THE PROFESSIONAL AUDIO DIVISION OF CROWN INTERNATIONAL, INC.

POWER AMPLIFIER

SERVICE MANUAL

POWER BASE-1® & 460CSL™

Mailing Address:
P.O. Box 1000
Elkhart, IN U.S.A. 46515-1000

Shipping Address:
57620 C.R. 105
Elkhart, IN U.S.A. 46517

K-SVCPB1
1-95

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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: ±0.1dB from 20 Hz to 20 kHz at 1 Watt.

Phase Response: ±10° 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: >13V 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.

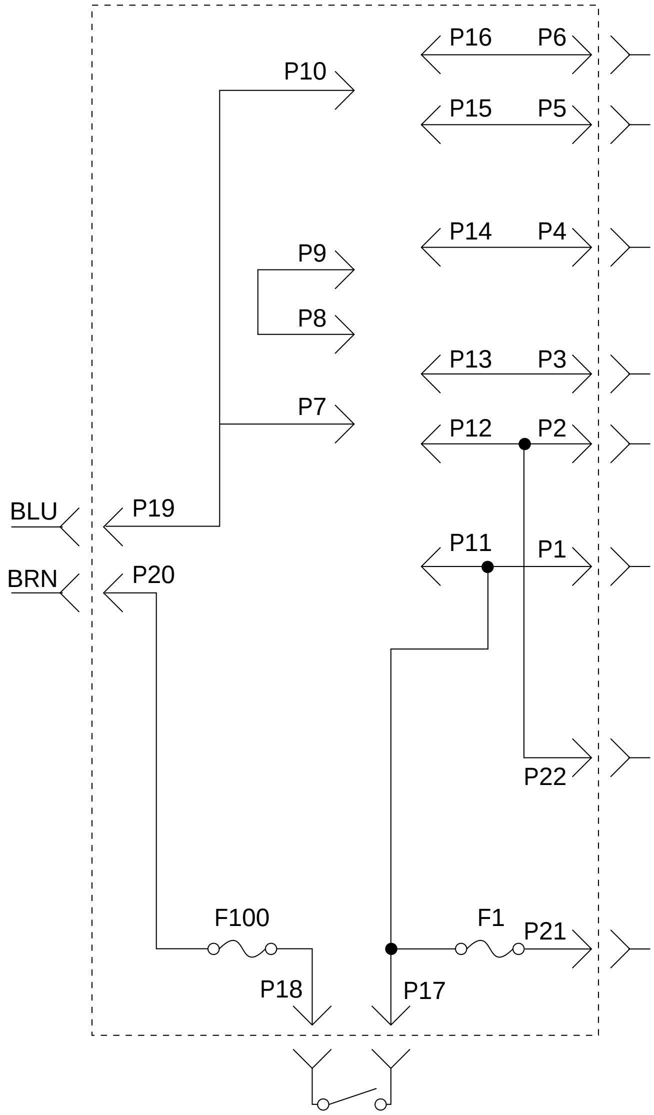
Mounting: Standard EIA 310 front-panel rack mount with supports for supplemental rear corner mounting.

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

Weight: 30 lbs.

Voltage Conversion

PB/CSL Universal Fuse Board



S1 Power Switch

100V Connections:
P10 to P15
P11 to P14
P7 to P12

120V Connections:
P10 to P16
P11 to P14
P7 to P13

220V Connections:
P10 to P15
P9 to P14
P8 to P13

240V Connections:
P10 to P16
P9 to P14
P8 to P13

For list of applicable transformer, fuse F100, fanformer, and power cord refer to voltage-parts cross-reference.

Specific parts are required for the PB-1/460CSL in order to be used at different international line voltages. Refer also to Mechanical Parts Lists.

100V AC Mains:	
10A Fuse	A10285-26
0.5A Low Voltage Supply Fuse	A10285-7
Power Transformer (Universal)	D 7598-2
Transmotor 120V 50 Hz	H43055-5
120V AC Mains:	
10A Fuse	A10285-26
0.5A Low Voltage Supply Fuse	A10285-7
Power Transformer (Universal)	D 7598-2
Power Transformer (United States)	D 6589-2
Transmotor 120V 50 Hz	H43055-5
Transmotor 120V 60 Hz	H43065-4
220V to 240V AC Mains:	
5A Fuse	A10285-21
0.5A Low Voltage Supply Fuse	A10285-7
Power Transformer	D 7598-2
Transmotor 120V 50 Hz	H43055-5

Note: The only versions of this product produced at the Crown Factory with international voltage capabilities built in are CSL versions built specifically for sale outside the United States.

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' include 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 ±15V to ±Vcc 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 ±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

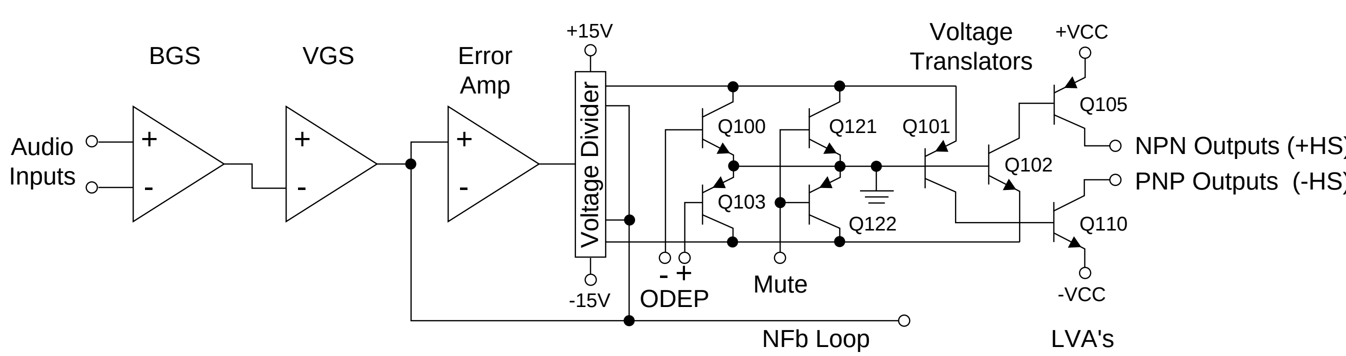


Figure 1. Typical Amplifier Front End and Voltage Amplification Stages.

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.

GROUNDED 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

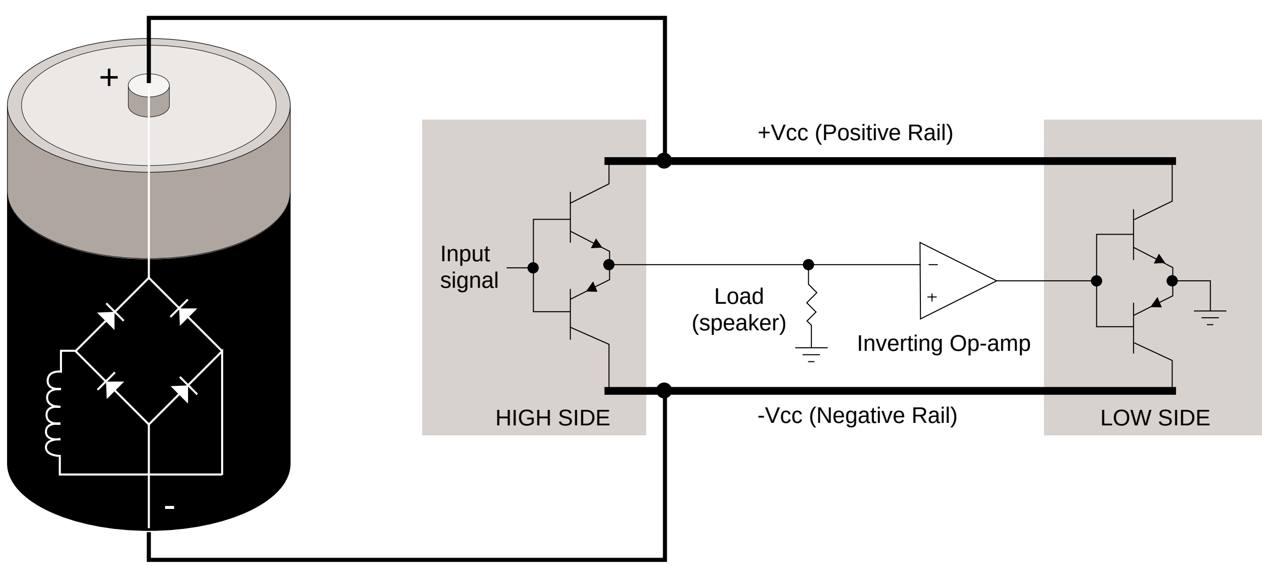


Figure 2. Crown Patented Grounded Bridge Topology

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 ±Vcc remain constant with respect to each other. This allows the power supply to deliver +Vcc and -Vcc 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 (±Vcc). 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, Vce of the PNP Darlington drops. With LS device emitters tied to ground, -Vcc is pulled toward ground reference. Since the power supply is not ground referenced (and the total voltage from +Vcc to -Vcc is constant) +Vcc is forced higher above ground potential. This continues until, at the positive amplifier output peak, -Vcc = 0V and +Vcc 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 (±35VDC 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 +Vcc swinging toward ground potential and -Vcc further from ground potential. At the negative amplifier output peak, +Vcc = 0V and -Vcc 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 ±35VDC 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 +Vcc are sensed, then multiplied to obtain a signal proportional to output power. Positive and negative ODEP voltages are adjustable via two potentiometers. Across ±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

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±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.

