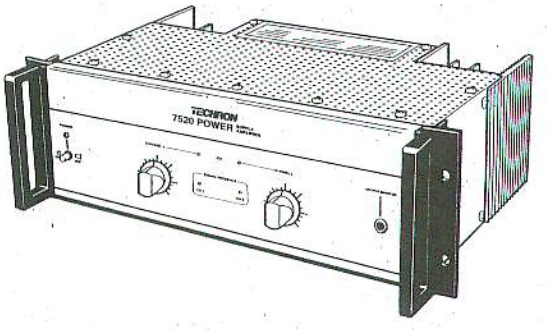
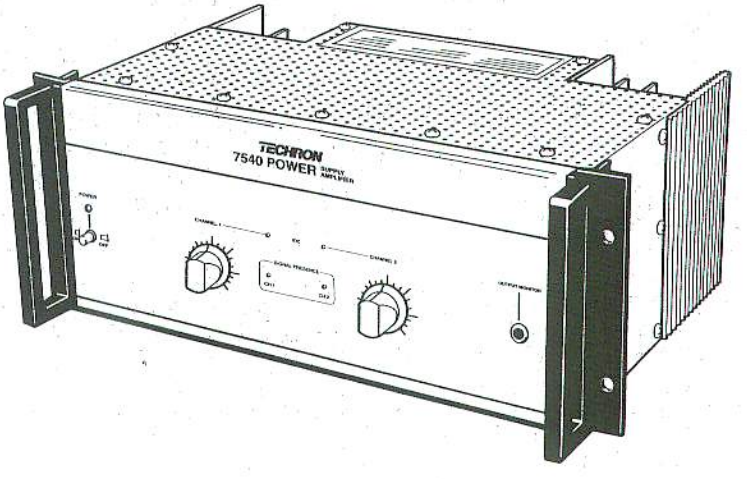
TECHRON®

User and Service Information





7520 & 7540

Power Supply Amplifiers

TECHRON®

7520 & 7540

Power Supply Amplifier

Technical Manual

K80667-7

1718 W. Mishawaka Road, Elkhart, Indiana, 46515-1000 U.S.A.
(219) 294-8300

TECHRON®

POWER PRODUCTS

LIMITED ONE-YEAR WARRANTY

SUMMARY OF WARRANTY

Techron, a division of Crown International, Inc., of Elkhart, Indiana (Warrantor) warrants to the ORIGINAL COMMERCIAL PURCHASER ONLY of each NEW Techron product, for a period of one (1) year from the date of purchase by the original purchaser (warranty period) that the product is free of defects in materials or workmanship and will meet or exceed all advertised specifications for such a product. This warranty does not extend to any subsequent purchaser or user, and automatically terminates upon your sale or other disposition of our product.

ITEMS EXCLUDED FROM WARRANTY

We are not responsible for product failure caused by misuse, accident or neglect. This warranty does not extend to any product on which the serial number has been defaced, altered, or removed. It does not cover damage to loads or any other products or accessories resulting from Techron product failure. It does not cover defects or damage caused by the use of unauthorized modifications, accessories, parts, or service.

WHAT WE WILL DO

We will remedy, at our sole discretion, any defect in materials or workmanship by repair, replacement, or refund. If a refund is elected, you must make the defective or malfunctioning component available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at our factory. Expenses in remedying the defect will be borne by Techron, including one-way surface freight shipping costs within the United States. (Purchaser must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other customs fees for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

When you notify us of your need for warranty service, we will give you an authorization to return the product for service. All components must be shipped in a factory pack or equivalent which, if needed, may be obtained from us for a nominal charge. Corrective actions will be taken within a reasonable time of the date of receipt of the defective product by us. If the repairs made by us are not satisfactory, notify us immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

You are not entitled to recover from us any consequential or incidental damages resulting from any defect in our product. This includes any damage to another product or products resulting from such a defect.

WARRANTY ALTERATIONS

No person has the authority to enlarge, amend, or modify this warranty. The warranty is not extended by the length of time for which you are deprived of the use of this product. Repairs and replacement parts provided under the terms of this warrranty shall carry only the unexpired portion of this warranty.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

There is no warranty which extends beyond the terms hereof. This written warranty is given in lieu of any oral or implied warranties not contained herein. We disclaim all implied warranties, including, without limitation, any warranties of merchantability or fitness for a particular purpose. No action to enforce this Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

TECHRON, Customer Service Department
57620 CR 105, Elkhart, IN 46517
219–294–8300; 219–294–8329 (fax)

April 1994

Introducing the Models 7520 & 7540

The popular Techron 7520 & 7540 amplifiers are mainstays in Techron's mid-power line of amplifiers. Their design and construction has withstood the test of time. They have a tradition of rugged reliability and performance—providing years of dependable and faithful amplification for their owners. Some of the outstanding features that make these amps popular are:

- ❑ Their power range, 135 watts for the 7520 and 265 watts for the 7540 per channel minimum RMS into a 4–ohm load, has very low harmonic (<0.05%) and intermodulation (<0.01%) distortion and low noise (110 dB below rated output).

- ❑ Dependable V-I current limiting along with input, RF, power supply, and thermal overload protection make the amplifier practically indestructible.

- ❑ Strong physical construction of thick aluminum stock dissipates heat and withstands unusual abuse!

The basic models in the 7520 & 7540 series of amplifiers are the 7520 & 7540. Any customization of these basic models results in a model with a name that includes other letters, e.g. DC7520 or CC7540. Any model other than the basic models will have a supplemental manual included with this manual.

a division of Crown International, Inc.
1718 W. Mishawaka Rd., Elkhart, Indiana 46515–1000
Telephone: (219) 294-8300

Manual Part No: K80667-7 Rev. 0, June, 1996

Revision Control

Revision	Date
0 (initial release)	June, 1996

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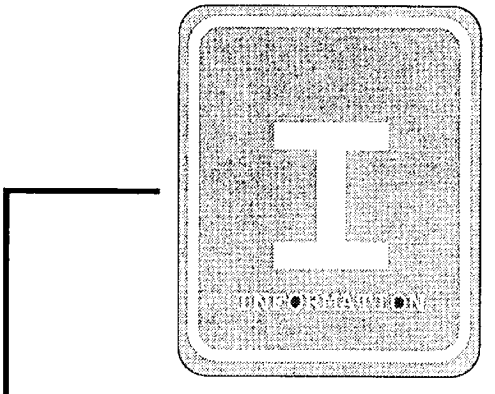
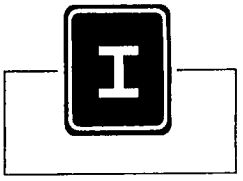


Section 1—Preinstallation

This section describes safety conventions used within this document and provides essential information about the Model 7520/7540 amplifier. Review this material before installing or operating the amplifier.



1.1 Safety Conventions

The 7520/7540 amplifier is a highly sophisticated instrument. Accordingly, this document provides full information on the amplifier including service procedures. Safety should be your primary concern as you use this product and follow these procedures.

Special hazard alert instructions appear throughout this manual. Note the following examples:

⚠ DANGER

DANGER represents the most severe hazard alert. Extreme bodily harm or death **will** occur if these guidelines are not followed. Note the explanation of the hazard and instructions for avoiding it.

⚠ WARNING

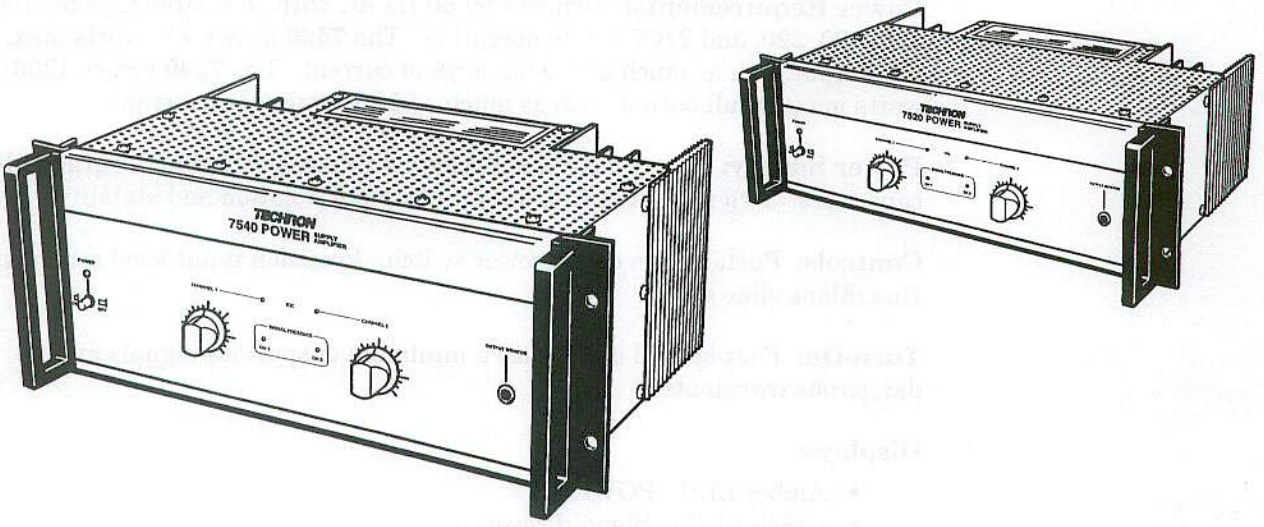
WARNING alerts you to hazards which **could** result in severe injury or death. Note the explanation of the hazard and the instructions for avoiding it.

⚠ CAUTION

CAUTION indicates hazards which could result in potential personal injury or equipment or property damage. Once again, note the explanation of the hazard and the instructions for avoiding it.

Note: A Note represents information which needs special emphasis but does not represent a hazard.

1.2 Product Description



1.2.1 General Description

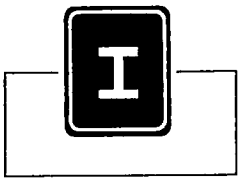
Both *TECHRON*® Models 7520 and 7540 are single or dual channel power supply amplifiers designed for use in the most demanding high power systems. They provide precision amplification of frequencies from DC to 20 kHz, with extremely low harmonic and intermodulation distortion and low noise. The major difference between the two models, besides physical size, is output power—142 watts/ch rms for the 7520, and 279 watts/ch rms for the 7540.

On the front panel, the push button power switch activates an amber ON indicator. Green signal presence indicators confirm signal path from input to output. Directly above these are red IOC indicators which indicate clipping and standby conditions. Adjust the output levels with the two knobs. To monitor the output, use the high impedance output monitor jack.

On the back panel, connect input to a BNC or to a 3–terminal barrier block. Connect output to a 3–terminal barrier block or Banana Jacks. Switch between Dual or Mono operation with a slide switch. Isolate chassis ground from electrical ground with the jumper on a 2–terminal barrier block. Massive black anodized heat sinks thermally joined to the chassis enable the entire amplifier to function as a heat sink.

The output transistors operate in the AB + B configuration in which quiescent current is carried by the driver stages until the output transistors are summoned by a large current demand. Output transistors are tested by Techron to verify their safe operating area. Dependable V-I current limiting provides protection against damage from shorted and low impedance loads, as well as damage from overloaded power supplies, input overload, and high frequency overloads. Dynamic thermal protection automatically switches in and out of standby operation to help assure uninterupted service.

The 7520 & 7540 come complete with user's manual, four mounting screws, and four nylon washers. They are rack mountable in a standard 19-inch (48.3 cm) enclosure. All Techron amplifiers are tested at the factory to assure operation at full efficiency upon delivery. Custom configurations are available, as well as full system implementations.



1.2.2. General Specifications

Power Requirements: Requires 50-60 Hz AC with selectable taps for 100, 120, 200, 220, and 240V ± 10% operation. The **7520** draws 750 watts max. at full output with as much as 5.9 amperes of current. The **7540** draws 1200 watts max. at full output with as much as 10.7 amperes of current.

Power Supply: Heavy duty transformer with massive computer-grade filter capacitors. Two regulated supplies for complete isolation and stability.

Controls: Push-button on/off power switch; Precision input level controls; Dual/Mono slide switch.

Turn-On: Four-second delay with a minimum of spurious signals and no dangerous transients.

Displays:

- Amber LED - POWER
- Green LEDs - Signal Presence
- Red LEDs - IOC/STANDBY

Connectors:

- AC line: three-wire (grounded) male connector.
- Fuse: Back panel, slotted, screw-in fuse holder.
- Input: BNC connectors; 3–terminal barrier block.
- Output: 3–terminal barrier block; Banana Jacks.
- Accessories: 11–pin radial socket.
- Ground Lift: 2–terminal barrier block with removable shorting strap.

Amplifier Output Protection: Short, mismatch, and open circuit proof. Limiting is instantaneous with no flyback pulses, thumps, cutouts, or premature limiting transients and other signals.

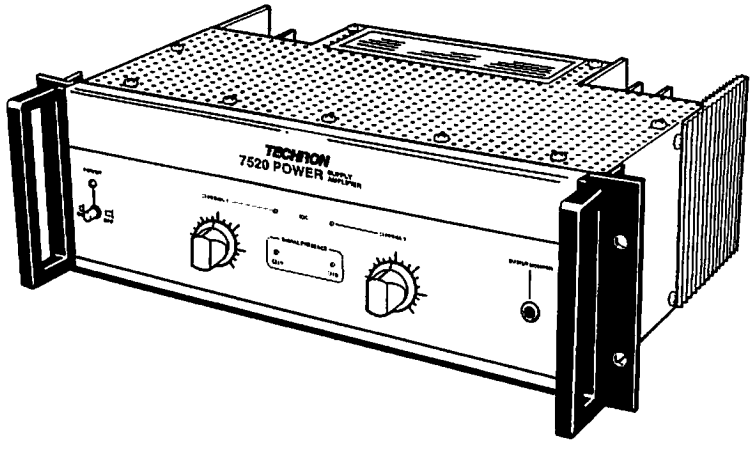
Overall Protection: AC line fused. Thermal switch in control logic protects against overheating caused by insufficient ventilation. Controlled slewing rate voltage amplifiers protect overall amplifier against RF burnouts. Input overload protection is furnished by internal resistance at inputs of amp.

Heat Sink: Massive black-anodized heat sinks are thermally joined with the chassis, using the entire amplifier as a heat sink. Optional fans available.

Chassis: All-aluminum construction for maximum heat conduction and minimum weight. Powder coated aluminum front panel, zinc die cast handles.

Dimensions: Standard rack mount 19" wide x 5.25" high x 10.25" deep from front panel mounting surface (48.3cm x 13.3 cm x 25.7 cm) for Model 7520; 19" wide x 7" high x 10.25" deep from front panel mounting surface. (48.3cm x 17.8cm x 26cm) for Model 7540.

Weight: 25 pounds for Model 7520; 55 pounds for Model 7540 net weight.



1.2.3 7520 Performance Specifications

Output Power: Dual: 142 watts rms per channel minimum continuous average power (both channels driven) into a 4 ohm load over a bandwidth of 1 Hz to 20 kHz at a rated rms sum total harmonic distortion of .05%. **Mono:** 280 watts rms continuous average power into an 8 ohm load over a bandwidth of 1 Hz to 20 kHz at rated rms THD of 0.1%.

Voltage Gain: 20.6 ± 2% or 26.3 ± 0.3 dB at maximum gain in Dual mode. 41.2 ± 2% or 32,3 ± 0.2 dB at maximum gain in Mono mode.

Input Sensitivity: At 1kHz, (Maximum output, not clipping): No load, 1.6 Vrms; 2 ohm load, 1.3 Vrms.

Input Impedance: 30 k ohm, ± 20%.

Hum and Noise: (DC -100 kHz): less than 0.09 mV. (See graph)

Frequency Response: DC to 35 kHz. (See graph)

Phase Response: +0, –15 degrees DC–20 k Hz at 1 watt. (See graph)

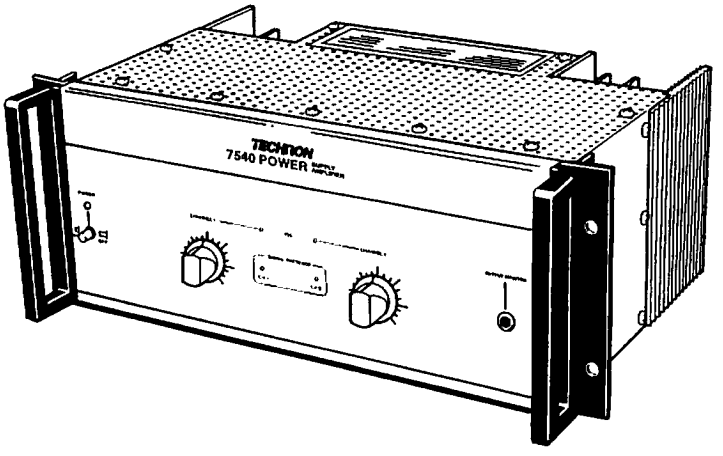
Harmonic Distortion: Less than 0.05% (20 Hz–20 k Hz) at full output power.

Intermodulation Distortion: Less than 0.05% at (-40) dB of full output power.

Slewing Rate: Dual: 12 V/µs; **Mono:** 24 V/µs.

Output Impedance: Dual: Less than 15 mΩ with less than 3 µH. **Mono:** Less than 30 mΩ with less than 6 µH. (See graph)

Output Signal: Dual: Unbalanced; **Mono:** Balanced.



1.2.4 7540 Performance Specifications

Output Power: Dual: 279 watts rms per channel minimum continuous average power (both channels driven) into a 4 ohm load over a bandwidth of 1 Hz to 20 kHz at a rated rms sum total harmonic distortion of .05%. **Mono:** 530 watts rms continuous average power into an 8 ohm load over a bandwidth of 1 Hz to 20 kHz at rated rms THD of .05%.

Voltage Gain: 20.6 ± 2% or 26.3 ± 0.3 dB at maximum gain in Dual mode. 41.2 ± 2% or 32,3 ± 0.2 dB at maximum gain in Mono mode.

Input Sensitivity: At 1kHz, (Maximum output, not clipping): No load, 1.6 Vrms; 2 ohm load, 1.3 Vrms.

Input Impedance: 30 k ohm, ± 20%.

Hum and Noise: (DC -100 kHz): less than 0.12 mV. (See graph)

Frequency Response: DC to 100 kHz. (See graph)

Phase Response: +0, –15 degrees DC–20 k Hz at 1 watt. (See graph)

Harmonic Distortion: Less than 0.05% (20 Hz–20 k Hz) at full output power.

Intermodulation Distortion: Less than 0.05% at (-40) dB of full output power.

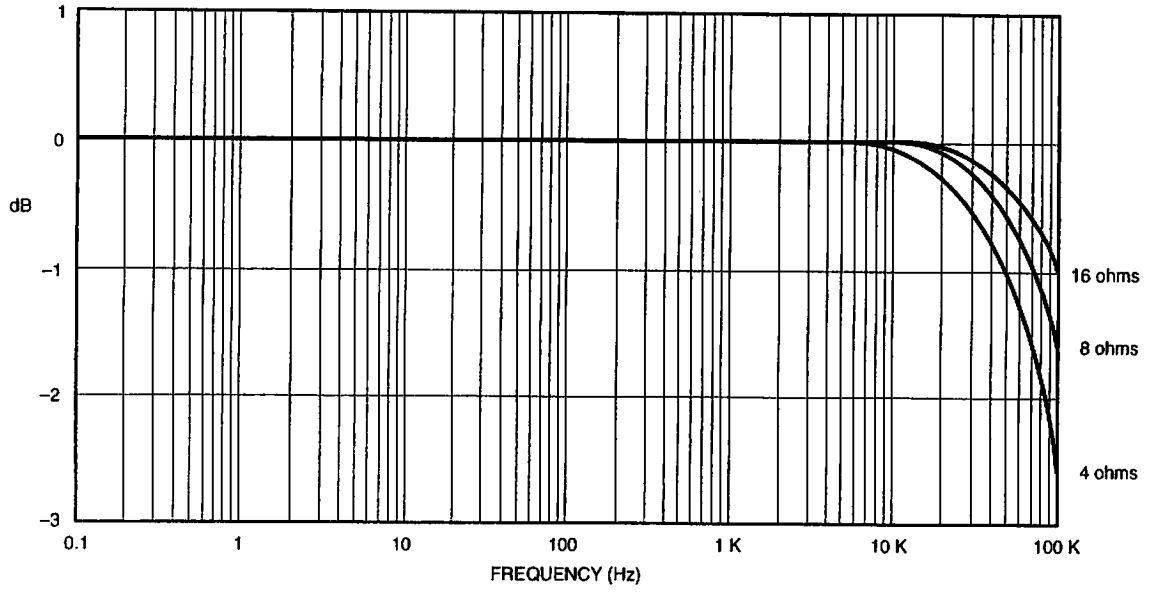
Slewing Rate: Dual: 16 V/µs; **Mono:** 32 V/µs.

