



POWER AMPLIFIER SERVICE MANUAL

MICRO-TECH[®]-1200

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

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CAUTION

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

AVIS

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

WARNING

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

Table of Contents

Introduction	4
Scope	4
Warranty	4
Parts Information	5
Specifications	6
Voltage Conversion	7
Circuit Theory	8
Electrical Checkout Procedures	13
Parts List (Non-Module)	17
Module and Schematic Information	20
Fuse and Display Modules	21
Q42549-8 Output Module	22
Q42647-0 Output Module	23
Q42717-1 Output Module	24
Q42871-6 Output Module	25
Q42968-0 Output Module	26
Q43202-3 Output Module	27
Q42552A0 Main Module	28
Q42714-8 Main Module	30
Q42776-7 Main Module	32
Q42980-5 Main Module	35
Q43035-7 Main Module	38
Q43031-6 Main Module	41

Introduction

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

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

SCOPE

This Service Manual is intended to apply to all versions of the MT-1200 amplifier including the Amcron MT-1201. The Parts Listings include parts specific for the US version and the European version (MT-1200E13). For parts specific only to other versions contact the Crown Technical Support Group for help in finding part numbers.

This Service Manual includes several sections. These sections include Parts Information, Specifications, Voltage Conversion, Circuit Theory, Electrical Test Procedures, Non-Module Parts Lists, and Module Parts Lists. Schematics are attached. Note that component parts with circuit board comprise a complete module. Module part numbers are always associated with a specific circuit board, although an unpopulated

circuit board may be built up with different parts to create different modules. Note that Crown does not sell blank (unpopulated) circuit boards.

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

WARRANTY

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

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Parts Information

GENERAL INFORMATION

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

PART NUMBERING SYSTEMS

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

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

STANDARD AND SPECIAL PARTS

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

ORDERING PARTS

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

SHIPMENT

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

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

TERMS

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

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

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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—310W/Ch
 4 Ohm Stereo—480W/Ch
 2 Ohm Stereo—675W/Ch
 8 Ohm Bridge Mono—970W
 4 Ohm Bridge Mono—1300W
 2 Ohm Parallel Mono—965W
 1 Ohm Parallel Mono—1300W

Load Impedances: Rated for 16, 8, 4, 2, and 1 (parallel mono only) Ohm operation; safe with all types of loads, even totally reactive loads.

AC Mains: 120VAC at 60 Hz with standard three-wire grounded connector for North American units; 100VAC, 120VAC, 220VAC, and 240VAC at 50 or 60 Hz when equipped with universal transformers, applicable fan assembly, and other applicable hardware with country specific power cord.

PERFORMANCE

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

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

Signal to Noise Ratio: A-weighted, better than 105 dB below full rated output. Better than 100 dB below full rated output 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 500W.

I.M. Distortion: $< 0.05\%$ from less than 164 milliwatts to 520 W at 26 dB gain.

Slew Rate: > 13 V per microsecond. (Slew rates are limited to useful levels for ultrasonic/RF protection.)

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. A high voltage circuit breaker in each main transformer primary and a low voltage power supply fuse in fan primary. Slew rate limiting to prevent RF burn out.

MECHANICAL

Input Connectors: Balanced 1/4 inch phone jacks. Optional XLR inputs with MT-XLR accessory.

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

Front Panel Controls: A front panel rocker switch used to power the amplifier on and off.

Back Panel Controls: A three-position switch which selects Stereo, Bridge-Mono, or Parallel-Mono mode. A rotary potentiometer for each channel used to control output level. A ground lift switch used to isolate the phone jack input grounds from the chassis (AC) ground. And a push button circuit breaker for each channel used to protect the power supplies.

Internal Controls: A three-position switch selects 0.775V, 1.4V, or 26 dB voltage gain input sensitivity.

Indicators: Amber Enable indicator shows on/off status of low-voltage power supply. An Amber ODEP indicator for each channel shows the reserve energy status. If no reserve energy is available the indicator will dim in proportion to ODEP limiting.

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: 41 lbs, 1 oz. Shipping; 45 lbs, 3 oz.

Voltage Conversion

The 120 Volt 60 Hz version, sold in the United States, is not voltage selectable. It does not have voltage selection boards. This version is to be used only with 120 Volts and only with 60Hz.

All other versions of the Micro Tech 1200 use voltage selection boards. The following chart indicates which jumpers are used for different voltages. Note that the fuses and transmotor may need to be changed to accommodate different voltages. Versions with the voltage selection boards may be used at 50 or 60 Hz.

VOLTAGE SELECTION BOARD

	100V	120V	200V	220V/230V	240V
Jumpers	Z101 Z104 Z106 Z201 Z204 Z206	Z100 Z104 Z105 Z200 Z204 Z205	Z101 Z103 Z201 Z203	Z101 Z102 Z201 Z202	Z100 Z102 Z200 Z202
Fuses F100/F200	A10285-28, 20A		A10285-26, 10A		
Transmotor TF1	H43068-8	H43407-8	H43061-3		

Theory

OVERVIEW

It should be noted that over time Crown makes improvements and changes to their products for various reasons. 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 Crown products) the theory of operation remains simplified.

FEATURES

Micro Tech 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 Micro Tech Series' include two separate power transformers (one for each channel), 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 mounted on the rear panel and are of the rotary type. Front panel indicators let the user know the status of the low voltage power supply (enable), and an ODEP indicator for each channel which shows the reserve energy status. In general, the

packaging of this model is designed for maximum watt/price/weight/size value with user friendly features.

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 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)

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 sensitivity 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.

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

Theory

amplifies the difference between input and output signals, any difference in the two waveforms will produce a near open loop gain condition which in turn results in high peak output voltage. The output of the Error Amp, called the Error Signal (ES) drives the Voltage Translators.

VOLTAGE AMPLIFICATION

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

Voltage Translators

A voltage divider network splits the Error Signal (ES) into positive and negative drive signals for the balanced voltage translator stage. These offset reference voltages drive the input to the Voltage Translator transistors. A nested NFB loop from the output of the amplifier mixes with the inverted signal riding on the offset references. This negative feedback fixes gain at the offset reference points (and the output of the Error Amp) at a factor of -25.2 with respect to the amplifier output. The Voltage Translators are arranged in a common base configuration for non-inverting voltage gain with equal gain. They shift the audio from the $\pm 15V$ reference to V_{CC} 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 allows the NFB loop to control Error Amp gain by feeding back to its non-inverting input (with its polarity opposite to the output of the VGS). With the added voltage swing provided by the LVAs, the signal then gains current amplification through the Darlington emitter-follower output stage.

GROUNDING BRIDGE TOPOLOGY

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

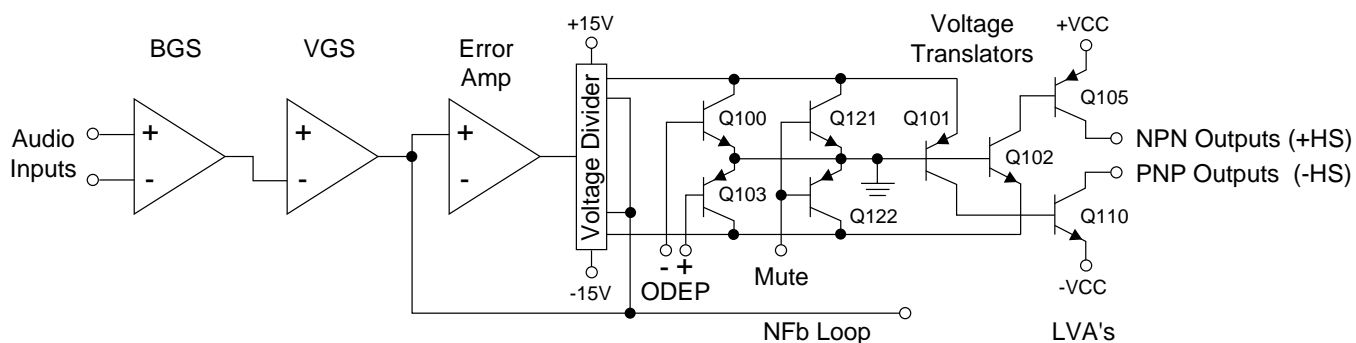


Figure 1. Typical Amplifier Front End and Voltage Amplification Stages.