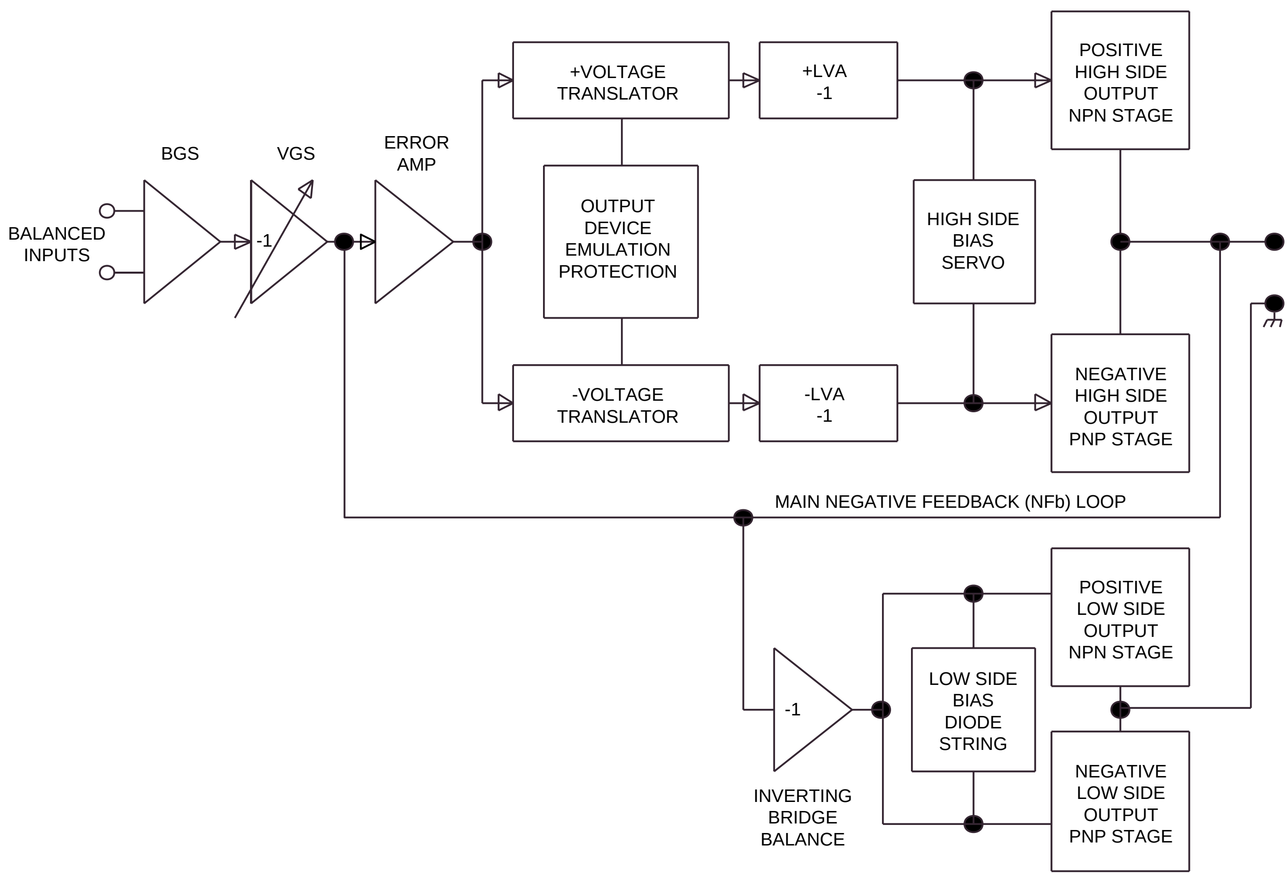


Figure 3. Typical Crown Amplifier Basic Block Diagram (One Channel Shown)

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, ±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 tolorance.

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 ±0.1V 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_{-ODEP}	V_{+ODEP}
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_{-ODEP} as specified above. Measure pin 6 of U200 and, if necessary, adjust R221 to obtain V_{-ODEP} as specified above.
+ODEP Procedure: Measure pin 6 of U103 and, if necessary, adjust R132 to obtain V_{+ODEP} as specified above. Measure pin 6 of U203 and, if necessary, adjust R232 to obtain V_{+ODEP} 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: ±3% when the Sensitivity Switch is set for 26dB gain, ±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 ±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 ±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 ±1.2 VAC at the amplifier output. Return the Sensitivity Switch to the 26 dB position.

TEST 7: PHASE RESPONSE

Spec: ±10° 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° 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 ±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 ±1 Amps. Observe clean (no oscillations) current clipping.

TEST 10: SLEW RATE & 10 KHZ SQUARE WAVE

Spec: >13V/µS.
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 V/µS. 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 µF. 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 µHenries. 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.

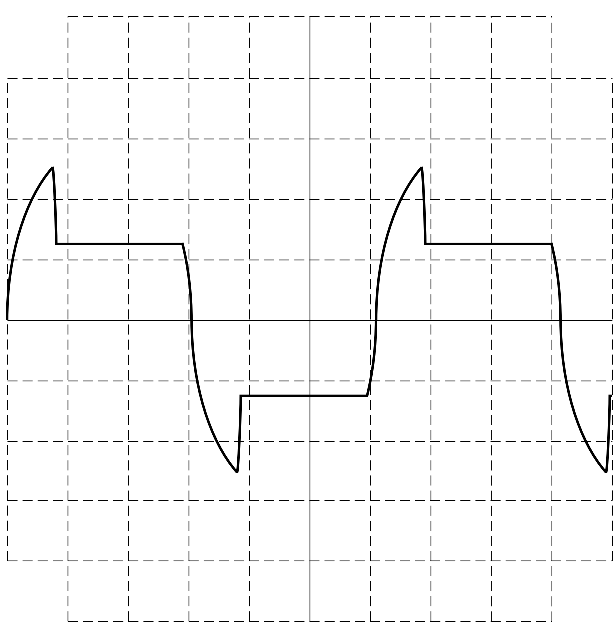


Figure 4. ODEP Limiting Wave Form

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 µV 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:

Mechanical (Non-Module) Parts

SUPPLIMENTAL ITEMS

CPN	ITEM	QTY
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

CPN	ITEM	QTY
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

CPN	ITEM	QTY
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)

CPN	ITEM	QTY
A10095-4	Washer, #10 Ext. Lock	2
A10098-5	Belleville Spring Washer	2
C 7015-8	C126/C226 7800µF 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

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

LED ASSEMBLY

CPN	ITEM	QTY
C 4342-9	Enable LED, Amber	1
P10068B4	LED Board	1

Mechanical (Non-Module) Parts

OUTPUT ASSEMBLY (ONE PER CHANNEL)

CPN	ITEM	QTY
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

CPN	ITEM	QTY
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

CPN	ITEM	QTY
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

CPN	ITEM	QTY
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 therefor 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	.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
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
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	.047µF
C02	C 3218-2	.22µF
C03	C 3218-2	.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

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	1.3µH Output Coil
L01	C 3510-2	470µH
L02	C 3510-2	470µH

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	.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 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
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
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 6911-9	UPA75 PNP
U103	U203	C 6910-1	UPA76 NPN
U104	U204	C 6900-2	MC34084P

MISC.

BOARD		D 6304B2	
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 7077-8	WIRE RETAINER
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 7077-8	3-Cond Wire Retain

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%
R2		OPEN	
R3		OPEN	
R4		A10265-46421	46.4K 1%
R5		A10266-3323	3.3K 1W
R10		OPEN	
R100	R200	C 7409-3	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	A10266-6831	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 5869-2	ZERO OHM
R155	R255	OPEN	
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
R169	R269	OPEN	
R170	R270	A10266-1021	1K
R171	R271	A10265-95301	953 OHM
R172	R272	OPEN	
R174	R274	A10265-38311	3.83K 1%
R175	R275	A10265-24311	2.43K 1%
R176	R276	A10266-1041	100K
R177	R277	C 5062-2	TRIM POT
R178	R278	A10266-1231	12K
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	A10266-2051	2M

SWITCHES

S3		C 7363-2	4PDT
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

INTERCONNECTS

J1		OPEN	
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
J500	J800	D 6619-7	10" RIBBON ASSY
J600	J700	D 6620-5	6" RIBBON ASSY

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	470µF
C2		C 3913-8	470µF
C4		C 6802-0	.47µF
C5		C 6806-1	.01µF
C6		C 6806-1	.01µF
C7		C 6094-4	33µF 16V
C8		C 6806-1	.01µF
C100	C200	C 5311-3	22µF
C101	C201	C 2820-6	5pF
C103	C203	C 6805-3	.022µF
C104	C204	C 6804-6	.1µF
C105	C205	C 6812-9	47pF
C106	C206	C 6812-9	47pF
C108	C208	C 6814-5	12pF
C112	C212	C 6803-8	.12µF
C113	C213	C 6802-0	.47µF
C114	C214	C 8876-8	100µF 35V
C115	C215	C 8876-8	100µF 35V
C116	C216	C 6802-0	.47µF
C117	C217	C 6803-8	.12µF
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	.1µF
C130	C230	C 6813-7	27pF
C133	C233	C 6814-5	12pF
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 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	100µF 35V
C145	C245	C 6814-5	12pF
C146	C246	C 6809-5	220pF
C147	C247	C 6806-1	.01µF
C148	C248	C 6810-3	180pF
C149	C249	C 6808-7	470pF
C152	C252	C 6809-5	220pF
C153	C253	C 6804-6	.1µF

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)

Q119	Q219	C 3625-8	NPN 2N4125
Q120	Q220	C 3625-8	NPN 2N4125
Q121	Q221	C 7458-0	NPN 2N4123
Q122	Q222	C 7458-0	NPN 2N4123
Q123	Q223	C 7458-0	NPN 2N4123
Q124	Q224	C 3625-8	NPN 2N4125

RESISTORS

N101	N201	D 6081-0	Network Package
N102	N202	D 6082-8	Network Package
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
R7		A10266-1041	100K
R8		A10266-2031	20K
R9		A10266-5121	5.1K
R16		A10266-5121	5.1K
R17		A10266-2031	20K
R18		A10266-1041	100K
R100	R200	C 7409-3	5K Linear Pot (Level)
R101	R201	A10265-49911	4.99K 1%
R102	R202	A10266-5111	510
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	A10266-8211	820
R109	R209	A10266-6801	68
R110	R210	A10266-6831	68K
R111	R211	A10266-1231	12K
R113	R213	A10266-4721	4.7K
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	C 7782-3	100 Flame Proof
R126	R226	C 7782-3	100 Flame Proof
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	C 7782-3	100 Flame Proof
R136	R236	A10266-6821	6.8K
R137	R237	C 7782-3	100 Flame Proof
R138	R238	A10266-6821	6.8K
R139	R239	A10266-8211	820
R140	R240	A10266-6801	68
R141	R241	A10266-1541	150K
R142	R242	A10266-1541	150K
R143	R243	A10266-1041	100K
R144	R244	A10266-1041	100K
R145	R245	A10266-1851	1.8M
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	JUMPER	JUMPER
R154	R254	C 8261-7	121K 0.1%
R155	R255	A10266-1321	1.3K
R156	R256	A10266-1321	1.3K
R157	R257	A10266-1321	1.3K
R158	R258	A10266-9121	9.1K
R159	R259	A10266-1021	1K
R160	R260	C 8260-9	10K 0.1%
R161	R261	A10266-1011	100
R162	R262	A10266-1011	100
R163	R263	C 8261-7	121K 0.1%
R164	R264	C 8260-9	10K 0.1%
R165	R265	C 8261-7	121K 0.1%
R166	R266	A10266-1851	1.8M
R167	R267	A10265-10011	1K 1%
R168	R268	A10265-95301	953 1%
R170	R270	A10265-10011	1K 1%
R171	R271	A10265-95301	953 1%
R173	R273	C 8260-9	10K 0.1%
R174	R274	A10265-24921	24.9K 1%
R175	R275	A10265-14721	14.7K 1%
R176	R276	A10265-24921	24.9K 1%
R177	R277	A10265-54921	54.9K 1%
R179	R279	A10266-1321	1.3K
R180	R280	A10266-4711	470
R181	R281	A10266-4721	4.7K
R182	R282	A10266-2201	22
R183	R283	A10266-2421	2.4K
R184	R284	A10266-4741	470K
R185	R285	A10266-2421	2.4K
R186	R286	A10266-2751	2.7M
R187	R287	A10266-3631	36K
R188	R288	A10266-3631	36K
R189	R289	A10266-2731	27K
R190	R290	A10266-2051	2M

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

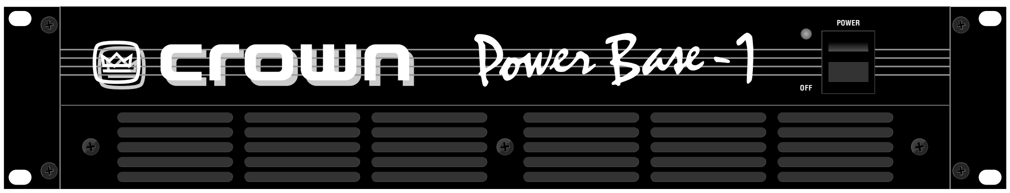
U1		C 5095-2	UA7815
U2		C 5096-0	UA7915
U100	U200	C 6911-9	UPA75
U101	U201	C 4345-2	LM339
U102	U202	C 4345-2	LM339
U103	U203	C 6910-1	UPA76
U104	U204	C 7558-7	MC33079P

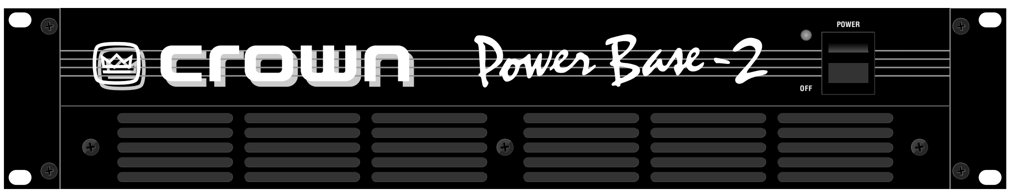
MISC.