Output Impedance: Dual: Less than 15 mΩ with less than 3 µH. **Mono:** Less than 30 mΩ with less than 6 µH. (See graph)

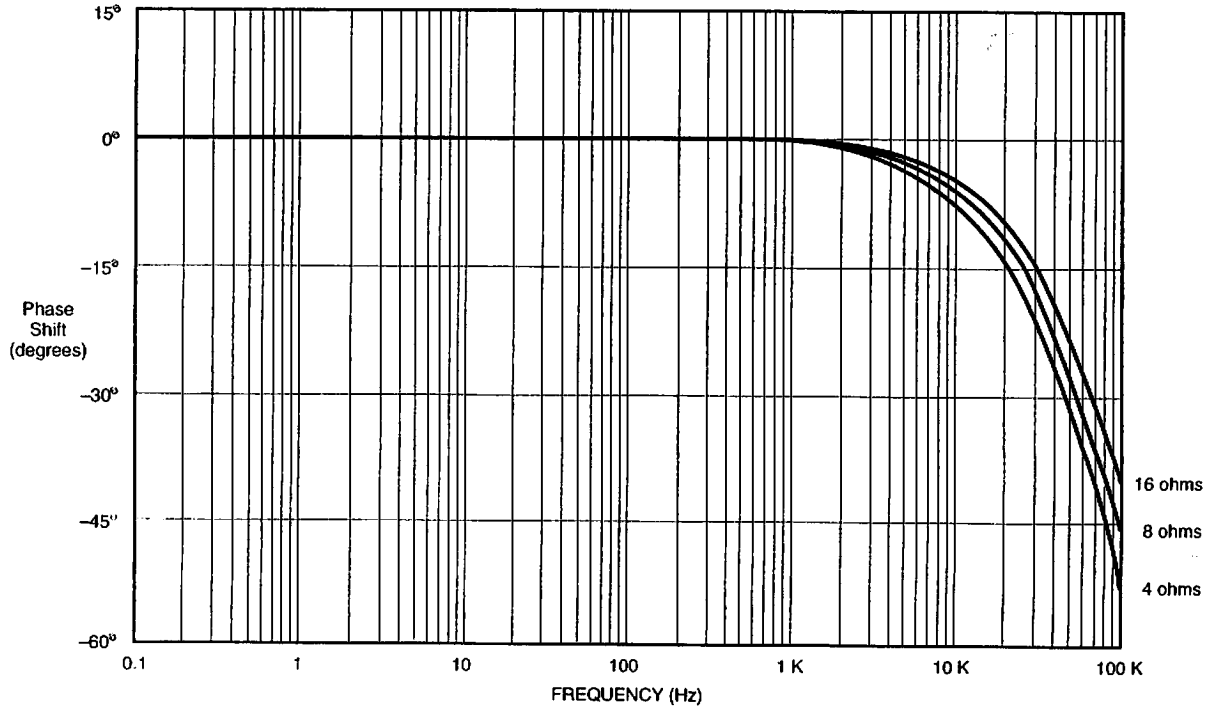
Output Signal: Dual: Unbalanced; **Mono:** Balanced.

1.2.5 Performance Graphs

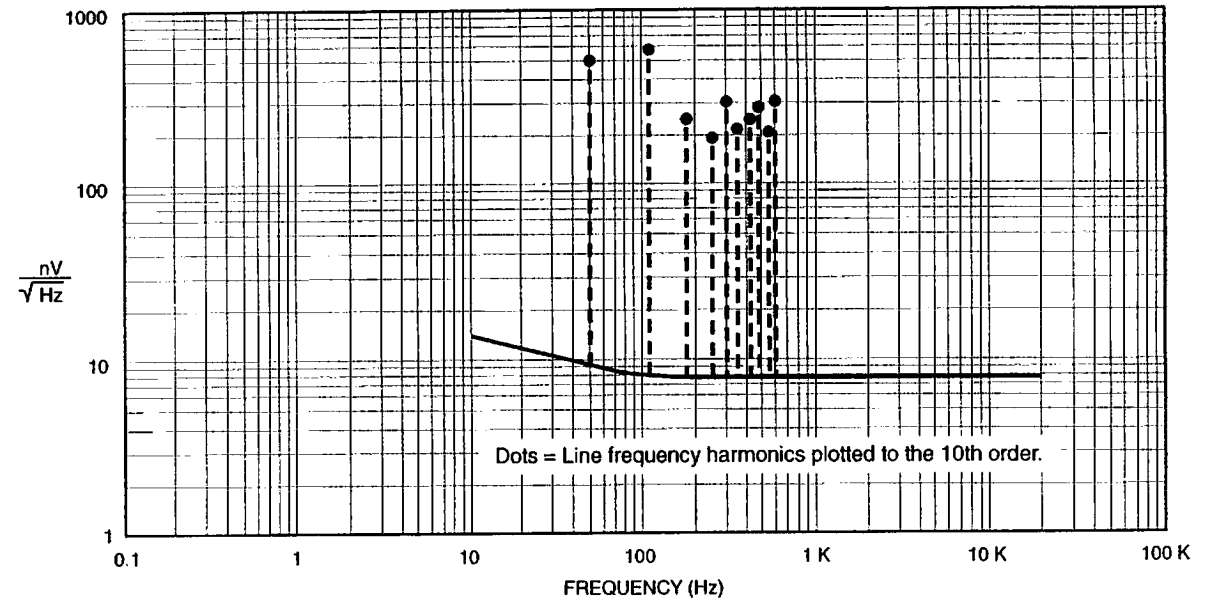
The graphs on the following pages show the performance of Model 7520 and/or Model 7540.



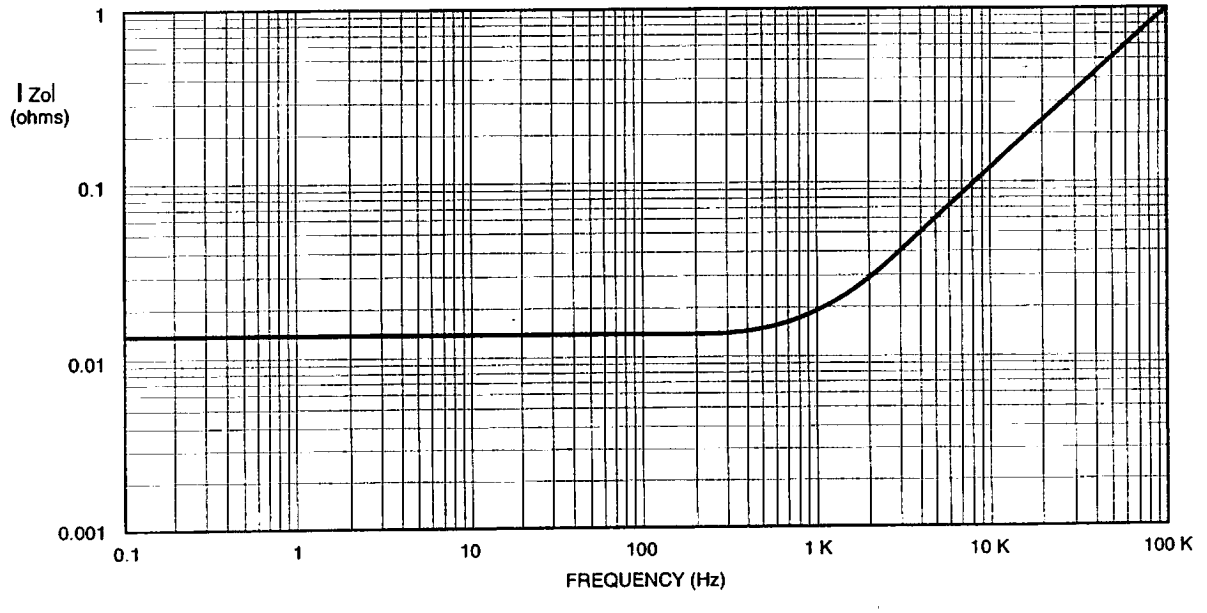
7520/7540 Nominal Frequency Responce



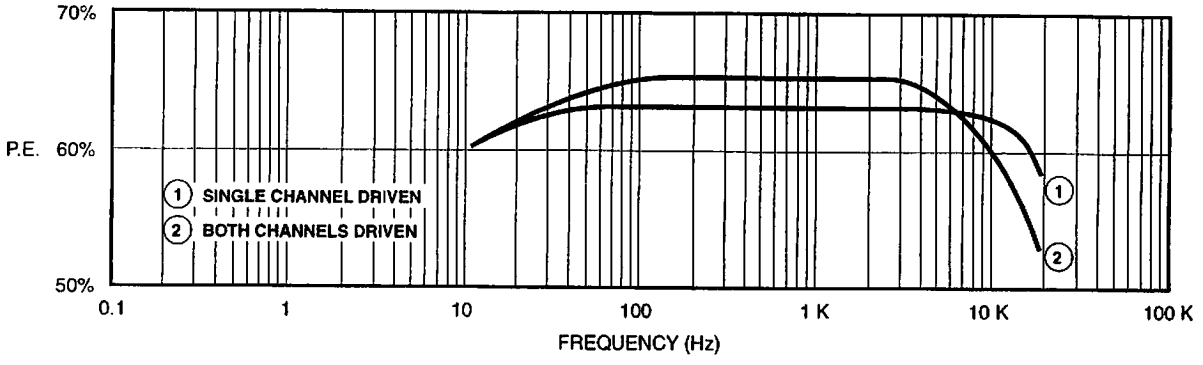
7520/7540 Nominal Phase Responce



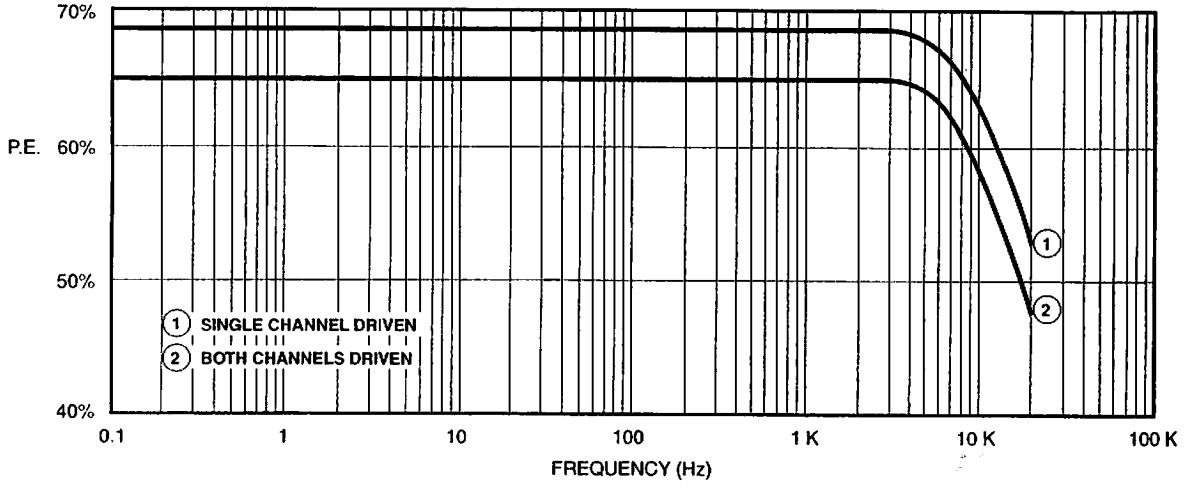
7520/7540 Nominal Noise Spectrum



7520/7540 Nominal Output Impedance



7520 Nominal Power Efficiency



7540 Nominal Power Efficiency

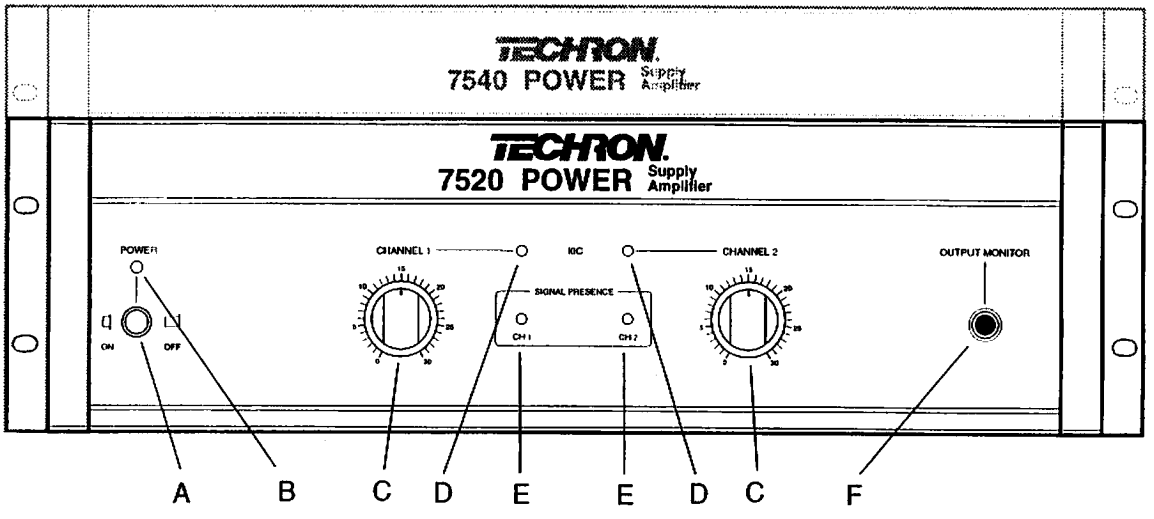
1.2.6 User Interface

During actual amplifier operation, the 7520/7540 interface is quite simple and straightforward. There are only three controls on the front panel—a push-button ON/OFF switch and two level controls. An amber LED tells you if the amplifier is powered or not. Two green LEDs indicate the presence of a signal. Two red LEDs keep you informed of amplifier status—whether or not there is distortion present in the signal and whether or not the amplifier is in standby. You can monitor the output through the high impedance phone jack on the front panel.

On the back panel, choose between a BNC or a 3–terminal barrier block for easy input connection. You can use either a 3–terminal barrier block or banana jacks for connection to your loads. A 2–terminal barrier block allows you to lift the chassis ground from the electrical ground. Switch between Dual and Mono modes with a slide switch. A 3–wire AC cord and an accessible fuse holder allow you to connect power and change fuses easily.

1.2.6.1 Front Panel Functions

The following illustration, showing the 7540 behind the 7520, has captioned call-outs providing a visual location of the 7520/7540 front panel functions. Both amplifiers have the same functions in basically the same locations.



A. Power Switch

This push-button ON/OFF switch controls power to the amplifier.

B. Power Indicator

An amber LED illuminates when the amplifier is ON.

C. Level Control

These level controls adjust the input level for each channel individually. The Channel 2 control should be turned down (fully counter clockwise) when operating in Mono mode.

D. (IOC)/Standby Indicator

These dual function LEDs act as Input/Output Comparators (IOCs) indicating any distortion over 0.05%, and as Standby indicators that lite when the amplifier is overheating or within the 4–second turn-on delay.

E. Signal Presence

Green LEDs indicate when a signal is present in either channel. At normal levels they will lite, but at very low levels they may not.

F. Output Monitor

This is a standard 1/4 inch 3–conductor jack paralleling the outputs, but intended to drive only high impedance loads.

G. Barrier Block Input

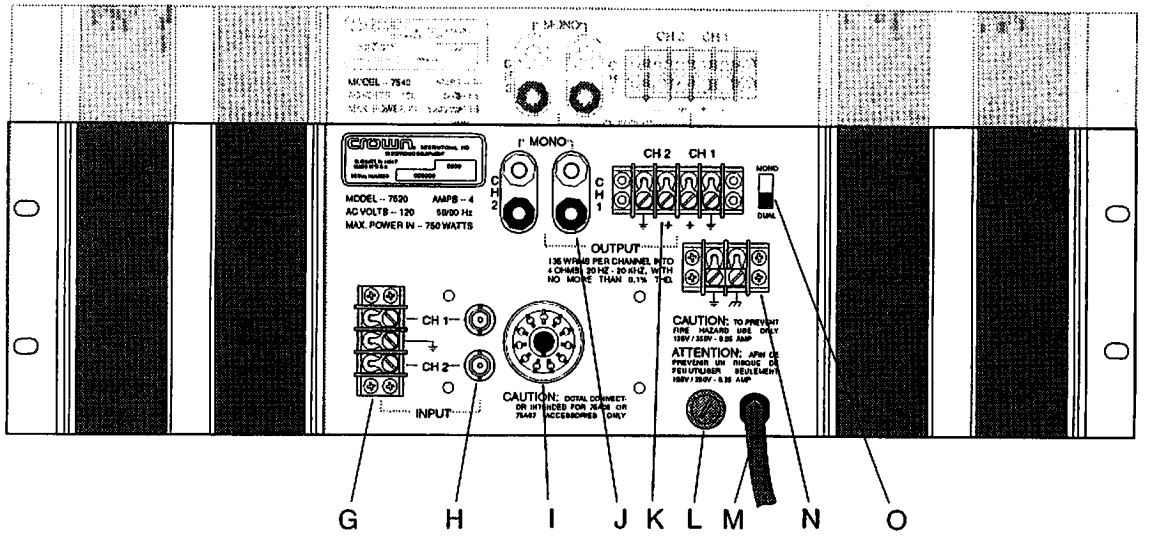
This input option saves you a connector and is more perminate. Do not use the BNC input option when using this one.

H. BNC Input

This input option allows quick change and complete shielding. Do not use the Barrier Block input when using this one.

1.2.6.2 Back Panel Functions

The following illustration, showing the 7540 behind the 7520, has captioned call-outs providing a visual location of the 7520/7540 back panel functions. Both amplifiers have the same functions in basically the same locations.



I. Balanced Input Module Socket

This 11–pin radial socket accommodates an optional balanced input module—the Model 75A06 is active while the 75A07 is a passive one.

J. Banana Jack Output

Banana jacks are provided at the output of each channel and are wired in parallel with the Output Barrier Block. Use only the top two jacks (the red ones) when operating in Mono mode.

K. Barrier Block Output

Connect output lines from the load to this 4–terminal barrier block. This more perminate output option saves you a connector. The terminals are connected in parallel with the Banana Jacks so do not use both at the same time. Use only the (+) terminals when operating in Mono mode.

L. Fuse

A slotted, screw-in fuse holder makes easy access to the AC line fuse. Model 7520 uses a 6.25 A for 100-120 VAC, and a 3 A for 200-240 VAC. Model 7540 uses a 10 A for 100-120 VAC, and a 5 A for 200-240 VAC.

M. Power Cord

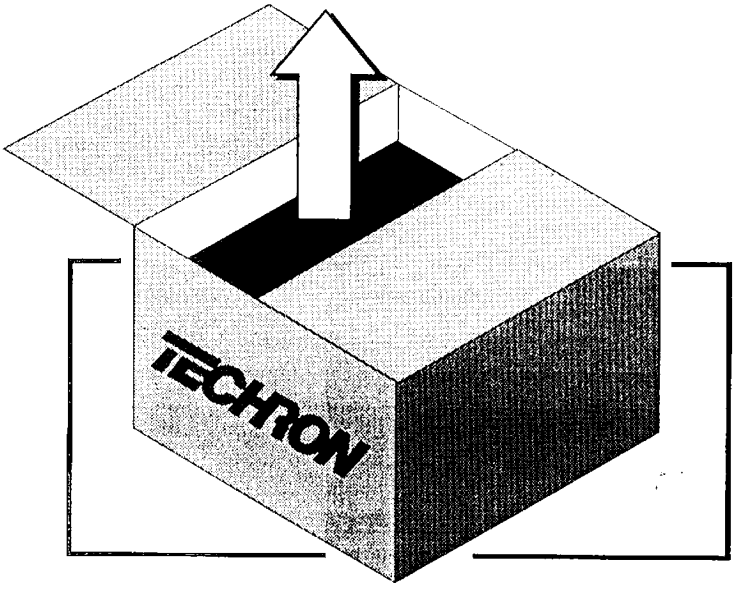
Power connection is through a standard 3–wire AC cord and plug.

N. Ground Lift

The chassis ground can be lifted from the electrical ground by removing the shorting strap from this 2–terminal barrier block. The grounds are connected internally by 2.7 Ω.

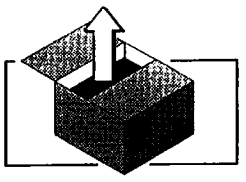
O. Dual-Mono Switch

Use this slide switch to change modes (see sections 2.3.1 & 2.3.2).



Section 2—Installation

This section provides general guidelines for installing the Model 7520/7540 amplifier with special emphasis on system installations.



