	180pF
C09	C 6809-5	220pF
C43	C 6806-1	.01uF

**DIODES**

D01	C 2851-1	1N4004
D02	C 2851-1	1N4004
D03	C 2851-1	1N4004
D04	C 2851-1	1N4004
D05	C 2851-1	1N4004
D06	C 2851-1	1N4004
D07	C 2851-1	1N4004
D08	C 2851-1	1N4004
D09	C 2851-1	1N4004
D10	C 2851-1	1N4004
D11	C 2851-1	1N4004
D12	C 2851-1	1N4004

**INDUCTORS**

L00	C 6592-6	Output Coil
L01	C 3510-2	470μH
L02	C 3510-2	470μH

**TRANSISTORS**

Q17	C 3810-6	NPN MPSA43
Q19	C 3578-9	PNP MPSA93

**RESISTORS**

R00	A10266-7501	75
R01	A10266-4711	470
R04	D 6600-7	.19 5W
R07	D 6600-7	.19 5W
R10	A10266-4711	470
R11	C 1001-4	2.7 1W
R12	C 3931-0	12 2W
R13	A10266-7501	75
R16	D 6600-7	.19 5W
R19	D 6600-7	.19 5W
R23	C 6844-2	250 Pot LS Bias
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot HS Bias
R27	A10266-3911	390
R28	A10266-1331	13K
R29	C 6402-9	51 OHM
R30*	A10265-10201*	102*
R31	C 7778-1	5.6 flame proof
R32	C 7778-1	5.6 flame proof
R33	C 7779-9	22 flame proof
R34	C 7779-9	22 flame proof
R35	C 3931-0	12 2W
R36	C 3931-0	12 2W
R37	C 3931-0	12 2W
R38	C 3931-0	12 2W
R39	C 3931-0	12 2W
R40	C 3931-0	12 2W

**MISC.**

Board	P10305-4	
Jumpers	C 5868-2	0 Ohm Jumper (7)
Clips	D 6414-3	Q17/19 Hold Down
J500 J600	C 7057-0	10 Pos. Connector
BEAD	C 8341-7	Over emitter of Q19

Note: R30 is 102 Ohms in most units, though in some cases a different value may be used to match the installed S100/S200 LM334 (C5826-0) device grade. This is the standard value and is used with the most common LM334 grade, green. If the LM334 is marked with a blue dot, R30 should be a 107 Ohm resistor (A10265-10701); if it is marked with a yellow dot then R30 should be a 100 Ohm resistor (A10265-10001).



## Q42967-2 Output Module Parts List (P10341-9 Board)

*Q42967-2 Output Module for Through Hole Chassis (THC)  
PB-1/460CSL units:*

### **CAPACITORS**

C01	C 8511-5	.047 $\mu$ F
C02	C 7964-7	.22 $\mu$ F
C03	C 7964-7	.22 $\mu$ F
C04	C 8534-7	.0047 $\mu$ F
C05	C 8534-7	.0047 $\mu$ F
C06	C 6806-1	.01 $\mu$ F
C07	C 6807-9	.001 $\mu$ F
C08	C 6810-3	180pF
C09	C 6809-5	220pF
C43	C 6806-1	.01 $\mu$ F

### **DIODES**

D01	C 2851-1	1N4004
D02	C 2851-1	1N4004
D03	C 2851-1	1N4004
D04	C 2851-1	1N4004
D05	C 2851-1	1N4004
D06	C 2851-1	1N4004
D07	C 2851-1	1N4004
D08	C 2851-1	1N4004
D09	C 2851-1	1N4004
D10	C 2851-1	1N4004
D11	C 2851-1	1N4004
D12	C 2851-1	1N4004

### **INDUCTORS**

L00	C 6592-6	Output Coil
L01	C 3510-2	470 $\mu$ H
L02	C 3510-2	470 $\mu$ H

### **TRANSISTORS**

Q17	C 3810-6	NPN MPSA43
Q19	C 3578-9	PNP MPSA93

### **RESISTORS**

R00	A10266-7501	75
R01	A10266-4711	470
R04	D 6600-7	.19 5W
R07	D 6600-7	.19 5W
R10	A10266-4711	470
R11	A10266-2R73	2.7 1W
R12	A10266-1204	12 2W
R13	A10266-7501	75
R14	A10266-1204	12 2W
R16	D 6600-7	.19 5W
R19	D 6600-7	.19 5W
R23	C 6844-2	250 Pot LS Bias
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot HS Bias
R27	A10266-3911	390
R28	A10266-1331	13K
R29	A10266-5101	51
R30*	A10265-10201*	102*
R31	C 7778-1	5.6 .5W Flame Proof
R32	C 7778-1	5.6 .5W Flame Proof
R33	C 7779-9	22 .5W Flame Proof
R34	C 7779-9	22 .5W Flame Proof
R35	A10266-1204	12 2W
R36	A10266-1204	12 2W
R37	A10266-1204	12 2W
R38	A10266-1204	12 2W
R39	A10266-1204	12 2W
R40	A10266-1204	12 2W

### **MISC.**

Board	P10341-9	
Jumpers	C 5868-2	0 Ohm (Qty 7)
Clips	D 6414-3	Q17/Q19 Hold Down
J500 J600	C 7057-0	10 Pin Header

\*Note: R30 is 102 Ohms in most units, though in some cases a different value may be used to match the installed S100/S200 LM334 (C5826-0) device grade. This is the standard value and is used with the most common LM334 grade, green. If the LM334 is marked with a blue dot, R30 should be a 107 Ohm resistor (A10265-10701); if it is marked with a yellow dot then R30 should be a 100 Ohm resistor (A10265-10001).

## Q43200-7 Output Module Parts List (P10397-1 Board)

*Q43200-7 Output Module (THC #2) for PB-1/460CSL Units:*

**CAPACITORS**

C01	C 8511-5	.047μF
C02	C 7964-7	.22μF
C03	C 7964-7	.22μF
C04	C 8534-7	.0047μF
C05	C 8534-7	.0047μF
C06	C 6806-1	.01μF
C07	C 6807-9	.001μF
C08	C 6810-3	180pF
C09	C 6809-5	220pF
C43	C 6806-1	.01μF

**DIODES**

D01	C 2851-1	1N4004
D02	C 2851-1	1N4004
D03	C 2851-1	1N4004
D04	C 2851-1	1N4004
D05	C 2851-1	1N4004
D06	C 2851-1	1N4004
D07	C 2851-1	1N4004
D08	C 2851-1	1N4004
D09	C 2851-1	1N4004
D10	C 2851-1	1N4004
D11	C 2851-1	1N4004
D12	C 2851-1	1N4004

**INDUCTORS**

L00	C 6592-6	Output Coil
L01	C 3510-2	470μH
L02	C 3510-2	470μH

**TRANSISTORS**

Q17	C 3810-6	NPN MPSA43
Q19	C 3578-9	PNP MPSA93

**RESISTORS**

R00	A10266-7501	75
R01	A10266-4711	470
R04	D 6600-7	.19 5W
R07	D 6600-7	.19 5W
R10	A10266-4711	470
R11	A10266-2R73	2.7 1W
R12	A10266-1204	12 2W
R13	A10266-7501	75
R14	A10266-1204	12 2W
R16	D 6600-7	.19 5W
R19	D 6600-7	.19 5W
R23	C 6844-2	250 Pot LS
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot HS
R27	A10266-3911	390
R28	A10266-1331	13K
R29	A10266-5101	51
R30*	A10265-10201*	102*
R31	C 7778-1	5.6 .5W Flame Proof
R32	C 7778-1	5.6 .5W Flame Proof
R33	C 7779-9	22 .5W Flame Proof
R34	C 7779-9	22 .5W Flame Proof
R35	A10266-1204	12 2W
R36	A10266-1204	12 2W
R37	A10266-1204	12 2W
R38	A10266-1204	12 2W
R39	A10266-1204	12 2W
R40	A10266-1204	12 2W

**MISC.**

Board	P10397-1	
Jumpers	C 5868-2	0 Ohm (Qty 7)
Clips	D 6414-3	Q17/Q19 Hold Down
J500 J600	C 7057-0	10 Pin Header

\*Note: R30 is 102 Ohms in most units, though in some cases a different value may be used to match the installed S100/S200 LM334 (C5826-0) device grade. This is the standard value and is used with the most common LM334 grade, green. If the LM334 is marked with a blue dot, R30 should be a 107 Ohm resistor (A10265-10701); if it is marked with a yellow dot then R30 should be a 100 Ohm resistor (A10265-10001).

## Q42552A0 Main Module Parts List (D 6304B2 Board)

### Q42552A0 Main Module (Original) for PB-1:

#### CAPACITORS

C1		C 4303-1	1000uF
C2		C 3913-8	470uF
C3		C 4303-1	1000uF
C4		C 6802-0	.47uF
C100	C200	C 5053-1	18uF
C101	C201	C 2821-4	10pF
C103	C203	C 6805-3	.022uF
C104	C204	C 6805-3	.022uF
C105	C205	C 6950-7	82pF
C106	C206	C 6950-7	82pF
C108	C208	C 6812-9	47pF
C112	C212	C 6803-8	.12uF
C113	C213	C 6802-0	.47uF
C114	C214	C 3729-8	100uF 16V
C115	C215	C 3729-8	100uF 16V
C116	C216	C 6802-0	.47uF
C117	C217	C 6803-8	.12uF
C118	C218	C 6812-9	47pF
C122	C222	C 6811-1	100pF
C124	C224	C 6809-5	220pF
C125	C225	C 3729-8	100uF 16V
C127	C227	C 3729-8	100uF 16V
C133	C233	C 6814-5	12pF
C134	C234	C 6805-3	.022uF
C135	C235	C 6805-3	.022uF
C136	C236	C 6808-7	470pF
C137	C237	C 6808-7	470pF
C138	C238	C 6814-5	12pF
C139	C239	C 6814-5	12pF
C140	C240	C 6812-9	47pF
C141	C241	C 6812-9	47pF
C142	C242	C 5162-0	3-12pF Trim

#### DIODES

D1		C 2851-1	1N4004
D2		C 2851-1	1N4004
D3		C 2851-1	1N4004
D4		C 2851-1	1N4004
D5		C 2851-1	1N4004
D6		C 2851-1	1N4004
D7		C 2851-1	1N4004
D104	D204	C 2851-1	1N4004
D105	D205	C 2851-1	1N4004
D106	D206	C 2851-1	1N4004
D107	D207	C 2851-1	1N4004
D108	D208	C 3181-2	1N4148
D109	D209	C 3181-2	1N4148
D110	D210	C 3181-2	1N4148
D111	D211	C 3181-2	1N4148

D112	D212	C 3181-2	1N4148
D113	D213	C 3181-2	1N4148
D114	D214	C 3181-2	1N4148
D115	D215	C 3181-2	1N4148
D120	D220	C 3181-2	1N4148
D121	D221	C 3181-2	1N4148
D122	D222	C 3181-2	1N4148
D123	D223	C 3181-2	1N4148

#### NETWORK RESISTORS

N100	N200	D 4669-4	Balanced Input Trim
N101	N201	D 6081-0	Resistor Network-B
N102	N202	D 6082-8	Resistor Network-C

#### TRANSISTORS

Q100	Q200	D 2961-7	SEL 2N3859A
Q101	Q201	C 3578-9	MPSA93
Q102	Q202	C 3810-6	MPSA43/A42
Q103	Q203	C 3786-8	PN4250A
Q104	Q204	C 3625-8	2N4125
Q105	Q205	C 3578-9	MPSA93
Q106	Q206	C 3625-8	2N4125
Q107	Q207	C 3786-8	PN4250A
Q108	Q208	D 2961-7	SEL 2N3859A
Q109	Q209	D 2961-7	SEL 2N3859A
Q110	Q210	C 3810-6	MPSA43/A42
Q111	Q211	D 2961-7	SEL 2N3859A
Q112	Q212	C 3625-8	2N4125
Q113	Q213	C 3625-8	2N4125
Q115	Q215	D 2962-5	MPS8097
Q116	Q216	C 3786-8	PN4250A
Q117	Q217	D 2961-7	SEL 2N3859A
Q118	Q218	D 2961-7	SEL 2N3859A
Q119	Q219	C 3625-8	2N4125
Q120	Q220	C 3625-8	2N4125

#### RESISTORS

R1		A10265-10031	100K 1%
R5		A10266-3321	3.3K
R100	R200	C 6893-9	5K POT
R101	R201	A10265-49911	4.99K
R102	R202	A10266-1021	1K
R103	R203	A10265-10031	100K 1%
R104	R204	A10266-2721	2.7K
R105	R205	A10266-2721	2.7K
R106	R206	A10266-1231	12K
R107	R207	A10266-4731	47K
R108	R208	A10266-1021	1K
R109	R209	A10266-8201	82 OHM
R110	R210	A10266-4731	47K
R112	R212	A10266-5131	51K
R113	R213	A10266-4721	4.7K