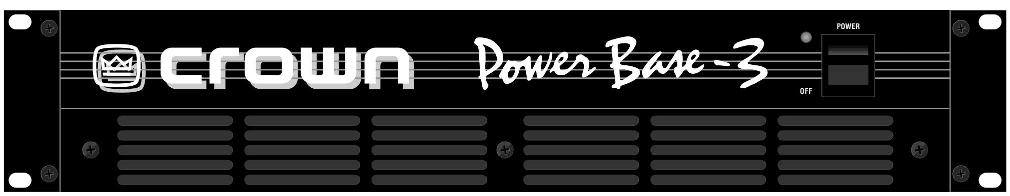
Board		D 7993-5	
Socket		C 3450-1	14 Pin
Nut		A10102-5	Hex 6-32
Heatsink		C 5341-0	TO-220
Torq. Spreader		C 6541-4	
Washer		C 8973-7	#6, Split
Screw		C 9067-7	Stainless
J1		C 7593-4	5 Pin Header
J11		C 7526-4	3 Pin Header
J12		C 7873-0	2 Pin Header
J100	J200	C 6777-4	Phone Jack
Cover		C 6778-2	Phone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

Power Base™

REFERENCE MANUAL







Models:
Power Base-1, 2 & 3

E106377

Applies only to 120 VAC, North American PB-1, PB-2 and PB-3 units.

LL 32521C

Applies only to 120 VAC, North American PB-1 and PB-2 units.

101229-1
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CONTENTS

ILLUSTRATIONS

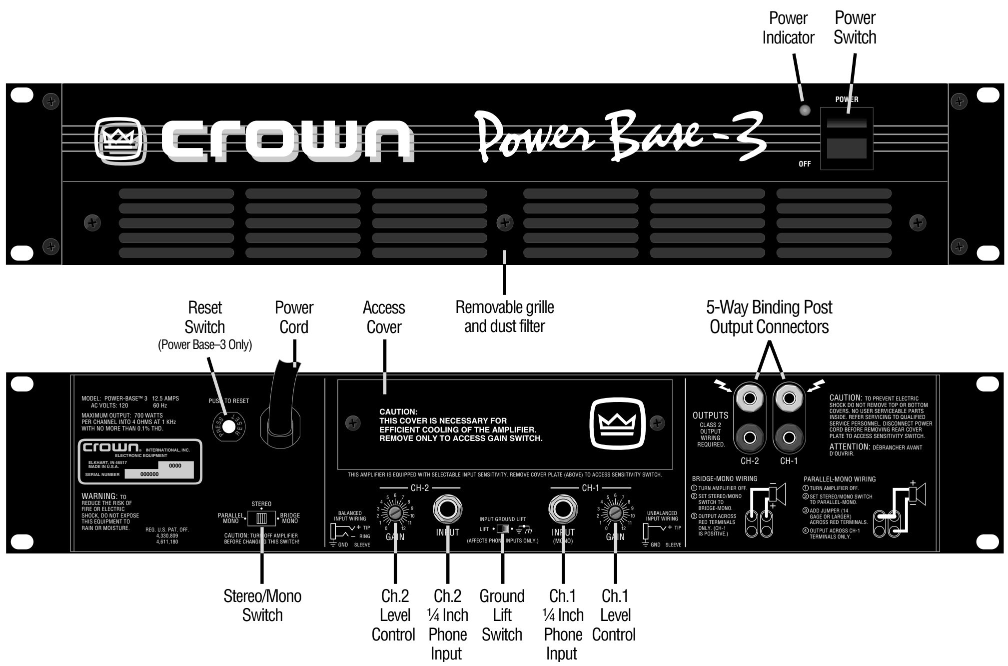
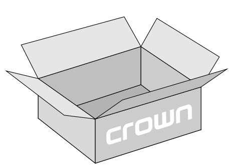


Fig. 1.1 Power Base Front and Back Panels

1 Welcome

Congratulations on choosing a *Power Base* amplifier. *Power Base* amplifiers are compact, professional stereo power amplifiers engineered to meet the most demanding sound reinforcement needs. They compare very favorably to more expensive amplifiers, providing uncolored sound and signal-to-noise ratios commonly associated with recording studios.

This manual will help you successfully install and use your amplifier—we strongly recommend you read all instructions, warnings and cautions. If you plan to operate in one of the two mono modes, be sure to read Section 2.2. Also for your protection, please save your bill of sale as it is your **official proof of purchase.**



1.1 Unpacking

Please unpack and inspect your new amplifier for any damage that may have occurred during transit. If damage is found, notify the transportation company immediately. Only you, the consignee, may initiate a claim with the carrier for damage resulting during shipment. Even if the unit arrived in perfect condition, as most do, save all packing materials so you will have them if you ever need to transport the unit. **NEVER SHIP THE UNIT WITHOUT THE FACTORY PACK.**

1.2 Features

- ❏ Rugged, professional power amplifier built for the road. Mounts in a standard 19 inch (48.3 cm) rack.
- ❏ Crown's patented *grounded bridge* circuitry generates large voltage swings while avoiding electrical stress on the output stages. This results in low distortion and high reliability.
- ❏ Front panel power switch with turn-on delay for loudspeaker protection.
- ❏ Patented Output Device Emulation Protection (*ODEP*®) keeps the amplifier working when others would fail.
- ❏ High damping factor provides superior control over low frequency drivers for a clean, accurate low end.
- ❏ Safe with any load. Bridge-Mono and Parallel-Mono modes offer optimal load-matching performance.
- ❏ Complete protection against shorted outputs, mismatched loads, overheating, DC input/output and high-frequency overload; full internal fault protection.
- ❏ Balanced phone jack inputs with internal three-position sensitivity switch. Optional XLR or barrier block input connectors are available with the *MT-XLR* or *MT-BB* accessories.
- ❏ Ground lift switch is provided to isolate the chassis ground from the phone jack input ground.
- ❏ Efficient heat sinks and self-contained forced air cooling system dissipate heat quickly and evenly for extra amplifier protection and greater power output.
- ❏ Three year "No-Fault" full warranty and guaranteed specifications protect your investment.

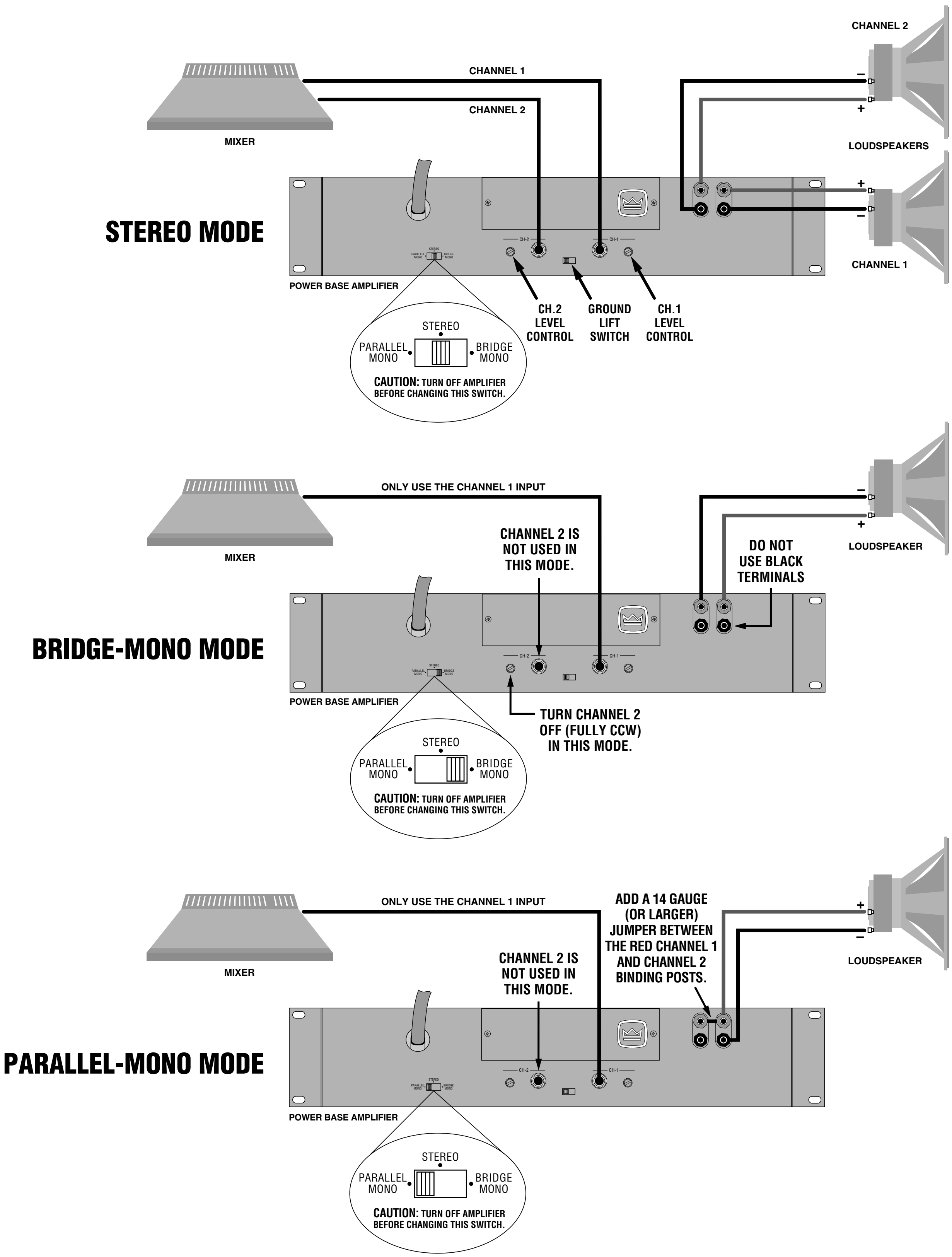


Fig. 2.1 Three System Connection Methods

2 Installation

Always remove power from the unit and turn the level controls off (fully counterclockwise) when making or breaking connections. This reduces the chance of blasts that can cause loudspeaker damage.