Theory

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 slightly 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 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

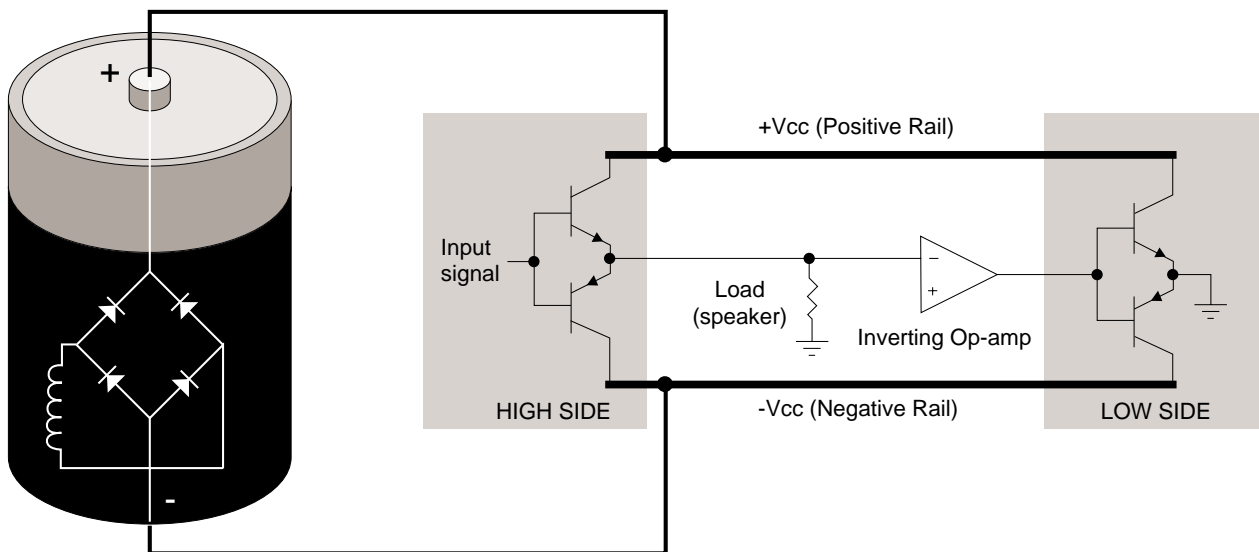


Figure 2. Crown Patented Grounded Bridge Topology

Theory

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 ($\pm V_{cc}$). Both LS quadrants are arranged in a three-deep Darlington and are biased AB+B in the same manner as the HS.

When the amplifier output swings positive, the audio is fed to an op-amp stage where it is inverted. This inverted signal is delivered directly to the bases of the positive (NPN) and negative (PNP) LS predrivers. The negative drive forces the LS PNP devices on (NPN off). As the PNP devices conduct, 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 ($\pm 35\text{VDC}$ 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 $\pm 35\text{VDC}$ 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 \pm ODEP are a PTC and a thermal sense (current source). The PTC is essentially a cutoff switch that causes hard ODEP limiting if heatsink temperature exceeds a safe maximum, regardless of signal level. The thermal sense causes the differential between +ODEP and -ODEP to decrease as heatsink temperature increases. An increase in positive output signal output into a load will result in -ODEP voltage dropping; an increase in negative output voltage and current will cause +ODEP voltage to drop. A complex RC network between the \pm 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.

Theory

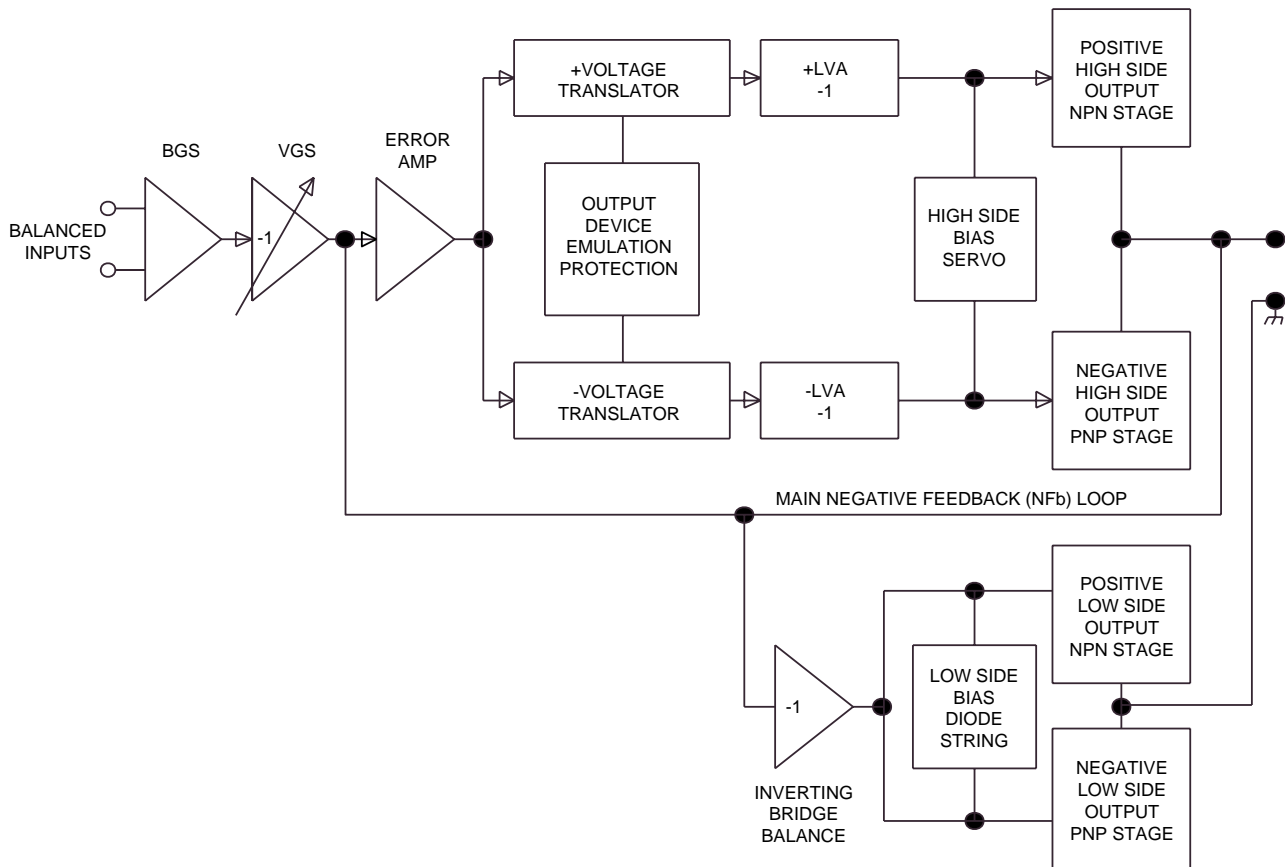


Figure 3. Typical Crown Amplifier Basic Block Diagram (One Channel Shown)

Electrical 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 tolerance.

TEST 2: OUTPUT BIAS ADJUSTMENT

Spec: 300 to 320 mVDC.

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

Procedure: Measure DC voltages on the output module across R02, adjust R26 if necessary. Measure DC voltages on the output module across R21, adjust R23 if necessary. Repeat for second channel.

TEST 3: ODEP VOLTAGE ADJUSTMENT

Spec: Bias Per Chart, ± 0.1 V DC.

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

Electrical Checkout Procedures

TEST 4: AC POWER DRAW

Spec: 100 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 (.775VRMS) 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 (4.9mVRMS). 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 (49mVRMS). For Main Modules with board numbers lower than D 7993-5 adjust N100 and N200 to calibrate CMR. For Main Modules with board number D 7993-5 or greater adjust R921 and R1021.

TEST 6: VOLTAGE GAIN

Spec 26dB Gain: Gain of 20.0 \pm 3%.

Spec 0.775V Sensitivity: \pm 6%.

Spec 1.4V Sensitivity: +12%/-6%.

Initial Conditions: Controls per standard.

Procedure: No load connected. Inject a 0.775 VAC 1 kHz sine wave with the Sensitivity Switch in the 26 dB position. Measure 15.5 VAC \pm 0.5 VAC at the amplifier output. Inject a 0.775 VAC 1 kHz sine wave with the Sensitivity Switch in the 0.775V position. Measure 50.6 VAC \pm 3 VAC at the amplifier output. Inject a 1.4 VAC 1 kHz sine wave with the Sensitivity Switch in the 1.4V position. Measure 50.6 VAC +6/-3 VAC at the amplifier output. Return the Sensitivity Switch to the 26 dB position.

TEST 7: PHASE RESPONSE

Spec: \pm 10° from 10 Hz to 20 kHz 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 30 Amps, \pm 2 Amps

Initial Conditions: Controls per standard.