## Q42552A0 Main Module Parts List (D 6304B2 Board)

R114	R214	A10266-4721	4.7K
R115	R215	A10266-5141	510K
R116	R216	A10266-3351	3.3M
R118	R218	A10266-2711	270 OHM
R119	R219	A10266-3011	300 OHM
R120	R220	A10266-2711	270 OHM
R121	R221	C 5062-2	100K TRIMMER
R122	R222	A10266-2741	270K
R123	R223	A10266-1831	18K
R124	R224	A10266-6821	6.8K
R125	R225	C 7782-3	100 OHM
R126	R226	C 7782-3	100 OHM
R127	R227	A10266-6821	6.8K
R128	R228	A10266-1031	10K
R129	R229	A10266-1041	100K
R130	R230	A10266-1041	100K
R131	R231	A10266-1031	10K
R132	R232	C 5062-2	100K TRIMMER
R133	R233	A10266-2741	270K
R134	R234	A10266-1831	18K
R135	R235	C 7782-3	100 OHM
R136	R236	A10266-6821	6.8K
R137	R237	C 7782-3	100 OHM
R138	R238	A10266-6821	6.8K
R139	R239	A10266-1021	1K
R140	R240	A10266-8201	82 OHM
R141	R241	A10266-1541	150K
R142	R242	A10266-1541	150K
R146	R246	A10266-1031	10K
R147	R247	C 7781-5	200 OHM
R148	R248	A10266-2721	2.7K
R149	R249	C 7781-5	200 OHM
R150	R250	A10266-2721	2.7K
R151	R251	A10266-1031	10K
R152	R252	A10266-1231	12K
R154	R254	A10266-1011	100 OHM
R156	R256	A10266-1321	1.3K
R157	R257	A10266-1321	1.3K
R158	R258	A10266-9121	9.1K
R159	R259	A10266-1031	10K
R161	R261	A10266-4701	47 OHM
R162	R262	A10266-4701	47 OHM
R165	R265	A10265-53611	5.36K 1%
R146	R246	A10265-53611	5.36K 1%
R167	R267	A10266-1021	1K
R168	R268	A10265-95301	953 OHM
R170	R270	A10266-1021	1K
R171	R271	A10265-95301	953 OHM

**SWITCHES**

S3	C 6841-8	4PDT
S100	C 6781-6	6P3T

**IC'S**

U1	C 5095-2	MC7815	
U2	C 5096-0	MC7915	
U100	U200	C 6500-0	UPA77 PNP
U103	U203	C 6910-1	UPA76 NPN
U104	U204	C 6900-2	MC34084P

**MISC.**

Board	D 6304A4 or D 6304B2		
J9	C 6871-5	6-Cond Snap Mate	
J100	J200	C 6777-4	PHONE JACK
J500	J800	D 6619-7	10" RIBBON ASSY
J600	J700	D 6620-5	6" RIBBON ASSY
MOUNTS U1, U2:			
	(2)	C 1889-2	6-32 NUT
	(2)	C 2176-3	6-32 X .5 SCREW
	(2)	C 5341-0	HEATSINK
	(2)	C 5594-4	STAR WASHER
MOUNTS U104, U204:			
	(2)	C 3450-1	14 Pin Socket
COVERS FOR J100, J200:			
	(2)	C 6778-2	Cover, Phone Jack
Additional Parts			
	(1)	C 4508-5	16 PIN SOCKET
	(1)	C 5061-4	1N3070 DIODE
	(1)	C 6851-7	5-Pos Header
	(1)	C 7077-8	3-Cond Wire Retain
		C 6899-6	Wire Posts

## Q42664-5 Main Module Parts List (D 6910-0 Board)

*Q42664-5 Main Module (Service Replacement For Original) for PB-1:*

### CAPACITORS

C1		C 4303-1	1000uF
C2		C 3913-8	470uF
C3		C 4303-1	1000uF
C4		C 6802-0	.47uF
C100	C200	C 5311-3	22uF
C101	C201	C 2821-4	10pF
C103	C203	C 6805-3	.022uF
C104	C204	C 6805-3	.022uF
C105	C205	C 6950-7	82pF
C106	C206	C 6950-7	82pF
C108	C208	C 6812-9	47pF
C112	C212	C 6803-8	.12uF
C113	C213	C 6802-0	.47uF
C114	C214	C 3729-8	100uF 16V
C115	C215	C 3729-8	100uF 16V
C116	C216	C 6802-0	.47uF
C117	C217	C 6803-8	.12uF
C118	C218	C 6812-9	47pF
C122	C222	C 6811-1	100pF
C123	C223	C 6811-1	100pF
C124	C224	C 6809-5	220pF
C125	C225	C 3729-8	100uF 16V
C127	C227	C 3729-8	100uF 16V
C128	C228	C 6803-8	.12uF
C133	C233	C 6814-5	12pF
C134	C234	C 6805-3	.022uF
C135	C235	C 6805-3	.022uF
C136	C236	C 6808-7	470pF
C137	C237	C 6808-7	470pF
C138	C238	C 6814-5	12pF
C139	C239	C 6814-5	12pF
C140	C240	C 6812-9	47pF
C141	C241	C 6812-9	47pF
	C242	C 5162-0	3-12pF Trim

### DIODES

D1		C 2851-1	1N4004
D2		C 2851-1	1N4004
D3		C 2851-1	1N4004
D4		C 2851-1	1N4004
D5		C 2851-1	1N4004
D6		C 2851-1	1N4004
D7		C 2851-1	1N4004
D104	D204	C 2851-1	1N4004
D105	D205	C 2851-1	1N4004
D106	D206	C 2851-1	1N4004
D107	D207	C 2851-1	1N4004
D108	D208	C 3181-2	1N4148

D109	D209	C 3181-2	1N4148
D110	D210	C 3181-2	1N4148
D111	D211	C 5061-4	1N3070
D112	D212	C 3181-2	1N4148
D113	D213	C 3181-2	1N4148
D114	D214	C 3181-2	1N4148
D115	D215	C 3181-2	1N4148
D120	D220	C 3181-2	1N4148
D121	D221	C 3181-2	1N4148
D122	D222	C 3181-2	1N4148
D123	D223	C 5061-4	1N3070

### NETWORK RESISTORS

N100	N200	D 4669-4	Balanced Input Trim
N101	N201	D 6081-0	Resistor Network-B
N102	N202	D 6082-8	Resistor Network-C

### TRANSISTORS

Q100	Q200	D 2961-7	SEL 2N3859A
Q101	Q201	C 3578-9	MPSA93
Q102	Q202	C 3810-6	MPSA43/A42
Q103	Q203	C 3786-8	PN4250A
Q104	Q204	C 3625-8	2N4125
Q105	Q205	C 3578-9	MPSA93
Q106	Q206	C 3625-8	2N4125
Q107	Q207	C 3786-8	PN4250A
Q108	Q208	D 2961-7	SEL 2N3859A
Q109	Q209	D 2961-7	SEL 2N3859A
Q110	Q210	C 3810-6	MPSA43/A42
Q111	Q211	D 2961-7	SEL 2N3859A
Q112	Q212	C 3625-8	2N4125
Q113	Q213	C 3625-8	2N4125
Q115	Q215	D 2962-5	MPS8097
Q116	Q216	C 3786-8	PN4250A
Q117	Q217	D 2961-7	SEL 2N3859A
Q118	Q218	D 2961-7	SEL 2N3859A
Q119	Q219	C 3625-8	2N4125
Q120	Q220	C 3625-8	2N4125

### RESISTORS

R1		A10265-10031	100K 1%
R5		A10266-3323	3.3K 1W
R100	R200	C 6893-9	5K POT
R101	R201	A10265-49911	4.99K
R102	R202	A10266-1021	1K
R103	R203	A10265-10031	100K 1%
R104	R204	A10266-2721	2.7K
R105	R205	A10266-2721	2.7K
R106	R206	A10266-1231	12K
R107	R207	A10266-4731	47K
R108	R208	A10266-1021	1K
R109	R209	A10266-8201	82 OHM

## Q42664-5 Main Module Parts List (D 6910-0 Board)

R110	R210	A10266-4731	47K	R159	R259	A10266-1031	10K
R111	R211	A10266-1231	12K	R161	R261	A10266-4701	47 OHM
R112	R212	A10266-5131	51K	R162	R262	A10266-4701	47 OHM
R113	R213	A10266-4721	4.7K	R165	R265	A10265-53611	5.36K 1%
R114	R214	A10266-4721	4.7K	R146	R246	A10265-53611	5.36K 1%
R115	R215	A10266-5141	510K	R167	R267	A10266-1021	1K
R116	R216	A10266-3351	3.3M	R168	R268	A10265-95301	953 OHM
R117	R217	A10266-4731	47K	R170	R270	A10266-1021	1K
R118	R218	A10266-2711	270 OHM	R171	R271	A10265-95301	953 OHM
R119	R219	A10266-3011	300 OHM				
R120	R220	A10266-2711	270 OHM	<b>SWITCHES</b>			
R121	R221	C 5062-2	100K TRIMMER	S3		C 6841-8	4PDT
R122	R222	A10266-2741	270K	S100		C 6781-6	6P3T
R123	R223	A10266-1831	18K				
R124	R224	A10266-6821	6.8K	<b>IC'S</b>			
R125	R225	C 7782-3	100 OHM	U1		C 5095-2	MC7815
R126	R226	C 7782-3	100 OHM	U2		C 5096-0	MC7915
R127	R227	A10266-6821	6.8K	U100	U200	C 6911-9	UPA75 PNP
R128	R228	A10266-1031	10K	U103	U203	C 6910-1	UPA76 NPN
R129	R229	A10266-1041	100K	U104	U204	C 6900-2	MC34084P
R130	R230	A10266-1041	100K				
R131	R231	A10266-1031	10K	<b>MISC.</b>			
R132	R232	C 5062-2	100K TRIMMER	BOARD		D 6304B2	
R133	R233	A10266-2741	270K	J1		C 7593-4	5 PIN HEADER
R134	R234	A10266-1831	18K	J2		C 4508-5	16 PIN SOCKET
R135	R235	C 7782-3	100 OHM	J9		C 7527-2	6 PIN HEADER
R136	R236	A10266-6821	6.8K	J10		C 7592-6	4 PIN HEADER
R137	R237	C 7782-3	100 OHM	J11		C 7077-8	WIRE RETAINER
R138	R238	A10266-6821	6.8K	J100	J200	C 6777-4	PHONE JACK
R139	R239	A10266-1021	1K	J500	J800	D 6619-7	10" RIBBON ASSY
R140	R240	A10266-8201	82 OHM	J600	J700	D 6620-5	6" RIBBON ASSY
R141	R241	A10266-1541	150K	MOUNTS U1, U2:			
R142	R242	A10266-1541	150K		(2)	C 1889-2	6-32 NUT
R146	R246	A10266-1031	10K		(2)	C 2176-3	6-32 X .5 SCREW
R147	R247	C 7781-5	200 OHM		(2)	C 5341-0	HEATSINK
R148	R248	A10266-2721	2.7K		(2)	C 5594-4	STAR WASHER
R149	R249	C 7781-5	200 OHM	MOUNTS U104, U204:			
R150	R250	A10266-2721	2.7K		(2)	C 3450-1	14 Pin Socket
R151	R251	A10266-1031	10K	COVERS FOR J100, J200:			
R152	R252	A10266-1231	12K		(2)	C 6778-2	Cover, Phone Jack
R154	R254	A10266-1011	100 OHM	Additional Parts			
R156	R256	A10266-1321	1.3K		(1)	C 7077-8	3-Cond Wire Retain
R157	R257	A10266-1321	1.3K				
R158	R258	A10266-9121	9.1K				

## Q42682-7 Main Module Parts List (D 6910-0 Board)

### Q42682-7 Main Module (#2) for PB-1:

#### CAPACITORS

C1	C 4303-1	1000uF
C2	C 3913-8	470uF
C3	C 4303-1	1000uF
C4	C 6802-0	.47uF
C5	OPEN	
C6	OPEN	
C100	C200 C 5311-3	22uF
C101	C201 C 2820-6	5pF
C103	C203 C 6805-3	.022uF
C104	C204 C 6805-3	.022uF
C105	C205 C 6812-9	47pF
C106	C206 C 6812-9	47pF
C108	C208 C 6814-5	12pF
C112	C212 C 6803-8	.12uF
C113	C213 C 6802-0	.47uF
C114	C214 C 3729-8	100uF 16V
C115	C215 C 3729-8	100uF 16V
C116	C216 C 6802-0	.47uF
C117	C217 C 6803-8	.12uF
C118	C218 C 6814-5	12pF
C122	C222 C 6811-1	100pF
C123	C223 C 6812-9	47pF
C124	C224 C 6812-9	47pF
C125	C225 C 3729-8	100uF 16V
C127	C227 C 3729-8	100uF 16V
C128	C228 C 7706-2	.1uF
C129	OPEN	
C130	C 6814-5	12pF
C133	C233 C 6814-5	12pF
C134	C234 C 6805-3	.022uF
C135	C235 C 6805-3	.022uF
C136	C236 C 6808-7	470pF
C137	C237 C 6808-7	470pF
C138	C238 C 6814-5	12pF
C139	C239 C 6814-5	12pF
C140	C240 C 6812-9	47pF
C141	C241 C 6812-9	47pF
	C242 C 5162-0	3-12pF Trim
C144	C244 C 5362-6	2.2uF
C145	C245 C 6814-5	12pF
C146	C246 C 6809-5	220pF
C147	C247 C 6806-1	.01uF
C148	C248 C 6810-3	180pF
C149	C249 C 6808-7	470pF
C150	C250 OPEN	
C151	C251 OPEN	
C152	C252 C 6809-5	220pF
C153	C253 C 5362-6	2.2uF

#### DIODES

D1	C 2851-1	1N4004
D2	C 2851-1	1N4004
D3	C 2851-1	1N4004
D4	C 2851-1	1N4004
D5	C 2851-1	1N4004
D6	C 2851-1	1N4004
D7	C 2851-1	1N4004
D104	D204 C 2851-1	1N4004
D105	D205 C 2851-1	1N4004
D106	D206 C 2851-1	1N4004
D107	D207 C 2851-1	1N4004
D108	D208 C 3181-2	1N4148
D109	D209 C 3181-2	1N4148
D110	D210 C 3181-2	1N4148
D111	D211 C 5061-4	1N3070
D112	D212 C 3181-2	1N4148
D113	D213 C 3181-2	1N4148
D114	D214 C 3181-2	1N4148
D115	D215 C 3181-2	1N4148
D120	D220 C 3181-2	1N4148
D121	D221 C 3181-2	1N4148
D122	D222 C 3181-2	1N4148
D123	D223 C 5061-4	1N3070