The guidelines below are provided to help you quickly get your amplifier installed and ready to go. Be sure to follow the instructions in Sections 2.1 and 2.2 for the selected mode of operation. Additional information on input sensitivity, load protection and required AC mains is provided in Sections 2.3, 2.4 and 2.5.

1. Install the amplifier in a standard 19 inch (48.3 cm) rack or place it on a stable surface. The mounting dimensions are 19 inches (48.3 cm) wide, 3.5 inches (8.9 cm) tall and 16 inches (40.6 cm) deep behind the mounting surface. **IMPORTANT! Allow for adequate ventilation.**

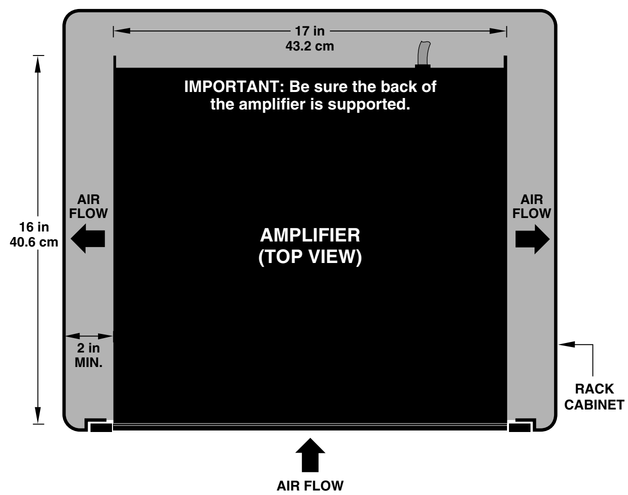


Fig. 2.2 Do NOT Block Air Flow

2. Use high-quality loudspeaker cables to connect the load to the amplifier's outputs. Do not use shielded cable.
3. Use shielded cables to connect audio sources to the amplifier inputs. Either balanced or unbalanced wiring can be used as shown below. (XLR connectors are available with the MT-XLR accessory. See Section 5.)

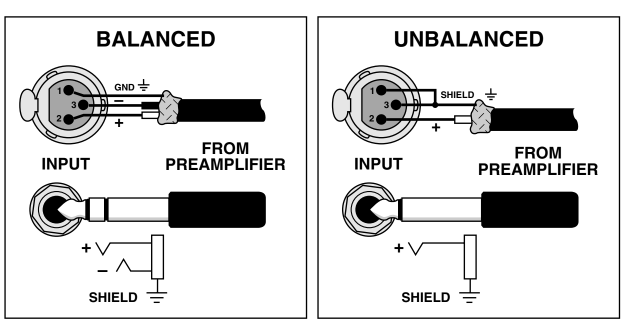


Fig. 2.3 Power Base Input Wiring

2.1 Stereo

1. Turn down the level controls (fully counterclockwise) and turn off the amplifier.
2. Set the back panel stereo/mono switch to Stereo.
3. If present, remove the Parallel-Mono jumper.
4. Connect the input and output cables as shown in the first example in Figure 2.1.
5. Turn on the amplifier and adjust the level for each channel using the back panel level controls.

CAUTION: Never parallel the two outputs by directly tying them together, and never parallel them with the output of another amplifier.

2.2 Mono

Your amplifier's mono modes provide double the power of Stereo mode in a single channel. In Bridge-Mono mode, the outputs are wired in series for twice the output voltage. In Parallel-Mono mode, the outputs are paralleled for twice the current capacity.

Bridge-Mono mode is provided for loads with an impedance greater than 4 ohms. Parallel-Mono mode should be used with loads of 4 ohms or less.

BRIDGE-MONO

1. Turn down the level controls (fully counterclockwise) and turn off the amplifier.
2. Set the back panel stereo/mono switch to Bridge-Mono.
3. If present, remove the Parallel-Mono jumper.
4. Connect the input and output cables as shown in the second example in Figure 2.1. **Only use the channel 1 input.**
5. Make sure the load is balanced (neither side shorted to ground) and do not use the black (–) binding posts.
6. Turn on the amplifier and adjust the level. **Only use the channel 1 level control.**

PARALLEL-MONO

1. Turn down the level controls (fully counterclockwise) and turn off the amplifier.
2. Set the back panel stereo/mono switch to Parallel-Mono.
3. Install a solid, 14-gauge (2 mm^2) or heavier jumper wire across the two red (+) binding post outputs.
4. Connect the input and output cables as shown in the third example in Figure 2.1. **Only use the channel 1 input.**
5. Turn on the amplifier and adjust the level. **Only use the channel 1 level control.**

CAUTION: With Parallel-Mono wiring, do not switch to Stereo or Bridge-Mono mode until the output jumper wire is removed.

2.3 Input Sensitivity Adjustment

The input sensitivity switch inside the amplifier is set to 0.775 volts at the factory. It can be changed to 1.4 volts or a voltage gain of 26 dB as follows:

1. Turn off and unplug the amplifier from the AC source.
2. Remove the access cover on the back panel.
3. Locate the labeled access hole for the sensitivity switch.
4. Set the switch to the desired position.
5. Replace the access cover plate.

When set to 26 dB gain, the *Power Base-1*® requires a 2.0 volt input, the *Power Base-2*® requires a 2.5 volt input and the *Power Base-3*™ requires a 3.2 volt input to deliver full output into an 8 ohm load.

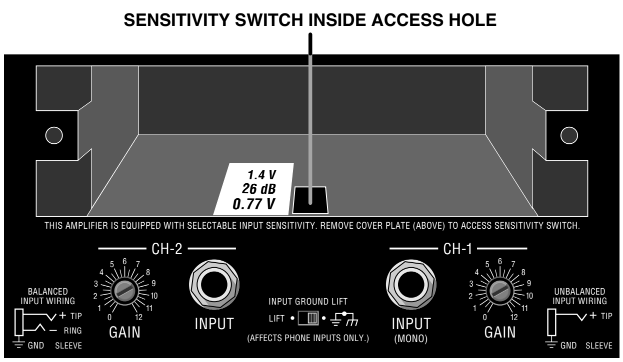


Fig. 2.4 Input Sensitivity Switch

2.4 Additional Load Protection

To protect against excessive power, a fuse can be added in series with each loudspeaker cable. A single fuse can protect the entire system, or one can be used for each driver. High-frequency drivers (tweeters) are usually more sensitive to large voltage peaks, while low-frequency drivers (woofers) are typically most sensitive to the heat from average (RMS) output power. To protect your tweeters, we recommend that you use a high-speed instrument fuse like the Littlefuse 361000 series. To protect your woofers, we recommend using a slow-blow fuse that more closely represents the thermal response of your woofer. Use Figure 2.5 to find the correct value for either type of fuse.

Example: (A) Find the peak music power of your loudspeaker (such as 75 watts). (B) Find the loudspeaker impedance (8 ohms). (C) Draw a line between points A and B. The line intersects the middle scale at the correct fuse value (1.5 amps).

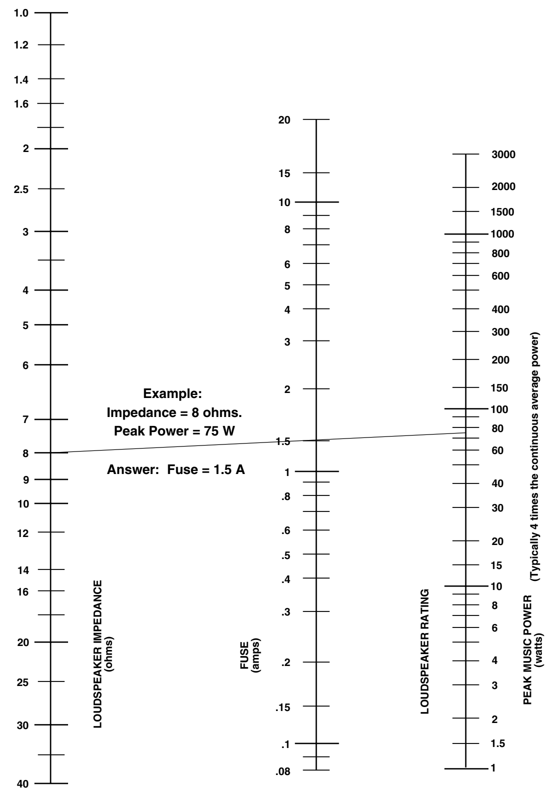


Fig. 2.5 Loudspeaker Fuse Nomograph

2.5 Required AC Mains

All *Power Base* amplifiers are shipped with an appropriate line cord and plug. When possible, use a power receptacle on a dedicated circuit, and always make sure it will provide the right voltage and sufficient current. We do not recommend operating your amplifier with voltages greater than 10% above or below the unit's rated voltage. For example, if your amplifier is rated for 120 VAC, the line voltage should not exceed 132 VAC.

3 Operation

3.1 Precautions

Although your amplifier is protected from external faults, the following safety precautions are recommended:

1. There are important differences among the Stereo, Bridge-Mono and Parallel-Mono operating modes. Please refer to Sections 2 for additional information.
2. **WARNING: Do not change the position of the stereo/mono switch unless the amplifier is first turned off.**
3. **CAUTION: In Parallel-Mono mode, a jumper is used to connect the red binding post outputs. Be sure to remove this jumper for Bridge-Mono or Stereo mode, or high distortion and excessive heating will occur.** Also, make sure the stereo/mono switch is set to the proper position.
4. Use care when making connections, selecting signal sources and controlling the output level. The load you save may be your own!
5. Do not short the ground lead of an output cable to the input signal ground. This will form a ground loop and may cause oscillations.
6. Operate the amplifier from AC mains of not more than 10% variation above or below the selected line voltage and only at the specified line frequency.
7. **Never connect the output to a power supply output, battery or power main.** Such connections may result in electrical shock.
8. Tampering with the circuitry by unqualified personnel or making unauthorized circuit changes may be hazardous and invalidates all agency listings.

Remember: Crown is not liable for any damage that results from overdriving other system components.

3.2 Power Indicator

When lit, the amber power indicator (to the left of the power switch) shows that the amplifier has been turned on. It is driven only by the low-voltage power supply and does not indicate the status of the high-voltage supplies.

3.3 Protection Systems

Power Base amplifiers have extensive protection systems, including *ODEP*, ultrasonic/RF protection, drive protection, transformer thermal protection and fuses or circuit breakers that protect the power supplies.