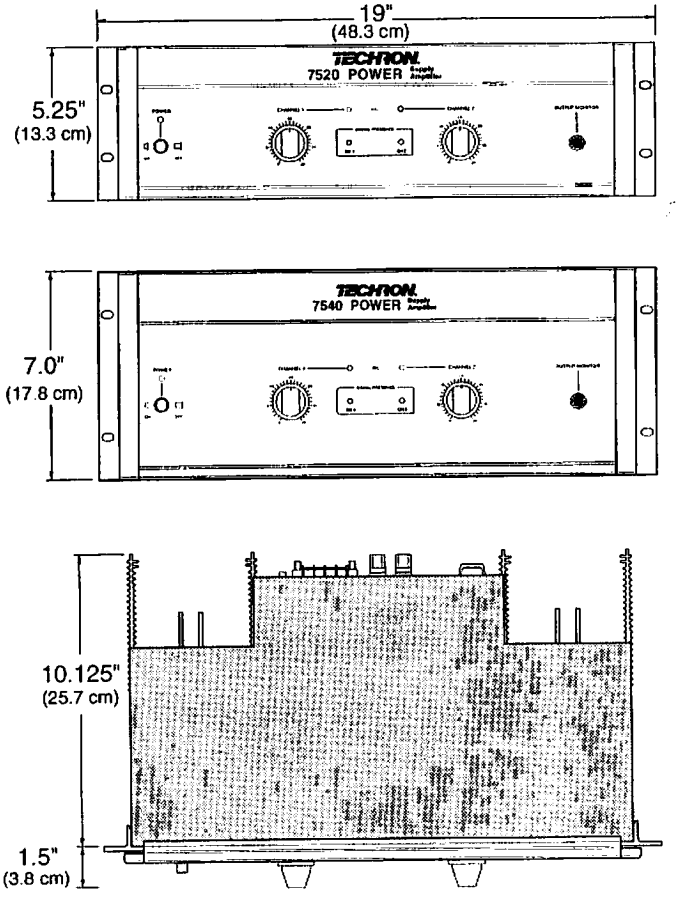
2.1 Unpacking

Every TECHRON Model 7520/7540 is carefully inspected and tested prior to leaving the factory. Carefully unpack and inspect the unit for damage in shipment. Besides the amplifier, you should find this manual and mounting hardware in the package.

If damage is found notify the transportation company immediately. Save the shipping carton and packing materials as evidence of damage for the shipper's inspection. TECHRON will cooperate fully in the case of any shipping damage investigation. In any event, save the packing materials for later use in transporting or shipping the unit. Replacement packing materials are available from TECHRON. Never ship this unit without proper packaging.

2.2 Mounting

The Model 7520/7540 mounts in a standard 19-inch rack. The illustration below shows the only mounting difference between the two amplifiers. The 7540 is higher than the 7520. You may want to allow at least two additional inches of depth for cables and connectors extending out from the back.



Mounting Dimensions

⚠ WARNING

To reduce the risk of *ELECTRIC SHOCK* or FIRE HAZARD, do NOT expose the 7520/7540 to rain or moisture.

⚠ CAUTION

Do not install 7520/7540 in a small sealed chamber of any kind. Improper operation and overheating will result.

2.3 Making Connections

Before beginning the installation of your amplifier, please note the following:

- ❑ Remove all power from the unit. Do not have the AC cord plugged in.
- ❑ Turn input level controls down (fully counter clockwise).

The input and output jacks are located on the back panel. Use care in making connections, selecting signal sources, and matching loads. During hookup take the following precautions:

1. **Use only shielded cable on inputs.** The higher the density of the shield (the outer conductor), the better the cable. Spiral wrapped shield is not recommended.
2. **Use only one input option at a time.** Use one or the other, but not both, type of connectors.
3. **The output wire and connectors should be heavy enough** to carry the intended current to the load.
4. **Use good quality connectors** with proper strain relief.
   - Do not use connectors that have any tendency to short circuit.
   - Do not use connectors that can be plugged into AC power receptacles.
5. **Keep unbalanced input cables as short as possible**—avoid lengths greater than 10 feet.
6. **Do not run signal** (input) **cables together with high level wiring** such as load (output) wires or AC cords (this helps avoid most hum and noise).
7. **Do not short the ground lead of an output cable to the input signal ground**. Oscillations may result.
8. **Operate the amplifier from proper AC current**. Supply voltage must be 50 to 60 Hz and no more than 10% above or below the selected line voltage. Failure to comply with these frequency limits may damage the unit and will result in unreliable operation.
9. **Never connect the output to a power supply output, battery, or power main**. These connections will cause serious damage to the amplifier.
10. **Do not permit unqualified personnel to tamper with circuitry**. Do not make unauthorized circuit modifications. Serious damage to the amplifier and/or safety hazards may result.

2.3.1 Dual Channel Hookup

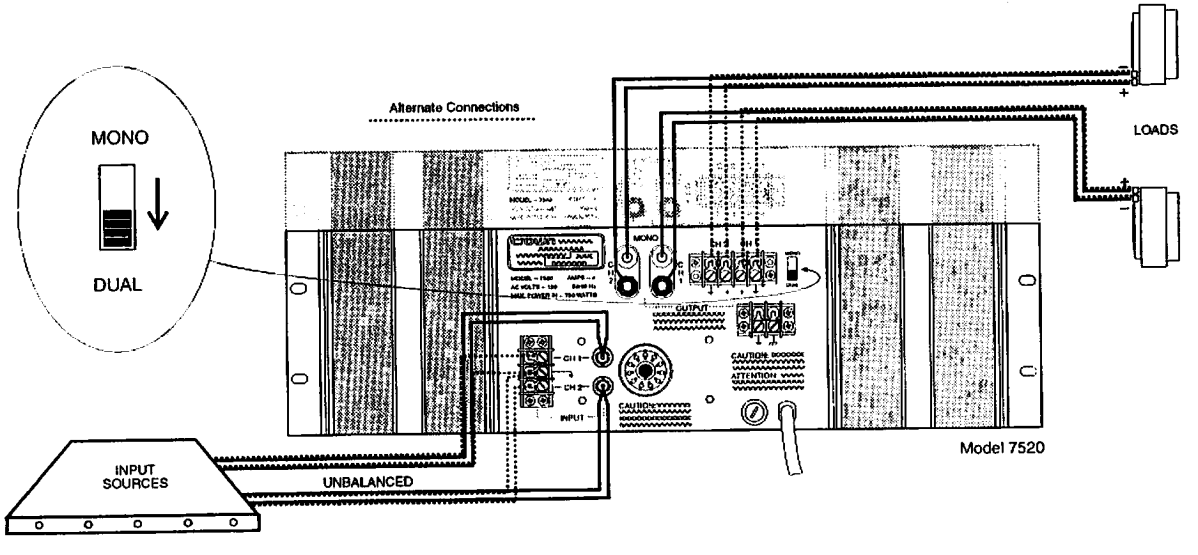
To put the amplifier in Dual Channel mode, move the slide switch on the back panel to the Dual postion. The illustration below shows the hookup to input options and output connection options to the loads.

The installation is very intuitive in Dual mode. The input of Channel 1 feeds the output of the same channel as does the input of Channel 2. The dotted lines in the illustration show an alternate means of connection. Don't use both means of connection at the same time.

> **⚠ CAUTION**
>
> Never parallel the two outputs together or parallel them with the output of any other amplifier without Techron approved modifications.

Paralleling the outputs does not result in increased power output and can cause the unit to prematurely go into Standby mode to prevent overheating.

> ***Note:*** The two channels of Model 7520/7540 may be operated in parallel under certain specific conditions. See Section 3.2.2 *Paralleling Channels for Increased Current.*



Dual Channel Hookup

2.3.2 Mono Channel Hookup

To put the amplifier in Mono Channel mode, move the slide switch on the back panel to the Mono postion. Mono Channel mode is quite different from Dual Channel mode. Switching to Mono position alters input circuitry so that the two internal amplifiers (the two separate channels) work as a push-pull team for single-channel output.

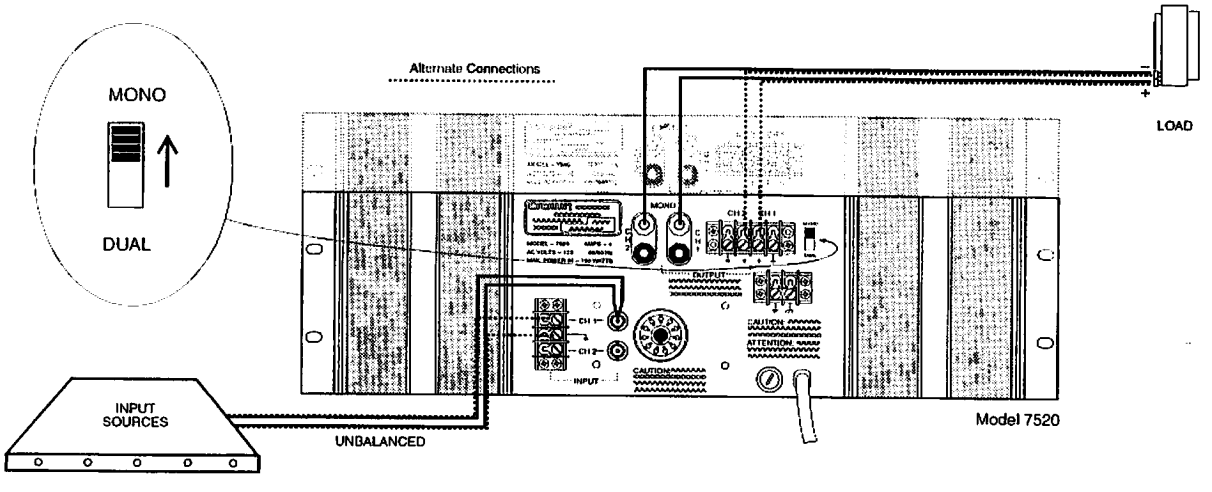
In this mode use only the Channel 1 input. DO NOT USE THE CHANNEL 2 INPUT. Signal level and quality may be greatly degraded. Keep the level control of Channel 2 turned down (fully counter clockwise).

> ***Note:*** The input jack and level control of Channel 2 are not defeated in MONO CHANNEL mode. Any signal fed into Channel 2 will combine with the signal in Channel 1 and distort. Using Ch–2 input only, causes low power output.

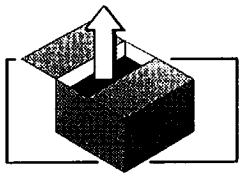
The output wiring is different too. Channel 2 output polarity is inverted so it can be bridged with Channel 1 output thus providing a balanced output. Both channels receive the same signal from Channel 1 input. The most common hookup (see illustration below) connects the load's positive lead to the (+) screw or (red) post of Channel 1 and its negative lead to the (+) screw or (red) post of Channel 2. The (–) screws and black posts are not used.

⚠ CAUTION

Severe *oscillations* will occur if either Mono output line is grounded. Both sides of the output lines must be totally isolated from input grounds and chassis grounds including any test equipment grounds.



Mono Channel Hookup



2.3.3 Connecting Power

The 7520/7540 uses a 3-wire (grounded) AC line system. At times, the third wire ground may introduce a ground loop into the system. If a ground loop is present, lift the chassis ground from the circuit ground by removing the ground strap from the 2–terminal barrier block on the back panel.

The AC power source must be between 50-60 Hz. The AC line voltage must be within ± 10%, otherwise improper operation may result. The serial tag on the back panel indicates the voltage for which the amplifier is connected. Model 7520/7540 may operate from five different AC voltages; they are 100, 120, 200, 220 and 240 volts. To convert from one voltage to another, follow these instructions:

⚠ DANGER

The risk of potentially lethal *ELECTRIC SHOCK* exists when covers are removed! Disconnect AC power and discharge the power supply capacitors before service.

Only a competent technician should attempt to convert from one voltage to another. Follow these instructions thoroughly.

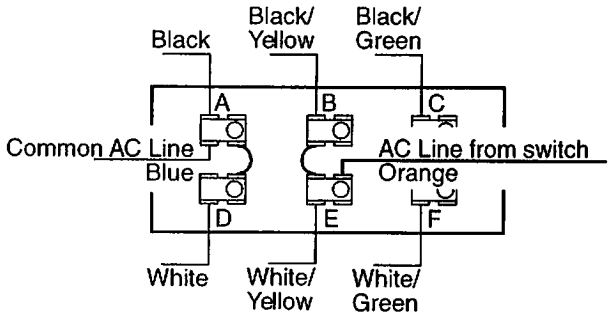
1. Turn the amplifier off and disconnect it from any power source.
2. Remove the top and bottom covers, see Sections 5.
3. If the unit has been in recent use, discharge the large power capacitors by placing a 10 ohm, 5 watt resistor across each capacitor terminal to ground. USE EXTREME CAUTION while handling the resistor.
4. Locate the diagram in the illustration on the next page that corresponds to the desired voltage. Move the orange AC wire and orange jumpers to match the diagram.
5. Carefully check all connections and reinstall the top and bottom covers on the amplifier.
6. Check to be sure the proper fuse is installed in the back panel. Install the correct one if necessary:

(Use a type 3 AG, 250 V, slow blow fuse)

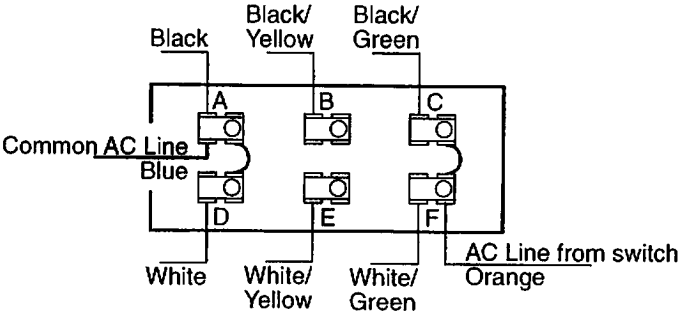
Model 7520 uses: 6.25 A for 100-120 VAC operation
3 A for 200-240 VAC operation.

Model 7540 uses: 10 A for 100-120 VAC operation
5 A for 200-240 VAC operation.

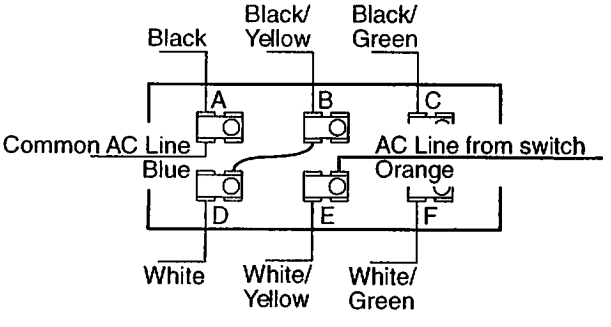
100 Volts AC



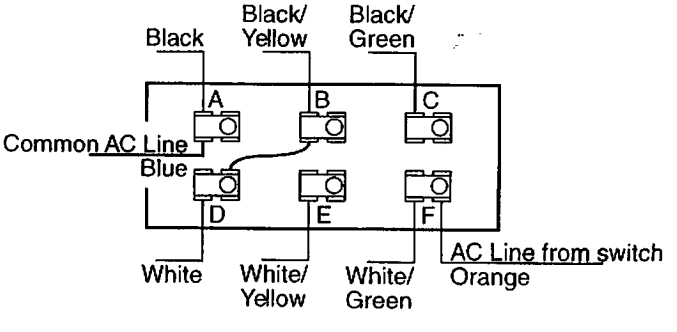
120 Volts AC



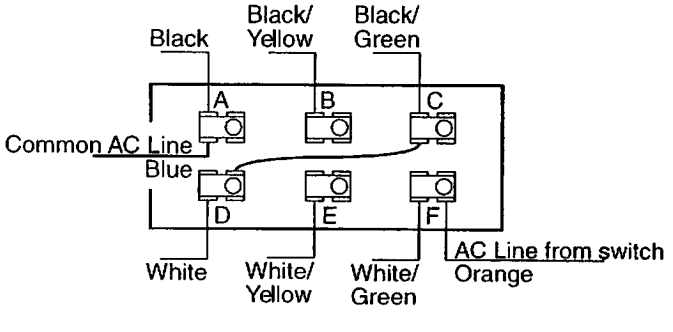
200 Volts AC



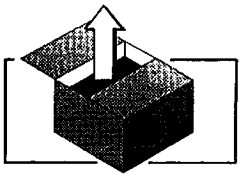
220 Volts AC



240 Volts AC



Internal AC Voltage Conversion Connections



2.4 Load Protection

The most common method of load protection is a fuse in series with the load. A single fuse may be used, or multiple fuses may be used in the case of multiple phase loads. Ordinary fuses will help prevent damage due to a prolonged overload. To protect against large transients, use high-speed instrument fuses such as little fuse 361000 in series. If the load is susceptible to damage by overheating, use a fuse or circuit breaker having the same slow thermal response as the load, for example, a slow-blow fuse.

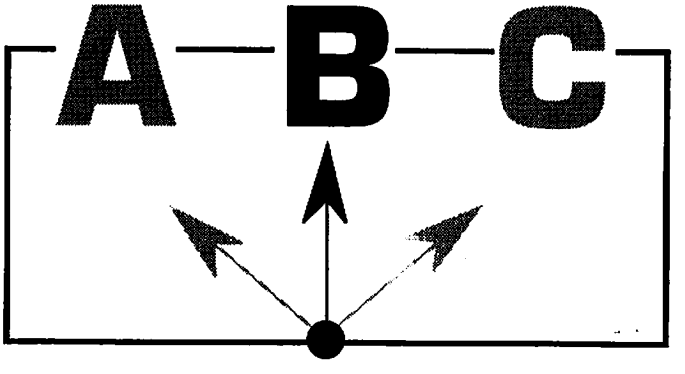
⚠ CAUTION

Whenever an OVERLOAD condition is known to be present, take the following steps as applicable to protect amplifier and load: 1. Reduce or limit input level. 2. Disconnect load from amplifier.

Each power section is independently protected against excessive internal operating temperatures. This circuitry will place the unit in the STANDBY mode in case of overheating. When sufficient cooling has taken place, operation resumes automatically.

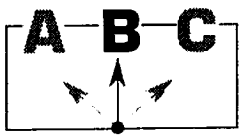
Model 7520/7540 is well protected against hazards common to high power amplifiers, including shorted, open, or mismatched loads, overloaded power supplies, excessive temperature, input overload damage, and high frequency overload damage.

> ***Note:*** A relatively simple internal wiring procedure is available for activating the low frequency interrupt circuit. Contact TECHRON Technical Service Department for information on this modification.



Section 3—Applications

This section describes the uses of the Techron Model 7520/7540 amplifier, its capabilities, and various associated system configurations. Review this material before attempting to change the amplifier.



3.1 Introduction

This section is included for customers who may need to customize the 7520/7540 for a new application. For these users, this section provides general theory and guidance.

This section assumes significant competence on your part in terms of amplifier systems, electronic components, and generally sound electronic working practices. You are encouraged to contact Techron Application Engineering for assistance with any modification or configuration of the 7520/7540.

⚠ WARNING

Except as recommended in this manual, do not attempt to change the circuitry of the amplifier. This could invalidate the warranty, damage the equipment, or harm the operator. Only qualified personnel should make any component or circuitry changes from factory settings.

3.2 Amplifier Capability

Model 7520/7540 is a well-built power supply amplifier. It is capable of delivering precision power levels in a wide range of demands and with a variety of loads. It may be operated in the usual, dual-channel mode, or in one of two special modes: Push-Pull or Parallel.

If these special operating modes are still unable to meet the needed power capability, contact *TECHRON* engineering, and/or consider using a Techron model or models with higher power handling capacity.

3.2.1 Push-Pull Mode for Increased Voltage

Switching the Dual/Mono switch to the "Mono" position automatically places Model 7520/7540 in the Push-Pull configuration. The load will be balanced in reference to ground. Connect the Load across both red or (+) terminals when using the Mono mode. See Section 2.3.2 for complete instructions on Mono operation.

3.2.2 Parallel Mode for Increased Current

Ordinarily, the two channels of dual-channel amplifiers may not be operated in parallel. But, parallel operation of the 7520/7540 is possible if the following steps are taken:

1. Connect a 0.1 to 0.25 ohm, 50 watt, 1% resistor to the (+) output of each channel.
2. Connect (+) outputs together beyond resistors, and then to (+) terminal of load.
3. Connect (–) outputs together, and then to (–) terminal of load.
4. Connect input in parallel to both inputs.
5. Adjust channel 1 input knob to the "9 o'clock" position.
6. Carefully adjust channel 2 input knob to achieve equal output from each channel, using channel 1 as the reference value.

   Note: This adjustment will be very fine and may be quite difficult to achieve. It is possible, however, with care and patience.