Procedure: Load each channel to 1 Ohm. Inject a 1 kHz differentiated (or 10% duty cycle) square wave. See figure 4. Increase output level until current limit occurs. Current limit should occur at 30 \pm 2 Amps (30 Vpk). Observe clean (no oscillations) current clipping.

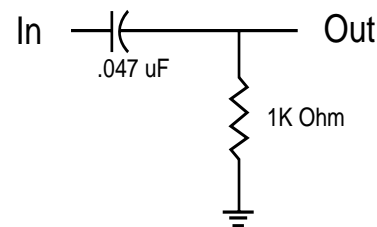


Figure 4. Differentiator Circuit

TEST 10: SLEW RATE & 10 KHZ SQUARE WAVE

Spec: 13 - 15 V/ μ S.

Initial Conditions: Controls per standard.

Procedure: Load each channel to 8 ohms. Inject a 10 kHz square wave to obtain 65 volts zero-to-peak at each output. Observe the slope of the square wave. It should typically measure 13 to 15 V/ μ S. Also, the square wave must not include overshoot, ringing, or any type of oscillation.

TEST 11: CROSSTALK

Spec: -60dB at 20 kHz.

Initial Conditions: Controls per standard. Terminate input of channel not driven with 600 ohms.

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

TEST 12: OUTPUT POWER

Spec at 8 Ohm Stereo: \geq 320W at 0.1% THD.

Electrical Checkout Procedures

Spec at 4 Ohm Stereo: $\geq 470W$ at 0.1% THD.

Spec at 2 Ohm Stereo: $\geq 600W$ at 0.1% THD.

International 8 Ohm Stereo: $\geq 305W$ at 0.1% THD.

International 4 Ohm Stereo: $\geq 430W$ at 0.1% THD.

International 2 Ohm Stereo: $\geq 535W$ 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 50.60 VAC at the output of each channel. Load each channel to 4 ohms. Inject a 1 kHz sine wave and measure at least 43.36 VAC. Load each channel to 2 ohms. Inject a 1 kHz sine wave and measure at least 34.64 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.

Procedure Capacitive: Load each channel to 8 ohms in parallel with 2 μF . Inject a 20 kHz sine wave with 33 VAC output for 10 seconds.

Procedure Inductive: Load each channel to 8 ohms in parallel with 159 μH enries. Inject a 1 kHz sine wave with 20 VAC output for 10 seconds.

Procedure Torture: Load each channel with the primary (red and black leads) of a DC-300A transformer (D5781-6). Inject a 15 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 20 VAC output. 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 20 Vrms at the output. After a few minutes observe a wave form similar to Figure 5. 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.

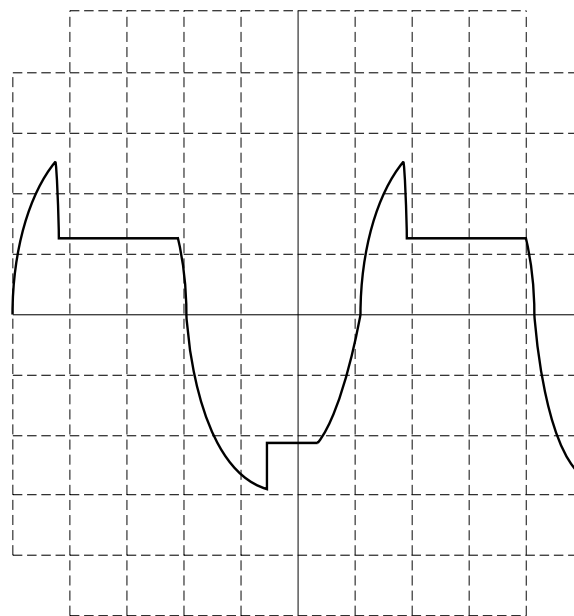


Figure 5. ODEP Limiting Wave Form

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, or a 2 Hz 6VAC sine wave into each channel and verify that each channel cycles into mute.

TEST 16: SIGNAL TO NOISE RATIO

Spec: 100 dB below rated 8 ohm power 20 Hz to 20 kHz. 105 dB A-Weighted.

Initial Conditions: Controls per standard. Short inputs.

Procedure: Load each channel to 8 ohms. Measure less than 506 μV at the output of each channel (20 Hz-20 kHz bandpass filter).

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

Electrical Checkout Procedures

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). Set the 60 Hz portion of the sine wave to 38.9 Volt RMS. Set the 7 kHz portion to 25%. With an IM analyzer measure less than 0.01% IMD. Repeat test at -35 dB (reference 38.9 Volt RMS, 60 Hz portion) 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:

Level Controls: 9 to 11 O'Clock.

Sensitivity Switch: 0.775V U.S., 1.4V International.

Stereo/Mono Switch: Stereo.

Ground Lift: Lift.

Power: Off.

Parts List (Non-Module)

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
K80583-6	MT Series Owners Manual	1

POWER SUPPLY

CPN	ITEM	QTY
M43534-3	MT Fuse Board Assembly (120V, 60Hz Units Only)	1
D 8069-4	Fuse Board Insulator	1
Q42867-4	Fuse Module, Ch 1 (50-60 Hz Units)	1
Q42866-6	Fuse Module, Ch 2 (50-60 Hz Units)	1
A10285-28	20 Amp Fuse (100-120V Units)	2
A10285-26	10 Amp Fuse (200-240V Units)	2
A10285-7	.5 Amp Fuse (120V 60Hz Units Only)	1
D 6438-2	Power Transformer (120V 60Hz Units Only)	2
D 7674-1	Power Transformer (50-60Hz Universal Voltage)	2
A10089-11032	10-32 x 2 Screw for power transformers	8
A10101-19	500OD x 195ID Fiber Washer	4
H42873-2	Transmotor (120V 60Hz Only)	1
H43068-8	Transmotor (100V Units Only)	1
H43407-8	Transmotor (120V 50Hz Only)	1
H43061-3	Transmotor (200-240V Units Only)	1
D 8439-8	Fan Bracket	1
C 9939-7	Fan Blade	1
C 7062-0	6-32 x 5/16 Flat head Screw	2
C 6485-4	10000 μ F 100V Capacitor	2
C 8752-5	35 Amp 400V Bridge Rectifier	2
D 8438-0	Capacitor Bracket	2
A10095-4	#10 External Star Lockwasher	4
A10098-5	1/4" Belleville Spring Washer	4
C 9870-4	10-32 x .38 Screw	4
D 6764-1	Shoulder Washer	4

OUTPUT ASSEMBLY (ONE PER CHANNEL)

CPN	ITEM	QTY (PER CHANNEL)
C 4751-1	NPN Power Transistor	6
C 6492-0	PNP Power Transistor	6
A 10315-1	6-32 x .56 Hex wshr HD	12
C 7326-9	#6 Solder Lug	2
C 9491-9	6-32 x .312 pan head	27
D 7796-2	Sil Pad (between heatsink and chassis) -For units with output board P10305-4 use Sil Pad D 6280-8. -For use with output boards earlier than P10305-4 use Sil Pad D 6104-0.	1
D 7797-0	Output Pad (between module and chassis) -For units with output board P10305-4 use Output Pad C 7597-4. -For units with ouput boards earlier than P10305-4 use Output Pad D 7026-4.	1
D 8197-2	Paper Shroud	1
C 9387-9	Plasti-Rivit	2

Parts List (Non-Module)

OUTPUT ASSEMBLY (CONT.)

CPN	ITEM	QTY (ONE PER CHANNEL)
D 8774-8	PTC, 95 Deg. Thermal Sensor	1
F12019-0	Aluminum Heatsink Slug (under diodes on output mod)	1
C 8813-5	MPS8097/MPSA18 NPN Transistor (Q318/Q418)	1
B 5842-8	#23 Tubing for Q318/Q418 transistor leads	Order in inches
C 5826-0	LM-234Z-6 Thermal Sense (S100/S200)	1
B 5464-1	#24 Teflon Tubing for S100/S200	Order in inches
C 8573-5	2SA1186 Power Transistor, PNP Driver (TO3P)	2
C 8574-3	2SC2837 Power Transistor, NPN Driver (TO3P)	2
M20586-0	PNP Driver Transistor Assembly, TO220 (Old style)	2
M20587-8	NPN Driver Transistor Assembly, TO220 (Old style)	2
D 7665-9	Clip, TO3P Mounting	2
D 7666-7	Bracket, TO3P Heatsink	2
M21324-5	Aluminum Heatsink with fins	2

BACK PANEL ASSEMBLY

CPN	ITEM	QTY
M21208J9	MT Back Panel	1
F10787J3	Back Panel Cover Plate	1
D 7074-4	Power Cord (US Version)	1
A10793-0503B	Power Cord (European Version)	1
A10214-7	Strain Relief	1
C 2823-0	Dual Binding Post	2
D 7600-6	Dual Banana Ground Strap	1

CHASSIS FRONT ASSEMBLY

CPN	ITEM	QTY
C 6487-0	Power Switch, 2 Pole 22 Amp Rocker	1
D 8052J8	End Cap	2
A10031-1	8-32 x .060 Flush Captive Nut	4
A10090-70808	8-32 x .5 Oval Head Screw	4
F12435J7	Grill, Metal	1
D 6944-9	Air Filter	1
A10173-1	Grill Clip	3
A10101-5	Nylon Washer	3
A10090-70806	8-32 x .375 Oval Head Screw	3
M43380-1	Old Filter Housing Assembly (Plastic)	1
C 6614-9	Rubber Grommets used with old filter assembly	12
F12264J1	Front Panel Overlay "ODEP"	1
F10886A2	Old Front Panel Overlay "Supply"	1

To upgrade the old plastic filter assembly to the new metal style, a kit may be ordered using Crown part number M44077-2. This kit includes a new bottom cover.