3.3.1 *ODEP*

Crown invented *ODEP* to keep the amplifier working under demanding conditions and to increase output efficiency. To do this, Crown established a rigorous program to measure each transistor's *safe operating area* (SOA). Intelligent circuitry was then designed to simulate the instantaneous conditions of the output transistors. Its name describes what it does: Output Device Emulation Protection, or *ODEP*. In simple terms, *ODEP* compares transistor conditions to their known SOA. If more power will be asked of them than they can deliver under the existing conditions, *ODEP* limits the drive until conditions fall within the SOA. Limiting is proportional and kept to an absolute minimum—only what is required to prevent output transistor damage. Under normal conditions, no limiting is required and *ODEP* is transparent to the audio signal.

ODEP makes possible a quantum leap in output efficiency and reliability—with *ODEP*, the show goes on.

3.3.2 Ultrasonic and Radio Frequency Protection

An amplifier's slew rate only needs to be large enough to deliver the maximum voltage at the highest required frequency. Higher slew rates actually allow undesirable ultrasonic and radio frequencies to be reproduced. By design, *Power Base* amplifiers have a controlled slew rate to limit the highest frequencies that they reproduce. Limiting occurs well above 20 kHz so there is no audible effect on performance. This approach protects the amplifier from radio frequencies and can even protect some sensitive loads (including some tweeters).

3.3.3 Drive Protection

The drive protection system temporarily removes output drive to protect the amplifier and its loads. Drive protection can be activated in two situations. First, if dangerous subsonic frequencies or direct current (DC) is detected in the amplifier's output, the unit will activate its DC/low-frequency protection circuitry which puts the amplifier in drive protection mode. This protects the loads and prevents oscillations. The unit resumes normal operation as soon as the amplifier no longer detects dangerous output. Although it is extremely unlikely that you will ever activate the amplifier's DC/low frequency protection system, improper source materials like subsonic square waves or input overloads that excessively clip the input signal can activate this system.

The amplifier's fault protection system will put the amplifier in drive protection mode in rare situations where heavy common-mode current is detected in the output.

The unit should never output heavy common-mode current unless its circuitry is damaged. Activating drive protection helps prevent further damage.

3.3.4 Transformer Thermal Protection

All *Power Base* amplifiers have transformer thermal protection. This protection circuitry is activated in unusual situations where the unit's transformer temperature rises to unsafe levels. Under these abnormal conditions, the unit removes power to the high-voltage transformer. The fan will continue to run in all units except those with 220/240 VAC transformers. The amplifier will return to normal after it cools to a safe temperature.

It is very unlikely that your *Power Base* amplifier will ever activate transformer thermal protection as long as it is operated within rated conditions. Your amplifier is designed to continue operating under conditions where other amplifiers would fail. But even when you exceed the limits of a *Power Base* amplifier, it still protects itself—and your investment—from damage.

3.3.5 Fuses and Circuit Breakers

All 120 VAC, 60 Hz units and all *Power Base-3* units have a fuse that protects the low-voltage power supply and cooling fan. The *Power Base-1* and *Power Base-2* high-voltage power supplies are protected by fuses, while the *Power Base-3* high-voltage power supplies are protected by a circuit breaker. With rated loads and output levels, these fuses (or the circuit breaker) should only shut down the amplifier in the incredibly rare instance of a catastrophic amplifier failure. The *ODEP* protection system keeps the amplifier operational under most other severe conditions. The fuses (or breaker) can also shut down the amplifier in situations where extremely low-impedance loads and high output levels result in excessive current draw.

A *Power Base* amplifier will not blow its fuses or trip its breaker unless something is wrong. In the rare event that an internal fuse blows, please refer the unit to a qualified technician. If the breaker in a *Power Base-3* trips, try to identify and correct the problem before resetting it with the back panel Circuit Breaker Reset. If the problem persists, refer the unit to a qualified technician.

3.4 Controls

The Power switch is th only control located on the front panel. All others are located on the rear, including the level controls.

When making any setup or wiring changes, don't forget to turn off the amplifier, turn down the level controls and disconnect the power cord. Be sure to turn down (full counterclockwise) the channel 2 level control when using either mono mode. The Parallell Mono/Stereo/ Bridge Mono switch is used to select Stereo, Bridge-Mono or Parallel-Mono operating modes. The Input Ground Lift switch isolates the phone jack input grounds from the chassis ground to help prevent ground loops. It does not affect any installed input accessories. The Input Sensitivity Switch, located inside the back cover plate, sets the amplifier's input sensitivity (refer to subsection 2.3 for information on changing this switch). And the *Power Base-3* has a back panel Circuit Breaker Reset button that resets the circuit breaker (refer to subsection 3.3.5).

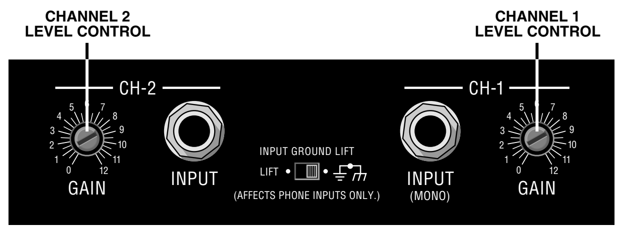


Fig. 3.1 Back Panel Level Controls

3.5 Filter Cleaning

A dust filter is provided on the unit's air intake. If it becomes clogged, the unit will cool less efficiently and may produce lower output levels. To clean the filter, use a phillips screwdriver to remove the three screws the secure the front grille. Use mild dishwashing detergent and warm water for best cleaning results. Be sure the filter is dry before you reinstall it. Replacement filters may be ordered from the factory.

Dust filters are not 100% efficient—long term this may require internal heat-sink cleaning by a qualified technician. Internal cleaning information is available from our Technical Support Group.

4 Specifications

All specifications apply to units in Stereo mode with 8-ohm loads and an input sensitivity of 26 dB unless otherwise specified.

Standard 1 kHz Power: refers to maximum average power in watts at 1 kHz with 0.1% THD+noise.

Full Bandwidth Power: refers to maximum average power in watts from 20 Hz to 20 kHz with 0.1% THD+noise.

120 VAC, 60 Hz Units: refers to amplifiers with dedicated transformers for 120 VAC, 60 Hz power mains.

Performance

Frequency Response: ±0.1 dB from 20 Hz to 20 kHz at 1 watt.

Phase Response: ±10 degrees from 10 Hz to 20 kHz at 1 watt.

Signal-to-Noise: A-weighted, better than 105 dB below full bandwidth power. Better than 100 dB below full bandwidth power from 20 Hz to 20 kHz.

Total Harmonic Distortion (THD): Less than 0.05% at full bandwidth power from 20 Hz to 1 kHz increasing linearly to 0.1% at 20 kHz.

Intermodulation Distortion (IMD): (60 Hz and 7 kHz 4:1) Less than 0.05% from less than 158 milliwatts to full bandwidth power.

Damping Factor: Greater than 1,000 from 10 Hz to 400 Hz.

Crosstalk

Power Base-1: Greater than 75 dB below full bandwidth power from 50 Hz to 2 kHz, rising linearly to greater than 60 dB at 20 kHz.

Power Base-2: Greater than 90 dB below full bandwidth power from 50 Hz to 2 kHz, rising linearly to greater than 66 dB at 20 kHz.

Power Base-3: Greater than 90 dB below full bandwidth power from 50 Hz to 4 kHz, rising linearly to greater than 70 dB at 20 kHz.

Common Mode Rejection (CMR): Better than 70 dB below rated full bandwidth power from 20 Hz to 1 kHz falling linearly to better than 50 dB at 20 kHz.

Controlled Slew Rate: Greater than 13 volts/ms.

Voltage Gain: 20:1 ±3% or 26 dB ±0.25 dB at the maximum level setting (Input Sensitivity switch set to its 26 dB position).

Power Base-1: 51:1 ±12% or 34.3 dB ±1 dB at 0.775 volt sensitivity; 28:1 ±12% or 29.1 dB ±1 dB at 1.4 volt sensitivity.

Power Base-2: 64:1 ±12% or 36.2 dB ±1 dB at 0.775 volt sensitivity; 35:1 ±12% or 31.0 dB ±1 dB at 1.4 volt sensitivity.

Power Base-3: 83:1 ±12% or 38.4 dB ±1 dB at 0.775 volt sensitivity; 46:1 ±12% or 33.3 dB ±1 dB at 1.4 volt sensitivity.

Power

Output Power: *The following specifications are guaranteed minimums for standard 1 kHz power. For more information, see the power matrices in Figures 4.1 through 4.6 (maximum average power @ 0.1% THD + N).*

Power Base-1

Stereo mode (both channels driven):

240 watts into 4 ohms.
200 watts into 8 ohms.

Bridge-Mono mode:

455 watts into 8 ohms.
395 watts into 16 ohms.

Parallel-Mono mode:

455 watts into 2 ohms.
400 watts into 4 ohms.

Power Base-2

Stereo mode (both channels driven):

460 watts into 4 ohms.
325 watts into 8 ohms.

Bridge-Mono mode:

910 watts into 8 ohms.
660 watts into 16 ohms.

Parallel-Mono mode:

920 watts into 2 ohms.
655 watts into 4 ohms.

Power Base-3

Stereo mode (both channels driven):

760 watts into 4 ohms.
540 watts into 8 ohms.

Bridge-Mono mode:

1525 watts into 8 ohms.
1090 watts into 16 ohms.

Parallel-Mono mode:

1530 watts into 2 ohms.
1080 watts into 4 ohms.

Load Impedance: Safe with all types of loads. Rated for 4 to 8 ohms in Stereo, 8 to 16 ohms in Bridge-Mono and 2 to 4 ohms in Parallel-Mono mode.

Required AC Mains: Current, frequency and voltage requirements are provided on each unit's back panel. All models draw 90 watts or less at idle.

Power Base-1: Draws up to 6 amps of current.

Power Base-2: Draws up to 10 amps of current.

Power Base-3: Draws up to 15 amps of current.

Low-Voltage Power Supply: A ±24 VDC fanformer supply (fan motor winding) regulated to ±15 VDC.

AC Connector: An appropriate AC line cord and plug are provided. 120 VAC, 60 Hz units have a standard 3-wire, 15-amp grounded connector (NEMA 5-15P).

Controls

Power: A front panel rocker switch used to turn the amplifier on and off.

Level: A back panel rotary potentiometer for each channel used to control the output level.

Stereo/Mono: A three-position back panel switch used to select Stereo, Bridge-Mono or Parallel-Mono mode.

Sensitivity: A three-position switch inside the back cover plate used to select the input sensitivity for both channels: 0.775 volts or 1.4 volts for standard 1 kHz power, or 26 dB voltage gain (see Section 2.3).

Input Ground Lift: A two-position back panel switch used to isolate the phone jack and chassis grounds.

Reset (*Power Base-3* only): A back panel push button used to reset the circuit breaker that protects the power supplies.

Indicators

Power: This amber indicator shows the on/off status of the low voltage power supply.

Input/Output

Input Connector: Balanced ¼ inch phone jacks. See Section 5 for XLR and barrier block accessories.

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

Output Connector: Two sets of color-coded 5-way bbinding posts (for banana plugs, spade lugs or bare wire).