#### NETWORK RESISTORS

N100	N200	D 4669-4	Balanced Input Trim
N101	N201	D 6081-0	Resistor Network-B
N102	N202	D 6082-8	Resistor Network-C

#### TRANSISTORS

Q100	Q200	D 2961-7	SEL 2N3859A
Q101	Q201	C 3578-9	MPSA93
Q102	Q202	C 3810-6	MPSA43/A42
Q103	Q203	C 3786-8	PN4250A
Q104	Q204	C 3625-8	2N4125
Q105	Q205	C 3578-9	MPSA93
Q106	Q206	C 3625-8	2N4125
Q107	Q207	C 3786-8	PN4250A
Q108	Q208	D 2961-7	SEL 2N3859A
Q109	Q209	D 2961-7	SEL 2N3859A
Q110	Q210	C 3810-6	MPSA43/A42
Q111	Q211	D 2961-7	SEL 2N3859A
Q112	Q212	C 3625-8	2N4125
Q113	Q213	C 3625-8	2N4125
Q115	Q215	D 2962-5	MPS8097
Q116	Q216	C 3786-8	PN4250A
Q117	Q217	D 2961-7	SEL 2N3859A
Q118	Q218	D 2961-7	SEL 2N3859A
Q119	Q219	C 3625-8	2N4125
Q120	Q220	C 3625-8	2N4125
Q121	Q221	C 3786-8	PN4250A

## *Q42682-7 Main Module Parts List (D 6910-0 Board)*

**RESISTORS**

R1	A10265-53621	53.6K 1%	R148	R248	A10266-2721	2.7K	
R2	OPEN		R149	R249	C 7781-5	200 OHM	
R3	OPEN		R150	R250	A10266-2721	2.7K	
R4	A10265-46421	46.4K 1%	R151	R251	A10266-1031	10K	
R5	A10266-3323	3.3K 1W	R152	R252	A10266-1231	12K	
R10	OPEN		R153	R253	C 5869-2	ZERO OHM	
R100	R200	C 7409-3	5K POT	R155	R255	OPEN	
R101	R201	A10265-49911	4.99K	R156	R256	A10266-1321	1.3K
R102	R202	A10266-1021	1K	R157	R257	A10266-1321	1.3K
R103	R203	A10265-10031	100K 1%	R158	R258	A10266-9121	9.1K
R104	R204	A10266-2721	2.7K	R159	R259	A10266-1031	10K
R105	R205	A10266-2721	2.7K	R161	R261	A10266-4701	47 OHM
R106	R206	A10266-1231	12K	R162	R262	A10266-4701	47 OHM
R107	R207	A10266-6831	68K	R167	R267	A10266-1021	1K
R108	R208	A10266-1021	1K	R168	R268	A10265-95301	953 OHM
R109	R209	A10266-8201	82 OHM	R169	R269	OPEN	
R110	R210	A10266-6831	68K	R170	R270	A10266-1021	1K
R111	R211	A10266-1231	12K	R171	R271	A10265-95301	953 OHM
R112	R212	A10266-5131	51K	R172	R272	OPEN	
R113	R213	A10266-4721	4.7K	R174	R274	A10265-38311	3.83K 1%
R114	R214	A10266-4721	4.7K	R175	R275	A10265-24311	2.43K 1%
R115	R215	A10266-5141	510K	R176	R276	A10266-1041	100K
R116	R216	A10266-3351	3.3M	R177	R277	C 5062-2	TRIM POT
R117	R217	A10266-4731	47K	R178	R278	A10266-1231	12K
R118	R218	A10266-2711	270 OHM	R179	R279	A10266-4731	47K
R119	R219	A10266-3011	300 OHM	R180	R280	A10266-4711	470 OHM
R120	R220	A10266-2711	270 OHM	R181	R281	A10266-4721	4.7K
R121	R221	C 5062-2	100K TRIMMER	R182	R282	A10266-2201	22 OHM
R122	R222	A10266-2741	270K	R183	R283	A10266-2051	2M
R123	R223	A10266-1831	18K				
R124	R224	A10266-6821	6.8K	<b>SWITCHES</b>			
R125	R225	C 7782-3	100 OHM	S3	C 7363-2	4PDT	
R126	R226	C 7782-3	100 OHM	S100	C 6781-6	6P3T	
R127	R227	A10266-6821	6.8K				
R128	R228	A10266-1031	10K	<b>IC'S</b>			
R129	R229	A10266-1041	100K	U1	C 5095-2	MC7815	
R130	R230	A10266-1041	100K	U2	C 5096-0	MC7915	
R131	R231	A10266-1031	10K	U100	U200	C 6911-9	UPA75 PNP
R132	R232	C 5062-2	100K TRIMMER	U103	U203	C 6910-1	UPA76 NPN
R133	R233	A10266-2741	270K	U104	U204	C 6900-2	MC34084P
R134	R234	A10266-1831	18K				
R135	R235	C 7782-3	100 OHM	<b>INTERCONNECTS</b>			
R136	R236	A10266-6821	6.8K	J1	OPEN		
R137	R237	C 7782-3	100 OHM	J2	C 4508-5	16 PIN SOCKET	
R138	R238	A10266-6821	6.8K	J9	C 7527-2	6 PIN HEADER	
R139	R239	A10266-1021	1K	J10	C 7592-6	4 PIN HEADER	
R140	R240	A10266-8201	82 OHM	J11	C 7526-4	3 PIN HEADER	
R141	R241	A10266-1541	150K	J100	J200	C 6777-4	PHONE JACK
R142	R242	A10266-1541	150K	J500	J800	D 6619-7	10" RIBBON ASSY
R146	R246	A10266-1031	10K	J600	J700	D 6620-5	6" RIBBON ASSY
R147	R247	C 7781-5	200 OHM				



## Q42682-7 Main Module Parts List (D 6910-0 Board)

**MISC.**

BOARD	D 6910-0	
MOUNTS U1, U2:		
(2)	C 1889-2	6-32 NUT
(2)	C 2176-3	6-32 X .5 SCREW
(2)	C 5341-0	HEATSINK
(2)	C 5594-4	STAR WASHER
MOUNTS U104, U204:		
(2)	C 3450-1	14 PIN SOCKET
COVERS FOR J100, J200:		
(2)	C 6778-2	Phone Jack Cover
STRAIN RELIEF:		
(4)	C 1811-6	CABLE TIE

## Q42776-7 Main Module Parts List (D 7251-8 Board)

**Q42776-7 Main Module (3rd Gain) for PB-1:**

**CAPACITORS**

C1	C 3913-8	470uF
C2	C 3913-8	470uF
C4	C 6802-0	.47uF
C5	C 6806-1	.01uF
C6	C 6806-1	.01uF
C7	C 6094-9	33uF
C8	C 6806-1	.01uF
C100	C200 C 5311-3	22uF
C101	C201 C 2820-6	5pF
C103	C203 C 6805-3	.022uF
C104	C204 C 6804-6	.1uF
C105	C205 C 6812-9	47pF
C106	C206 C 6812-9	47pF
C108	C208 C 6814-5	12pF
C112	C212 C 6803-8	.12uF
C113	C213 C 6802-0	.47uF
C114	C214 C 8026-4	100uF 35V
C115	C215 C 8026-4	100uF 35V
C116	C216 C 6802-0	.47uF
C117	C217 C 6803-8	.12uF
C118	C218 C 6814-5	12pF
C122	C222 C 6811-1	100pF
C123	C223 C 6812-9	47pF
C124	C224 C 6812-9	47pF
C125	C225 C 8026-4	100uF 35V
C127	C227 C 8026-4	100uF 35V
C128	C228 C 7706-2	.1uF 100V
C129	C229	OPEN
C130	C230 C 6813-7	27pF
C133	C233 C 6814-5	12pF
C134	C234 C 6805-3	.022uF
C135	C235 C 6805-3	.022uF
C136	C236 C 6808-7	470pF
C137	C237 C 6808-7	470pF
C138	C238 C 6814-5	12pF
C139	C239 C 6814-5	12pF
C140	C240 C 6812-9	47pF
C141	C241 C 6812-9	47pF
C144	C244 C 8026-4	100uF 35V
C145	C245 C 6814-5	12pF
C146	C246 C 6809-5	220pF
C147	C247 C 6806-1	.01uF
C148	C248 C 6810-3	180pF
C 149	C249 C 6808-7	470pF
C150	C250	OPEN
C151	C251	OPEN
C152	C252 C 6809-5	220pF
C153	C253 C 6804-6	.1uF

**DIODES**

D1	C 2851-1	1N4004
D2	C 2851-1	1N4004
D3	C 2851-1	1N4004
D4	C 2851-1	1N4004
D5	C 2851-1	1N4004
D6	C 2851-1	1N4004
D7	C 2851-1	1N4004
D8	C 3181-2	1N4148
D9	C 3549-0	1N916B 10V
D104	D204 C 2851-1	1N4004
D105	D205 C 2851-1	1N4004
D106	D206 C 2851-1	1N4004
D107	D207 C 2851-1	1N4004
D108	D208 C 3181-2	1N4148
D109	D209 C 3181-2	1N4148
D110	D210 C 3181-2	1N4148
D111	D211 C 5061-4	1N3070
D112	D212 C 3181-2	1N4148
D113	D213 C 3181-2	1N4148
D114	D214 C 3181-2	1N4148
D115	D215 C 3181-2	1N4148
D120	D220 C 3181-2	1N4148
D121	D221 C 3181-2	1N4148
D122	D222 C 3181-2	1N4148
D123	D223 C 5061-4	1N3070
D124	D224 C 5061-4	1N3070

**NETWORK RESISTORS**

N100	N200 D 4669-4	Balanced Input Trim
N101	N201 D 6081-0	Resistor Network-B
N102	N202 D 6082-8	Resistor Network-C

**TRANSISTORS**

Q1	C 7458-0	2N4123
Q2	C 3625-8	2N4125
Q100	Q200 D 2961-7	SEL 2N3859A
Q101	Q201 C 3578-9	MPSA93
Q102	Q202 C 3810-6	MPSA43/A42
Q103	Q203 C 3786-8	PN4250A
Q104	Q204 C 3625-8	2N4125
Q105	Q205 C 3578-9	MPSA93
Q106	Q206 C 3625-8	2N4125
Q107	Q207 C 3786-8	PN4250A
Q108	Q208 D 2961-7	SEL 2N3859A
Q109	Q209 D 2961-7	SEL 2N3859A
Q110	Q210 C 3810-6	MPSA43/A42
Q111	Q211 D 2961-7	SEL 2N3859A
Q112	Q212 C 3625-8	2N4125
Q113	Q213 C 3625-8	2N4125
Q115	Q215 D 2962-5	MPS8097

## Q42776-7 Main Module Parts List (D 7251-8 Board)

Q116	Q216	C 3786-8	PN4250A
Q117	Q217	D 2961-7	SEL 2N3859A
Q118	Q218	D 2961-7	SEL 2N3859A
Q119	Q219	C 3625-8	2N4125
Q120	Q220	C 3625-8	2N4125
Q121	Q221	C 7458-0	2N4123
Q122	Q222	C 7458-0	2N4123

### RESISTORS

R1		A10265-53621	53.6K
R2		A10266-2402	24 OHM
R3		A10266-2402	24 OHM
R4		A10265-46421	46.4K
R5		A10266-3321	3.3K
R11		A10266-5621	5.6K
R12		A10266-4331	43K
R13		A10266-1021	1K
R14		A10266-8221	8.2K
R15		A10266-6211	620 OHM
R100	R200		OPEN
R101	R201	A10265-49911	4.99K
R102	R202	A10266-1021	1K
R103	R203	A10266-1041	100K
R104	R204	A10266-2721	2.7K
R105	R205	A10266-2721	2.7K
R106	R206	A10266-1231	12K
R107	R207	A10266-6831	68K
R108	R208	A10266-1021	1K
R109	R209	A10266-8201	82 OHM
R110	R210	A10266-6831	68K
R111	R211	A10266-1231	12K
R112	R212	A10266-5131	51K
R113	R213	A10266-4721	4.7K
R114	R214	A10266-4721	4.7K
R115	R215	A10266-5141	510K
R116	R216	A10266-3351	3.3M
R117	R217	A10266-4731	47K
R118	R218	A10266-2711	270 OHM
R119	R219	A10266-3011	300 OHM
R120	R220	A10266-2711	270 OHM
R121	R221	C 5062-2	100K TRIMMER
R122	R222	A10266-2741	270K
R123	R223	A10266-1831	18K
R124	R224	A10266-6821	6.8K
R125	R225	C 7782-3	100 OHM
R126	R226	C 7782-3	100 OHM
R127	R227	A10266-6821	6.8K
R128	R228	A10266-1031	10K
R129	R229	A10266-1041	100K
R130	R230	A10266-1041	100K
R131	R231	A10266-1031	10K
R132	R232	C 5062-2	100K TRIMMER

R133	R233	A10266-2741	270K
R134	R234	A10266-1831	18K
R135	R235	C 7782-3	100 OHM
R136	R236	A10266-6821	6.8K
R137	R237	C 7782-3	100 OHM
R138	R238	A10266-6821	6.8K
R139	R239	A10266-1021	1K
R140	R240	A10266-8201	82 OHM
R141	R241	A10266-1541	150K
R142	R242	A10266-1541	150K
R146	R246	A10266-1031	10K
R147	R247	C 7781-5	200 OHM
R148	R248	A10266-2721	2.7K
R149	R249	C 7781-5	200 OHM
R150	R250	A10266-2721	2.7K
R151	R251	A10266-1031	10K
R152	R252	A10266-1231	12K
R153	R253	C 5868-2	ZERO OHM
R156	R256	A10266-1321	1.3K
R157	R257	A10266-1321	1.3K
R158	R258	A10266-9121	9.1K
R159	R259	A10266-1031	10K
R161	R261	A10266-4701	47 OHM
R162	R262	A10266-4701	47 OHM
R167	R267	A10266-1021	1K
R168	R268	A10265-95301	953 OHM
R170	R270	A10266-1021	1K
R171	R271	A10265-95301	953 OHM
R174	R274	A10265-24921	24.9K
R175	R275	A10265-14721	14.7K
R176	R276	A10265-24921	24.9K
R179	R279	A10266-4731	47K
R180	R280	A10266-4711	470 OHM
R181	R281	A10266-4721	4.7K
R182	R282	A10266-2201	22 OHM
R183	R283	A10266-2421	2.4K
R185	R285	A10266-2421	2.4K
R186	R286	A10266-1051	1M
R187	R287	A10265-52321	52.3K