7. Note changes in value:
   - **V** (voltage) remains the same as with one amplifier;
   - **I** (current) is multiplied by two;
   - **Z** (impedance) equals the number of amplifiers times the R value of the Load, plus the numerical value of the added resistor.

> **⚠ CAUTION**
>
> Never attempt to operate more than ONE dual-channel amplifier in parallel. The absence of an interlock exposes the amplifiers to severe damage.

Note: Recommended resistor for outputs as described above: Dale brand, model NH50. Other resistors of equal value and precision are perfectly acceptable.

3.3 Application Options

If you have an application requiring the capabilities outlined in this section, contact Techron Application Engineering for recommendations regarding the best course to follow for your specific need.

3.3.1 Low Frequency Interrupt

Model 7520/7540 includes a Low Frequency protection circuit which interrupts power (standby and turn-on delay modes) when low frequencies are present at the input. To activate this circuit, remove the jumpers across capacitors C115 & C215 on the Control Board and/or contact Techron Application Engineering for further details.

3.3.2 Active Balanced Input Module (75A06)

This option plugs into the 11–pin accessory socket on the back panel. Its active circuitry provides two channel balanced input with a frequency response of DC to 25 kHz.

3.3.3 Passive Balanced Input Module (75A07)

This module uses transformers to provide a balanced input and provides a frequency response of 20 Hz to 20 kHz, along with complete isolation from the power supply. Transformer balanced input provides complete electrical isolation of input signals. This option also plugs into the accessory socket on the 7520/7540 back panel.

> ***Note:*** Use a balanced input when input lines are over 20 ft. long, or when the other advantages (isolation, etc.) are needed.

3.3.4 Controlled Current Module (75A08)

Controlled Current (CC) Mode provides current correction via current sampling at the output for installations in which current must be maintained at specific levels. Controlled Current Mode is a factory installed modification. Call Techron Application Engineering for further details and recommendations. There are several other Techron amplifiers specifically designed for Controlled Current operation.

3.3.5 Cooling Needs

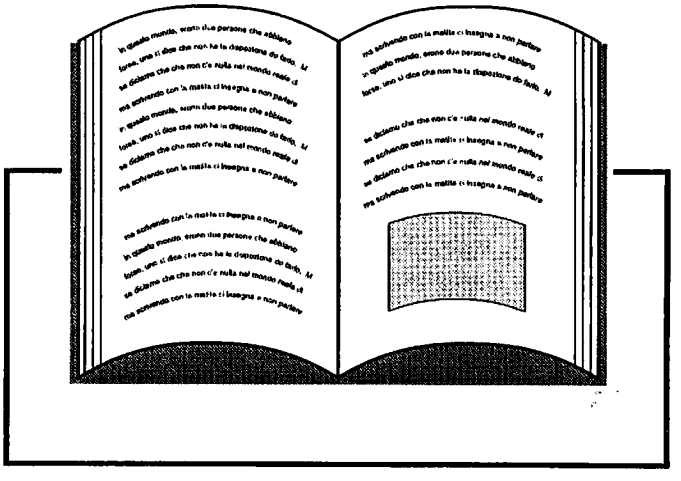
Model 7520/7540 uses convection cooling in normal operation. An optional fan package (75C02) provides extra cooling capacity in installations where this is needed (crowded rack mounting, high ambient temperatures, constant high power demands, etc.). With the use of special panels, one fan package can provide cooling for as many as four amplifiers stacked vertically.

Convection or fan cooling will be ample in nearly every instance. If overheating continues to be a problem, select one or more of the following or similar methods for improved cooling:

1. In crowded rack mounting, a vent tube to the outside of the rack is often helpful.
2. A fan mounted in a crowded rack will add to air circulation.
3. Locate amplifier away from other heat-producing devices whenever possible.

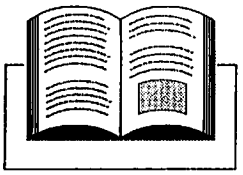
⚠ CAUTION

When the optional fan package is installed, AC current must be at 50–60Hz, rather than 50–400Hz as without fan cooling.



Section 4—Principles of Operation

This section discusses the principles upon which the Techron 7520/7540 amplifier functions.



4.1 General Concepts

Refer to the block diagram on the following page. The diagram does not show all circuit connections or feedback loops due to circuit complexity, but there is sufficient data to grasp the function of each circuit. Only Channel 1 is shown.

An input signal is fed to the initial Main Amplifier stage via the standard unbalanced jacks or optional balanced connectors. At this stage the maximum gain of the amplifier is established. However, it is possible to vary the input signal level, with the variable potentiometer, preceding the Main Amplifier. The main operational amplifier used in this circuit provides ultra low noise specifications, particularly for audio use. The input bias compensation stage, directly related to the Main stage, helps control any DC drift that may occur with a unique temperature-controlled circuit.

At the output of the Main Amplifier is the IOC circuitry, which works in conjunction with the error correcting signal of the main op amp. Any time a small non-linearity exists in the amplifier, an error signal appears at the output of the main op amp value, exceeding the "window" of the IOC and illuminating the LED. Since transient overload can happen rapidly, a pulse stretching circuit is added so the eye can detect the LED lighting.

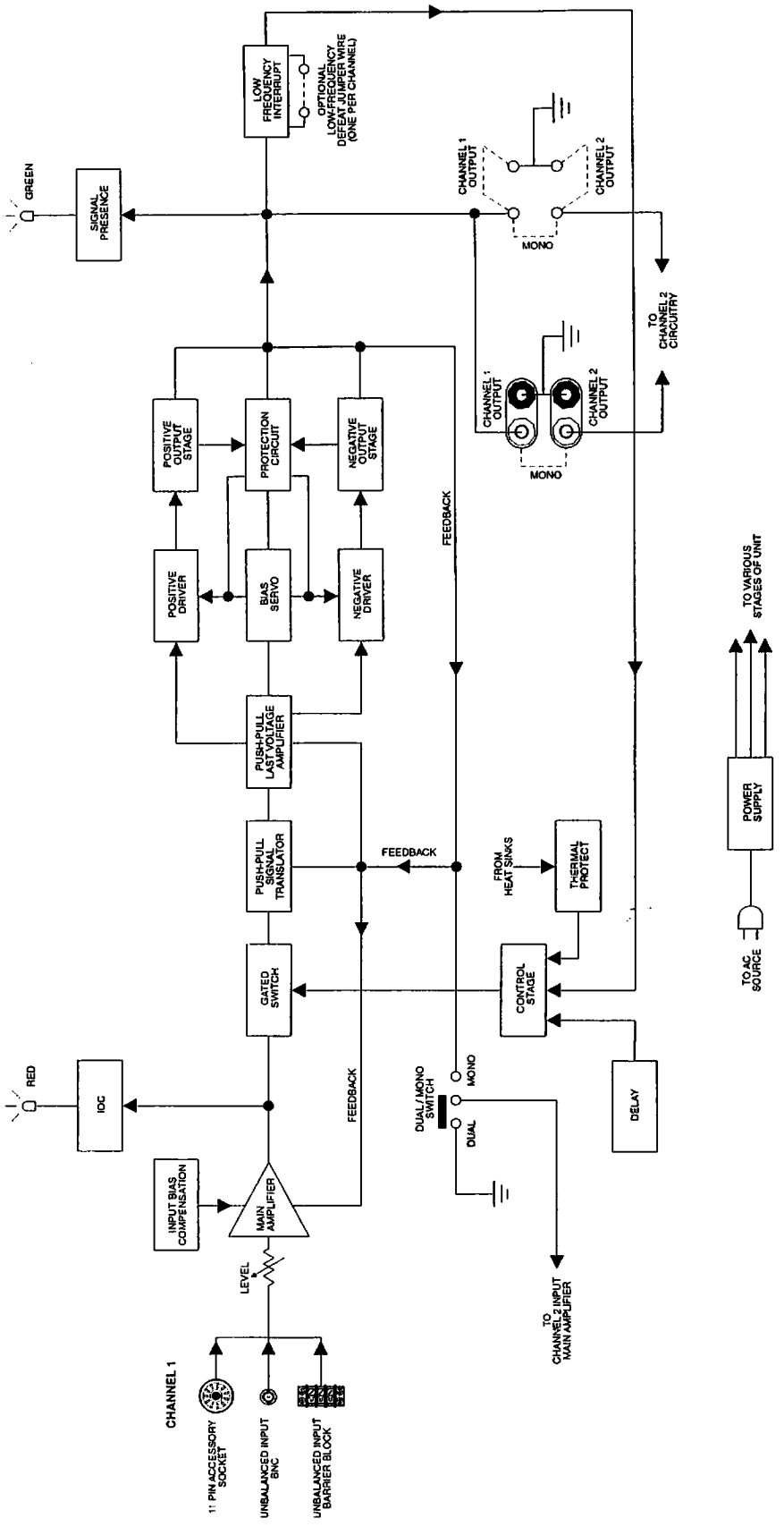
A pair of gated switches follow next in line and provide a method of controlling the signal path through the unit. When a signal is obtained from the control stage, these switches allow the signal to pass through the unit uninterrupted. However, should the Delay, Thermal or Low Frequency Interrupt circuits become activated, the control stage will cause the switches to open, blocking the signal from the output stages.

The Signal Translator stage, combined with the push-pull Last Voltage Amplifier, form a voltage amplifier stage of the 7520/7540. Virtually no voltage amplification is performed beyond these stages.

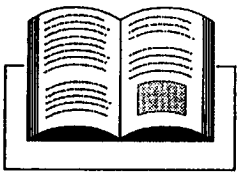
Current amplification circuitry consists of three stages: the Predriver, the Driver and the Output transistor stages. Connected to these is the protection circuitry which is activated when a predetermined amount of voltage and/or current is drawn across the output stage sense resistors. This protection signal is fed back to the limiting circuit which limits any increase in the bias servo voltage to the power devices. Feedback paths are indicated as such.

Before the signal reaches its final output destination, (banana output jacks or barrier strip), it confronts the Signal Presence indicator circuitry. Any time an output signal of 0.6 Vrms or more is detected, the green LED will light. Also at this point, a portion of the Channel 1 output signal is sent to the Dual/Mono switch where it will feed the input of the Channel 2 main amplifier when in the Mono mode.

The power supply is a continuous-duty type. The main DC supplies are full-wave capacitor input type with heavy duty chassis-heat-sinked diodes. The main amplifiers, thermal protection and other supplementary circuitry, are powered by zener regulated power supplies. The temperature compensated bias current source, along with the biasing of the push-pull signal translator stage, is from well regulated zener supplies. This results in accurate bias adjustment which eliminates distortion or noise due to line voltage variations.



7520/7540 Circuit Block Diagram



4.2 Detailed Circuit Analysis

Refer to the schematic in the back of the manual, as well as the block diagram on the previous page, for the following component-level discussions.

4.2.1 Input

The input signal enters 7520/7540 through the BNC jacks or the input barrier block. The signal travels first to the front panel Input Level control, R102, a 50 kΩ linear taper potentiometer. R101 then alters the response characteristics of R102 for the customary logarithmic result.

4.2.1.1 RF Protection

RF signals are kept from the front end circuitry by an 800 kHz low-pass filter consisting of R103 and C101. From there, the signal travels to the non-inverting side of the input IC operational amplifier, U1A. U1A includes a wide bandwidth and very low noise.

Connected to the inverting input of U1A, pin 6, are the components of the main feedback loop, R106, R109, and C103. These help determine the gain and frequency response of the amplifier while providing a path for the error correction signal explained next.

4.2.1.2 "Error Signal"

The main purpose of op amp U1 is to compare the input signal (pin 5) to a portion of the output stage signal fed back through a feedback path appearing on pin 6. The result is an "error signal" from the output of U1, pin 7. This "error signal" deviates from the input signal in a way that attempts to compensate for any non-ideal output device nonlinearities, such as signal clipping, faulty output device operation, etc. This process forces the output signal to always be exactly twenty times the input signal.

In fact, 7520/7540 includes several feedback loops, all of which contribute to the high performance of the amplifier. Other such loops will be described throughout this section.

C102, a 47 pF capacitor also connected to pin 6 of U1, is part of the frequency compensation circuitry used to help in stabilization of the circuit.

4.2.1.3 DC Offset, Temperature Dependency

To control any variable DC offset that may occur as a result of this stage, input and output offset controls (R104 and R108 respectively) provide adjustments for obtaining maximum zero DC offset at the output of the amplifier. This is achieved by applying small current signals to both inputs of IC U1. The output offset control, R108 and R208 is connected to the inverting input (pin 6). Q1 and related components also send a current signal to U1, through R105 and R104. This signal, however, is temperature dependent, tracking the current demand change with respect to the temperature change of U1. This circuit compensates for the change in current necessary to maintain a low offset voltage with respect to change in operating temperature of the unit.

4.2.2 Voltage Amplification

R110, 111, 112, and 113 form a voltage divider string, providing a bias voltage ultimately for the Signal Translator transistors Q101 and Q102. Between these two sections, however, are the transmission gates U2A and U2B. These act as analog switches which electronically control the signal path. When not activated, the bias voltage generated in the voltage divider string cannot reach the Signal Translator stage. This means all the stages that follow Q101 and Q102 will be dormant, including the path through to the output of the amplifier. This is the basis for the turn-on delay, as well as the thermal and optional low frequency protection, described later in this section.

4.2.2.1 Intermediate Feedback Loop

An intermediate feedback loop, encompassing everything from the Signal Translator stage to the output stage, consists of R115, R121, and C106. R118 and R119 are emitter resistors, helping to stabilize the operating point of the Signal Translator transistors.

4.2.2.2 Signal Translator Stage

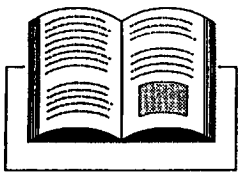
The Signal Translator stage, as well as the Last Voltage Amplifier stage, is of the push-pull type, providing a convenient method of utilizing the transmission gates. With the design, turn-on and turn-off occur without spurious noises or pops. The push-pull circuit design also helps to cancel distortion, and is capable of developing twice the current of other circuit designs to drive the output stage. The complementary signal translator circuitry, Q101 and Q102, develops the "voltage based" input signal into a "current based" signal at its collectors, free from the effects of power supply ripple. At R117 and R120, it is converted back to a voltage and is used to drive the Last Voltage Amplifier stage.

4.2.2.3 Last Voltage Amplifiers

The Last Voltage Amplifiers, Q104 and Q106, are the main source of voltage amplification in the unit. As already described, the input signal developed across R117 and R120 is the signal fed to the base of Q104 and Q106.

4.2.2.4 Current Limiting

Q103 and Q105 act as current limiting transistors, helping to limit the current to the Last Voltage Amplifier transistors when there is potential to exceed the recommended power dissipation level of Q104 and Q106. As the base-emitter voltage developed across R122 and R126 increases beyond its design level of 0.65 volts, Q103 and Q105 turn on, shunting or "pulling" the drive signal away from the last voltage amplifier transistors.



4.2.3 Output

The output signal from the Final Voltage Amplifier transistors provides the drive to the predriver (Q130, and Q132), driver (Q133, and Q134), and output transistor (Q135, and Q136) stages. This output configuration is referred to as the CROWN Multi-Mode™ circuit (TECHRON is a division of Crown, International, Inc.) .

At low output signal levels, the circuit functions in the Class A mode (predriver and driver stages biased on). At mid levels, it functions in the Class A+B mode (predrivers and drivers operate in Class A while output stage moves smoothly into Class B operation). And at high levels, it functions in Class B (predrivers and drivers operate in Class AB, while output stage operates in Class B).

At each level, the Multi-Mode™ circuit offers optimum performance in terms of extremely low distortion and circuit efficiency.

4.2.3.1 Bias Servo Circuit

Q129 is a thermally sensitive bias transistor, working to maintain a constant quiescent current through the driver stage, even when operating temperatures fluctuate. This bias-servo circuit also includes component parts R123, R124, R125, and R187. It controls the voltage supplied to the base of the predrivers as the unit's temperature varies. By doing so, it avoids thermal runaway.

4.2.3.2 Predrivers

The predrivers, Q130 and Q132, provide the correct "charge" current to the base of the driver transistors when called upon by the front end stage. R190, R192 and Q131 discharge or turn off the driver stage according to the signal polarity requirements. Part of the charge flows out through R190, while the rest flows across "charge-dumping" transistor Q131. This provides a smooth on/off action of the output stage without current spiking.

4.2.3.3 Slew Rate Limiting

Capacitors C133 and C134, connected across the predrivers, determine the slew rate limiting point for the maximum frequency that the output stage can tolerate.

The output transistors are NPN devices. Emitter resistors R194-195 stabilize the operating point in the output stage.

4.2.3.4 RF Protection

R196, R199, C137, and L101 form a terminator circuit providing a load for the output stage at high frequencies. This also helps eliminate RF signals at the output stage.

4.2.3.5 V-I Protection

The V-I Protection circuitry is composed of Q107 & 108, with R131, R135, R128, and R129. In the positive portion of the push-pull circuit, R131 and R128 form a voltage divider developing a voltage across the base of transistor Q107. Before the output current becomes dangerously high, Q107 is activated, shunting the current away from the predriver transistors. The negative portion of the push-pull circuit operates in the same way.

4.2.3.6 Protection Relative to History

C111 and C112 allow larger peak power signals to be handled by the output stages for short periods of time. If C111 and C112 are charged in a more positive direction, less current will be required to activate Q107 and Q108. But if C111 and C112 are charged in a less positive direction, more current will be required to activate the protection circuit. Thus, the history of the output is taken into account before limiting takes place.

D101 and D102 prevent improper flow through this circuit. C109, C110 and R133 help stabilize the protection circuit, particularly at low load impedances (below 2 ohms) where oscillations could occur.

4.2.4 Control

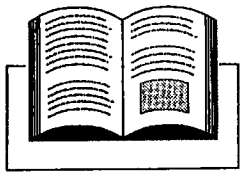
This stage is responsible for three areas of operation: thermal protection, low frequency protection, and turn-on delay. However, a large majority of the operation of this stage depends on the function of the logic circuitry.

4.2.4.1 Logic

As mentioned earlier, transmission gates U2 are the main components responsible for smoothly interrupting the signal path flow to the output stages and silencing the amplifier's output. The output from U5C, a triple AND gate, is connected to pins 12 and 6 of U2. In order for this AND gate to produce a logic "high" output, U5C must receive a logic "high" at all three of its inputs. Indeed, this is the desirable state for U5C during normal operation, so all three sections of the control stage must be functioning properly, and thus sending a "high" signal to the appropriate input.

4.2.4.2 Thermal Protection

Thermal protection in 7520/7540 is provided by an electronic device, Q111, mounted on the output stage heat sinks. This device converts temperature to a calibrated voltage to be used by the logic circuitry of the control stage. U4C, a comparator op amp, compares the signal established by the divider network R3, R4, and R5 (all fed to pin 4), to the signal from Q111 (fed to pin 5). When the voltage of the signal from Q111 is lower than the threshold voltage established with the wiper of R4, the output of U4C (pin 2) will be logic "low". The reverse is true when Q111 sends a higher signal voltage than that of the threshold point, forcing the output of U4C "high". The latter condition exists during normal operation. Finally, to prevent erratic switching, U4D is connected to U4C, providing a "hysteresis" in the comparator circuit.



4.2.4.3 Low Frequency Protection

7520/7540 is shipped with the Low Frequency Protect feature disabled. To enable the circuit, remove jumpers across Capacitors C115 & C215 on the Control Board .

The Low Frequency Protection circuitry, when activated, consists of U6B (an exclusive OR gate) and its closely related components. If both of the inputs of U6B (pins 5 and 6) are logic "high" or both are "low", then the output (pin 4) will be logic "low". If one input is high and the other low, the output will be high. Under normal operation, the output is high. This meets the requirements of U5C, described in Section 4.2.4.2. For example, if no DC or low frequency information is detected at the input of U6B, the voltage potential on pin 5 will be more positive than that of the voltage on pin 6. This is due to the voltage divider networks R145, R147, and R146, R148 connected to the +/- VCC supplies. With the difference of potential now across the input of U6B, the output will be logic high and the conditions for normal operation (from the standpoint of low frequency protection) will have been met. However, should a DC voltage exist at the input, both pin 5 and pin 6 will appear as logic high, forcing the output at pin 4 to become logic low. With one of the inputs of U5C now low, the output will also be low, shutting down the transmission gates and removing the signal to the output stage. R114 and C115 determine the roll-off point for the Low Frequency Protection circuitry. It activates at DC outputs greater than 10 V or low frequency outputs greater than 10 V at 2 Hz.