Output Impedance: Less than 10 milliohms in series with less than 2 microhenries.

DC Output Offset: Less than 10 millivolts.

Output Signal

Stereo: Unbalanced, two-channel.

Bridge-Mono: Balanced, single-channel. Channel 1 controls are active; Channel 2 controls should be turned down and not used.

Parallel-Mono: Unbalanced, single-channel. Channel 1 controls are active; Channel 2 controls should be turned down and not used.

Protection

Power Base amplifiers are protected against shorted, open or mismatched loads; overloaded power supplies; excessive temperature, chain destruction phenomena, input overload and high-frequency blowups. They also protect loudspeakers from input and output DC, as well as providing protection from turn-on/turn-off transients.

If operating conditions are unreasonable, the patented *ODEP* circuitry proportionally limits the drive level to protect the output transistors, particularly in the case of elevated temperature. A thermal switch imbedded in the transformer protects the power supplies from overload. In the rare event that a transformer overheats, the thermal switch removes power, waits until the unit has cooled to a safe temperature and then resets itself.

Turn On: Four second delay with no dangerous transients. Contact us if you need to change the delay.

Construction

Durable black finish on steel chassis with special "flow-through" ventilation from front to side panels.

Cooling: Internal heat sinks with forced-air cooling for rapid, uniform heat dissipation.

Dimensions: Standard 19-inch (48.3 cm) rack mount width (EIA RS-310-B), 3.5-inch (8.9 cm) height and 16-inch (40.6 cm) depth behind the mounting surface.

Approximate Weight: Center of gravity is 6 inches (15.2 cm) behind front mounting surface.

120 VAC, 60 Hz Units:

Power Base-1: 30 pounds (13.6 kg) net; 34 pounds (15.4 kg) shipping weight.

Power Base-2: 34 pounds (15.4 kg) net; 38 pounds (17.2 kg) shipping weight.

Power Base-3: 36 pounds (16.3 kg) net; 40 pounds (18.2 kg) shipping weight.

Crown specifications are guaranteed for three years.

In an effort to provide you with as much information as possible about the high power-producing capabilities of your amplifier, we have created the following power matrices.

Minimum Power Specifications

Crown's minimum power specifications represent the absolute smallest amount of output power you can expect from your amplifier when it is driven to full output under the given conditions. Some spaces in each matrix may be left blank because the same guarantee is not provided for those conditions—however, your amplifier will perform well under all conditions listed in each matrix.

When measuring power, 0.1% THD appears to be the industry standard for distortion. Two of the maximum average power specifications shown in each minimum power matrix are measured at 0.1% THD so you can easily compare Crown specifications to those of other manufacturers. But this high level of distortion actually allows for some clipping which is undesirable. Because of this, a maximum average power spec at 0.05% THD is included in each minimum power matrix which represents non-clipped conditions. Although most manufacturers do not give you power specifications at 0.05% THD, we encourage them to provide these specifications so you will have a more realistic representation of the way amplifiers should be used in the real world—without a clipped output signal.

Many manufacturers publish power specs with a tolerance of ±1 dB or worse. This means their amplifier can deviate more than 20% in output! A 100 watt amplifier would meet their specification if it only produced 79.4 watts. Other manufacturers qualify their specs by saying they are "typical," "subject to manufacturing tolerances," "single channel driven" or that they are specified with "fuses bypassed." Each of these statements effectively removes any performance guarantee. In fact, some manufacturers use these tactics to generate large power numbers, and they don't even print a disclaimer. We take a different approach at Crown—our amplifiers are *guaranteed* to meet or exceed their specifications for three years. Further, because our published specs are set below our "in-house" measurements, you can expect *every* Crown amplifier to *exceed* its published minimum power specs. We believe you should get what you pay for.

Minimum Power Notes:

All minimum power specifications are based on 0.1% regulated AC mains and an ambient room temperature of 70° F (21° C). A 100V, 50Hz model was used because of its higher current demand. The standard EIA power measurement (RS-490) is not identified here because it is identical to the FTC Continuous Average Power specification.

1. A 1 kHz sine wave is presented to the amplifier and the output monitored for nonlinear distortion. The level is increased until the THD reaches 0.1%. At this level the average power per channel is reported.
2. A sine wave is presented to the amplifier over the range from 20 Hz to 20 kHz and the output monitored for nonlinear distortion. The level at each frequency is increased until the THD reaches 0.1%. At this level the average power per channel is reported.
3. A 1 kHz sine wave is presented to the amplifier and the output monitored for nonlinear distortion. The level is increased until the THD reaches 0.05%. At this level the average power per channel is reported.
4. Continuous power in the context of Federal Trade Commission testing is understood to be a minimum of five minutes of operation. Harmonic distortion is measured as the RMS sum total and given as a percentage of the fundamental output voltage. This applies for all wattages greater than 0.25 watts.

Power Base-1 – Minimum Guaranteed Power (Watts)

AC Mains	Stereo-Mono Mode	Load (Ohms)	Maximum Average			FTC Continuous Average	
			0.1% THD+N (See note 1)	0.1% THD+N (See note 2)	0.05% THD+N (See note 3)	0.1% THD + Noise (See note 4)	
			1 kHz	20Hz-20kHz	1 kHz	1 kHz	20Hz-20kHz
120 VAC, 60 Hz Units	Stereo (both channels driven)	4	240	175	235		
		8	200	185	200	200	180
	Bridge-Mono (balanced output)	8	455	360	455		
		16	395	370	390	390	350
	Parallel-Mono	2	455		445		
		4	400		395	390	
International Units	Stereo (both channels driven)	4	230	165	225		
		8	205	185	200	200	175
	Bridge-Mono (balanced output)	8	465	355	455		
		16	410	375	405	390	350
	Parallel-Mono	2	440		430		
		4	410		405	390	

Fig. 4.1 Power Base-1 Minimum Power Matrix

Power Base-2 – Minimum Guaranteed Power (Watts)							
AC Mains	Stereo-Mono Mode	Load (Ohms)	Maximum Average			FTC Continuous Average	
			0.1% THD+N (See note 1)	0.1% THD+N (See note 2)	0.05% THD+N (See note 3)	0.1% THD + Noise (See note 4)	
			1 kHz	20Hz-20kHz	1 kHz	1 kHz	20Hz-20kHz
120 VAC, 60 Hz Units	**Stereo** (both channels driven)	4	460	425	460	385	
		8	325	310	325	310	265
	Bridge-Mono (balanced output)	8	910	830	905	815	
		16	660	615	655	625	530
	Parallel-Mono	2	920		915	805	
		4	655		650	630	
International Units	**Stereo** (both channels driven)	4	425	390	425	395	325
		8	310	290	305	305	275
	Bridge-Mono (balanced output)	8	855	775	850	790	640
		16	620	575	615	615	545
	Parallel-Mono	2	850		845	785	
		4	620		615	610	

Fig. 4.2 Power Base-2 Minimum Power Matrix

Power Base-3 – Minimum Guaranteed Power (Watts)							
AC Mains	Stereo-Mono Mode	Load (Ohms)	Maximum Average			FTC Continuous Average	
			0.1% THD+N (See note 1)	0.1% THD+N (See note 2)	0.05% THD+N (See note 3)	0.1% THD + Noise (See note 4)	
			1 kHz	20Hz-20kHz	1 kHz	1 kHz	20Hz-20kHz
120 VAC, 60 Hz Units	**Stereo** (both channels driven)	4	760	715	755		
		8	540	525	540	530	495
	Bridge-Mono (balanced output)	8	1525	1430	1500		
		16	1090	1045	1075	1055	985
	Parallel-Mono	2	1530		1520		
		4	1080		1080	1065	
International Units	**Stereo** (both channels driven)	4	680	630	660	555	485
		8	510	495	505	510	470
	Bridge-Mono (balanced output)	8	1335	1240	1305	1115	1085
		16	1025	980	1000	1025	930
	Parallel-Mono	2	1365		1340	1115	
		4	1015		1010	1030	

Fig. 4.3 Power Base-3 Minimum Power Matrix

Maximum Power Specifications

Crown's maximum power specifications represent the largest amount of output power you can expect from your amplifier when it is driven to full output under the given conditions. These specifications can be used to prevent loudspeaker and hearing damage.

The maximum power matrices include specifications for single cycle and 40 millisecond burst sine waves. Burst signals act like large transient peaks that are present in common source signals. Loudspeakers can respond to a single cycle burst, so the single cycle burst specifications should be used to help you protect your loudspeakers. In contrast, a 40 millisecond burst represents the typical response time of the human ear. Your ear will not respond to the entire dynamic change of a burst that lasts less than 40 milliseconds.

The specifications are provided at 0.05% THD because this represents a low distortion condition. To help you operate your amplifier within these tolerances, Crown's premium amplifiers include an input/output comparator that shows when the amplifier has exceeded 0.05% THD. Operating the amplifier at levels higher than 0.05% THD can result in output power levels that are higher than those listed in the maximum power matrices.

Maximum Power Notes:

All maximum power specifications are based on 0.1% regulated AC mains and an ambient room temperature of 70° F (21° C). A 100V, 50Hz model was used because of its higher current demand. Although it is an unusual condition, your amplifier can function well with AC mains voltages up to 10% over the specified line voltage. With overvoltage conditions, your amplifier may be capable of delivering instantaneous power levels up to 20% greater than the specifications in the matrix.

1. A single cycle sine wave is presented to the amplifier and monitored for nonlinear distortion. The average power during the burst is reported. Loudspeakers must be able to withstand this level if they are to be safely used with this amplifier.
2. A 40 millisecond sine wave burst (10 percent duty cycle) is presented to the amplifier and monitored for nonlinear distortion. The average power during the burst is reported. This power level is a measurement of the amplifier's maximum transient power that can be perceived by the human ear.