### SWITCHES

S2		C 7325-1	DPDT SIDE
S3		C 7363-2	DPDT GOLD
S100		C 6781-6	6P3T

### IC'S

U1		C 5095-2	MC7815
U2		C 5096-0	MC7915
U100	U200	C 6911-9	UPA75 PNP
U103	U203	C 6910-1	UPA76 NPN
U104	U204	C 6900-2	MC34084P

## Q42776-7 Main Module Parts List (D 7251-8 Board)

**INTERCONNECTS**

J1		C 7593-4	HEADER 5 PIN
J2		C 4508-5	16 PIN SOCKET
J9		C 7527-2	HEADER 6 PIN
J10		C 7592-6	HEADER 4 PIN
J11		C 7526-4	HEADER 3 PIN
J100	J200	C 6777-4	PHONE JACK
J500	J800	D 6619-7	10" RIBBON ASSY
J600	J700	D 6620-5	6" RIBBON ASSY

**MISC.**

BOARD		D 7251-8	
MOUNTS U1, U2:			
	(2)	C 1889-2	6-32 NUT
	(2)	C 2176-3	6-32 X .5 SCREW
	(2)	C 5341-0	HEATSINK
	(2)	C 5594-4	STAR WASHER
MOUNTS U104, U204:			
	(2)	C 3450-1	14 PIN SOCKET
COVERS FOR J100, J200:			
	(2)	C 6778-2	Phone Jack Cover
STRAIN RELIEF:			
	(4)	C 1811-6	CABLE TIE

Note: To use this module in the PB-1, it is necessary to remove R187/287 and install level control pots (C 7409-3).

## Q42953-2 Main Module Parts List (D 7251-8 Board)

*Q42953-2 PB-1 Main Module 3rd Gain Stage and Improved offset (Original 460CSL Main Module.):*

### CAPACITORS

C1	C 3913-8	470 $\mu$ F
C2	C 3913-8	470 $\mu$ F
C4	C 6802-0	.47 $\mu$ F
C5	C 6806-1	.01 $\mu$ F
C6	C 6806-1	.01 $\mu$ F
C7	C 6094-4	33 $\mu$ F 16V
C8	C 6806-1	.01 $\mu$ F
C100	C200 C 5311-3	22 $\mu$ F
C101	C201 C 2820-6	5pF
C103	C203 C 6805-3	.022 $\mu$ F
C104	C204 C 6804-6	.1 $\mu$ F
C105	C205 C 6812-9	47pF
C106	C206 C 6812-9	47pF
C108	C208 C 6814-5	12pF
C112	C212 C 6803-8	.12 $\mu$ F
C113	C213 C 6802-0	.47 $\mu$ F
C114	C214 C 8876-8	100 $\mu$ F 35V
C115	C215 C 8876-8	100 $\mu$ F 35V
C116	C216 C 6802-0	.47 $\mu$ F
C117	C217 C 6803-8	.12 $\mu$ F
C118	C218 C 6814-5	12pF
C122	C222 C 6811-1	100pF
C123	C223 C 6811-1	100pF
C124	C224 C 6812-9	47pF
C127	C227 C 8576-8	100pF
C128	C228 C 7706-2	.1 $\mu$ F
C130	C230 C 6813-7	27pF
C133	C233 C 6814-5	12pF
C134	C234 C 6805-3	.022 $\mu$ F
C135	C235 C 6805-3	.022 $\mu$ F
C136	C236 C 6808-7	470pF
C137	C237 C 6808-7	470pF
C138	C238 C 6814-5	12pF
C139	C239 C 6814-5	12pF
C140	C240 C 6812-9	47pF
C141	C241 C 6812-9	47pF
C144	C244 C 8576-8	100 $\mu$ F 35V
C145	C245 C 6814-5	12pF
C146	C246 C 6809-5	220pF
C147	C247 C 6806-1	.01 $\mu$ F
C148	C248 C 6810-3	180pF
C149	C249 C 6808-7	470pF
C152	C252 C 6809-5	220pF
C153	C253 C 6804-6	.1 $\mu$ F

### DIODES

D1	C 2851-1	1N4004
----	----------	--------

D2	C 2851-1	1N4004
D3	C 2851-1	1N4004
D4	C 2851-1	1N4004
D5	C 2851-1	1N4004
D6	C 2851-1	1N4004
D7	C 2851-1	1N4004
D8	C 3181-2	1N4148
D9	C 3549-0	1N916B 10V Zener
D104	D204 C 2851-1	1N4004
D105	D205 C 2851-1	1N4004
D106	D206 C 2851-1	1N4004
D107	D207 C 2851-1	1N4004
D108	D208 C 3181-2	1N4148
D109	D209 C 3181-2	1N4148
D110	D210 C 3181-2	1N4148
D111	D211 C 5061-4	1N3070
D112	D212 C 3181-2	1N4148
D113	D213 C 3181-2	1N4148
D114	D214 C 3181-2	1N4148
D115	D215 C 3181-2	1N4148
D120	D220 C 3181-2	1N4148
D121	D221 C 3181-2	1N4148
D122	D222 C 3181-2	1N4148
D123	D223 C 5061-4	1N3070
D124	D224 C 5061-4	1N3070

### TRANSISTORS

Q1	C 7458-0	NPN 2N4123
Q2	C 3625-8	PNP 2N4125
Q100	Q200 D 2961-7	NPN 2N3859A SEL
Q101	Q201 C 3578-9	PNP MPSA93
Q102	Q202 C 3810-6	NPN MPSA43/A42
Q103	Q203 C 3786-8	PNP PN4250A
Q104	Q204 H43113-2	Diode Pair
Q105	Q205 C 3578-9	PNP MPSA93
Q106	Q206 C 3625-8	PNP 2N4125
Q107	Q207 C 3786-8	PNP PN4250A
Q108	Q208 D 2961-7	NPN 2N3859A SEL
Q109	Q209 D 2961-7	NPN 2N3859A SEL
Q110	Q210 C 3810-6	NPN MPSA43/A42
Q111	Q211 H43113-2	Diode Pair
Q112	Q212 C 3625-8	PNP 2N4125
Q113	Q213 C 3625-8	PNP 2N4125
Q115	Q215 D 2962-5	NPN MPS8097
Q116	Q216 C 3786-8	PNP PN4250A
Q117	Q217 D 2961-7	NPN 2N3859A SEL
Q118	Q218 D 2961-7	NPN 2N3859A SEL
Q119	Q219 C 3625-8	PNP 2N4125
Q120	Q220 C 3625-8	PNP 2N4125
Q121	Q221 C 7458-0	NPN 2N4123
Q122	Q222 C 7458-0	NPN 2N4123

## Q42953-2 Main Module Parts List (D 7251-8 Board)

**RESISTORS**

N100	N200	D 4669-4	CMR Trim Network
N101	N201	D 6081-0	Resistor Network
N102	N202	D 6082-8	Resistor Network
R1		A10265-53621	53.6K 1%
R2		C 7340-0	24 5W
R3		C 7340-0	24 5W
R4		A10265-46421	46.4K 1%
R5		A10266-3321	3.3K
R11		A10266-5621	5.6K
R12		A10266-4331	43K
R13		A10266-1021	1K
R14		A10266-8221	8.2K
R15		A10266-6211	620
R100	R200	C 7409-3	Pot, 5K Linear
R101	R201	A10265-49911	4.99K 1%
R102	R202	A10266-1021	1K
R103	R203	A10265-10031	100K 1%
R104	R204	A10266-2721	2.7K
R105	R205	A10266-2721	2.7K
R106	R206	A10266-1231	12K
R107	R207	A10266-6831	68K
R108	R208	A10266-1021	1K
R109	R209	A10266-8201	82
R110	R210	A10266-6831	68K
R111	R211	A10266-1231	12K
R112	R212	A10266-5131	51K
R113	R213	A10266-4721	4.7K
R114	R214	A10266-4721	4.7K
R115	R215	A10266-5141	510K
R116	R216	A10266-3351	3.3M
R117	R217	A10266-4731	47K
R118	R218	C 7780-7	270 Flame Proof
R119	R219	A10266-3011	300
R120	R220	C 7780-7	270 Flame Proof
R121	R221	C 5062-2	100K Pot (-ODEP)
R122	R222	A10266-2741	270K
R123	R223	A10266-1832	18K .5W
R124	R224	A10266-6821	6.8K
R125	R225	A10266-1011	100
R126	R226	A10266-1011	100
R127	R227	A10266-6821	6.8K
R128	R228	A10266-1031	10K
R129	R229	A10266-1041	100K
R130	R230	A10266-1041	100K
R131	R231	A10266-1031	10K
R132	R232	C 5062-2	100K Pot (+ODEP)
R133	R233	A10266-2741	270K
R134	R234	A10266-1832	18K .5W

R135	R235	A10266-1011	100
R136	R236	A10266-6821	6.8K
R137	R237	A10266-1011	100
R138	R238	A10266-6821	6.8K
R139	R239	A10266-1021	1K
R140	R240	A10266-8201	82
R141	R241	A10266-1541	150K
R142	R242	A10266-1541	150K
R146	R246	A10266-1031	10K
R147	R247	C 7781-5	200 .5W Flame Proof
R148	R248	A10266-2721	2.7K
R149	R249	C 7781-5	200 .5W Flame Proof
R150	R250	A10266-2721	2.7K
R151	R251	A10266-1031	10K
R152	R252	A10266-1231	12K
R153	R253	C 5868-2	0 Ohm Jumper
R156	R256	A10266-1321	1.3K
R157	R257	A10266-1321	1.3K
R158	R258	A10266-9131	9.1K
R159	R259	A10266-5121	5.1K
R161	R261	A10266-1011	100
R162	R262	A10266-1011	100
R167	R267	A10265-10011	1K 1%
R168	R268	A10265-95301	953 1%
R170	R270	A10265-10011	1K 1%
R171	R271	A10265-95301	953 1%
R174	R274	A10265-24921	24.9K 1%
R175	R275	A10265-14721	14.7K 1%
R176	R276	A10265-24921	24.9K 1%
R179	R279	A10266-4731	47K
R180	R280	A10266-4711	470
R181	R281	A10266-4721	4.7K
R182	R282	A10266-2201	22
R183	R283	A10266-2421	2.4K
R185	R285	A10266-2421	2.4K
R186	R286	A10266-1051	1M

**SWITCHES**

S2		C 7325-1	Ground Switch
S3		C 7363-2	Sensitivity
S100		C 6781-6	Stereo/Mono

**IC'S**

U1		C 5095-2	UA7815
U2		C 5096-0	UA7915
U100	U200	C 6911-9	UPA75
U103	U203	C 6910-1	UPA76
U104	U204	C 6900-2	MC33084P

**Q42953-2 Main Module Parts List (D 7251-8 Board)****MISC.**

Board	D 7251-8	Blank PC Board
Socket	C 3450-1	14 Pin U104/204
Nut	A10102-5	Hex 6-32
Heatsink	C 5341-0	TO-220
Torq Sprdr	C 6541-4	
Washer	C 8973-7	#6, Split
Screw	C 9067-7	Stainless
J1	C 7593-4	5 Pin Header
J2	C 4508-5	16 Pin Socket
J9	C 7527-2	6 Pin Header
J10	C 7592-6	4 Pin Header
J11	C 7526-4	3 Pin Header
J100 J200	C 6777-4	Phone Jack
Cover	C 6778-2	Phone Jack Cover
J500 J800	D 6619-7	10 Inch Ribbon
J600 J700	D 6620-5	6 Inch Ribbon

## Q43060-5 Main Module Parts List (D 7993-5 Board)

*Q43060-5 Applicability: Main Module for Through Hole Chassis (THC) PB-1/460CSL units.*

### CAPACITORS

C1	C 4303-1	1000μF
C2	C 3913-8	470μF
C4	C 6802-0	.47μF
C5	C 6806-1	.01μF
C6	C 6806-1	.01μF
C7	C 8897-8	.1μF
C100	C200 C 5311-3	22μF
C101	C201 C 2821-4	10pF
C103	C203 C 6805-3	.022μF
C104	C204 C 6805-3	.022μF
C105	C205 C 6812-9	47pF
C106	C206 C 6812-9	47pF
C107	C207 C 8897-8	.1μF
C108	C208 C 6814-5	12pF
C109	C209 C 7417-6	.0033μF
C110	C210 C 5362-6	2.2μF
C111	C211 C 8897-8	.1μF
C112	C212 C 6803-8	.12μF
C113	C213 C 8991-9	.47μF
C114	C214 C 8854-9	100μF
C115	C215 C 8854-9	100μF
C116	C216 C 8991-9	.47μF
C117	C217 C 6803-8	.12μF
C118	C218 C 6814-5	12pF
C119	C219 C 6802-0	.47μF
C120	C220 C 8897-8	.1μF
C122	C222 C 6811-1	100pF
C123	C223 C 6812-9	47pF
C124	C224 C 6812-9	47pF
C129	C229 C 6814-5	12pF
C130	C230 C 6813-7	27pF
C133	C233 C 6813-7	27pF
C134	C234 C 6805-3	.022μF
C135	C235 C 6805-3	.022μF
C136	C236 C 6808-7	470pF
C137	C237 C 6808-7	470pF
C138	C238 C 6813-7	27pF
C139	C239 C 6813-7	27pF
C140	C240 C 6812-9	47pF
C141	C241 C 6812-9	47pF
C144	C244 C 8576-8	100μF
C145	C245 C 6812-9	47pF
C146	C246 C 6812-9	47pF
C147	C247 C 6806-1	.01μF
C148	C248 C 6810-3	180pF
C149	C249 C 6808-7	470pF
C150	C250 C 6806-1	.01μF