4.2.4.4 Delay

Turn-on delay is accomplished with U5A, the other third of the 3-input AND gate. C5 and R17 form a timing circuit, responsible for the four-second delay upon power-up. When the unit is turned on, the relay K1 is energized, removing the short from C5. This in turn allows C5 to slowly become charged from R17. When fully charged, a logic high signal will appear at pin 11 of U5A. Since pins 12 and 13 are tied together to the +9 volt supply (logic high), the output of U5A, pin 10 will appear high, satisfying the input conditions for U5C. When the output of U6B is low, signifying a low frequency input problem, it pulls the charge away from C5 through D109. This causes the output of U5A to go low, thus causing the transmission gates to remove signal to the output stage. Because the output stage is no longer active, the Low Frequency Protect circuit, when activated (See Section 4.2.4.3. "Low Frequency Protection"), will not sense a problem, and the four-second turn-on delay cycle will automatically repeat. This process will continue until the low frequency problem is solved. R15, R16, C12, and C13 are decoupling components for the +/- 9 volt supply, providing additional filtering.

4.2.5 Display

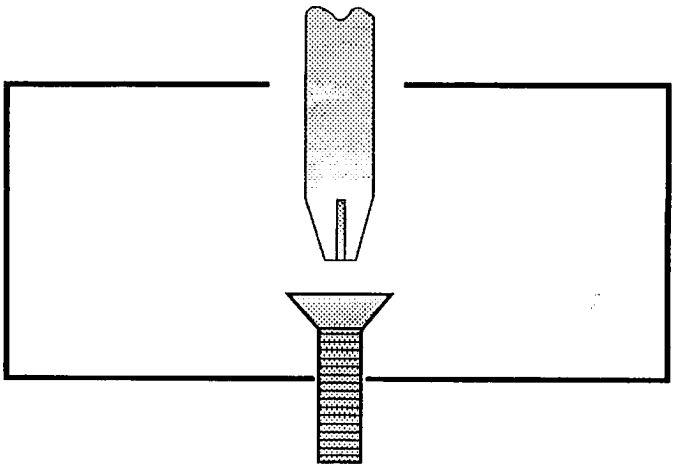
All displays are Light Emitting Diodes. The power LED is amber. It operates from the +VCC supply through a 3.3 kΩ resistor.

4.2.5.1 Signal Presence

LED 105 is the green Signal Presence Indicator and illuminates any time the voltage measured at the output stage and applied to the base of Q126 and Q127 reaches 1 or more volts. Both positive and negative signal excursions will be indicated with this full wave detector circuit.

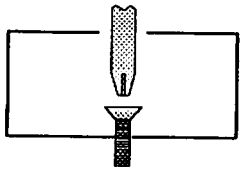
4.2.5.2 IOC Display

The IOC display is actually a window comparator circuit using one quad op amp, U3. Any small nonlinearity in the amplifier causes an error in the feedback loop to appear at the output of IC U1.This means the output of U1A, pin 7, will rise above its normal value in an attempt to correct the problem. This "error signal" is responsible for raising the input voltage on U3 and in turn activating Q109 which illuminates LED 101. R139 and C113 form a pulse stretching circuit to hold the LED on for approximately one second, even if the nonlinearity exists for only a few microseconds.



Section 5—Component Removals/Replacements

Failed components may need to be removed, seviced, and reinstalled or replaced. Use this information for removing and reinstalling such components.



5.1 Introduction

From a mechanical stand point, servicing the 7520/7540 is straight forward. Refer to Section 7, where the exploded view assembly drawings show the relationship of all parts, modules, and assemblies.

This section has two purposes:

- ❑ To review important safety information for the protection of both equipment and service personnel.
- ❑ To identify several assembly and disassembly procedures that might not be apparent from a study of the Exploded Views in Section 7.

5.2 Important Safety Information

The 7520/7540 operates from High Voltage AC mains. In addition to physical hazards to service personnel, certain electrical conditions could cause damage to components.

⚠ DANGER

The amplifier carries potentially lethal voltages even after the main power supply has been disconnected. If covers are removed, disconnect AC power and discharge the power supply capacitors.

To discharge capacitors, place a 10 ohm 10 watt resistor across positive and negative terminals of each of the two capacitors for at least 5 seconds each. Do not touch leads of resistor or capacitor terminals.

5.2.1 Power Down Procedure

Before attempting to service the amplifier, shut down the outside power supply as described below:

1. Turn off the power.
2. Disconnect the AC mains plug from the AC power source.
3. Wait two minutes for capacitors to discharge before touching any part of the amplifier.
4. Remove the bottom cover (see Section 5.4.2) to expose the power supply capacitors.
5. Verify the capacitor discharge by connecting a voltmeter across the (+) and (–) terminals of the power supply capacitors (two places).
6. The voltmeter should give a reading of less than 50 volts.
7 If voltage is above 50 V, discharge capacitor by placing a 10 Ω, 10 W resistor across the positive and negative terminals of the capacitor for at least five seconds.

5.3 Visual Inspection

Visually inspect Model 7520/7540 regularly during normal operation, and at the beginning of any troubleshooting procedure. For a complete yet efficient visual inspection, follow these instructions:

1. Check all external screws. Be sure these are tight and none are missing.
2. Check all fuses and circuit breakers.
3. Check switches, knobs, jacks and other connections. Be sure these operate smoothly and properly, and that none are loose.
4. Inspect line cord for possible damage to cap, jacket and conductors.
5. Remove top and bottom covers as outlined in Sections 5.4.1 and 5.4.2.
6. Check that all attaching parts for internal circuits are tight and that none are missing.
7. Inspect wiring and internal components for evidence of charring or discoloration. These may indicate previous overheating.
8. Check all electrical connections, including wire terminals, screw and stud type terminals, and all soldered connections.
9. Check for obvious destruction of internal structural parts.

Note: The interior of Model 7520/7540 normally looks neat and orderly. Physical distortion or disorder of wiring or other components may indicate damage from severe shock, from being dropped, or from previous improper repair procedures.

5.4 Parts Replacement

The 7520/7540 includes many stock electrical and electronic parts, which are available from electronic supply houses. However, some electronic parts that appear to be standard are actually special. Order parts from TECHRON to assure acceptable replacement and reliable operation. Structural items, covers, and panels are available from TECHRON only.

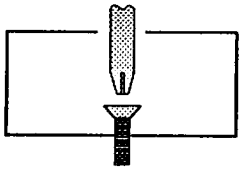
⚠ CAUTION

After replacement of any electronic component in the amplifier, insure proper operation by performing check-out procedures as described in Section 6.

5.4.1 Top Cover Removal/Installation

Note: Cover screws are not uniform in size. Be sure to note proper location of screws.

1. Remove the screws (5 machine & 7 metal) & washers from the top cover.
2. Gently lift and remove the cover.
3. To install the top cover, align the mounting screw holes.
4. Install the screws in their proper location.



5.4.2 Bottom Cover Removal/Installation

Note: Cover screws are not all the same. Be sure to note the proper location of screws.

1. With the unit inverted, remove the mounting screws (5 machine & 7 sheet metal) and their washers from the bottom cover.
2. Lift and remove the cover .
3. To install, hold the cover in place, aligning mounting screw holes.
4. Install the mounting screws and their washers and tighten securly.

5.4.3 Main Board Removal/Installation

1. Remove top and bottom covers as described in Sections 5.4.1 and 5.4.2.
2. Remove the six phillips head screws and internal star washers which secure back panel.
3. Slide back panel to either side as far as it will go, permitting the opposite end of the panel to clear its mounting slot.
4. Allow the back panel to drop down as far as the connecting wires will allow.
5. Gently lift the four release tabs of the main board support brackets located in each corner of the main board.
6. Pull board away from the mounting pegs, applying equal pressure to the edges.
7. For more complete removal of main board, note locations of soldered wires and disconnect.

5.4.4 Front Panel Removal and Installation

(provides access to display board, bridge rectifier, and output monitor jacks.)

1. Remove sheet metal screws and loosen the machine screws at the edge of the top and bottom covers.
2. Remove the four phillips head mounting screws and internal star washers (2 on each side) which mount front panel to side panels.
3. Taking care not to damage internal wiring still connected to front panel, gently pull front panel straight back, away from the unit.
4. Display board, bridge rectifier block, output monitor jacks, and input level control are now exposed.
5. To remove display board, squeeze small release levers of each mounting peg, and pull display board straight out, away from mounting pegs.
6. For complete removal of display board, unsolder three multi-colored wires, noting locations for reconnection. Refer to component board and schematics in Section 7 for reconnection locations.

Installation of Front Panel-Mounted Components and Front Panel

7. To install display board, carefully align on mounting pegs and press gently until pegs latch.

   Note: If wires have been unsoldered from display board, consult previously noted wire locations, component board, or hard wiring schematics for exact locations.

8. Using care to protect wires, place front panel in position on unit.

9. Install two phillips head mounting screws and internal star washers on each side of the front panel. Tighten securely, but do not overtighten.
10. Install sheet metal screws and tighten machine screws on the top and bottom covers.

5.4.5 Control Module Removal

1. Remove top cover.
2. Locate the control module at the front left of the unit.
3. For adequate access to control module, remove 4 phillips head screws and washers from left side panel.
4. Squeeze release levers of mounting pegs and pull board upward away from mounting plate.
5. For complete removal of control module, disconnect the multi-colored wires soldered to it, noting their location for reconnection.

Control Module Installation

6. If wires have been disconnected from control module, refer to previously noted locations, or component board layout, or check accuracy of schematic in Section 7. Following these notes, solder wires to correct locations on control module board.
7. Carefully align control module board on mounting pegs and gently press into place.
8. Install left side panel using 4 phillips head screws and their respective internal star washers.
9. Install top cover.

5.4.6 Output Module Removal

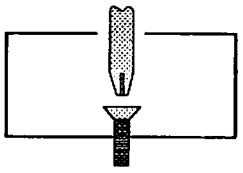
(includes output transistors removal)

1. Remove top and bottom covers.
2. For easy access to output boards, detach heat sink assembly by removing three phillips head mounting screws on the rear panel and the three mounting screws on the side panel.
3. Remove output transistor cover panels by sliding them up and out of their slots.
4. To remove an individual output transistor:
   - Unsolder the two leads of the transistor,
   - Remove its two phillips head mounting screws and star washers.
5. To remove an entire output board:
   - Remove two output transistors as described in step 4.
   - Disconnect all wires connected to this board, noting their location for future reconnection.

Output Module Installation

(includes output transistor installation)

6. To install a complete output board:
   - Refer to noted wiring locations or schematics in Section 7 for wiring locations.
   - Attach wires to proper locations on output board.
   - To mount board on heat sink, install output transistors as described in step 7 below.



Note: Output transistor mounting screws hold output board in place.

7. To mount an output transistor:
   - Apply heat sink compound lightly and completely to transistor mounting surface as well as both sides of insulating wafer.
   - With insulating wafer between transistor and heat sink surface, attach transistor to heat sink using two phillips head mounting screws and star washers.

⚠ CAUTION

To avoid damage to foil traces on output board, do not overtighten transistor mounting screws..

   - Solder output transistor leads in place.

5.4.7 Thermal Sensor Transistor Removal

1. Observe bending of thermal sensor transistor leads for ease in installing replacement.
2. Pull thermal sensor transistor out of recess.
3. Unsolder leads and remove.

Thermal Sensor Transistor Installation

4. Bend leads to fit recess, observing previously installed thermal sensor transistor for pattern.
5. Apply heat sink compound to transistor body.
6. Insert into recess.
7. Solder leads.

5.4.8 Bias Servo Transistor Removal

Bias Servo is located near Thermal Sensor Transistor. Removal and installation are similar. See the previous Section (5.4.7) for Bias Servo Transistor Removal and Installation.

5.4.9 Power Supply Capacitor Removal

1. Remove top and bottom covers.
2. Discharge capacitors as follows: Place 50 ohm/10 watt resistor across positive and negative terminals of each capacitor for at least 5 seconds. Do not touch capacitor terminals or resistor leads during discharge procedure.
3. Remove front panel as described in Section 5.4.4, steps 1–4.
4. Remove phillips head screw supporting bridge rectifier block.

Note: This relieves the nut and solder lug that are attached to the back side of this panel and in turn to the capacitor board.

5. Remove right side panel by removing two #10 machine screws, three #10 sheet metal screws, two #8 machine screws and star washers. Be sure to keep screws sorted for later installation.
6. Using diagonal cutters, snip each of the four heavy duty tie wraps supporting the capacitors.
7. For access to capacitor screw terminals, slide assembly sideways.
8. For complete removal of capacitor assembly, disconnect wires soldered to board, noting their location for reconnection.

Power Supply Capacitor Installation

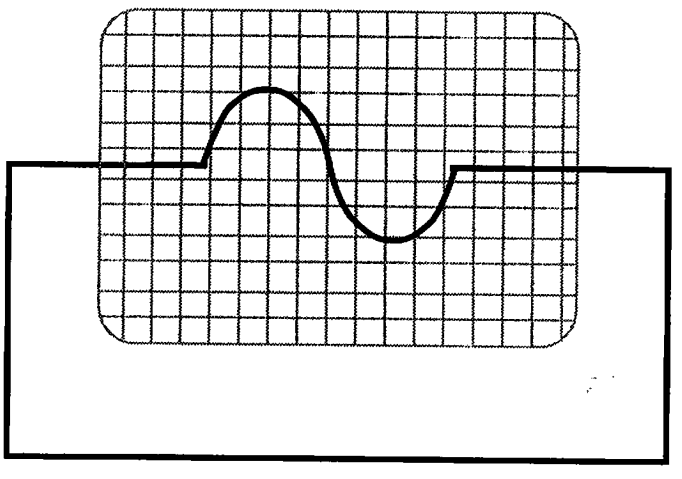
9. If wires have been unsoldered from board, refer to previous notes or schematic in Section 7 for proper wire location. Solder wires in place.
10. Using four heavy duty tie wraps (these are standard heavy duty tie wraps and are generally available), secure capacitor assembly snugly in place. Trim any excess from tie wraps.
11. Install right side panel, using seven phillips head screws and star washers.
12. Install phillips head screw in bridge rectifier block. Place solder lug attached to resistor R1 over mounting screw, then attach nut and tighten.
13. Install front panel as described in Section 5.4.4 steps 8, 9 and 10.
14. Install top and bottom covers.

5.4.10 Power Transformer Removal

Power transformer failure is highly unlikely in this unit and transformer replacement involves virtually complete disassembly of the amplifier. The most effective method of servicing this component is to return the amplifier to TECHRON Service Department. If transformer replacement must be made outside the TECHRON Service Department, follow all disassembly instructions in this section carefully, noting all wire locations and using care in sorting and labeling parts for reassembly.

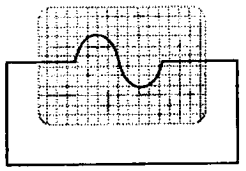
5.4.11 Back Panel Parts Replacement

1. Loosen two screws on both the top and bottom covers.
2. Remove back panel as described in Section 5.4.3, steps 2, 3, and 4.
3. Back panel components are now accessible and may be repaired or removed, using ordinary repair and removal procedures.



Section 6—Adjustments and Tests

This section describes the tests and adjustments you may need to perform following other service activities such as parts replacements.



6.1 Equipment Requirements

In addition to standard hand tools and electronic test equipment, the following specialized equipment is required to perform the tests in this section. Using the equipment listed will help you test and adjust the ampifier to factory specifications. Any compromises in equipment could result in unsatisfactory performance or calibration.

Equipment Needed	Recommendation
1. Oscilloscope Dual Channel Vert. Sensitivity - 2mV/div Vert. Frequency DC-15 MHz	Tektronix 2215A Hewlett-Packard 1740A Phillips PM3207
2. Audio Signal Generator Sine/Square Output-3 Volts RMS into 600 ohm load, 1%THD	Wavetek 193 Khrohn-Hite 1000, 1200
3. AC Voltmeter 20Hz-4Mhz Sensitivity-100μV FS ±1% Accuracy 20-20kHz	Hewlett-Packard 400F Amber 3501 Sound Technology 170B/1710A
4. Digital Voltmeter AC/DC Volts-1mV-100v AC/DC Amps-10mAmps-10 Amps Ohms-.1 ohm-10Mohms	Data Precision 248/1350,1351 Fluke 8020B Fluke 8060 series
5. Intermodulation Distortion Analyzer IM capable of .003% 60Hz/7kHz THD capable of .01% 20Hz-20kHz	Amber 3501 Technology 17701A, 1700 series Hewlett-Packard 339A
6. Variac or Autotransformer 0-140 volts 20 Amp capacity 0-260 volts 10 Amp capacity	Various Gen Rad. Models, Superior Electric Models or equivalent.
7. Peak-Equivalent Line Voltage Monitor	See schematic in Section 6.2 for construction details.
8. Bandpass Filter 20-20kHz, 18dB/Octave rolloff	Sound Technology 170 or equivalent.
9. Resistive Loads 8 ohms-1kW 4 ohms-2kW 2 ohms-500 W	Construct from Dale NH-250 series, 1% resistors.
10. Non metallic screwdriver	GC 8276 or 8277
11. Plug-In Extender Board	Crown Part M41471-0
12. Precision Current Shunt	1% resistor

Recommended Test Equipment

6.2 Pretest Procedures

This section warns and cautions you about the testing environment. Follow these procedures to help ensure your safety and provide proper testing of the amplifier.

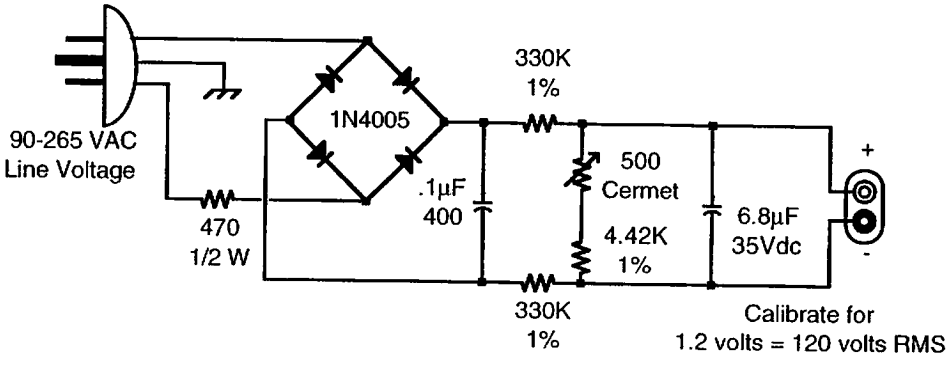
⚠ WARNING

An *ELECTRIC SHOCK* hazard exists within the enclosure. Observe safety policy as outlined in Section 5.2.

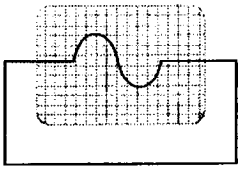
⚠ CAUTION

To avoid ground loops in test equipment, do not connect output ground to input ground, especially when testing distortion.

Improper AC line voltage can affect the results of some tests. Therefore, you will want to monitor the line voltage, then take appropriate corrective measures if needed (adjust the AC supply using a variac or autotransformer). The circuit below represents a peak-equivalent line voltage monitor you can construct and use, along with a high-input-resistance DC voltmeter ($3^1/_2$ digit, digital voltmeter preferred), to monitor the AC line voltage.



Peak-Equivalent Line Voltage Monitor



6.3 Test Procedures

This section describes procedures for testing proper amplifier operation. Follow these procedures after any repair involving amplifier circuitry, or to help identify the cause of a particular problem. Unless otherwise specified, all tests and adjustments are done in the Controlled Voltage mode.

6.3.1 Four Second Delay Test

PROCEDURE:

Load: None.

With the power switch in the "Off" (out) position, connect the required input line power and check accuracy with a digital voltmeter. Turn the unit on and then off again while listening for the "click" of the relay becoming activated. This process should take about four seconds each time the unit is turned on.

> ***Note:*** The red STANDBY light should remain on during the four second delay period.

6.3.2 DC Output Offset

Input: None.

Load: None.

Set the output offset of power section 1 and 2 on main board (R108 & R208).

PROCEDURE:

1. Measure from ground to the circuit board side of heat sink resistor R22. Adjust R108 for 0VDC ± 10mVDC.
2. Measure from ground to the circuit board side of heat sink resistor R21. Adjust R208 for 0VDC ± 10mVDC.

> ***Note:*** These controls (R108 and R208) may interact, therefore, rechecking after adjustment is necessary.

6.3.3 Gain Balance Adjuster

Load: None

Signal: 1 kHz sine wave

Set the gain trim pot R28 by either adjusting it for minimum quiescent power or minimum AC output measured between output wells at the circuit board side of R21 and R22.

Following Gain Adjust, recheck R108 and R208 readings as described in 6.3.2.2 above for power section 1 and 2.

6.3.4 Check Bias Voltage

Load: None

Measure the bias voltage across Output Board resistors R191 and R291. Voltage should read 430mV ± 20mV. If reading is out of range, re-adjust the bias controls R124 and R224 on Main Board.