Power Base-1 – Maximum Power (Watts)								
AC Mains	Stereo-Mono Mode	Load (Ohms)	Single Cycle Tone Burst At less than 0.05% THD (See note 1)			40 Millisecond Tone Burst 0.05% THD + Noise (See note 2)		
			50 Hz	1 kHz	7 kHz	50 Hz	1 kHz	7 kHz
120 VAC, 60 Hz Units	Stereo (both channels driven)	4	325	335	335	315	295	310
		8	265	310	300	230	220	230
	Bridge-Mono (balanced output)	8	630	640	620	600	565	580
		16	540	630	610	470	440	455
	Parallel-Mono	2	635	645	640	620	580	605
		4	530	615	600	465	430	450
International Units	Stereo (both channels driven)	4	325	330	330	320	315	330
		8	290	345	335	260	235	250
	Bridge-Mono (balanced output)	8	640	650	670	635	625	655
		16	580	690	670	520	470	495
	Parallel-Mono	2	620	625	625	615	615	625
		4	580	690	670	515	475	490

Fig. 4.4 Power Base-1 Maximum Power Matrix

Power Base-2 – Maximum Power (Watts)								
AC Mains	Stereo-Mono Mode	Load (Ohms)	Single Cycle Tone Burst At less than 0.05% THD (See note 1)			40 Millisecond Tone Burst 0.05% THD + Noise (See note 2)		
			50 Hz	1 kHz	7 kHz	50 Hz	1 kHz	7 kHz
120 VAC, 60 Hz Units	Stereo (both channels driven)	4	655	805	790	550	500	520
		8	460	525	515	400	375	395
	Bridge-Mono (balanced output)	8	1410	1850	1805	1190	1090	1125
		16	915	1060	1020	795	755	780
	Parallel-Mono	2	1440	1685	1645	1185	1085	1120
		4	915	1055	1020	805	750	775
International Units	Stereo (both channels driven)	4	720	900	885	605	545	565
		8	465	530	510	410	380	395
	Bridge-Mono (balanced output)	8	1440	1770	1785	1200	1075	1120
		16	920	1055	1020	820	750	785
	Parallel-Mono	2	1390	1670	1655	1185	1065	1110
		4	915	1055	1015	820	750	775

Fig. 4.5 Power Base-2 Maximum Power Matrix

Power Base-3 – Maximum Power (Watts)								
AC Mains	Stereo-Mono Mode	Load (Ohms)	Single Cycle Tone Burst At less than 0.05% THD (See note 1)			40 Millisecond Tone Burst 0.05% THD + Noise (See note 2)		
			50 Hz	1 kHz	7 kHz	50 Hz	1 kHz	7 kHz
120 VAC, 60 Hz Units	Stereo (both channels driven)	4	1090	1575	1525	910	815	855
		8	715	870	838	610	570	595
	Bridge-Mono (balanced output)	8	2155	3140	3040	1780	1615	1690
		16	1415	1740	1675	1250	1135	1180
	Parallel-Mono	2	2140	3135	3015	1790	1605	1680
		4	1420	1735	1665	1225	1135	1170
International Units	Stereo (both channels driven)	4	1190	1750	1695	970	870	920
		8	785	960	920	675	625	645
	Bridge-Mono (balanced output)	8	2355	3490	3380	1945	1725	1805
		16	1540	1915	1840	1360	1235	1285
	Parallel-Mono	2	2330	3485	3345	1940	1720	1800
		4	1570	1895	1825	1360	1235	1270

Fig. 4.6 Power Base-3 Maximum Power Matrix

5 Accessories

There are two accessories available at the time of this printing: the *MT-XLR* and the *MT-BB*. **Important: The *MT-XLR* and *MT-BB* must be installed at a Crown Factory Service Center or the Crown factory.**

5.1 MT-XLR

The *MT-XLR* is an accessory panel that provides two standard 3-pin female XLR input connectors. The *MT-XLR* accessory makes it easy to quickly change connections in a system that uses standard XLR connectors. It can also be used in systems that need to daisy chain an input signal from one amplifier to another. Because the *MT-XLR* connectors are wired in parallel with the amplifier's built in phone jack connectors, an input signal fed to either input can be fed to another amplifier from the unused connector for that channel.

5.2 MT-BB

The *MT-BB* is an accessory panel that provides barrier strip input connectors. An *MT-BB* accessory might be desirable in applications requiring bare wire connections. It can also be used to daisy chain an input signal from one amplifier to another just like the *MT-XLR*.

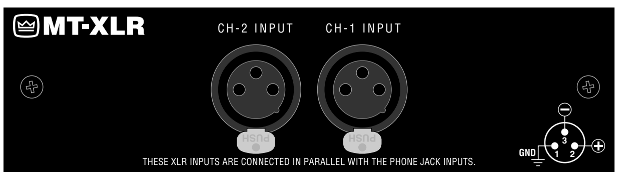


Fig. 5.1 The MT-XLR

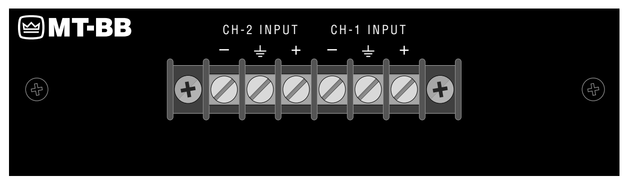


Fig. 5.2 The MT-BB


BALANCED TO UNBALANCED INPUT STAGE
GAIN STAGE LEVEL
LAST VOLTAGE AMP
OUTPUT BOARD
HIGH-SIDE NPN DRIVER AND OUTPUT
LOW-SIDE NPN DRIVER AND OUTPUT
PRE-DRIVER
CHANNEL 1
HIGH-SIDE ERROR AMP
VOLTAGE TRANSLATOR STAGE
REAR PANEL OUTPUT
RED
BLACK
BIAS STRING
LOW-SIDE ERROR AMP
HIGH-SIDE PNP DRIVER AND OUTPUT
LOW-SIDE PNP DRIVER AND OUTPUT
ODEP
FAULT CIRCUIT
BUFFER
TURN ON DELAY AND FAULT OUTPUT
DC/LF PROTECT
OUTPUT HEATSINK
STEREO-MONO SWITCH (S4)
PARALLEL
STEREO
BRIDGE
E.C.N. | ZONE | REV | DESCRIPTION | DATE | BY | APPROVALS CK ME EE PE
EAT# 95-282 | | A | ADD NOTE 12 | 11/28/95 | LCD | JM
EAT# 96-183 | | B | C105, C106 WERE 47pF | 05/28/96 | LCD
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C.P.N. SHEET 1 OF 2 REV
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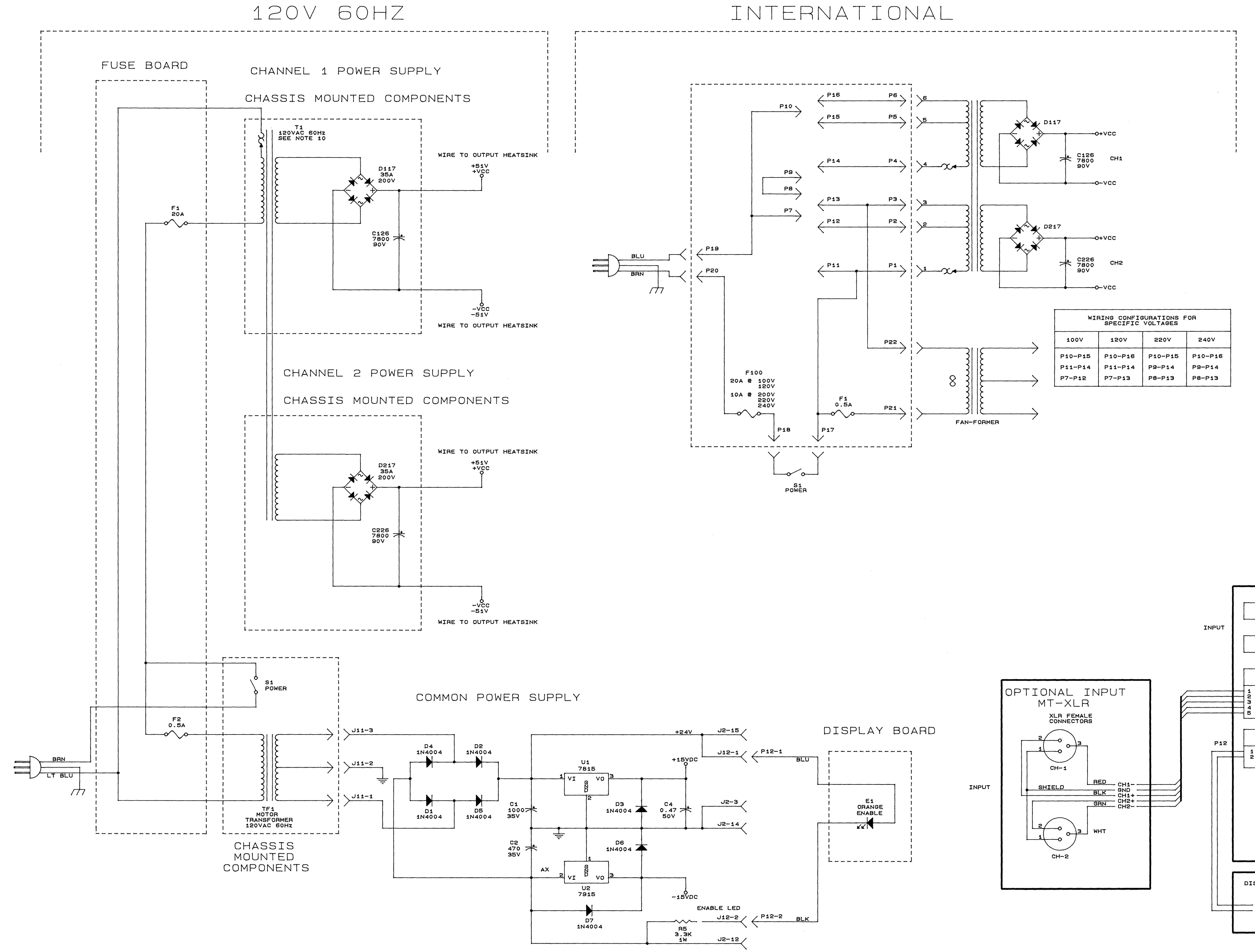
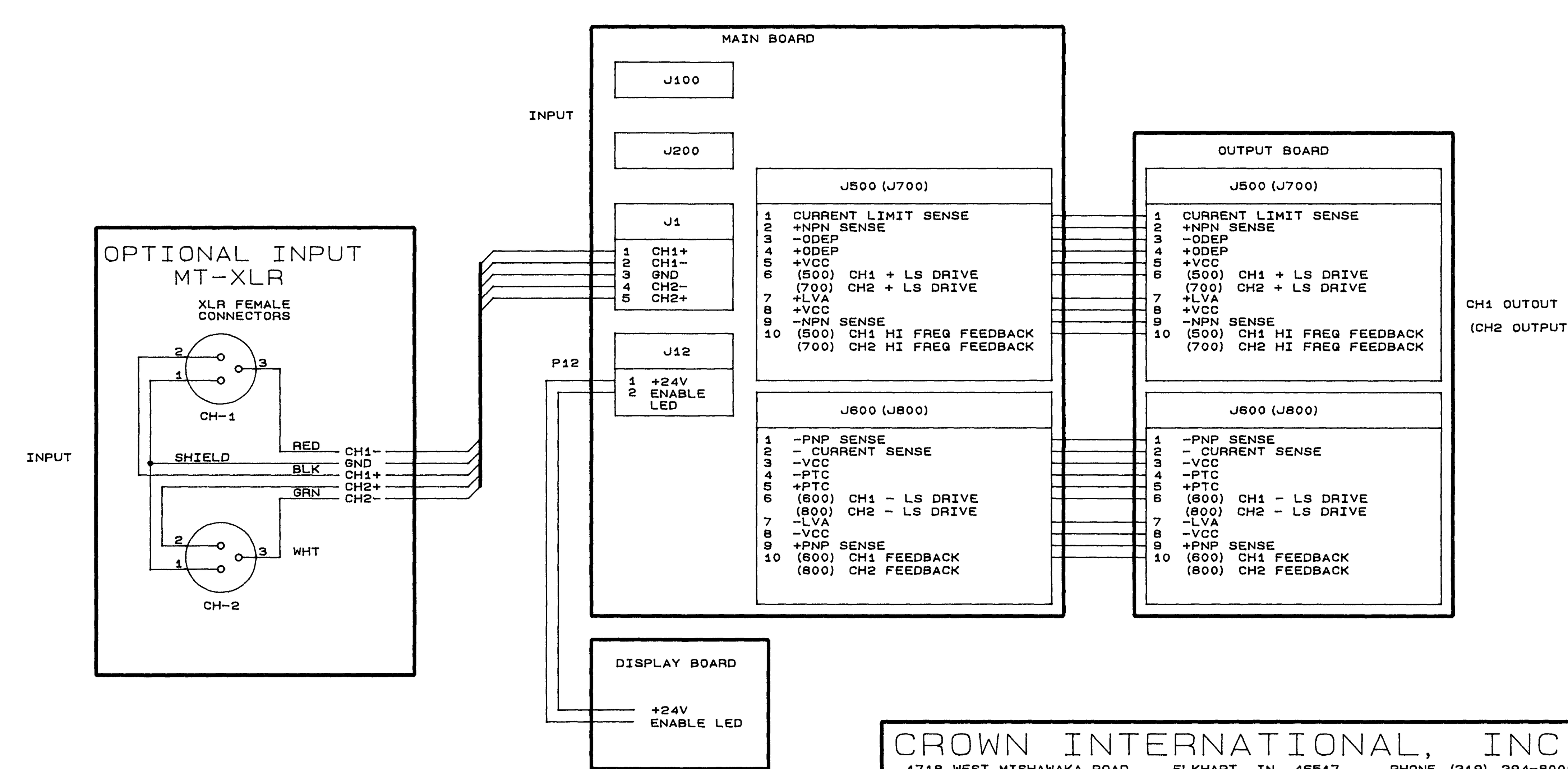