C151	C251	C 6806-1	.01μF
C152	C252	C 6950-7	82pF 5%
C153	C253	C 8897-8	.1μF
C154	C254	C 8426-6	.1μF 250V
C155	C255	C 8897-8	.1μF
C156	C256	C 8897-8	.1μF
C157	C257	C 6806-1	.01μF

### DIODES

D1		C 2851-1	1N4004
D2		C 2851-1	1N4004
D3		C 2851-1	1N4004
D4		C 2851-1	1N4004
D5		C 2851-1	1N4004
D6		C 2851-1	1N4004
D7		C 2851-1	1N4004
D108	D208	C 3181-2	1N4148
D109	D209	C 3181-2	1N4148
D110	D210	C 3181-2	1N4148
D111	D211	C 5061-4	1N3070
D112	D212	C 3181-2	1N4148
D113	D213	C 3181-2	1N4148
D120	D220	C 3181-2	1N4148
D121	D221	C 3181-2	1N4148
D122	D222	C 3181-2	1N4148
D123	D223	C 5061-4	1N3070
D124	D224	C 3181-2	1N4148
D125	D225	C 3181-2	1N4148
D126	D226	C 5061-4	1N3070
D127	D227	C 5061-4	1N3070
D129	D229	C 3181-2	1N4148
D130	D230	C 3181-2	1N4148
D131	D231	C 3181-2	1N4148
D132	D232	C 3181-2	1N4148

### TRANSISTORS

Q100	Q200	D 2961-7	NPN 2N3859A
Q101	Q201	C 3578-9	PNP MPSA93
Q102	Q202	C 3810-6	NPN MPSA43
Q103	Q203	C 3786-8	PNP PN4250
Q105	Q205	C 3578-9	PNP MPSA93
Q106	Q206	C 3625-8	NPN 2N4125
Q107	Q207	C 3786-8	PNP PN4250
Q108	Q208	D 2961-7	NPN 2N3859A
Q109	Q209	D 2961-7	NPN 2N3859A
Q110	Q210	C 3810-6	NPN MPSA43
Q112	Q212	C 3625-8	NPN 2N4125
Q113	Q213	C 3625-8	NPN 2N4125
Q115	Q215	D 2962-5	NPN MPS8097
Q116	Q216	C 3786-8	PNP PN4250
Q117	Q217	D 2961-7	NPN 2N3859A
Q118	Q218	D 2961-7	NPN 2N3859A





## Q43060-5 Main Module Parts List (D 7993-5 Board)

R191	R291	A10266-3331	33K
R192	R292	A10266-1031	10K
R193	R293	A10266-1031	10K
R194	R294	A10266-1041	100K
R195	R295	A10266-3021	3K
R196	R296	A10266-4721	4.7K
R197	R297	A10266-1031	10K
R198	R298	A10266-4721	4.7K
R199	R299	A10266-1031	10K
R909	R1009	A10266-4741	470K
R910	R1010	A10266-4741	470K
R911	R1011	A10266-1521	1.5K
R912	R1012	A10266-4711	470
R913	R1013	A10266-1051	1M
R915	R1015	A10266-1001	10
R916	R1016	A10266-1001	10
R917	R1017	A10266-10021	10K
R918	R1018	A10266-10021	10K
R919	R1019	A10266-10021	10K
R920	R1020	A10266-10021	10K
R921	R1021	C 9079-2	200 Pot (CMR Null)

**SWITCHES**

S2	C 7325-1	Ground Lift
S3	C 7960-5	Sensitivity
S4	C 6781-6	Stereo/Mono

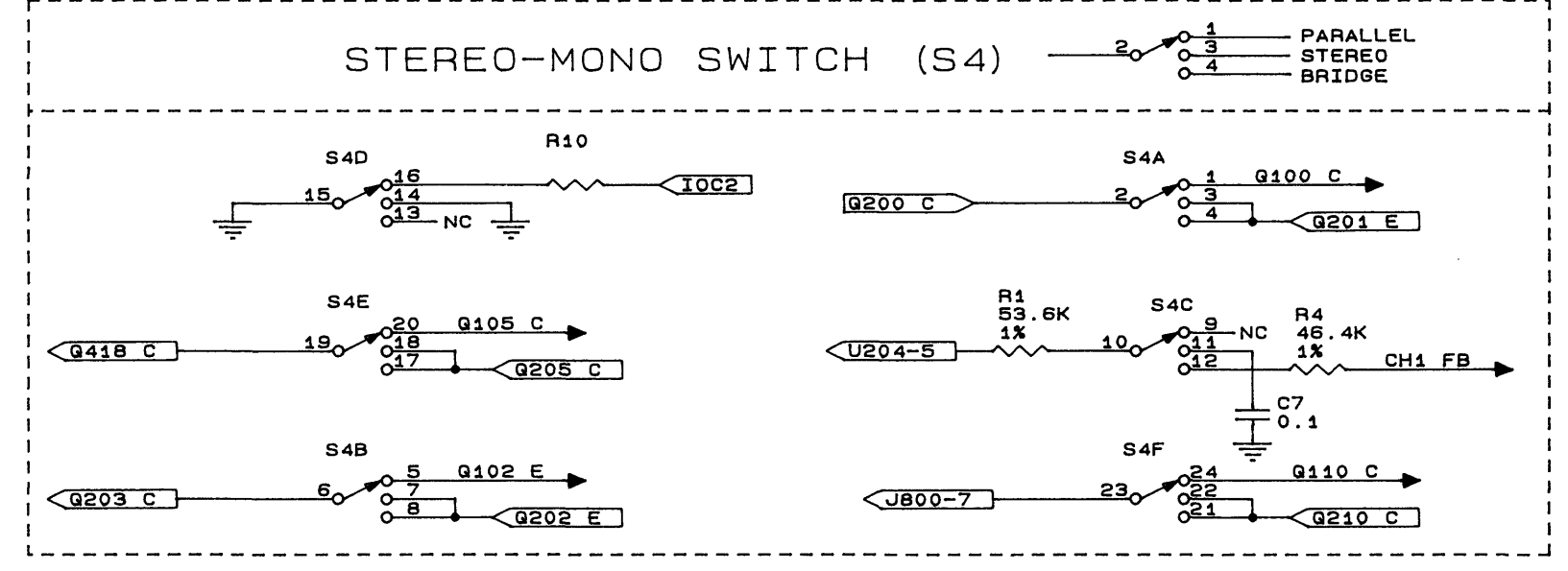
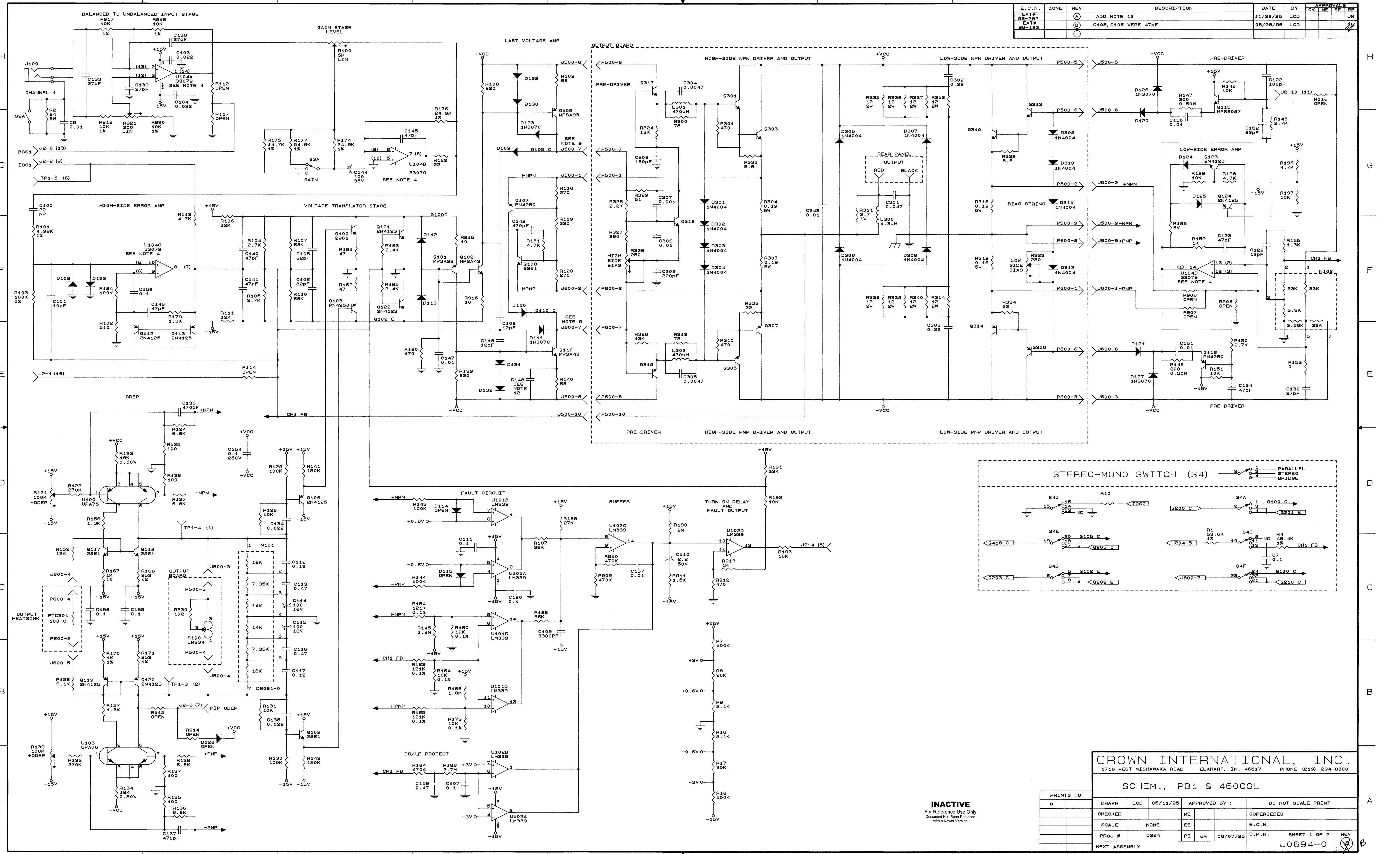
**IC'S**

U1		C 5095-2	UA7815
U2		C 5096-0	UA7915
U100	U200	C 6911-9	UPA75
U101	U201	C 4345-2	LM339
U102	U202	C 4345-2	LM339
U103	U203	C 6910-1	UPA76
U104	U204	C 7558-7	MC33079P

**MISC.**

Board		D 7993-5	
Socket		C 3450-1	14 Pin
Nut		A10102-5	Hex 6-32
Heatsink		C 5341-0	TO-220
Torq. Spreader		C 6541-4	
Washer		C 8973-7	#6, Split
Screw		C 9067-7	Stainless
J1		C 7593-4	5 Pin Header
J11		C 7526-4	3 Pin Header
J12		C 7873-0	2 Pin Header
J100	J200	C 6777-4	Phone Jack
Cover		C 6778-2	Phone Jack Cover
J500	J800	D 6619-7	10 Inch Ribbon
J600	J700	D 6620-5	6 Inch Ribbon

E. C. N.	ZONE	REV	DESCRIPTION	DATE	BY	APPROVALS
EAT# 95-282		(A)	ADD NOTE 12	11/28/95	LCD	JK
EAT# 95-183		(B)	C105, C106 WERE 47pF	05/28/96	LCD	JK



**CROWN INTERNATIONAL, INC.**  
 1718 WEST WISHAWAKA ROAD ELKHART, IN. 46517 PHONE (219) 294-8000

SCHEM., PB1 & 460CSL

PRINTS TO		DRAWN	LCD	05/11/95	APPROVED BY :	DO NOT SCALE PRINT
G		ME				
CHECKED		EE				SUPERSEDES
SCALE	NONE	PE	JM	06/07/95	E. C. N.	
PROJ #	D264				C.P.N.	SHEET 1 OF 2
NEXT ASSEMBLY						J0694-0