MAIN CHASSIS ASSEMBLY

CPN	ITEM	QTY
D 8501-5	Cover, Top	1
D 8548-6	Cover, Bottom	1
	-Note: The old Style bottom cover used with the plastic grill is no longer available. You may upgrade to the new style by ordering the kit M44077-2.	

Parts List (Non-Module)

MAIN CHASSIS ASSEMBLY (CONT.)

CPN	ITEM	QTY.
A10110-70605	Screw, 6-32-.312 Taptite Ph (Covers)	20
A10086-70806	8-32 x .37 Screw	3
A10094-3	#6 Internal Star Washer	3
A10094-6	#8 Internal Star Washer	4
A10094-8	#10 Internal Star Washer, Zinc	12
A10099-7	#10 Nylonb Shoulder Washer	8
A10100-16	7/16OD x .203ID Washer	8
A10102-8	10-32 Hex Nut	12
A10109-10822	8-18 x 1.375 Pan Head Screw	2
A10110-70812	8-32 x .750 Taptite Pan Head Screw	2
A10192-1	.500 Snap Bushing	4
A11376-6130L	13 inch Black Output Wire	1
A11376-6235L	23.5 inch Black Output Wire	1
A11394-6160GE	16 inch Red Output Wire	1
A11394-6235G	23.5 inch Red Output Wire	1
C 1811-6	4" Cable Tie	4
C 1813-2	7.5" Cable Tie	2
C 3163-0	Solder Lug, #6 Hole	1
C 6709-7	Ferrite Bead	4
C 6912-7	Tension Retaining Board Support	2
C 6913-5	1" Spacer toggle nut, Plastic	2
C 6914-3	.75" Spacer toggle nut, Plastic	2
C 9491-9	6-32 x .312 Pan Head Screw	4
C 9953-8	2-20 x .312 Pan Head Screw	6
C10111-0	Button, Mtg	2
D 7622-0	16.5" 28AWG Ribbon Cable, 16 Pin	1
H43424-3	Tube, .75 x 3.5 Slit	1
H43451-6	Tube, .375 x 3.5	1

Module and Schematic Information

MODULE HISTORY

The Micro Tech 1200 amplifier was introduced in January 1986. Since then there have been several updates and revisions, some of which called for new modules. The following is a list of all modules used up to this date, August 1995.

OUTPUT MODULES: (left and right are identical)

Q42549-8
Original output module on P10115-7 board. No longer available. Use Q42717-1 as service replacement.

Q42647-0
Output module on P10137-1. No longer available. Use Q42717-1 as service replacement.

Q42717-1
Output module on P10233-8 board.

Q42871-6
Output module on P10305-4 board.

Q42968-0
Output module on P10341-9 board. No longer available. Use Q43202-3 as service replacement.

Q43202-3
Output module on P10397-1 board.

MAIN MODULES:

Q42552A0
Original main module on D 6304A4 or D 6304B2 board. No longer available. Use Q42776-7 as service replacement.

Q42714-8
Main module on D 6910-0 board. No longer available. Use Q42776-7 as service replacement.

Q42776-7
Main module on D 7251-8 board. Used as a replacement for all older modules.

Q42980-5
Main module on D 7911-7 board. No longer available use Q43033-2 as service replacement.

Q43035-7
Main module on D 7993-5 board. No longer available use Q43033-2 as service replacement.

Q43031-6
Main module on D 7993-5 board.

FUSE MODULE:

M43534-3 (120V 60Hz U.S. Units Only)
Fuse module on P10391-4 board.

Q42866-6 -Channel 2 (Universal Volt Units Only)
Fuse module on P10296-5 board.

Q42867-4 -Channel 1 (Universal Volt Units Only)
Fuse module on P10295-7 board.

DISPLAY MODULE:

Q43061-3 (With ODEP Indicators)
Display module on D 8030-5 board.

M43530-1 (Old style with SUPPLY Indicators)
LED Assembly.

SCHEMATIC INFORMATION:

The schematics provided are representative only. There may be slight variations between amplifier to amplifier. These schematics are intended to be used for troubleshooting purposes only.

For amplifiers with main boards D 6304A4, D 6304B2 or D 6910-0 refer to schematic number J0190-9.

For amplifiers with main board D 7251-8 refer to schematic number J0444-0.

For amplifiers with main boards D 7911-7 or D 7993-5 refer to schematic number J0638-8.

Fuse and Display Module Parts Lists

M43534-3 FUSE MODULE

<i>CPN</i>	<i>Item</i>	<i>Qty</i>
C 5060-6	PC Mount Fuse Clip	6
P10391-4	MT Fuse Board	1

Q42866-6 CHANNEL 2 FUSE MODULE

<i>CPN</i>	<i>Item</i>	<i>Qty</i>
A10124-24	#24 Solid Buss Wire	7
C 5060-6	PC Mount Fuse Clip	2
C 7817-7	Faston, Tab .250 PC	6
C 8537-0	6 Pin Socket Header	1
C 8539-6	4 Pin Socket Header	1
P10296-5	Ch 2 Fuse Board	1

Q42867-4 CHANNEL 1 FUSE MODULE

<i>CPN</i>	<i>Item</i>	<i>Qty</i>
A10124-24	#24 Solid Buss Wire	7
C 5060-6	PC Mount Fuse Clip	2
C 8537-0	6 Pin Socket Header	1
C 8539-6	4 Pin Socket Header	1
P10295-7	Ch 1 Fuse Board	1

M43530-1 LED ASSEMBLY "SUPPLY"

<i>CPN</i>	<i>Item</i>	<i>Qty</i>
A10266-6224	6.2K Ohm 2W	5%
C 4342-9	Amber LED	3
C 5868-2	0 Ohm Jumper	1
S 5846-1	Double Side Foam Tape	
P10105-8	MT LED Board	1

Q43061-3 ODEP DISPLAY MODULE

CAPACITORS

C503	C603	C 6806-1	.01 μ F 100V
C507	C607	C 6809-5	220pF 100V
C701		C 6802-0	.47 μ F 50V
C702		C 6802-0	.47 μ F 50V

DIODES

D701	C 3533-4	1N966B 16V Zener
D702	C 3533-4	1N966B 16V Zener

LED'S

E502	E602	C 4342-9	Amber #MV5153
E701		C 4342-9	Amber #MV5153

RESISTORS

R508	R608	A10266-1351	1.3M
R509	R609	A10266-4751	4.7M
R510	R610	A10266-4751	4.7M
R511	R611	A10266-4741	470K
R512	R612	A10266-2221	2.2K
R513	R613	A10266-1522	1.5K .5W
R514	R614	A10266-1001	10
	R615	A10266-1522	1.5K .5W
R702	R802	A10266-5111	510

TRANSISTORS

Q504	Q604	C 3625-8	2N4125 PNP
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IC'S

U502	C 5070-5	TL072CP Op Amp
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MISC.

U502X Board	C 4508-5	16 Pin IC Socket
	D 8030-5	MT Display Bd.