NOTES :

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 PARENTHESIS 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 D7993-5 / MODULE Q43059-7 AND OUTPUT BOARD P10341-9 / MODULE Q43015-9 OR OUTPUT BOARD P10397-1 / MODULE Q43203-1
12. C148 IS 180pF 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



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SCALE	NONE		EE			E.C.N.
PROJ #	D264		PE	JM	06/07/95	C.P.N. SHEET 2 OF 2 J0694-0 REV B
NEXT ASSEMBLY						

REVISION HISTORY								
E.C.N.	ZONE	REV	DESCRIPTION	DATE	APPROVED DWN	CHK	CM	PE
EAT 95-282		A	ADD NOTE 12	11/28/95	LCD			JM
EAT 96-183		B	C105,C105 WERE 47PF	05/28/95	LCD			JY
99N1035		C	U100,U200 WERE UPA75. U103,U203 WERE UPA76. NOTE 11, Q43006-5 WAS Q43059-7. CHANGED TO NEW TITLE BLOCK FORMAT.	01/11/00	JAW	JCM	DBV	LB

DWN	LCD	05/11/95
CHK	JCM	1-11-00
CM		
PE	JM	06/07/95

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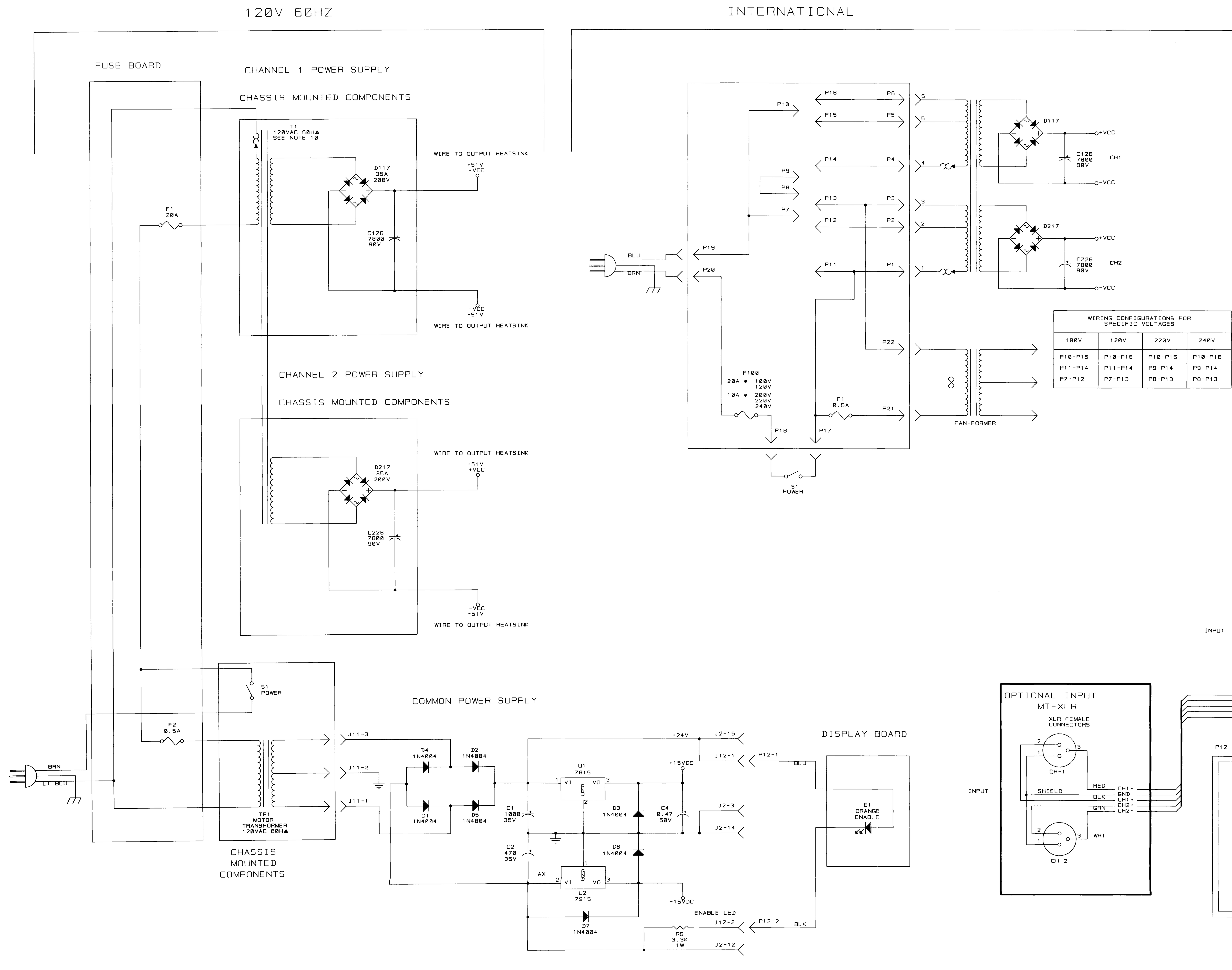

WIRING CONFIGURATIONS FOR SPECIFIC VOLTAGES			
100V	120V	220V	240V
P10-P15	P10-P16	P10-P15	P10-P16
P11-P14	P11-P14	P9-P14	P9-P14
P7-P12	P7-P13	P8-P13	P8-P13

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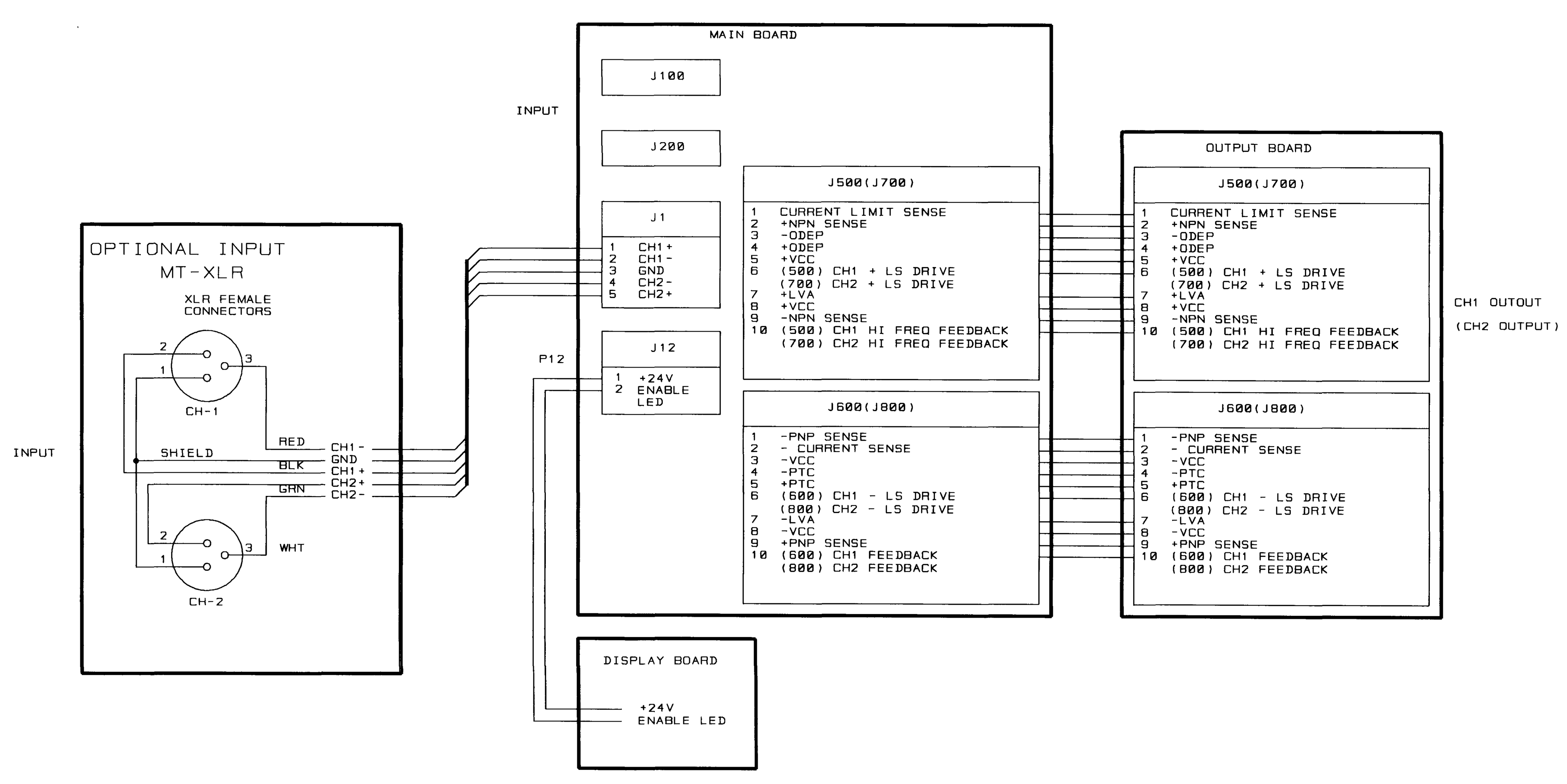

SIZE	DWG NO.		REV
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SCALE NONE	PROJ NO. MD264S0	SHEET 3 OF 3	