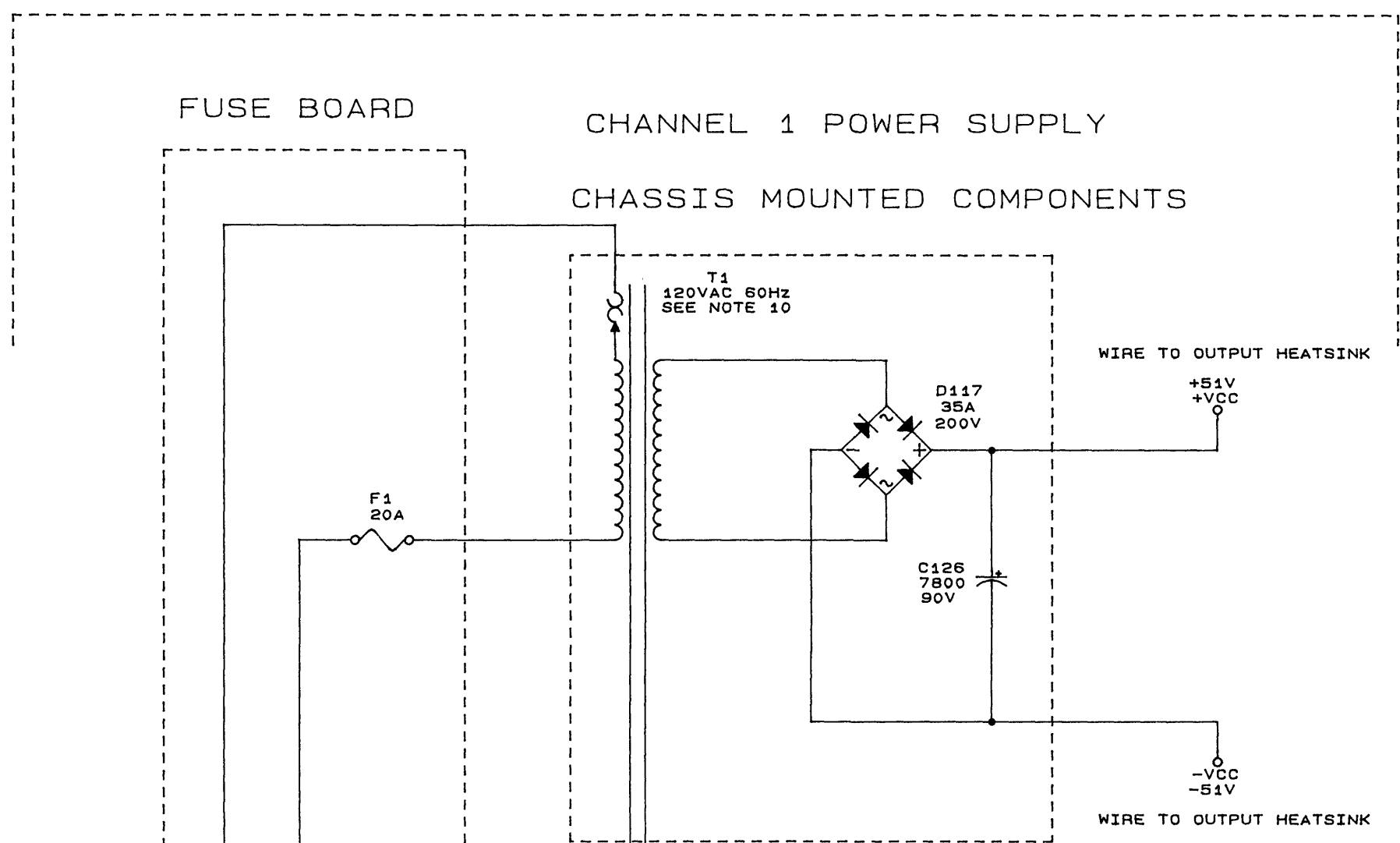
**INACTIVE**  
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 Document Has Been Replaced  
 with a Newer Version

120V 60HZ

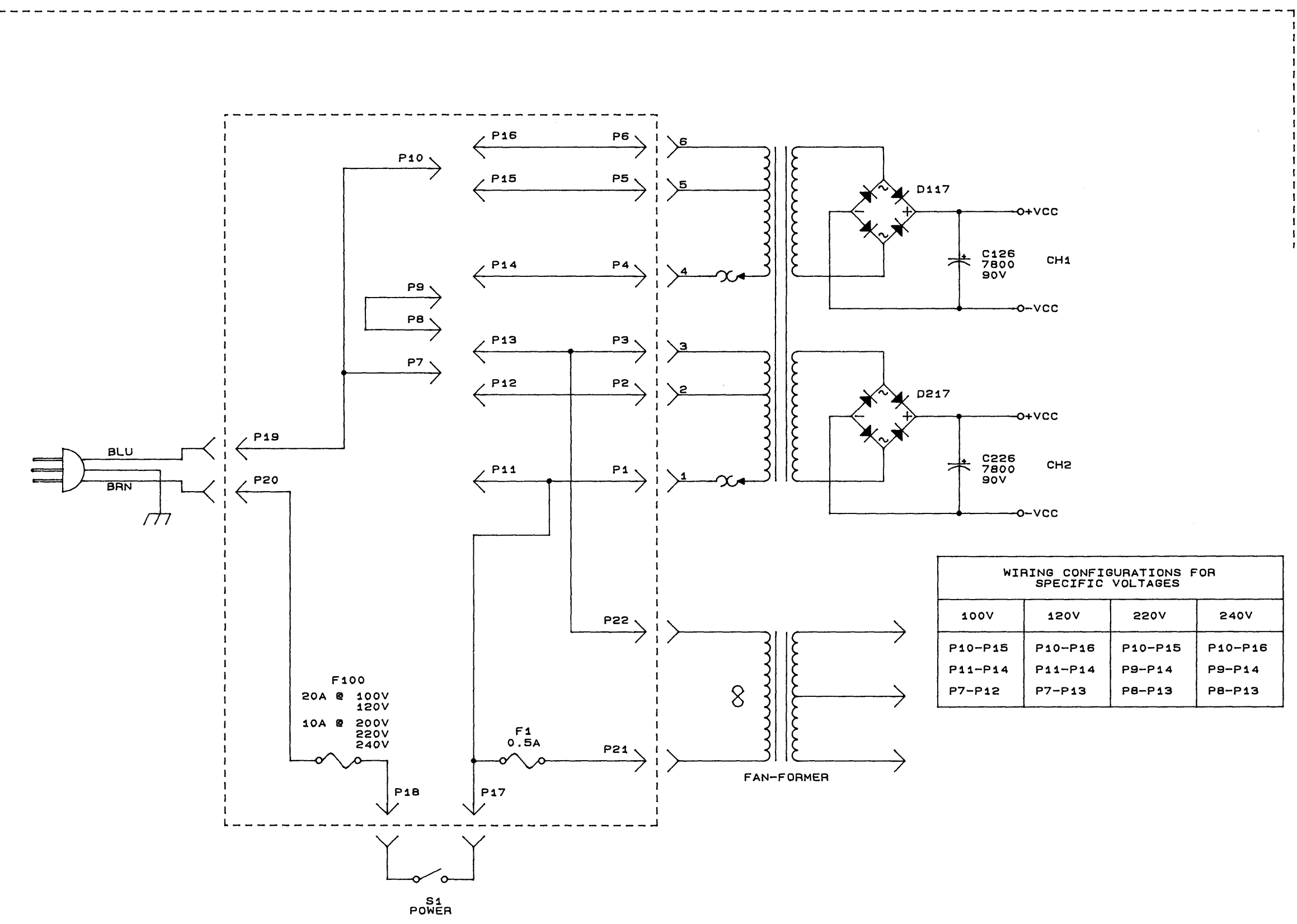
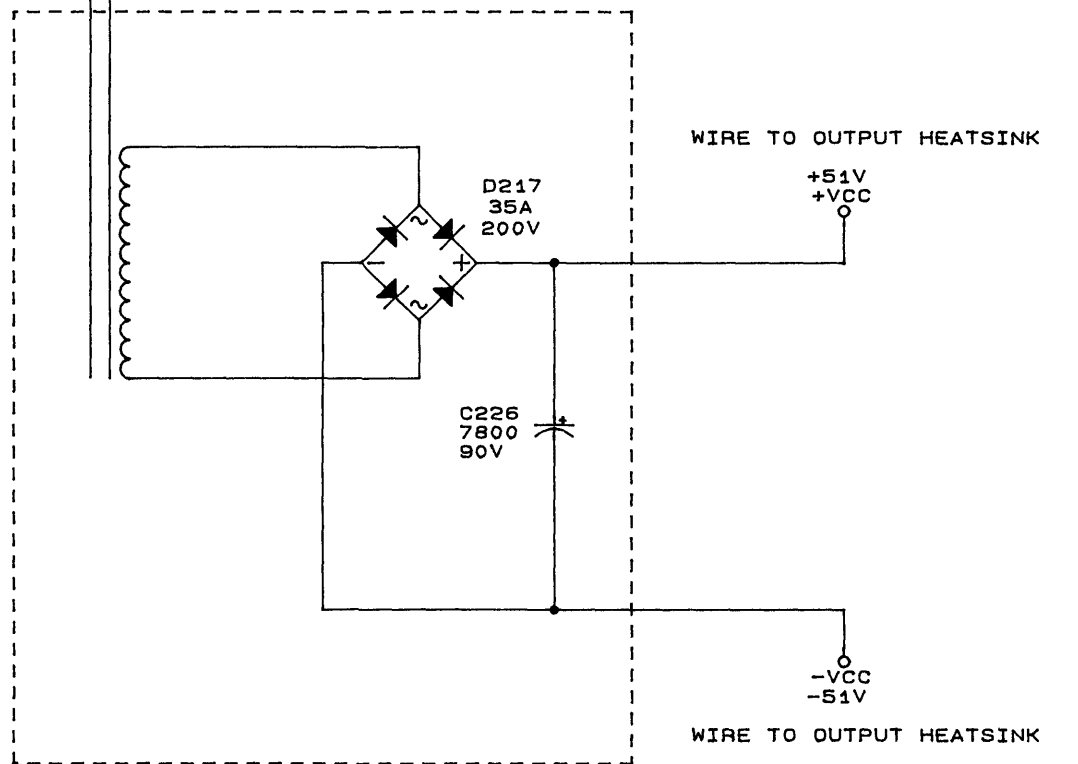
INTERNATIONAL

NOTES :

1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. VALUES SELECTED AS NEEDED FOR DIFFERENT OP AMP CHARACTERISTICS.
4. CHANNEL 2 IS SHOWN ON SHEET 3. WHEN SHEET 3 IS NOT PRINTED, THEN FOR CHANNEL 2 ADD 100 TO REFERENCE DESIGNATORS. (EXAMPLE : CHANNEL 1 R101 WOULD BE CHANNEL 2 R201.) CONNECTOR AND IC PIN NUMBERS FOR CHANNEL 2 ARE SHOWN IN PARENTHESES WHEN THEY DIFFER FROM CHANNEL 1. EXCEPTIONS ARE CHAN 1 R2 CORRESPONDS TO CHAN 2 R3, CHAN 1 C5 CORRESPONDS TO CHAN 2 C6, CHAN 1 J500 CORRESPONDS TO CHAN 2 J700, AND CHAN 1 J600 CORRESPONDS TO CHAN 2 J800.
5. ALL DIODES ARE 1N4148 UNLESS OTHERWISE SPECIFIED.
6. ON J500 AND J700 THE STRIPED WIRE GOES TO PIN 10 OF THE BOARD AND THE PIN NUMBERS MOLDED ON THE CABLE SOCKET ARE REVERSED FROM THE PIN NUMBERS ON THE BOARD AND THE SCHEMATIC.
7. POWER SUPPLY VOLTAGES SHOWN UNDER NO LOAD/NO SIGNAL CONDITIONS.
8. CHANNEL 2 PRE-DRIVER BASES LOOP THROUGH STEREO-MONO SWITCH S100, SECTIONS E AND F.
9. T1 INCLUDES AN INTERNAL THERMAL SWITCH.
10. J2 IS LEFT EMPTY.
11. THIS SCHEMATIC APPLIES TO AMPLIFIERS USING MAIN BOARD D7883-5 / MODULE G43059-7 AND OUTPUT BOARD P10341-9 / MODULE G43015-9 OR OUTPUT BOARD P10397-1 / MODULE G43203-1
12. C148 IS 180pF AND C248 IS OPEN.