Q42549-8 Output Module (P10115-7 board) Parts List

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 6809-5	220pF
C09	C 6810-3	180pF

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	MPSA43
Q19	C 3578-9	MPSA93

RESISTORS

R00	A10266-7501	75
R02	C 3299-2	5.6 .5W
R03	C 6486-2	.2 5W
R04	C 6486-2	.2 5W
R06	C 6486-2	.2 5W
R07	C 6486-2	.2 5W
R09	C 4479-9	22
R10	A10266-4711	470
R11	A10266-2R73	2.7 1W
R12	A10266-2R73	2.7 1W
R13	A10266-7501	75
R14	A10266-2R73	2.7 1W
R16	C 6486-2	.2 5W
R17	C 6486-2	.2 5W
R19	C 6486-2	.2 5W
R20	C 6486-2	.2 5W

R21	C 3299-2	5.6 .5W
R22	C 4479-9	22
R23	C 6844-2	250 Pot
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot
R27	A10266-3911	390
R28	A10266-1331	13K
R30*	A10265-10201*	102*

MISC

Board	P10115-7	
Jumpers	C 5868-2	0 Ohm (8)
Clips	D 6414-3	Q17/Q19
J500	J600	C 7057-0
		10 Pin HDR

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).

Q42647-0 Output Module (P10137-1 board) Parts List

CAPACITORS

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

DIODES

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

INDUCTORS

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

TRANSISTORS

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

RESISTORS

R00	A10266-7501	75
R01	A10266-4711	470
R02	C 7778-1	5.6 FP
R03	C 6486-2	.2 5W
R04	C 6486-2	.2 5W
R06	C 6486-2	.2 5W
R07	C 6486-2	.2 5W
R09	C 7779-9	22 FP
R10	A10266-4711	470
R11	A10266-2R73	2.7 1W
R12	A10266-2R73	2.7 1W
R13	A10266-7501	75
R14	A10266-2R73	2.7 1W
R16	C 6486-2	.2 5W
R17	C 6486-2	.2 5W
R19	C 6486-2	.2 5W

R20	C 6486-2	.2 5W
R21	C 7778-1	5.6 FP
R22	C 7779-9	22 FP
R23	C 6844-2	250 Pot
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot
R27	A10266-3911	390
R28	A10266-1331	13K
R30*	A10265-10201*	102*

MISC

Board	P10137-1	
Jumpers	C 5868-2	0 Ohm (8)
Clips	D 6414-3	Q17/Q19
J500	J600	C 7057-0
		10 Pin HDR

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).

Q42717-1 Output Module (P10233-8 board) Parts List

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

TRANSISTORS

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

RESISTORS

R00	A10266-7501	75
R01	A10266-4711	470
R02	C 7778-1	5.6 FP
R03	C 6486-2	.2 5W
R04	C 6486-2	.2 5W
R05	C 6486-2	.2 5W
R06	C 6486-2	.2 5W
R07	C 6486-2	.2 5W
R08	C 6486-2	.2 5W
R09	C 7779-9	22 FP
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	C 6486-2	.2 5W

R16	C 6486-2	.2 5W
R17	C 6486-2	.2 5W
R18	C 6486-2	.2 5W
R19	C 6486-2	.2 5W
R20	C 6486-2	.2 5W
R21	C 7778-1	5.6 FP
R22	C 7779-9	22 FP
R23	C 6844-2	250 Pot
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot
R27	A10266-3911	390
R28	A10266-1331	13K
R30*	A10265-10201*	102*
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 (5)
Clips	D 6414-3	Q17/Q19
J500	J600	C 7057-0
		10 Pin HDR

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).

Q42871-6 Output Module (P10305-4 board) Parts List

CAPACITORS

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

DIODES

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

INDUCTORS

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

TRANSISTORS

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

RESISTORS

R00	A10266-7501	75
R01	A10266-4711	470
R02	C 7778-1	5.6 FP
R03	C 6486-2	.2 5W
R04	C 6486-2	.2 5W
R05	C 6486-2	.2 5W
R06	C 6486-2	.2 5W
R07	C 6486-2	.2 5W
R08	C 6486-2	.2 5W
R09	C 7779-9	22 FP
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	C 6486-2	.2 5W
R16	C 6486-2	.2 5W
R17	C 6486-2	.2 5W
R18	C 6486-2	.2 5W
R19	C 6486-2	.2 5W
R20	C 6486-2	.2 5W
R21	C 7778-1	5.6 FP
R22	C 7779-9	22 FP
R23	C 6844-2	250 Pot
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot
R27	A10266-3911	390
R28	A10266-1331	13K
R29	A10266-5101	51
R30*	A10265-10201*	102*
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	P10305-4	
Jumpers	C 5868-2	0 Ohm (7)
Clips	D 6414-3	Q17/Q19
Beads	C 8341-7	Q17/Q19
J500 J600	C 7057-0	10 Pin HDR

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).

Q42968-0 Output Module (P10341-9 board) Parts List

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

TRANSISTORS

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

RESISTORS

R00	A10266-7501	75
R01	A10266-4711	470
R02	C 7778-1	5.6 FP
R03	C 6486-2	.2 5W
R04	C 6486-2	.2 5W
R05	C 6486-2	.2 5W
R06	C 6486-2	.2 5W
R07	C 6486-2	.2 5W
R08	C 6486-2	.2 5W
R09	C 7779-9	22 FP
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	C 6486-2	.2 5W
R16	C 6486-2	.2 5W
R17	C 6486-2	.2 5W
R18	C 6486-2	.2 5W
R19	C 6486-2	.2 5W
R20	C 6486-2	.2 5W
R21	C 7778-1	5.6 FP
R22	C 7779-9	22 FP
R23	C 6844-2	250 Pot
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot
R27	A10266-3911	390
R28	A10266-1331	13K
R29	A10266-5101	51
R30*	A10265-10201*	102*
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 (8)
Clips	D 6414-3	Q17/Q19
J500	J600	C 7057-0
		10 Pin HDR

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).

Q43202-3 Output Module (P10397-1 board) Parts List

CAPACITORS

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

DIODES

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

INDUCTORS

L00	D 6592-6	Output Coil
L01	C 3510-2	470 μ H
L02	C 3510-2	470 μ H

TRANSISTORS

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

RESISTORS

R00	A10266-7501	75
R01	A10266-4711	470
R02	C 7778-1	5.6 FP
R03	C 6486-2	.2 5W
R04	C 6486-2	.2 5W
R05	C 6486-2	.2 5W
R06	C 6486-2	.2 5W
R07	C 6486-2	.2 5W
R08	C 6486-2	.2 5W
R09	C 7779-9	22 FP
R10	A10266-4711	470
R11	A10266-2R74	2.7 2W
R12	A10266-1204	12 2W
R13	A10266-7501	75
R14	A10266-1204	12 2W

R15	C 6486-2	.2 5W
R16	C 6486-2	.2 5W
R17	C 6486-2	.2 5W
R18	C 6486-2	.2 5W
R19	C 6486-2	.2 5W
R20	C 6486-2	.2 5W
R21	C 7778-1	5.6 FP
R22	C 7779-9	22 FP
R23	C 6844-2	250 Pot
R24	A10266-1331	13K
R25	A10266-2221	2.2K
R26	C 6844-2	250 Pot
R27	A10266-3911	390
R28	A10266-1331	13K
R29	A10266-5101	51
R30*	A10265-10201*	102*
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 (7)
Clips	D 6414-3	Q17/Q19
J500	J600	C 7057-0
		10 Pin HDR

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 (D6304A4/D6304B2 board) Parts List

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

RESISTOR NETWORKS

N100 N200	D 4669-4	BAL INPUT
N101 N201	D 6081-0	RES NET B
N102 N202	D 6082-8	RES NET C

TRANSISTORS

Q100 Q200	D 2961-7	2N3859A
Q101 Q201	C 3578-9	MPSA93
Q102 Q202	C 3810-6	MPSA43/42
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	2N3859A
Q109 Q209	D 2961-7	2N3859A
Q110 Q210	C 3810-6	MPSA43/42
Q111 Q211	D 2961-7	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	2N3859A
Q118 Q218	D 2961-7	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
R114 R214	A10266-4721	4.7K
R115 R215	A10266-5141	510K

Q42552A0 Main Module (D6304A4/D6304B2 board) Parts List Cont.