6.3.5 Set Thermal Voltage

The proper thermal voltage setting depends upon the grade number of the specific thermal sensor installed in the unit under test. Table 7-1 shows the relationship between sensor grades and thermal voltage.

1. Locate the thermal sensor grade number (Q 111; Q 211). The number is either printed on a white label attached to the output board or clearly inscribed on the sensor itself.
2. Measure voltage between ground and wiper of R4 (on Control Board). Adjust voltage to proper level as per Table 7-1.

Thermal Sensor Grade Number	VDC
596	0.485
597	.486
598	.487
599	.488
600	.489
601	.490
602	.492
603	.493

Table 7-1 Thermal Sensor Voltage Chart

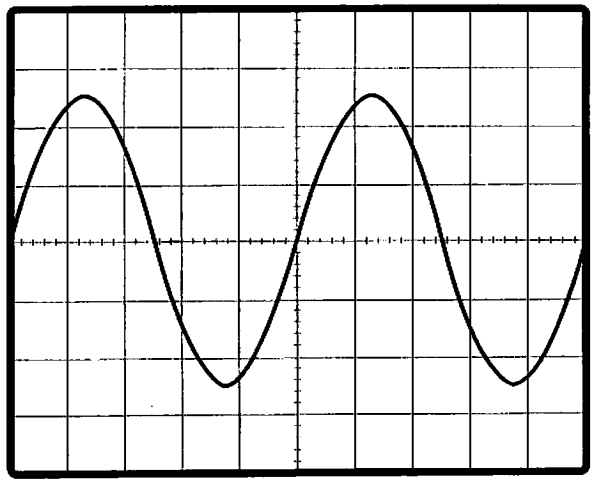
6.3.6 Power Response (at 120VAC)

Load: Begin with 4 ohm

Signal: Begin with 1 kHz sine wave

Under various loads and different signals, you will apply input voltage and observe the resulting waveforms. With all signals except the 10 kHZ square wave, power input will be approximately 2V rms. For the final test with the 10 kHZ square wave, peak power input should be about 1.0V rms.

1. With 1 kHz into 4 Ω the signal should reach 25 VAC before clipping and look like the waveform in the illustration below.

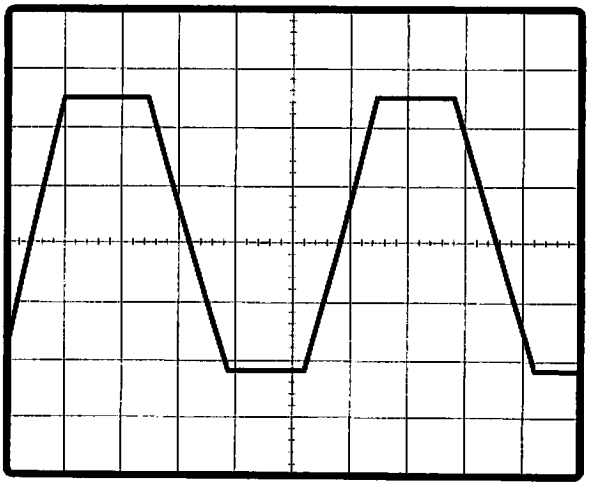


Sine Waveform Before Clipping

2. With 20 kHz into 4 Ω the signal should reach 25 VAC before clipping and look like the waveform in the illustration above.

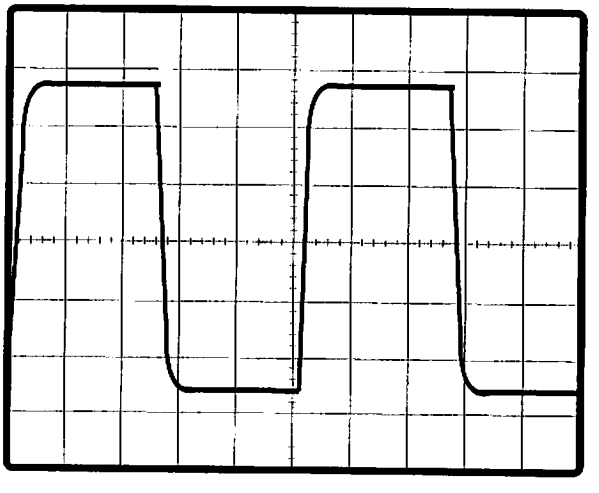
3. With 1 kHz into 2 Ω the signal should reach 23 VAC before clipping and look like the waveform in the illustration above.

4. With 1 kHz into 1 Ω the signal should reach limiting and look like the waveform in the illustration below. Only observe this momentarily because the fuse may blow!



Limit Waveform

5. With 10 kHz into 4 Ω the signal should look like the waveform in the illustration below. The waveform must be clean with no overshoot or ringing.



Clean Square Waveform

6.3.7 Protection - Thermal Test

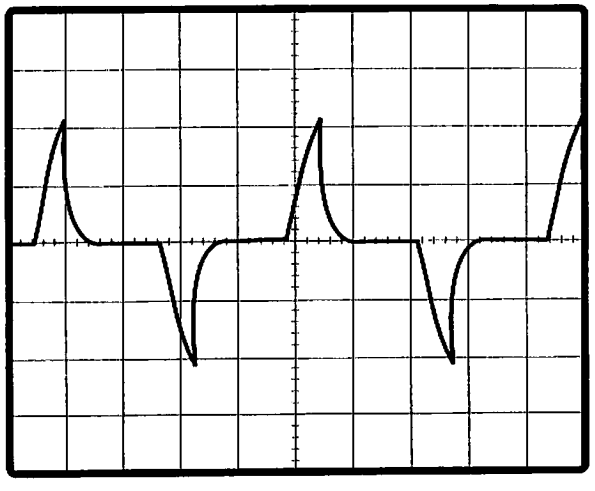
Check both thermal shut-off output transistors Q111 and Q211 by shorting the emitter to the collector. The unit should go into standby. The Standby signal should go on and should remain lighted until short is removed.

6.3.8 Protection - Inductive Load

Load: 4 ohm in parallel with an inductive load of 80 uh.

Signal: 1 kHz sine wave.

At input of approximately 2V rms, you should obtain an inductive distortion-free waveform as shown in the illustration below.



Protection Inductive Waveform

6.3.9 Protection - Short Circuit

Signal: .5 Hz square wave

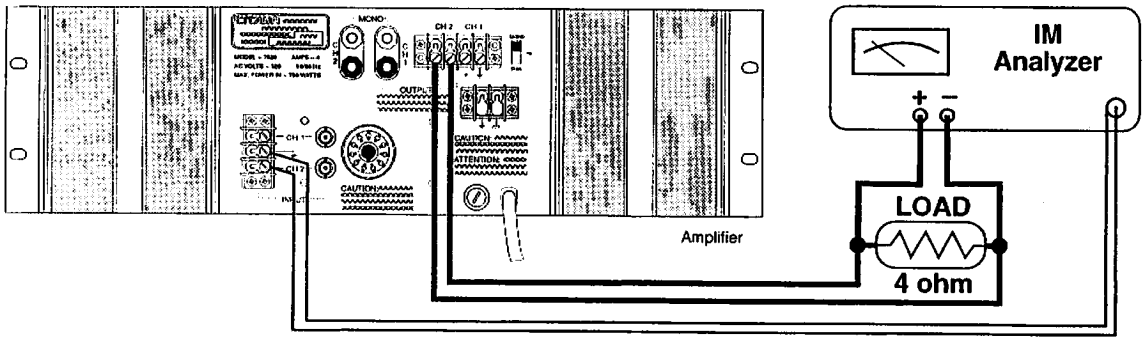
Set input level to 2V rms. Short positive and negative outputs together. Continue test until automatic shut down. Standby light will remain lit until unit cools. Unit should start up again after cooling.

6.3.10 Intermodualtion (IM) Distortion

Load: 4 ohms

Signal: See Illustration below for the hook-up of a 60 Hz/7 kHz signal summed in a 4:1 ratio for IM check.

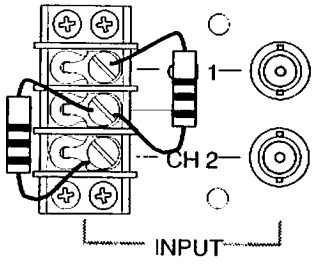
Adjust input level for output voltage of 20V. Readings on an Intermodulation Distortion Analyzer should be less than .01% from 0-25 db, and less than .05% from 30-40 db for each channel. Hookup for channel 2 shown below.



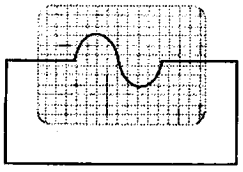
Typical 60 Hz/7 kHz IM Hookup

3.11 Signal to Noise Ratio

1. See Illustration below for hook-up of 1K input terminator.
2. Install a 20 Hz - 20 kHz bandpass filter ahead of the voltmeter. Turn input level controls both fully counterclockwise. Output signal should be no more than 0.6 mV (0.5mV for Model 7540) of noise.



1 KΩ Input Terminator Hookup



6.3.12 Quiescent Power

Load: None

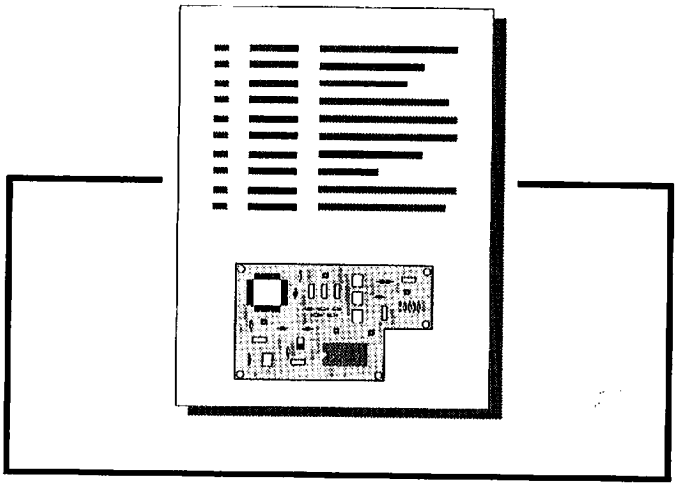
The quiescent power of the unit should be approximately 60 watts (about 70 watts for Model 7540).

6.3.13 Voltage Monitor Output

Load: None

Signal: 1 kHZ sine wave

At power input of approximately 1V rms (1.5 V rms for Model 7540), check the voltage monitor output. The signal should be present at the same amplitude and phase as the output signal. Loads of less than 300 ohms should not be connected to the monitor.



Section 7—Parts and Schematics

This section provides a complete graphic summary of parts used in the 7520/7540 amplifier including board layouts and exploded views to aid in service procedures.

7.1 General Parts Information

This section includes illustrations, schematics, and parts lists for the Model 7520/7540 Power Supply Amplifiers. This information should be used with the service, repair and adjustment procedures in Sections 5 and 6.

Mechanical and structural parts are illustrated and indexed on exploded view drawings. Electrical and electronic parts are listed and indexed in both the exploded view drawings and the schematic parts lists.

7.2 Standard and Special Parts

Many electrical and electronic parts used in Model 7520/7540 are standard items stocked by and available from electronic supply houses. However, some electronic parts that appear to be standard are actually special. Order parts from TECHRON to be sure of a workable replacement. Structural items, covers and panels are available only from TECHRON.

7.3 Ordering Parts

TECHRON, a division of Crown International, supplies parts through the Crown International Parts Department. Replacement parts are obtained from the following address:

Crown International
Parts Department
P.O. Box 1000
Elkhart, Indiana 46515

Phone: (219) 294-8210
FAX: (219) 294-8301

When ordering parts, be sure to give the model and serial number and include the part description and Crown Part Number (CPN) from the parts list. Price quotes are available upon request.

7.4 Shipment

Shipment will be made by UPS or best method unless a preferred method is specified. Shipments are made F.O.B. Elkhart, Indiana, only.

Shipments to Techron should be made as described below:

Techron
Customer Service Department
1718 West Mishawaka Road
Elkhart, IN 46517-4095
U.S.A.

Phone: 219-294-8315
Fax: 219-294-8301

7.5 Terms

Normal terms are C.O.D., Master Card, or Visa, unless the order is prepaid. If prepaying, please add an amount for the freight charge. Established accounts will have large orders shipped freight prepaid and billed net 30 days. All others, shipped freight collect.

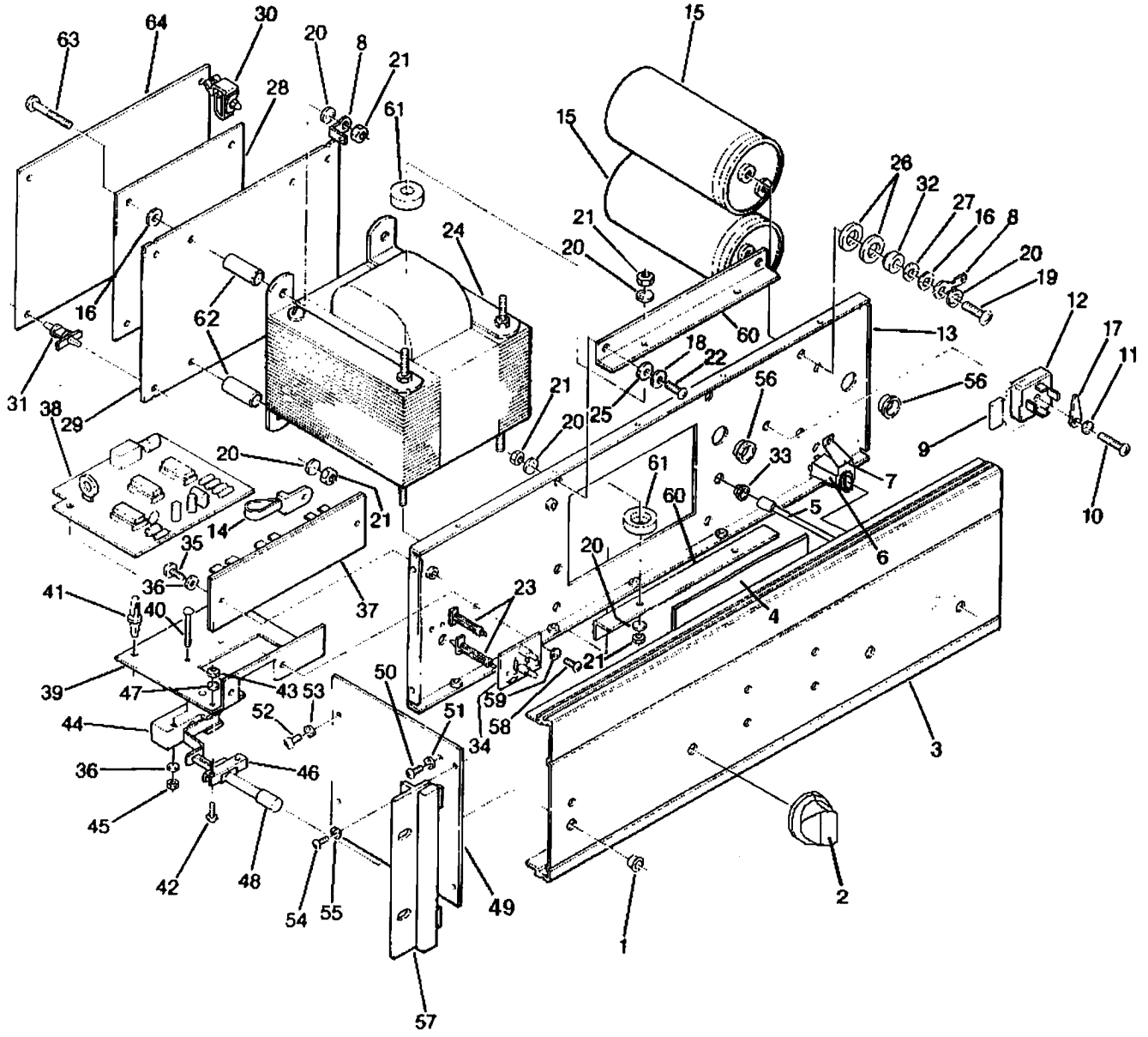
Parts prices are subject to change without notice. New parts returned for credit are subject to a 10% restocking charge.

You must receive authorization from the Crown Parts Department before returning parts for credit. Please state reason for returning.

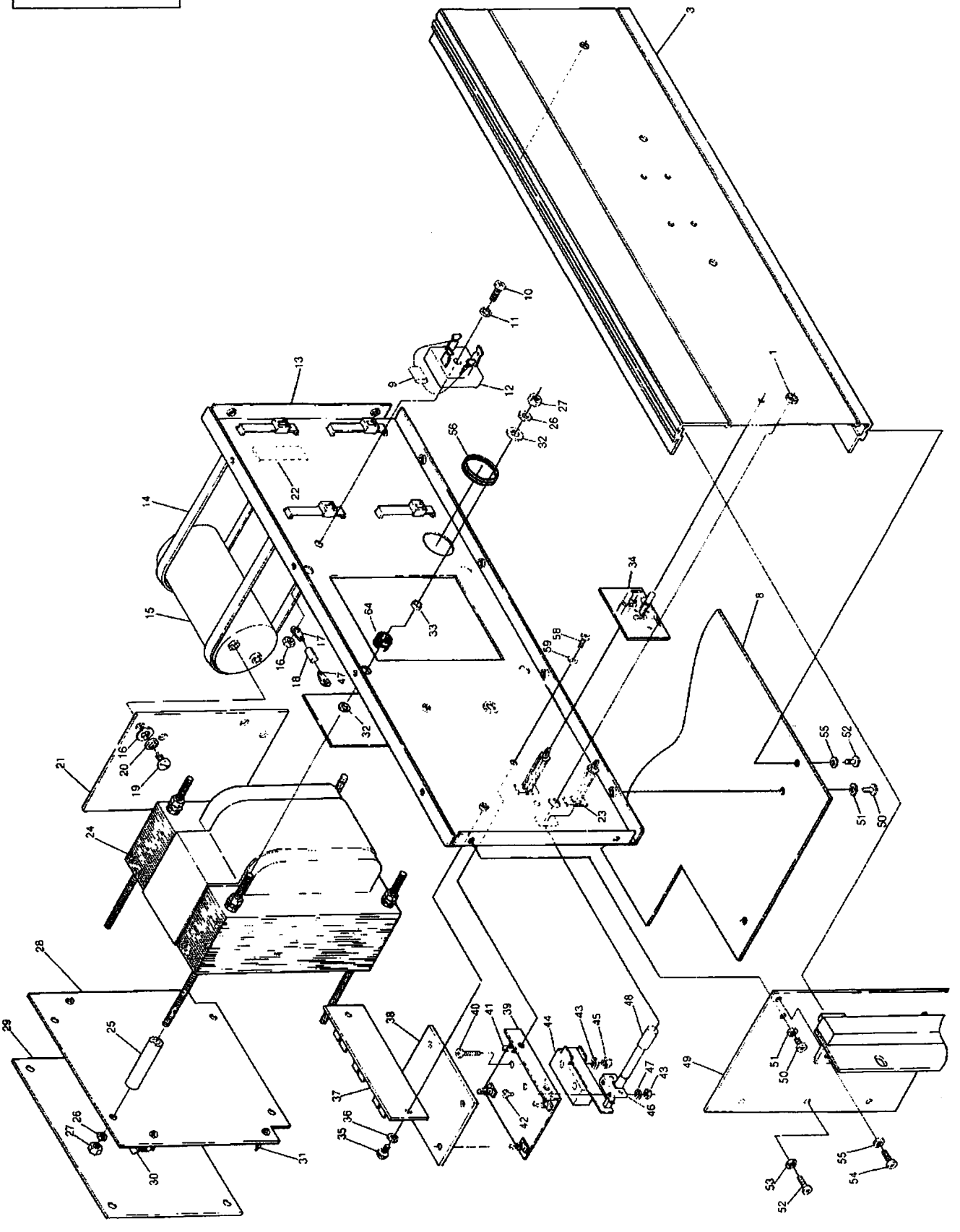
7.6 Front Panel Exploded View

ITEM #	PART #	QTY	DESCRIPTION
1	D 4108-3	1	.35" Round Collar
2	A10891-4	2	KNOB, 1.25, Tan
3	F11312J9	1	Panel Front (Model 7520)
	F11313J7	1	Panel Front (Model 7540)
4	Q42450-9	1	Display PC Board
5	F10691-8	2	SHAFT, .250" x 7.6" (Model 7520)
	F10690-0	2	SHAFT, .250" x 7.6" (Model 7540)
	F11658-6	2	COUPLER, SHAFT .257 ID
6	C 3507-8	1	PHONE Jack, 3-Cond, Isolated
	A10094-11	1	.507 X.391 INT STAR WASHER
	A10102-17	1	.37 X 32 JAM NUT
7	F11209-8	1	BRKT, Phone Jack Mounting
	C 5893-0	2	3/32 MOUNTING BUTTON