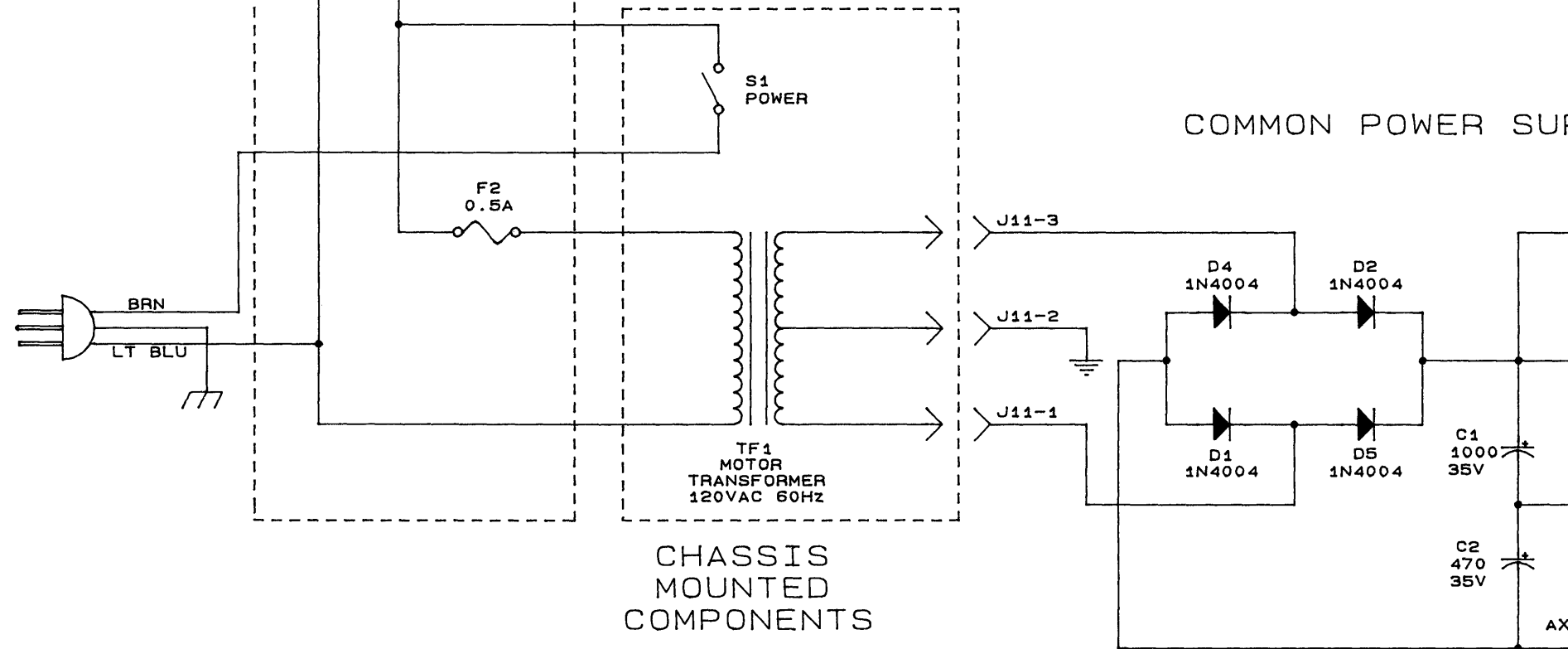


CHANNEL 2 POWER SUPPLY  
CHASSIS MOUNTED COMPONENTS



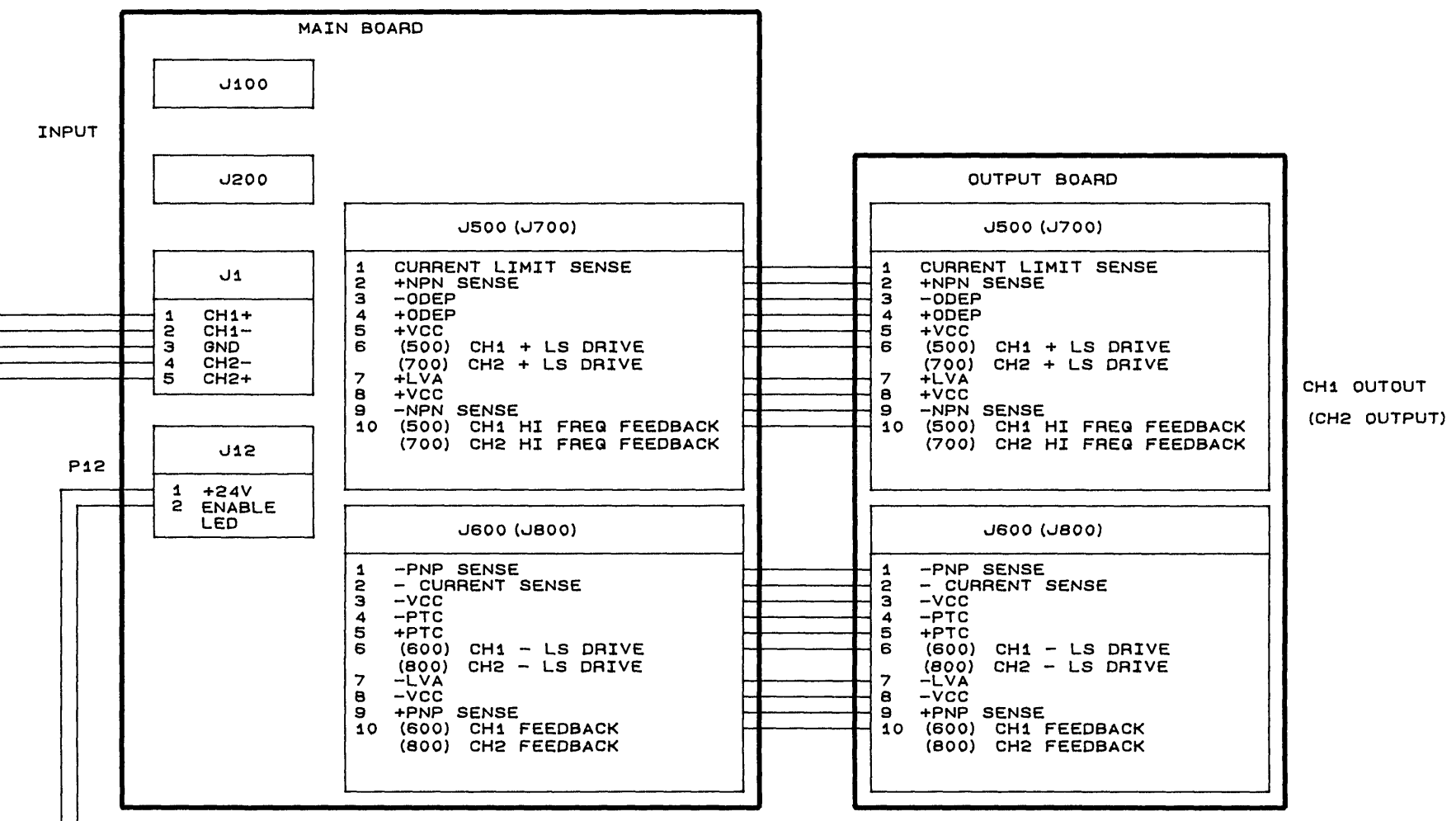
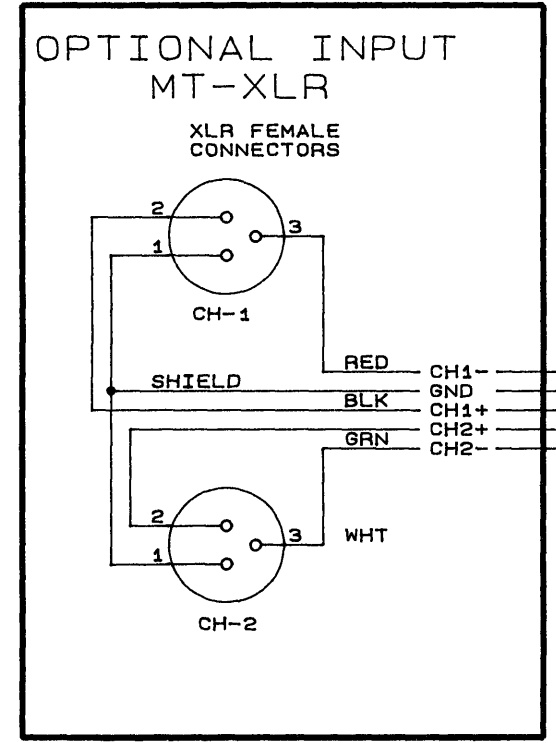
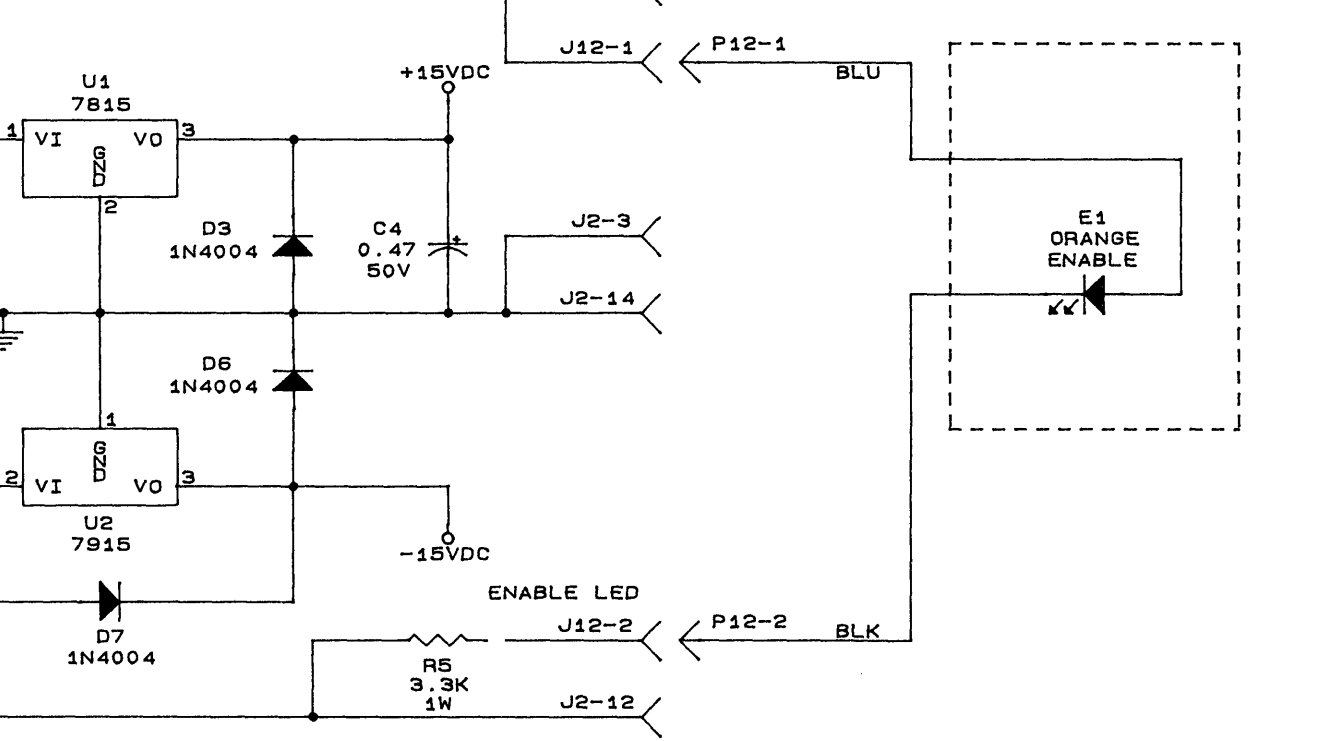
WIRING CONFIGURATIONS FOR SPECIFIC VOLTAGES

100V	120V	220V	240V
P10-P15	P10-P16	P10-P15	P10-P16
P11-P14	P11-P14	P9-P14	P9-P14
P7-P12	P7-P13	P8-P13	P8-P13



COMMON POWER SUPPLY

DISPLAY BOARD



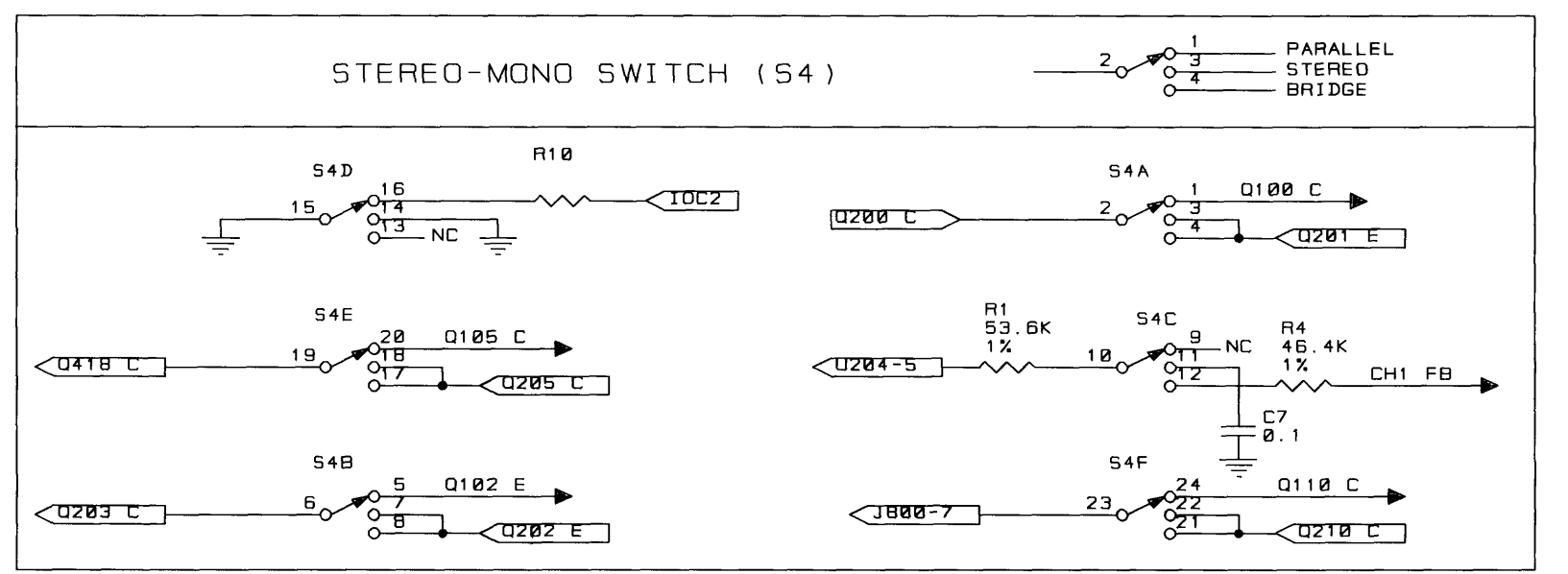
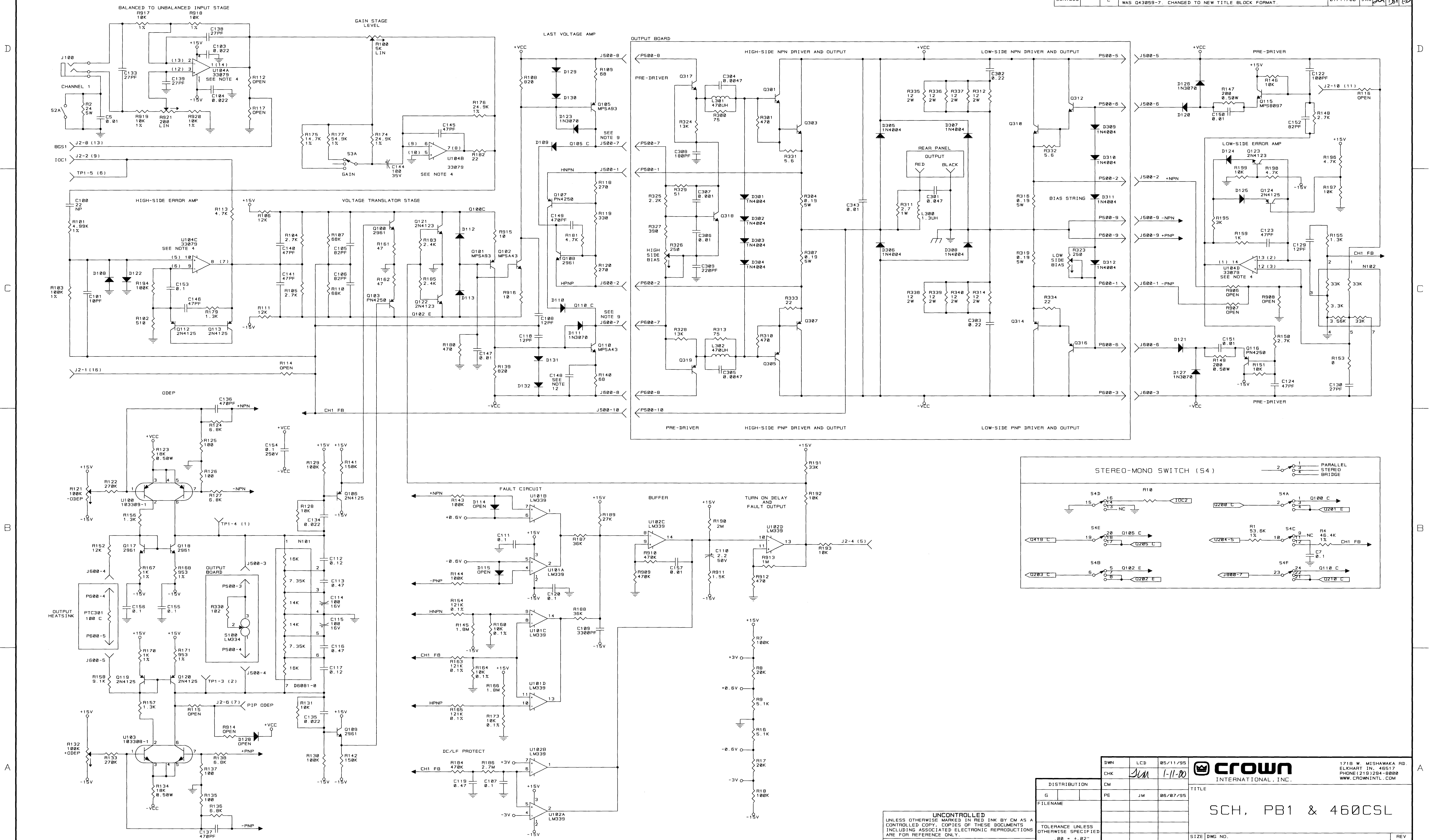
CROWN INTERNATIONAL, INC.  
1718 WEST MISHAWAKA ROAD ELKHART, IN. 46517 PHONE (219) 294-8000