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 TRIM
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 TRIM
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%
R166	R266	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

INTEGRATED CIRCUITS

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

CONNECTORS

J9		C 6871-5	6-Pin Conn.
J100	J200	C 6777-4	Phone Jk.
J500	J800	D 6619-7	10" Ribbon
J600	J700	D 6620-5	6" Ribbon

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
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COVERS FOR J100, J200

(2)	C 6778-2	COVER, PHONE JACK
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MISC

(1)	C 4508-5	16 PIN SOCKET
(1)	C 5061-4	1N3070 DIODE
(1)	C 6851-7	5-Position .1 Center Header
(1)	C 7077-8	3-Conductor Wire Retainer
	C 6899-6	Wire Posts

BLANK CIRCUIT BOARD

D 6304A4 or D 6304B2

Q42714-8 Main Module (D 6910-0 board) Parts List

CAPACITORS

C1	C 4303-1	1000µF
C2	C 3913-8	470µF
C3	C 4303-1	1000µF
C4	C 6802-0	.47µF
C5	C 6806-1	.01µF
C6	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 6805-3	.022µF
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 3729-8	100µF 16V
C115 C215	C 3729-8	100µF 16V
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 6812-9	47pF
C124 C224	C 6812-9	47pF
C125 C225	C 3729-8	100µF 16V
C127 C227	C 3729-8	100µF 16V
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 5362-6	2.2µF
C145 C245	C 6814-5	12pF
C146 C246	C 6809-5	220pF
C147 C247	C 68061	.01µF
C148 C248	C 6810-3	180pF
C149 C249	C 6808-7	470pF
C152 C252	C 6809-5	220pF
C153 C253	C 5362-6	2.2µF

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

RESISTOR NETWORKS

N100 N200	D 4669-4	BAL INPUT
N101 N201	D 6081-0	RES NET B
N102 N202	D 6082-8	RES NET C

TRANSISTORS

Q100 Q200	D 2961-7	2N3859A
Q101 Q201	C 3578-9	MPSA93
Q102 Q202	C 3810-6	MPSA43/42
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	2N3859A
Q109 Q209	D 2961-7	2N3859A
Q110 Q210	C 3810-6	MPSA43/42
Q111 Q211	D 2961-7	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	2N3859A
Q118 Q218	D 2961-7	2N3859A
Q119 Q219	C 3625-8	2N4125
Q120 Q220	C 3625-8	2N4125
Q121 Q221	C 3786-8	PN4250A

RESISTORS

R1	A10265-53621	53.6K 1%
R2	C 7340-0	24
R3	C 7340-0	24
R4	A10265-46421	46.4K 1%

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

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 6094-9	33μF
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 8026-4	100μF 35V
C115 C215	C 8026-4	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 6812-9	47pF
C124 C224	C 6812-9	47pF
C125 C225	C 8026-4	100μF 35V
C127 C227	C 8026-4	100μF 35V
C128 C228	C 7706-2	.1μF 100V
C129 C229		OPEN
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 8026-4	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
C 149 C249	C 6808-7	470pF
C150 C250		OPEN
C151 C251		OPEN
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
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

RESISTOR NETWORKS

N100 N200	D 4669-4	Bal. Input
N101 N201	D 6081-0	Res. Net-B
N102 N202	D 6082-8	Res. Net-C

TRANSISTORS

Q1	C 7458-0	2N4123
Q2	C 3625-8	2N4125
Q100 Q200	D 2961-7	2N3859A
Q101 Q201	C 3578-9	MPSA93
Q102 Q202	C 3810-6	MPSA43/42
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	2N3859A
Q109 Q209	D 2961-7	2N3859A
Q110 Q210	C 3810-6	MPSA43/42
Q111 Q211	D 2961-7	2N3859A
Q112 Q212	C 3625-8	2N4125
Q113 Q213	C 3625-8	2N4125
Q115 Q215	D 2962-5	MPS8097

Q42776-7 Main Module (D 7251-1 board) Parts List Cont.

Q116	Q216	C 3786-8	PN4250A	R132	R232	C 5062-2	100K Trim
Q117	Q217	D 2961-7	2N3859A	R133	R233	A10266-2741	270K
Q118	Q218	D 2961-7	2N3859A	R134	R234	A10266-1831	18K
Q119	Q219	C 3625-8	2N4125	R135	R235	C 7782-3	100 OHM
Q120	Q220	C 3625-8	2N4125	R136	R236	A10266-6821	6.8K
Q121	Q221	C 7458-0	2N4123	R137	R237	C 7782-3	100 OHM
Q122	Q222	C 7458-0	2N4123	R138	R238	A10266-6821	6.8K
RESISTORS				R139	R239	A10266-1021	1K
R1		A10265-53621	53.6K	R140	R240	A10266-8201	82 OHM
R2		A10266-2402	24 OHM	R141	R241	A10266-1541	150K
R3		A10266-2402	24 OHM	R142	R242	A10266-1541	150K
R4		A10265-46421	46.4K	R146	R246	A10266-1031	10K
R5		A10266-3321	3.3K	R147	R247	C 7781-5	200 OHM
R10			OPEN	R148	R248	A10266-2721	2.7K
R11		A10266-5621	5.6K	R149	R249	C 7781-5	200 OHM
R12		A10266-4331	43K	R150	R250	A10266-2721	2.7K
R13		A10266-1021	1K	R151	R251	A10266-1031	10K
R14		A10266-8221	8.2K	R152	R252	A10266-1231	12K
R15		A10266-6211	620 OHM	R153	R253	C 5868-2	ZERO OHM
R100	R200		OPEN	R155	R255		OPEN
R101	R201	A10265-49911	4.99K	R156	R256	A10266-1321	1.3K
R102	R202	A10266-1021	1K	R157	R257	A10266-1321	1.3K
R103	R203	A10266-1041	100K	R158	R258	A10266-9121	9.1K
R104	R204	A10266-2721	2.7K	R159	R259	A10266-1031	10K
R105	R205	A10266-2721	2.7K	R161	R261	A10266-4701	47 OHM
R106	R206	A10266-1231	12K	R162	R262	A10266-4701	47 OHM
R107	R207	A10266-6831	68K	R167	R267	A10266-1021	1K
R108	R208	A10266-1021	1K	R168	R268	A10265-95301	953 OHM
R109	R209	A10266-8201	82 OHM	R169	R269		OPEN
R110	R210	A10266-6831	68K	R170	R270	A10266-1021	1K
R111	R211	A10266-1231	12K	R171	R271	A10265-95301	953 OHM
R112	R212	A10266-5131	51K	R172	R272		OPEN
R113	R213	A10266-4721	4.7K	R174	R274	A10265-24921	24.9K
R114	R214	A10266-4721	4.7K	R175	R275	A10265-14721	14.7K
R115	R215	A10266-5141	510K	R176	R276	A10265-24921	24.9K
R116	R216	A10266-3351	3.3M	R179	R279	A10266-4731	47K
R117	R217	A10266-4731	47K	R180	R280	A10266-4711	470 OHM
R118	R218	A10266-2711	270 OHM	R181	R281	A10266-4721	4.7K
R119	R219	A10266-3011	300 OHM	R182	R282	A10266-2201	22 OHM
R120	R220	A10266-2711	270 OHM	R183	R283	A10266-2421	2.4K
R121	R221	C 5062-2	100K Trim	R185	R285	A10266-2421	2.4K
R122	R222	A10266-2741	270K	R186	R286	A10266-1051	1M
R123	R223	A10266-1831	18K	R187	R287	A10265-52321	52.3K
R124	R224	A10266-6821	6.8K	SWITCHES			
R125	R225	C 7782-3	100 OHM	S2		C 7325-1	DPDT SIDE
R126	R226	C 7782-3	100 OHM	S3		C 7363-2	DPDT
R127	R227	A10266-6821	6.8K	S100		C 6781-6	6P3T
R128	R228	A10266-1031	10K				
R129	R229	A10266-1041	100K				
R130	R230	A10266-1041	100K				
R131	R231	A10266-1031	10K				

Q42776-7 Main Module (D 7251-1 board) Parts List Cont.

INTEGRATED CIRCUITS

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

CONNECTORS

J1		C 7593-4	HDR, 5 PIN
J2		C 4508-5	16 PIN Soc
J9		C 7527-2	HDR, 6 PIN
J10		C 7592-6	HDR, 4 PIN
J11		C 7526-4	HDR, 3 PIN
J100	J200	C 6777-4	PH. JACK
J500	J800	D 6619-7	10" Ribbon
J600	J700	D 6620-5	6" Ribbon

MISC

MOUNTS U1, U2:

(2)	C 1889-2	6-32 NUT
(2)	C 2176-3	6-32 X .5
(2)	C 5341-0	HEATSINK
(2)	C 5594-4	Star Wash.