ITEM #	PART #	QTY	DESCRIPTION
8	D 3312-2	3	806SOLDR LUG #10HOLE
	F10175L6	2	Cover, Top and Bottom
9	C 8426-6	1	.1MF 200V 10% Film
10	A10086-10814	1	8-32 x .87" RH PH Machine Screw
11	A10094-6	3	#8 Internal Star Lockwasher
12	C 4305-6	1	35A Bridge Rectifier
13	M20231A1	1	Subfront Panel (Model 7520)
	M20230-5	1	Subfront Panel (Model 7540)
14	C 1811-6	1	4" CABLE TIE (Model 7520)
	C 5894-8	4	15" CABLE TIE (Model 7540)
15	C 6038-1	2	20,000 MF 55V (Model 7520)
	C 3436-0	2	13,500 MF 70V (Model 7540)
16	A10100-16	20	7/16 OD x .203 ID Washer
	A10102-6	2	8/32 Hex Nut (Model 7540)
17	D 2934-4	3	389SOLDR LUG.218HOLE
	D 3312-2	2	#10 Solder Lug (Model 7540)
18	A10100-17	4	562 X 250 X 047 Washer
	C 6046-4	1	2.7 Ω 2W 10% wire
19	A10087-11008	4	T10 32 .50 A S MSCR
20	A10094-8	11	#10 Internal Tooth Lockwasher
21	A10102-8	12	10/32 HEX NUT
	P9979A7	1	Filter PC Board (Model 7540)
22	A10087-31010	4	10-32 X .62 TRHD PH Screw
	S 2693-0		Foam Tape (Model 7540)
23	C 5895-5	2	1-1/8 Lock Board Support
24	D 5695D0	1	Power Transformer (Model 7520)
	C 5660C6	1	Power Transformer (Model 7540)
25	A10224-3	4	GROM .375 Grooved (Model 7520)
	A10100-20	4	.5 x .25 x 1.4" Spacer (Model 7540)
26	D 7001-7	8	.525X.730X.125 NYLON WSHR (FR)
	A10094-9	8	.25 Int. Star Washer (Model 7540)
27	A10101-24	4	750 X 440 X 015 FIBER WASHER
	A10102-13	8	.25 x 20 Hex Nut (Model 7540)
28	F10152A9	1	Main Shield (Model 7520)
	F10183A4	1	Main Shield (Model 7540)
29	F10059E8	1	Main Board Plate (Model 7520)
	F10037C8	1	Main Board Plate (Model 7540)
30	C 5896-3	2	PC Board Retainer
31	C 5897-1	2	Flexible Board Support
32	D 7142-9	4	Cap Washer .343X.325X.025
	A10100-22	16	.625" Steel Washer (Model 7540)
33	C 6784-0	2	COLLAR, .250" SHAFT (BEARING)
	A10191-3	4	.375-4 SNAP BUSHING
	C 5931-8	4	.250x.375x.187" Spacer (Model 7540)



Model 7520 Front Panel Exploded View

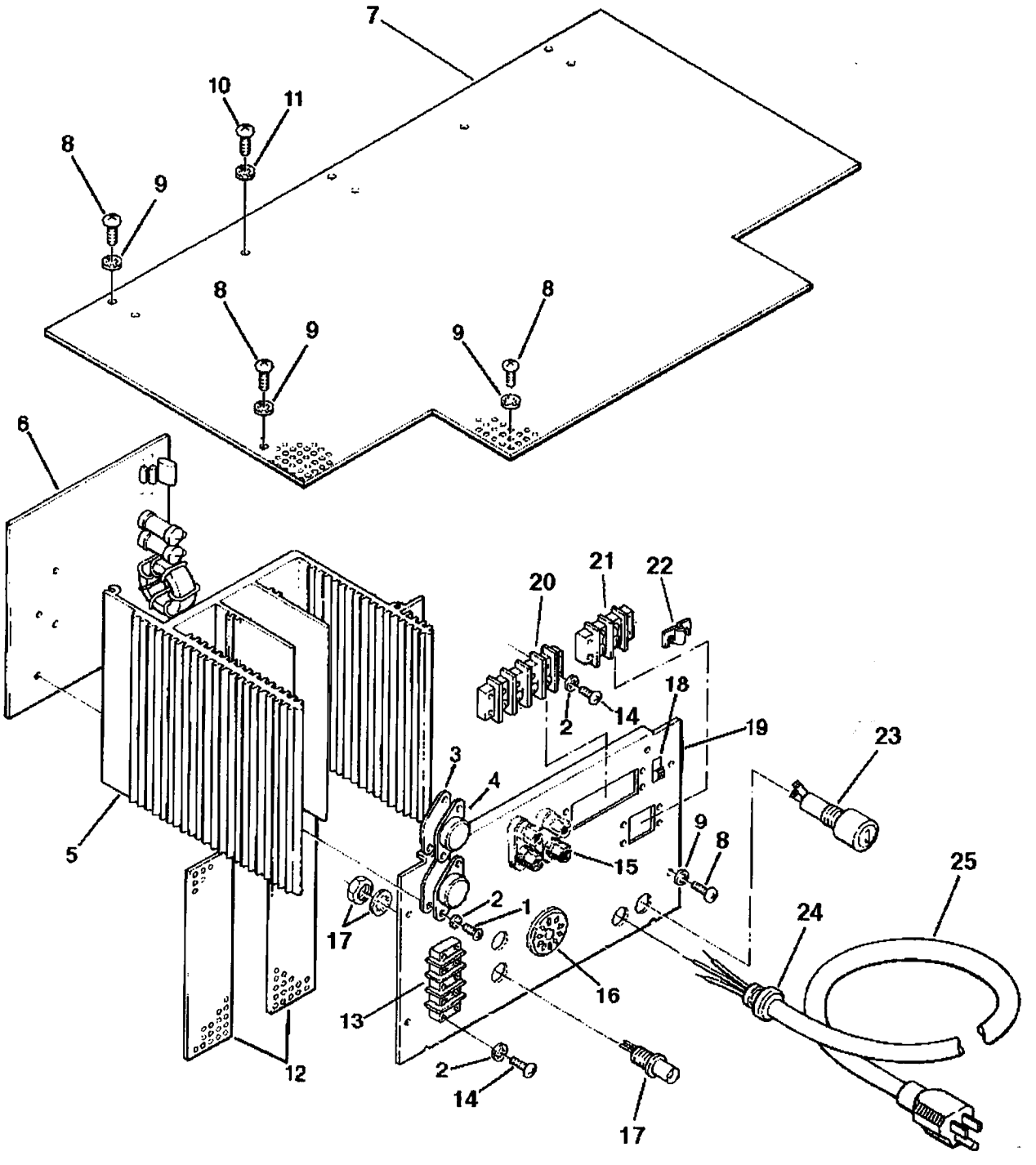


Model 7540 Front Panel Exploded View

ITEM #	PART #	QTY	DESCRIPTION
34	M43262-1	1	PS POWER LED ASM
	A10266-4724	1	4.7 KOHM 2W 5% CF Resistor
	C 4342-9	1	LED, AMBER GI #MV5153
35	A10086-10604	2	6-32 x .25 RH Machine Screw
36	A10094-3	2	#6 Internal Star Lockwasher
37	D 5712A9	1	Post Terminal Board
38	Q43334-4	1	Control Module
39	M20174A3	1	Control Plate
40	A10089-10616	2	6-32 x 1" Pan Head Machine Screw
41	C 5055-6	4	3/16" Lock Board Support
42	A10091-10306	2	3-48 x .25" Machine Screw
43	A10102-2	2	3/48" Hex Nut (Model 7520)
	A10094-3	2	#6 Int. Star Washer (Model 7540)
44	D 5699A8	1	SPST 20A Lever Switch (AC power)
45	A10102-5	2	6 x 32" Hex Nut
46	D 7167-6	1	Dummy Switch (AC switch plunger)
47	C 1825-6	2	#3 Star Lockwasher (Model 7520)
	D 2935-1	1	#8 Solder Lug (Model 7540)
48	D 5969J6	1	Snap-On Push Button
49	M20364J1	2	Side Panel (Model 7520)
	M20362J5	2	Side Panel (Model 7540)
50	A10086-70806	3	8-32 x .37 Machine Screw Brass
51	A10094-5	7	#8 Internal Star Lockwasher
52	C 6916-8	12	10-24 x .375 Sheet Metal Screw
53	A10094-8	6	#10 Internal Lockwasher
54	A10087-31010	2	10-32 x .62 Machine Screw
55	A10094-8	16	#10 Internal Lockwasher
56	C 6042-3	1	Bushing
57	M20357J5	1	Rack Mount Bracket (Model 7520)
	M20360J9	1	Rack Mount Bracket (Model 7540)
58	A10086-10604	3	6-32 x .25" RH Machine Screw
59	A10094-3	11	#6 Internal Star Lockwasher
60	F10182A6	2	BRAKET, XFMR Sup. (Model 7520)
61	A10100-24	4	.75x.440x.25 Spacer (Model 7520)
62	A10100-13	4	.375 x .192 x 1 Spacer (Model 7520)
63	A10087-31010	4	10-32 X 1.75 TRHD PH MSCR
64	Q43299-9	1	Main Board (Model 7520)
	Q43300-5	1	Main Board (Model 7540)
	A10224-5	4	Rubber Grommet (Model 7540)

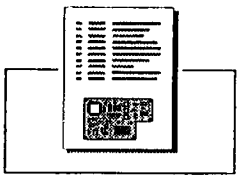
7.7 Back Panel Exploded View

TEM #	PART #	QTY	DESCRIPTION
1	A10086-10610	8	6-32 x 5/8" Round Head Screw
2	A10094-3	16	#6 Star Lockwasher
3	C 3570-6	4	TO-3 Insulator
4	C 7901-9	4	Output Transistor (Model 7520)
	C 7423-4	16	Output Transistor (Model 7540)
5	F11400-3	2	Heat Sink (Model 7520)
	F11401-1	2	Heat Sink (Model 7540)
6	M20679-3	2	Output Board (Model 7520)
	M20217-2	2	Output Board (Model 7540)
7	F10175L6	2	Cover, Top and Bottom
8	C 6916-8	11	10-24 x .375" Pan Head, Self Tap
9	A10094-7	11	#10 Internal Star Lockwasher
10	A10086-70806	12	8-32 x .37" Machine Screw
11	A10094-6	12	#8 Internal Tooth Lockwasher
12	F10663J6	4	Heat Sink Slides (Model 7520)
	F10040K4	4	Heat Sink Slides (Model 7540)
13	C 3842-9	1	Barrier Block, 3–Terminal
14	A10089-10608	12	6-32 x .5 Pan Head Machine Screw
15	C10184-7	2	Binding Posts, dual banana
16	C 3910-4	1	11–pin Socket
17	C 6011-8	2	Panel Mount BNC input
18	C 8025-4	1	DPDT Slide Switch
19	M20526J5	1	Back Panel (Model 7520)
	M20527J3	1	Back Panel (Model 7540)
20	C 5990-4	1	Barrier Block, 4–Terminal
21	C 3489-9	1	Barrier Block, 2–Terminal
22	C 4726-3	1	Jumper
23	C 5597A5	1	Fuse Holder
	A10285-22	1	Fuse 6.25A (Model 7520, 100-120V)
	A10285-16	1	Fuse 3A (Model 7520, 200-240V)
	A10285-26	1	Fuse 10A (Model 7540, 100-120V)
	A10285-21	1	Fuse 5A (Model 7540, 200-240V)
24	A10214-4	1	Strain Relief
25	C 7965-3	1	Power Cord



Back Panel Exploded View

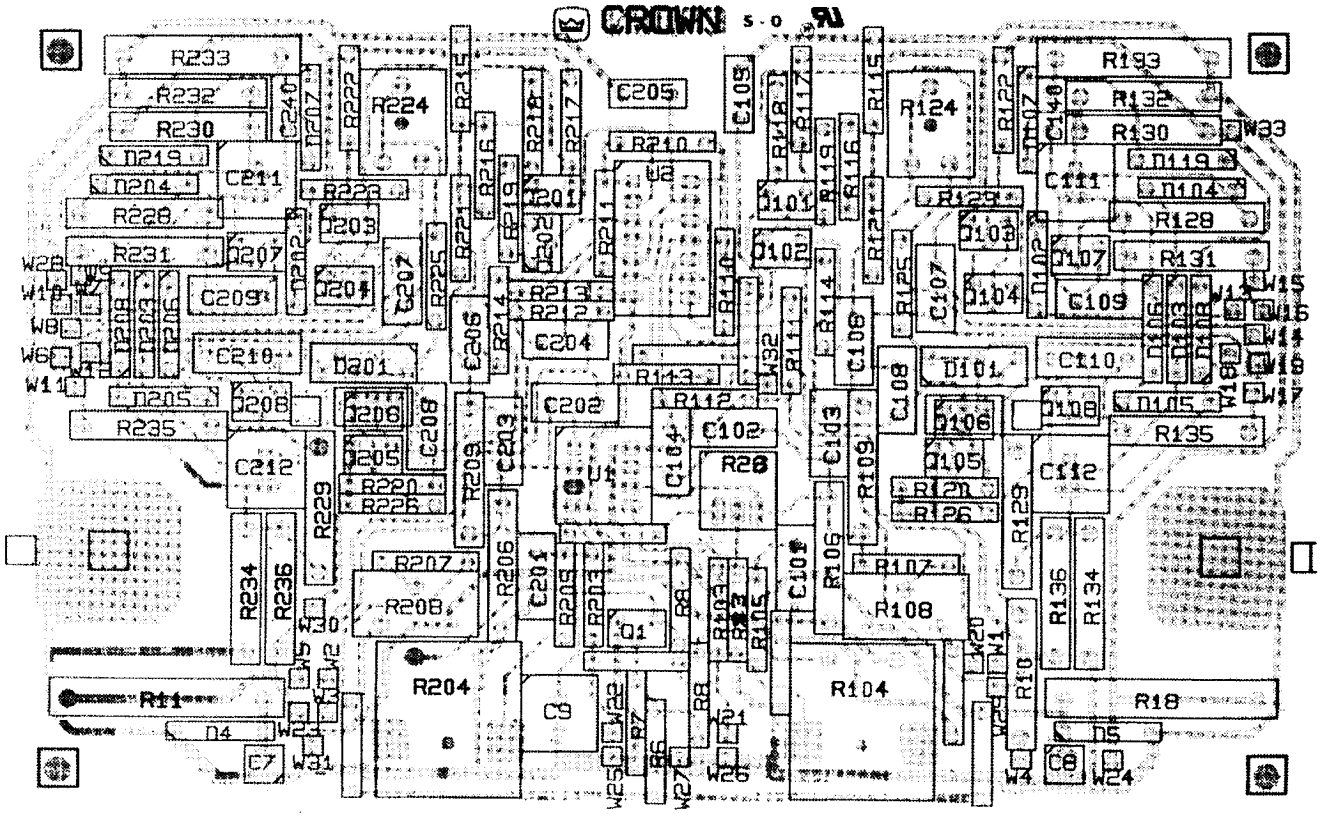
(represents both models)



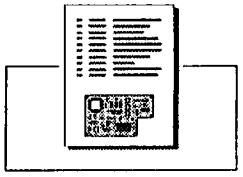
7.8 Main Board Parts

LOCATION #	PART #	DESCRIPTION
C7	C 4253-8	4.7MF Vert
C8	C 4253-8	4.7MF Vert
C9	C 8576-8	100MF/35V Vert
C101	C 9796-1	200PF Mica
C102	C 9890-2	47PF Mica
C103	C 9887-8	120PF Mica
C104	C 9796-1	200PF Mica
C105	C 9161-8	.01MF 500V Disc
C106	C 9890-2	47PF Mica
C107	C 6087-8	62PF Mica
	C 2342-1	27PF Mica (Model 7540)
C108	C 6087-8	62PF Mica
	C 2342-1	27PF Mica (Model 7540)
C109	C 9796-1	200PF Mica
C110	C 3285-1	.0022MF 200V film
	C 9161-8	.01MF 500V Disc (Model 7540)
C111	C 3728-0	10MF 50V
	C 5311-3	22MF 50V 20 NP (Model 7540)
C112	C 3728-0	10MF 50V
	C 5311-3	22MF 50V 20 NP (Model 7540)
C140	C 5330-5	.02MF 50V
		OPEN (Model 7540)
C201	C 9796-1	200PF Mica
C202	C 9890-2	47PF Mica
C203	C 9887-8	120PF Mica
C204	C 9796-1	200PF Mica
C205	C 9161-8	.01MF 500V Disc
C206	C 9890-2	47PF Mica
C207	C 6087-8	62PF Mica
	C 2342-1	27PF Mica (Model 7540)
C208	C 6087-8	62PF Mica
	C 2342-1	27PF Mica (Model 7540)
C209	C 9796-1	200PF Mica
C210	C 3285-1	.0022MF 200V film
	C 9161-8	.01MF 500V Disc (Model 7540)
C211	C 3728-0	10MF 50V
	C 5311-3	22MF 50V 20 NP (Model 7540)
C212	C 3728-0	10MF 50V
	C 5311-3	22MF 50V 20 NP (Model 7540)
C240	C 5330-5	.02MF 50V
		OPEN (Model 7540)

LOCATION #	PART #	DESCRIPTION
D4	C 5900-3	1N960B 9.1V Zener Diode
D5	C 5900-3	1N960B 9.1V Zener Diode
D101, D201	D 2961-7	SPS8010 60V NPN T/R
	D 6212-1	1N270 Diode (Model 7540)
D102, D202	C 3181-2	1N4148 Diode
D103, D203	C 3181-2	1N4148 Diode
D104, D204	C 5868-2	Jumper
	C 3181-2	1N4148 Diode (Model 7540)
D105, D205	C 3181-2	1N4148 Diode
D106, D206	C 5868-2	Jumper
	C 3181-2	1N4148 Diode (Model 7540)
D107, D207	C 3181-2	1N4148 Diode
D108, D208	C 3181-2	1N4148 Diode
D119, D219	C 3181-2	1N4148 Diode
	C 5868-2	Jumper (Model 7540)

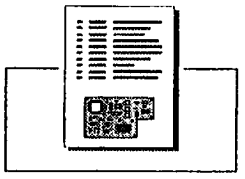


7520/7540 Main Board



LOCATION #	PART #	DESCRIPTION
Q1	D 2961-7	2N3859A NPN
Q101, Q201	C 6776-6	MPSA43 NPN
Q102, Q202	C 3578-9	MPSA93 PNP
Q103, Q203	C 3625-8	2N4125 PNP
Q104, Q204	C 3578-9	MPSA93 PNP
	D 2923-7	2N4929 PNP (Model 7540)
Q105, Q205	D 2961-7	2N3859A NPN
Q106, Q206	C 6776-6	MPSA43 NPN
	C10556-6	MPSW10 NPN (Model 7540)
	C 4414-6	298SB Heat Sink
Q107, Q207	D 2961-7	2N3859A NPN
Q108, Q208	C 3625-8	2N4125 PNP
R6	A10266-2041	200K ohm .25W Resistor
R7	A10266-6221	6.2K ohm .25W Resistor
R8	A10266-1041	100K ohm .25W Resistor
R9	A10266-8221	8.2K ohm .25W Resistor
R10	A10265-10022	10K ohm 0.5W 1% Resistor
R11	C10217-5	1.2K ohm .5W WW Resistor
	C 8888-7	2K ohm 5W WW Resistor (Model 7540)
R18	C10217-5	1.2K ohm .5W WW Resistor
	C 8888-7	2K ohm 5W WW Resistor (Model 7540)
R23	A10266-2431	24K ohm .25W Resistor
R28	C 3090-9	10K ohm Pot
R102, R202	C 9982-7	50.KOHM 31 step Level Control
R103, R203	A10266-1021	1K ohm .25W Resistor
R104, R204	C 3087-1	250K ohm .25W Pot
R105, R205	A10266-2051	2M ohm .25W Resistor
R106, R206	C 3304-0	511 ohm .5W 1% Resistor
R107, R207	A10266-1051	1M ohm .25W Resistor
R108, R208	C 1713-4	100K ohm Vert. Pot
R109, R209	C 2343-9	10K ohm .5W 1% Resistor
R110, R210	A10266-1031	10K ohm .25W Resistor
R111, R211	A10266-2021	2K ohm .25W Resistor
R112, R212	A10266-2021	2K ohm .25W Resistor
R113, R213	A10266-1031	10K ohm .25W Resistor
R114, R214	A10266-2031	20K ohm .25W Resistor
R115, R215	A10266-1821	1.8K ohm .25W Resistor
R116, R216	A10266-2031	20K ohm .25W Resistor
R117, R217	A10266-8211	820 ohm .25W Resistor