SCHEM., PB1 & 460CSL

PRINTS TO	DRAWN	LCD	05/11/95	APPROVED BY :	DO NOT SCALE PRINT
	CHECKED			ME	SUPERSEDES
	SCALE	NONE		EE	E.C.N.
	PROJ #	D264		PE JM	06/07/95
	NEXT ASSEMBLY				C.P.N. SHEET 2 OF 2
					J0694-0

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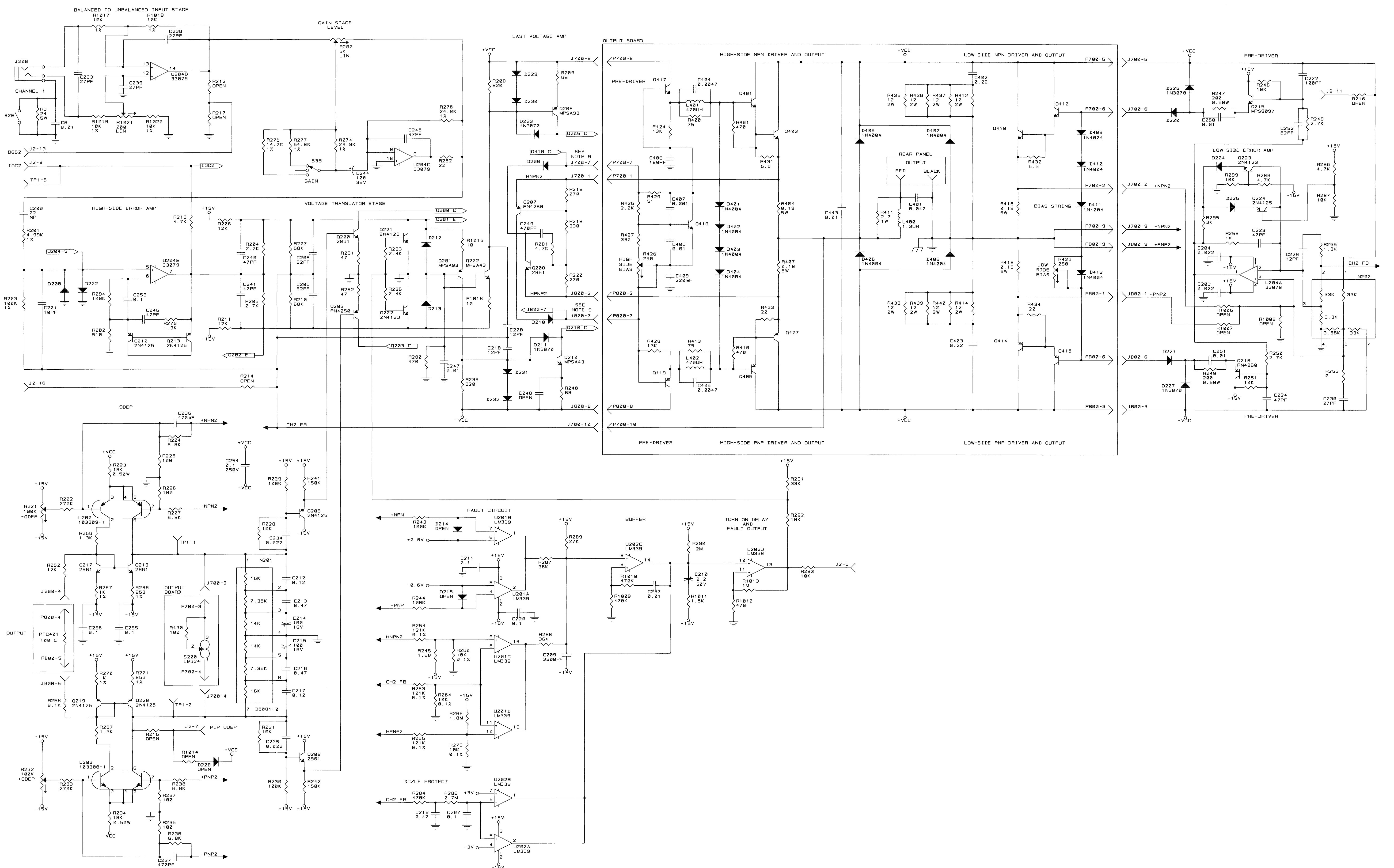
REVISION HISTORY				DATE	APPROVED
E.C.N.	ZONE	REV	DESCRIPTION		
EAT 95-282		A	ADD NOTE 12	11/28/95	LCD
EAT 95-183		B	C105, C106 WERE 47PF	05/28/95	LCD
BSNI035		C	U108, U208 WERE UPA75. U103, U203 WERE UPA75. NOTE 11. 043086-5 WAS 043089-7. CHANGED TO NEW TITLE BLOCK FORMAT.	01/11/98	JAW



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FILENAME	PE	06/07/95		TITLE
TOLERANCE UNLESS OTHERWISE SPECIFIED			SIZE	DWG NO.
.00 - 1.02"			D	J0694-0
.000 - 1.018"			SCALE	NONE
.001 - 1.003"			PROJ. NO.	MD26458
DO NOT SCALE DRAWING			SHEET	1 OF 3



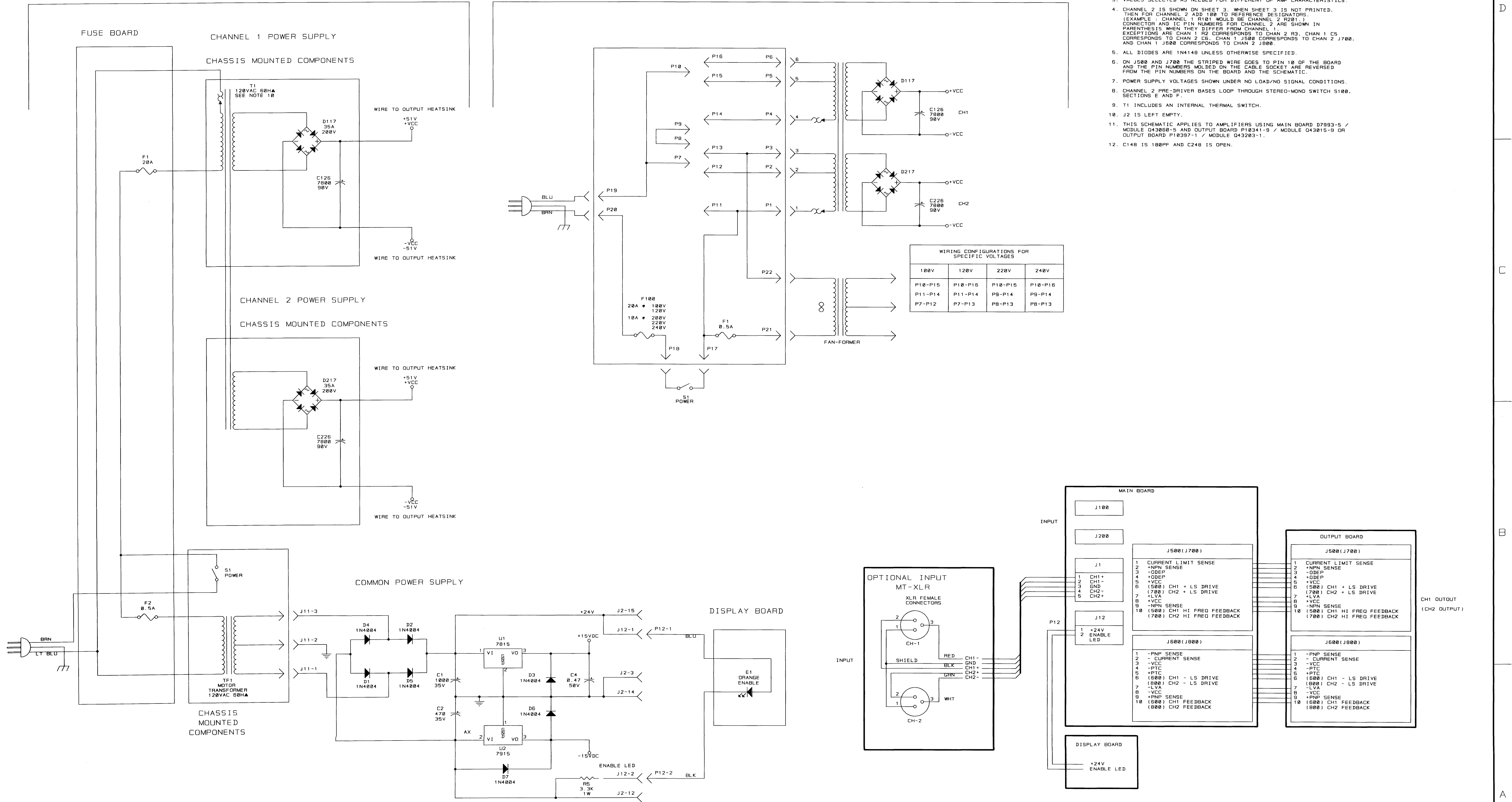


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				D	J0694-0	C
SCALE	NONE	PROJ. NO.	MD26458	SHEET		2 OF 3

120V 60HZ

INTERNATIONAL

- NOTES :
1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
  2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
  3. VALUES SELECTED AS NEEDED FOR DIFFERENT OP AMP CHARACTERISTICS.
  4. CHANNEL 2 IS SHOWN ON SHEET 3. WHEN SHEET 3 IS NOT PRINTED, THEN FOR CHANNEL 2 ADD 100 TO REFERENCE DESIGNATORS. (EXAMPLE : CHANNEL 1 P101 WOULD BE CHANNEL 2 P201.) CONNECTOR AND IC PIN NUMBERS FOR CHANNEL 2 ARE SHOWN IN PARENTHESES WHEN THEY DIFFER FROM CHANNEL 1. EXCEPTIONS ARE CHAN 1 P2 CORRESPONDS TO CHAN 2 R3, CHAN 1 C5 CORRESPONDS TO CHAN 2 C6, CHAN 1 J500 CORRESPONDS TO CHAN 2 J700, AND CHAN 1 J800 CORRESPONDS TO CHAN 2 J900.
  5. ALL DIODES ARE 1N4148 UNLESS OTHERWISE SPECIFIED.
  6. ON J500 AND J700 THE STRIPED WIRE GOES TO PIN 10 OF THE BOARD AND THE PIN NUMBERS MOLDED ON THE CABLE SOCKET ARE REVERSED FROM THE PIN NUMBERS ON THE BOARD AND THE SCHEMATIC.
  7. POWER SUPPLY VOLTAGES SHOWN UNDER NO LOAD/NO SIGNAL CONDITIONS.
  8. CHANNEL 2 PRE-DRIVER BASES LOOP THROUGH STEREO-MONO SWITCH S100, SECTIONS E AND F.
  9. T1 INCLUDES AN INTERNAL THERMAL SWITCH.
  10. J2 IS LEFT EMPTY.
  11. THIS SCHEMATIC APPLIES TO AMPLIFIERS USING MAIN BOARD D7993-5 / MODULE Q43060-5 AND OUTPUT BOARD P10341-9 / MODULE Q43015-9 OR OUTPUT BOARD P10337-1 / MODULE Q43203-1.
  12. C148 IS 100PF AND C248 IS OPEN.



WIRING CONFIGURATIONS FOR SPECIFIC VOLTAGES

100V	120V	220V	240V
P10-P15	P10-P16	P10-P15	P10-P16
P11-P14	P11-P14	P9-P14	P9-P14
P7-P12	P7-P13	P8-P13	P8-P13