MOUNTS U104, U204:

(2)	C 3450-1	14 Pin Skt.
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COVERS FOR J100, J200:

(2)	C 6778-2	Ph. Jk. Cvr.
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STRAIN RELIEF:

(4)	C 1811-6	Cable Tie
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CIRCUIT BOARD:

D 7251-8

Q42980-5 Main Module (D7911-7 board) Parts List

CAPACITORS

C1	C 4303-1	1000 μ F
C2	C 3913-8	470 μ F
C4	C 6802-0	.47 μ F
C5	C 6806-1	.01 μ F
C6	C 6806-1	.01 μ F
C7	C 6804-6	.1 μ F
C100	C200 C 5311-3	22 μ F
C101	C201 C 2821-4	10pF
C103	C203 C 6805-3	.022 μ F
C104	C204 C 6805-3	.022 μ F
C105	C205 C 6812-9	47pF
C106	C206 C 6812-9	47pF
C107	C207 C 6804-6	.1 μ F
C108	C208 C 6814-5	12pF
C109	C209 C 7417-6	.0033 μ F
C110	C210 C 5362-6	2.2 μ F
C111	C211 C 6804-6	.1 μ F
C112	C212 C 6803-8	.12 μ F
C113	C213 C 6802-0	.47 μ F
C114	C214 C 8854-9	100 μ F
C115	C215 C 8854-9	100 μ F
C116	C216 C 6802-0	.47 μ F
C117	C217 C 6803-8	.12 μ F
C118	C218 C 6814-5	12pF
C119	C219 C 6802-0	.47 μ F
C120	C220 C 6804-6	.1 μ F
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	.022 μ F
C135	C235 C 6805-3	.022 μ F
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	100 μ F
C145	C245 C 6812-9	47pF
C146	C246 C 6812-9	47pF
C147	C247 C 6806-1	.01 μ F
C148	C248 C 6810-3	180pF
C 149	C249 C 6808-7	470pF
C150	C250 C 6806-1	.01 μ F
C151	C251 C 6806-1	.01 μ F
C152	C252 C 6950-7	82pF
C153	C253 C 6804-6	.1 μ F
C154	C254 C 8426-6	.1 μ F 250V

C155	C255	C 6804-6	.1 μ F
C156	C256	C 6804-6	.1 μ F
C157	C257	C 6806-1	.01 μ F

DIODES

D1		C 2851-1	1N4004
D2		C 2851-1	1N4004
D3		C 2851-1	1N4004
D4		C 2851-1	1N4004
D5		C 2851-1	1N4004
D6		C 2851-1	1N4004
D7		C 2851-1	1N4004
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
D128	D228	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

RESISTOR NETWORKS

N100	N200	D 4669-4	Bal. Input
N101	N201	D 6081-0	Res. Net-B
N102	N202	D 6082-8	Res. Net-C

TRANSISTORS

Q100	Q200	D 2961-7	2N3859A
Q101	Q201	C 3578-9	MPSA93
Q102	Q202	C 3810-6	MPSA43/42
Q103	Q203	C 3786-8	PN4250A
Q105	Q205	C 3578-9	MPSA93
Q106	Q206	C 3625-8	2N4125
Q107	Q207	C 3786-8	PN4250A
Q108	Q208	D 2961-7	2N3859A
Q109	Q209	D 2961-7	2N3859A
Q110	Q210	C 3810-6	MPSA43/42
Q112	Q212	C 3625-8	2N4125
Q113	Q213	C 3625-8	2N4125
Q115	Q215	D 2962-5	MPS8097
Q116	Q216	C 3786-8	PN4250A

Q42980-5 Main Module (D7911-7 board) Parts List Cont.

Q117	Q217	D 2961-7	2N3859A	R132	R232	C 5062-2	100K Trim
Q118	Q218	D 2961-7	2N3859A	R133	R233	A10266-2741	270K
Q119	Q219	C 3625-8	2N4125	R134	R234	A10266-1832	18K .5W
Q120	Q220	C 3625-8	2N4125	R135	R235	C 7782-3	100 OHM
Q121	Q221	C 7458-0	2N4123	R136	R236	A10266-6821	6.8K
Q122	Q222	C 7458-0	2N4123	R137	R237	C 7782-3	100 OHM
Q123	Q223	C 7458-0	2N4123	R138	R238	A10266-6821	6.8K
Q124	Q224	C 3625-8	2N4125	R139	R239	A10266-8211	820
				R140	R240	A10266-6801	68 OHM
				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 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
				R154	R254	A10265-12131	121K 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	A10265-10021	10K 1%
				R161	R261	A10266-4701	47 OHM
				R162	R262	A10266-4701	47 OHM
				R163	R263	A10265-12131	121K 1%
				R164	R264	A10265-10021	10K 1%
				R165	R265	A10265-12131	121K 1%
				R166	R266	A10266-1851	1.8M
				R167	R267	A10265-10011	1K 1%
				R168	R268	A10265-95301	953 OHM
				R170	R270	A10265-10011	1K 1%
				R171	R271	A10265-95301	953 OHM
				R173	R273	A10265-10021	10K 1%
				R174	R274	A10265-24921	24.9K 1%
				R175	R275	A10265-11521	11.5K 1%
				R176	R276	A10265-24921	24.9K 1%
				R177	R277	A10265-40221	40.2K 1%
				R179	R279	A10266-1321	1.3K
				R180	R280	A10266-4711	470 OHM
				R181	R281	A10266-4721	4.7K
				R182	R282	A10266-2201	22 OHM
				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

RESISTORS

R1		A10265-53621	53.6K
R2		A10266-2402	24 OHM
R3		A10266-2402	24 OHM
R4		A10265-46421	46.4K
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 POT
R101	R201	A10265-49911	4.99K
R102	R202	A10266-5111	510 OHM
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	A10266-8211	820 OHM
R109	R209	A10266-6801	68 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	A10266-2751	2.7M
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 Trim
R122	R222	A10266-2741	270K
R123	R223	A10266-1832	18K .5W
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

Q42980-5 Main Module (D7911-7 board) Parts List Cont.

R188	R288	A10266-3631	36K				
R189	R289	A10266-2731	27K				
R190	R290	A10266-2051	2M				
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 OHM				
R913	R1013	A10266-1051	1M				
R914	R1014	A10266-1051	1M				
R915	R1015	A10266-1001	10 OHM				
R916	R1016	A10266-1001	10 OHM				
SWITCHES							
S2		C 7325-1	DPDT SIDE				
S3		C 7960-5	DP3T				
S100		C 6781-6	6P3T				
INTEGRATED CIRCUITS							
U1		C 5095-2	MC7815				
U2		C 5096-0	MC7915				
U100	U200	C 6911-9	UPA75 PNP				
U101	U201	C 4345-2	LM339				
U102	U202	C 4345-2	LM339				
U103	U203	C 6910-1	UPA76 NPN				
U104	U204	C 7558-7	MC33079P				
				CONNECTORS			
				J1	C 7593-4	HDR, 5 PIN	
				J2	C 4508-5	16 PIN Soc	
				J11	C 7526-4	HDR, 3 PIN	
				J100	J200	C 6777-4	PH. JACK
				J500	J800	D 6619-7	10" Ribbon
				J600	J700	D 6620-5	6" Ribbon
				MISC			
				MOUNTS U1, U2:			
				(2)	C 1889-2	6-32 NUT	
				(2)	C 2176-3	6-32 X .5	
				(2)	C 5341-0	HEATSINK	
				(2)	C 5594-4	Star Wash.	
				IC SOCKETS:			
				(6)	C 3450-1	14 Pin Skt.	
				COVERS FOR J100, J200:			
				(2)	C 6778-2	Ph. Jk. Cvr.	
				STRAIN RELIEF:			
				(4)	C 1811-6	Cable Tie	
				CIRCUIT BOARD:			
				D 7911-7			

Q43035-7 Main Module (D7993-5 board) Parts List

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 8990-1	.18μF
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 8990-1	.18μF
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
D128	D228	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 MP5A93
Q102	Q202	C 3810-6	NPN MP5A43
Q103	Q203	C 3786-8	PNP PN4250
Q105	Q205	C 3578-9	PNP MP5A93
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 MP5A43
Q112	Q212	C 3625-8	NPN 2N4125
Q113	Q213	C 3625-8	NPN 2N4125
Q115	Q215	D 2962-5	NPN MP58097
Q116	Q216	C 3786-8	PNP PN4250
Q117	Q217	D 2961-7	NPN 2N3859A
Q118	Q218	D 2961-7	NPN 2N3859A
Q119	Q219	C 3625-8	NPN 2N4125
Q120	Q220	C 3625-8	NPN 2N4125
Q121	Q221	C 7458-0	NPN 2N4123

Q43035-7 Main Module (D7993-5 board) Parts List Cont.

Q122	Q222	C 7458-0	NPN 2N4123	R133	R233	A10266-2741	270K
Q123	Q223	C 7458-0	NPN 2N4123	R134	R234	A10266-1832	18K .5W
Q124	Q224	C 3625-8	NPN 2N4125	R135	R235	C 7782-3	100 Flame Proof
RESISTOR NETWORKS				R136	R236	A10266-6821	6.8K
N101	N201	D 7946-3	Resistor Network	R137	R237	C 7782-3	100 Flame Proof
N102	N202	D 6082-8	Resistor Network	R138	R238	A10266-6821	6.8K
RESISTORS				R139	R239	A10266-8211	820
R1		A10265-53621	53.6K 1%	R140	R240	A10266-6801	68
R2		C 7340-0	24 5W	R141	R241	A10266-1541	150K
R3		C 7340-0	24 5W	R142	R242	A10266-1541	150K
R4		A10265-46421	46.4K 1%	R143	R243	A10266-1041	100K
R7		A10266-1041	100K	R144	R244	A10266-1041	100K
R8		A10266-2031	20K	R145	R245	A10266-1851	1.8M
R9		A10266-5121	5.1K	R146	R246	A10266-1031	10K
R16		A10266-5121	5.1K	R147	R247	C 7781-5	200 .5W Flame Proof
R17		A10266-2031	20K	R148	R248	A10266-2721	2.7K
R18		A10266-1041	100K	R149	R249	C 7781-5	200 .5W Flame Proof
R100	R200	C 7409-3	Pot, 5K Linear	R150	R250	A10266-2721	2.7K
R101	R201	A10265-49911	4.99K 1%	R151	R251	A10266-1031	10K
R102	R202	A10266-5111	510	R152	R252	A10265-11821	11.8K 1%
R103	R203	A10265-10031	100K 1%	R153	R253	JUMPER	JUMPER
R104	R204	A10266-2721	2.7K	R154	R254	C 8261-7	121K 0.1%
R105	R205	A10266-2721	2.7K	R155	R255	A10266-1321	1.3K
R106	R206	A10266-1231	12K	R156	R256	A10266-1321	1.3K
R107	R207	A10266-6831	68K	R157	R257	A10266-1321	1.3K
R108	R208	A10266-8211	820	R158	R258	A10265-11321	11.3K 1%
R109	R209	A10266-6801	68	R159	R259	A10266-1021	1K
R110	R210	A10266-6831	68K	R160	R260	C 8260-9	10K 0.1%
R111	R211	A10266-1231	12K	R161	R261	A10266-4701	47
R112	R212	A10266-5131	51K	R162	R262	A10266-4701	47
R113	R213	A10266-4721	4.7K	R163	R263	C 8261-7	121K 0.1%
R114	R214	A10266-4721	4.7K	R164	R264	C 8260-9	10K 0.1%
R115	R215	A10266-5141	510K	R165	R265	C 8261-7	121K 0.1%
R116	R216	A10266-2751	2.7M	R166	R266	A10266-1851	1.8M
R117	R217	A10266-4731	47K	R167	R267	A10265-10011	1K 1%
R118	R218	C 7780-7	270 Flame Proof	R168	R268	A10265-97601	976 1%
R119	R219	A10266-3011	300	R170	R270	A10265-10011	1K 1%
R120	R220	C 7780-7	270 Flame Proof	R171	R271	A10265-95301	953 1%
R121	R221	C 5062-2	100K Pot (-ODEP)	R173	R273	C 8260-9	10K 0.1%
R122	R222	A10266-2741	270K	R174	R274	A10265-24921	24.9K 1%
R123	R223	A10266-1832	18K .5W	R175	R275	A10265-11521	11.5K 1%
R124	R224	A10266-6821	6.8K	R176	R276	A10265-24921	24.9K 1%
R125	R225	C 7782-3	100 Flame Proof	R177	R277	A10265-40221	40.2K 1%
R126	R226	C 7782-3	100 Flame Proof	R179	R279	A10266-1321	1.3K
R127	R227	A10266-6821	6.8K	R180	R280	A10266-4711	470
R128	R228	A10266-1031	10K	R181	R281	A10266-4721	4.7K
R129	R229	A10266-1041	100K	R182	R282	A10266-2201	22
R130	R230	A10266-1041	100K	R183	R283	A10266-2421	2.4K
R131	R231	A10266-1031	10K	R184	R284	A10266-4741	470K
R132	R232	C 5062-2	100K Pot (+ODEP)	R185	R285	A10266-2421	2.4K
				R186	R286	A10266-2751	2.7M
				R187	R287	A10266-3631	36K

Q43035-7 Main Module (D7993-5 board) Parts List Cont.

R188	R288	A10266-3631	36K
R189	R289	A10266-2731	27K
R190	R290	A10266-2051	2M
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
R914	R1014	A10266-1051	1M
R915	R1015	A10266-3901	39
R916	R1016	A10266-3901	39
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 Switch
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	
J2	C 4508-5	16 Pin Socket	
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

Q43031-6 Main Module (D7993-5 board) Parts List

CAPACITORS

C1	C 4303-1	1000 μ F
C2	C 3913-8	470 μ F
C4	C 6802-0	.47 μ F
C5	C 6806-1	.01 μ F
C6	C 6806-1	.01 μ F
C7	C 8897-8	.1 μ F
C100	C200 C 5311-3	22 μ F
C101	C201 C 9464-6	10pF
C103	C203 C 6805-3	.022 μ F
C104	C204 C 6805-3	.022 μ F
C105	C205 C 6812-9	47pF
C106	C206 C 6812-9	47pF
C107	C207 C 8897-8	.1 μ F
C108	C208 C 6814-5	12pF
C109	C209 C 7417-6	.0033 μ F
C110	C210 C 5362-6	2.2 μ F
C111	C211 C 8897-8	.1 μ F
C112	C212 C 8990-1	.18 μ F
C113	C213 C 8991-9	.47 μ F
C114	C214 C 8854-9	100 μ F
C115	C215 C 8854-9	100 μ F
C116	C216 C 8991-9	.47 μ F
C117	C217 C 8990-1	.18 μ F
C118	C218 C 6814-5	12pF
C119	C219 C 6802-0	.47 μ F
C120	C220 C 8897-8	.1 μ F
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	.022 μ F
C135	C235 C 6805-3	.022 μ F
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	100 μ F
C145	C245 C 6812-9	47pF
C146	C246 C 6812-9	47pF
C147	C247 C 6806-1	.01 μ F
C148	C248 C 6810-3	180pF
C149	C249 C 6808-7	470pF
C150	C250 C 6806-1	.01 μ F
C151	C251 C 6806-1	.01 μ F
C152	C252 C 6950-7	82pF 5%
C153	C253 C 8897-8	.1 μ F
C154	C254 C 8426-6	.1 μ F 250V

C155	C255	C 8897-8	.1 μ F
C156	C256	C 8897-8	.1 μ F
C157	C257	C 6806-1	.01 μ F

DIODES

D1		C 2851-1	1N4004
D2		C 2851-1	1N4004
D3		C 2851-1	1N4004
D4		C 2851-1	1N4004
D5		C 2851-1	1N4004
D6		C 2851-1	1N4004
D7		C 2851-1	1N4004
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
D128	D228	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
Q119	Q219	C 3625-8	NPN 2N4125
Q120	Q220	C 3625-8	NPN 2N4125
Q121	Q221	C 7458-0	NPN 2N4123

Q43031-6 Main Module (D7993-5 board) Parts List Cont.

Q122	Q222	C 7458-0	NPN 2N4123
Q123	Q223	C 7458-0	NPN 2N4123
Q124	Q224	C 3625-8	NPN 2N4125

RESISTOR NETWORKS

N101	N201	D 7946-3	Resistor Network
N102	N202	D 6082-8	Resistor Network

RESISTORS

R1		A10265-53621	53.6K 1%
R2		C 7340-0	24 5W
R3		C 7340-0	24 5W
R4		A10265-46421	46.4K 1%
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	Pot, 5K Linear
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
R112	R212	A10266-5131	51K
R113	R213	A10266-4721	4.7K
R114	R214	A10266-4721	4.7K
R115	R215	A10266-5141	510K
R116	R216	A10266-2751	2.7M
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	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	A10265-11821	11.8K 1%
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	A10265-11321	11.3K 1%
R159	R259	A10266-1021	1K
R160	R260	C 8260-9	10K 0.1%
R161	R261	A10266-4701	47
R162	R262	A10266-4701	47
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	A10265-97601	976 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	A10265-11321	11.3K 1%
R176	R276	A10265-24921	24.9K 1%
R177	R277	A10265-40221	40.2K 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

Q43031-6 Main Module (D7993-5 board) Parts List Cont.

R188	R288	A10266-3631	36K				
R189	R289	A10266-2731	27K				
R190	R290	A10266-2051	2M				
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				
R914	R1014	A10266-1051	1M				
R915	R1015	A10266-3901	39				
R916	R1016	A10266-3901	39				
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 Switch				
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	
				J2	C 4508-5	16 Pin Socket	
				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