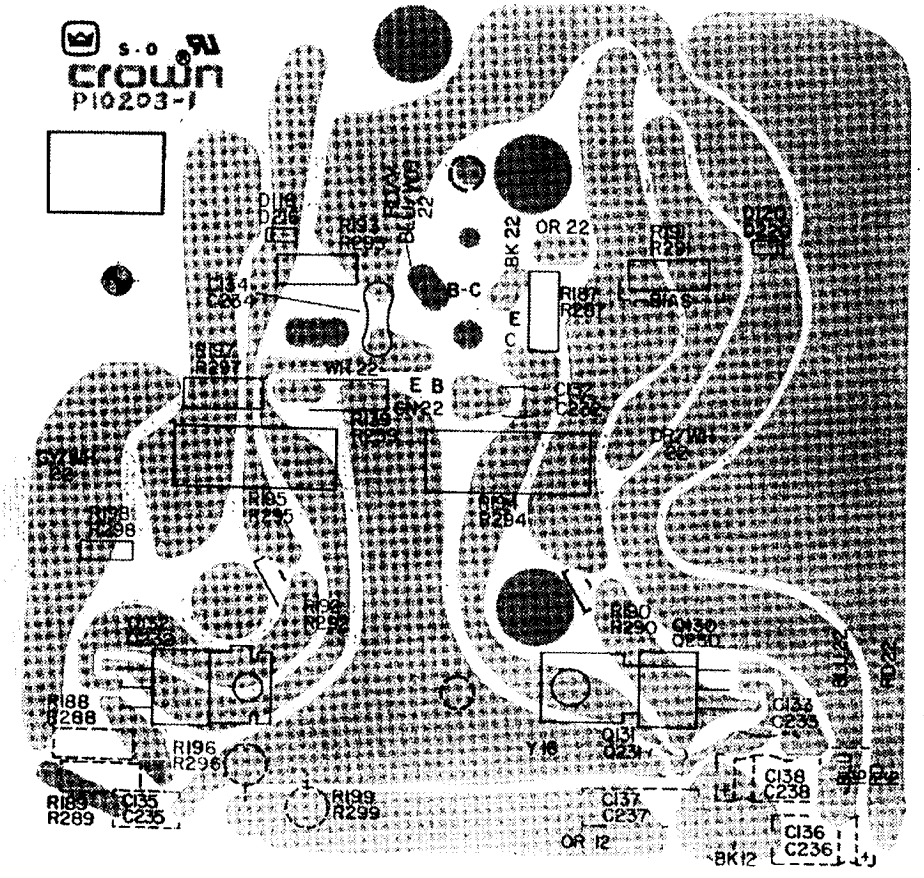
LOCATION #	PART #	DESCRIPTION
R118, R218	A10266-7511	750 ohm .25W Resistor
R119, R219	A10266-7511	750 ohm .25W Resistor
R120, R220	A10266-8211	820 ohm .25W Resistor
R121, R221	A10266-1831	18K ohm .25W Resistor
R122, R222	A10266-8201	82 ohm .25W Resistor
R123, R223	A10266-2221	2.2K ohm .25W Resistor
R124, R224	C 6048-0	500 ohm Piher Trim Pot
R125, R225	A10266-6211	620 ohm .25W Resistor
R126, R226	A10266-8201	82 ohm .25W Resistor
R127, R227		NA
R128, R228	A10266-1112	110 ohm .5W Resistor
R129, R229	A10266-1212	120 ohm .5W Resistor
R130, R230	A10266-2432	24K ohm .5W Resistor
		Open (Model 7540)
R131, R231	A10266-1312	130 ohm .5W Resistor
R132, R232		Open (Model 7520)
	A10265-17421	17.4K ohm .25W 1% Resistor
R133, R233	A10266-5124	5.1K ohm 1W Resistor
	A10266-4723	4.7K ohm .25W Resistor (Model 7540)
R134, R234		Open (Model 7520)
	A10265-17421	17.4K ohm .25W 1% Resistor
R135, R235	A10266-1212	120 ohm .5W Resistor
R136, R236	A10265-22122	22.1KOHM .5W 1% MF
		Open (Model 7540)
U1	C 5881-5	NE5532N Dual Op Amp
	C 3451-9	8–pin IC Socket
U2	C 4834-5	MC14016 BCP Quad Switch
	C 3450-1	14–pin IC Socket
----	P10420-1	PC Board
----	C 5868-2	0 ohm Jumpers
----	C 1250-7	T05 Mounting Pad



7.9 Model 7520 Output Board Parts

LOCATION #	PART #	DESCRIPTION
C132	C 2288-6	0.001MF CERAMIC DISC CAPC
C133-C134	C 3410-5	100PF DIPPED SILVER MICA
C135	C 8546-1	.0022MF100V 10% POLYESTER
C136	C 5050-7	4.7MF100V AXIAL LYTIC
C137	C 8426-6	0.1MF200V 10%FILM
C138	C 5050-7	4.7MF100V AXIAL LYTIC
C139	C 8426-6	0.1MF200V 10%FILM
C141	C 8548-7	.0039MF200V FILM
C232	C 2288-6	0.001MF CERAMIC DISC CAPC
C233-C234	C 3410-5	100PF DIPPED SILVER MICA
C235	C 8546-1	.0022MF100V 10% POLYESTER
C236	C 5050-7	4.7MF100V AXIAL LYTIC
C237	C 8426-6	0.1MF200V 10%FILM
C238	C 5050-7	4.7MF100V AXIAL LYTIC
C239	C 8426-6	0.1MF200V 10%FILM
C241	C 8548-7	.0039MF200V FILM
D116	C 2851-1	RECTIFIER, 1N4004 SILICON
D120	C 2851-1	RECTIFIER, 1N4004 SILICON
D216	C 2851-1	RECTIFIER, 1N4004 SILICON
D220	C 2851-1	RECTIFIER, 1N4004 SILICON
Q111	C 5891-4	MTS105 THERMAL SENSE
Q112	D 2961-7	SEL 2N3859A, SPS8010 NPN
Q130	C10556-6	MPSW10 NPN
Q131	C 3625-8	2N4125 PNP
Q132	C 5453A1	2SA1006BR TO-220 PNP
Q133, Q134	C 5890-6	MJE15028 80V .6A 5MS DVR
Q135, Q136	C 7901-9	NPN Power, SJ4438, Higher Temp
Q211	C 5891-4	MTS105 THERMAL SENSE
Q212	D 2961-7	SEL 2N3859A,SPS8010 NPN
Q230	C10556-6	MPSW10 NPN
Q231	C 3625-8	2N4125 PNP
Q232	C 5453A1	2SA1006BR TO-220 PNP
Q233, Q234	C 5890-6	MJE15028 80V .6A 5MS DVR
Q235, Q236	C 7901-9	NPN Power, SJ4438, Higher Temp
R187	A10266-3602	36.0 OHM .5W 5% CF
R188	A10266-2202	22.0 OHM .5W 5 CF50
R189	A10266-2R72	2.7 OHM .5W 5% CF50
R190	A10266-1811	180. OHM .25W 5% CF25
R191	A10266-5R62	5.6 OHM .5W 5 CF
R192	A10266-1011	100. OHM .25W 5% CF

LOCATION #	PART #	DESCRIPTION
R193	A10266-5R62	5.6 OHM .5W 5 CF
R194, R195	C 4761-0	0.1 OHM 5W 10% FA-5
R196	C 6625-5	5.6 OHM 5W 5% METAL OXIDE
R197	A10266-1R02	1.0 OHM .5W 5% CF
R198	A10266-1001	10.0 OHM .25W 5% CF
R199	C 6625-5	5.6 OHM 5W 5% METAL OXIDE
R287	A10266-3602	36.0 OHM .5W 5% CF
R288	A10266-2202	22.0 OHM .5W 5 CF50
R289	A10266-2R72	2.7 OHM .5W 5% CF50
R290	A10266-1811	180. OHM .25W 5% CF25
R291	A10266-5R62	5.6 OHM .5W 5 CF
R292	A10266-1011	100. OHM .25W 5% CF
R293	A10266-5R62	5.6 OHM .5W 5 CF
R294, R295	C 4761-0	0.1 OHM 5W 10% FA-5
R296	C 6625-5	5.6 OHM 5W 5% METAL OXIDE
R297	A10266-1R02	1.0 OHM .5W 5% CF
R298	A10266-1001	10.0 OHM .25W 5% CF
R299	C 6625-5	5.6 OHM 5W 5% METAL OXIDE
T102, T202	M43258-9	7520 TORROID ASM

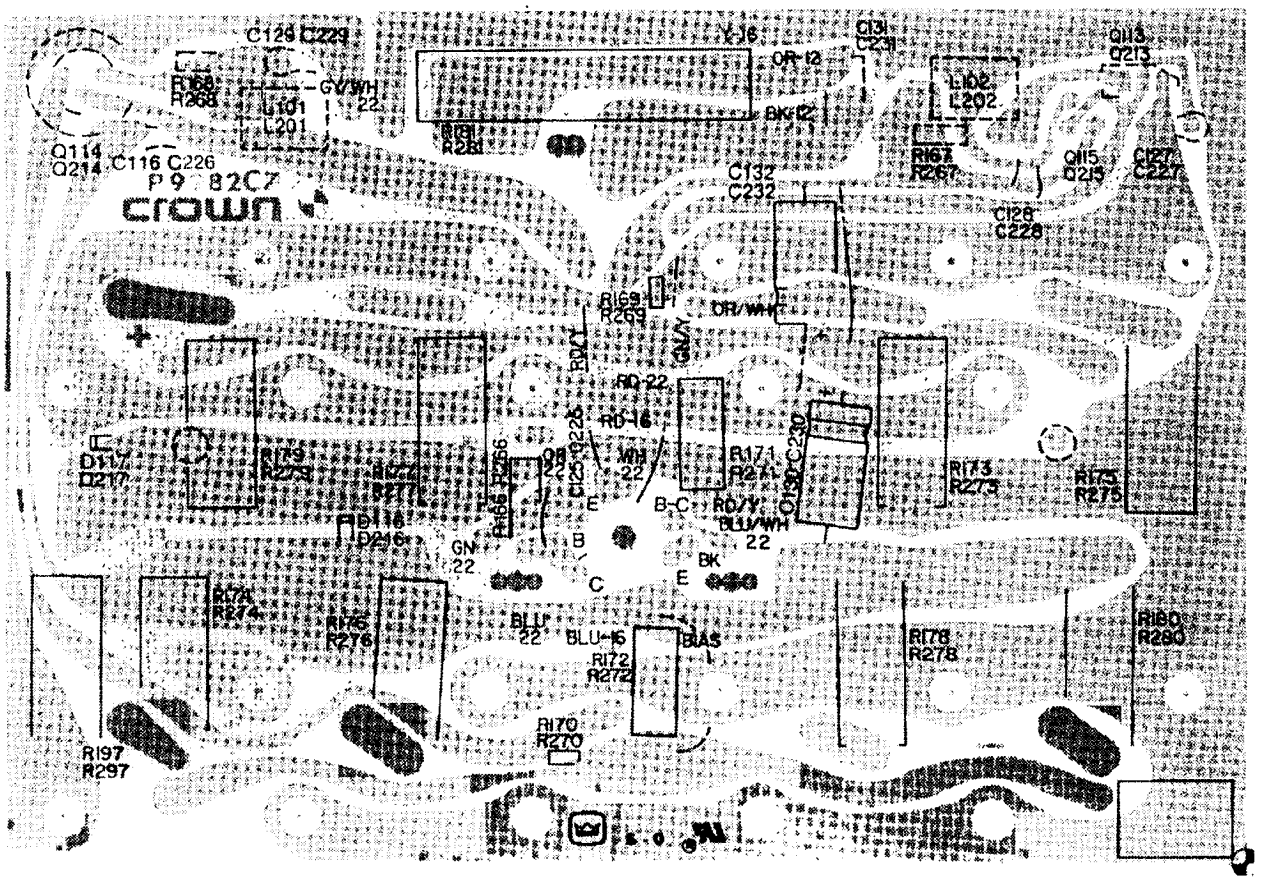


Model 7520 Output Board

7.10 Model 7540 Output Board Parts

LOCATION #	PART #	DESCRIPTION
C125	C 2288-6	0.001MF CERAMIC DISC CAPC
C126	C 3410-5	100PF DIPPED SILVER MICA
C127	C 3410-5	100PF DIPPED SILVER MICA
C128	C 8550-3	.0082MF100V 10% POLYESTER
C129	C 8550-3	.0082MF100V 10% POLYESTER
C130	C 5050-7	4.7MF100V AXIAL LYTIC
C131	C 8426-6	0.1MF200V 10%FILM
C132	C 5050-7	4.7MF100V AXIAL LYTIC
C225	C 2288-6	0.001MF CERAMIC DISC CAPC
C226	C 3410-5	100PF DIPPED SILVER MICA
C227	C 3410-5	100PF DIPPED SILVER MICA
C228	C 8550-3	.0082MF100V 10% POLYESTER
C229	C 8550-3	.0082MF100V 10% POLYESTER
C230	C 5050-7	4.7MF100V AXIAL LYTIC
C231	C 8426-6	0.1MF200V 10%FILM
C232	C 5050-7	4.7MF100V AXIAL LYTIC
L101	C 3510-2	470 µHy Coil
L102	C 3510-2	470 µHy Coil
L103	M43258-9	3 µHy Coil
L201	C 3510-2	470 µHy Coil
L202	C 3510-2	470 µHy Coil
L203	M43258-9	3 µHy Coil
D116–D117	C 2851-1	RECTIFIER, 1N4004 SILICON
D216–D217	C 2851-1	RECTIFIER, 1N4004 SILICON
Q111	C 5891-4	MTS105 THERMAL SENSE
Q112	D 2961-7	SEL 2N3859A, NPN Transistor
Q113	C 7339-2	MJE334 NPN Transisitor
Q114	D 2923-7	SEL 2N4929 Transistor
Q115	C 3625-8	2N4125 PNP Transistor
Q116–Q117	C 7411-9	MJ15018 NPN Transistor
Q118–Q125	C 7423-4	150V C 7064-6 NPN Power Transistor
Q211	C 5891-4	MTS105 THERMAL SENSE
Q212	D 2961-7	SEL 2N3859A, NPN Transistor
Q213	C 7339-2	MJE334 NPN Transisitor
Q214	D 2923-7	SEL 2N4929 Transistor
Q215	C 3625-8	2N4125 PNP Transistor
Q216–Q217	C 7411-9	MJ15018 NPN Transistor
Q218–Q225	C 7423-4	150V C 7064-6 NPN Power Transistor
R166	A10266-3602	36.0 OHM .5W 5% CF
R167	A10266-4702	47.0 OHM .5W 5 CF50
R168	A10266-8202	82 OHM .5W 5% CF50
R169	A10266-1811	180 OHM .25W 5% CF25
R170	A10266-1811	180 OHM .25W 5% CF25

LOCATION #	PART #	DESCRIPTION
R171-R172	A10266-5R64	5.6 OHM 1W CF
R173-R180	C 3583-9	0.33 OHM 5W
R181	C 7045-5	2.7 OHM 9W
R197	C 3583-9	0.33 OHM 5W
R266	A10266-3602	36.0 OHM .5W 5% CF
R267	A10266-4702	47.0 OHM .5W 5 CF50
R268	A10266-8202	82 OHM .5W 5% CF50
R269-R270	A10266-1811	180 OHM .25W 5% CF25
R271-R272	A10266-5R64	5.6 OHM 1W CF
R273-R280	C 3583-9	0.33 OHM 5W
R281	C 7045-5	2.7 OHM 9W
R290	C 3583-9	0.33 OHM 5W
-----	C 5915-1	Nylon Spacers
-----	D 5715B0	Fish Paper
-----	C 3570-6	TO- 3 Insulator
-----	C 1250-7	TO-3 Mounting Pad
-----	P 9982C7	PC Board

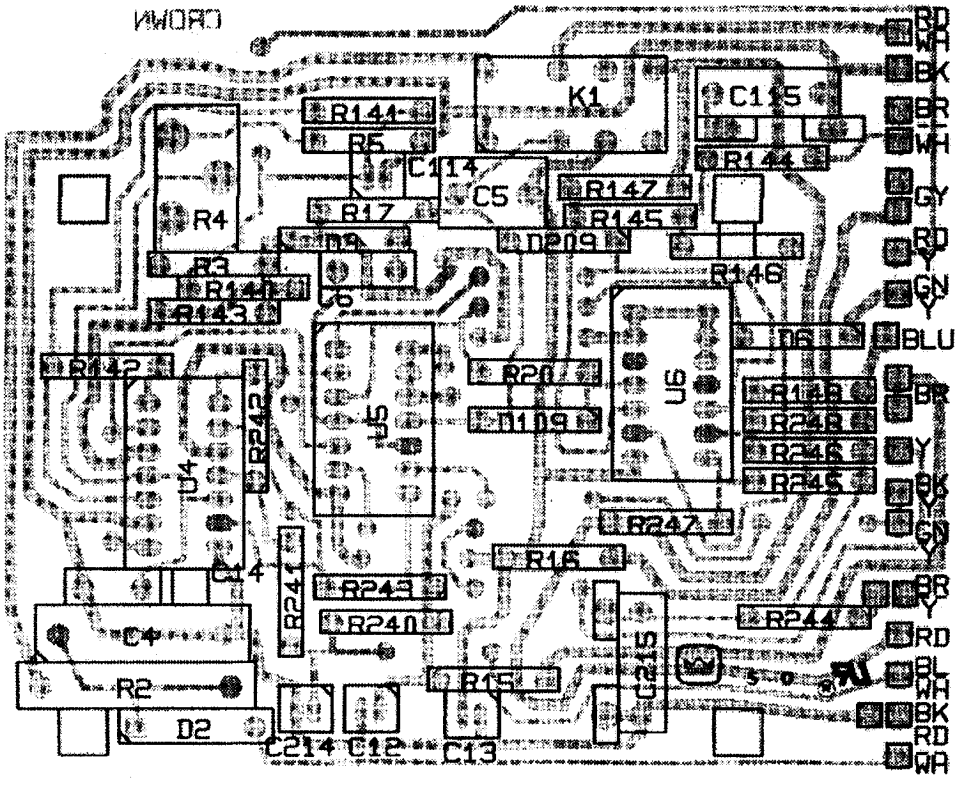


Model 7540 Output Board

7.11 Amplifier Control Board Parts

LOCATION #	PART #	DESCRIPTION
C4	C 8889-5	10MF 100V 20% Axial Electroletic
C5	C 7603-1	.47MF 63V 10% Poly
C6	C 1751-4	.01MF 500V Disc
C12	C 5362-6	2.2MF 50V Vert
C13	C 5362-6	2.2MF 50V Vert
C14	C 1751-4	.01MF 500V Disc
C114	C 5362-6	2.2MF 50V Vert
C115	C 8511-5	.047MF 250V 5% Film Mylar
C214	C 5362-6	2.2MF 50V Vert
C215	C 8511-5	.047MF 250V 5% Film Mylar
D2	C 2851-1	1N4004 Diode
D3	C 3181-2	1N4148 Diode
D6	C 3181-2	1N4148 Diode
D109	C 3181-2	1N4148 Diode
D209	C 3181-2	1N4148 Diode
K1	C 7745-0	24V DPDT Relay
R2	A10266-8213	820 ohm 1W Resistor
R3	A10266-8231	82K ohm .25W Resistor
R4	C 2871-9	2K ohm Vert. Lin. Pot
R5	A10266-4321	4.3K ohm .25W Resistor
R15	A10266-4701	47 ohm .25W Resistor
R16	A10266-4701	47 ohm .25W Resistor
R17	A10266-1061	10M ohm .25W Resistor
R20	A10266-4731	47K ohm .25W Resistor
R140	A10266-9131	91K ohm .25W Resistor
R141	A10266-1021	1K ohm .25W Resistor
R142	A10266-2051	2M ohm .25W Resistor
R143	A10266-1051	1M ohm .25W Resistor
R144	A10266-3351	3.3M ohm .25W Resistor
R145	A10266-3051	3M ohm .25W Resistor
R146	A10266-3051	3M ohm .25W Resistor
R147	C 5215-6	22M ohm .25W Resistor
R148	C 5215-6	22M ohm .25W Resistor

LOCATION #	PART #	DESCRIPTION
R240	A10266-9131	91K ohm .25W Resistor
R241	A10266-1021	1K ohm .25W Resistor
R242	A10266-2051	2M ohm .25W Resistor
R243	A10266-1051	1M ohm .25W Resistor
R244	A10266-3351	3.3M ohm .25W Resistor
R245	A10266-3051	3M ohm .25W Resistor
R246	A10266-3051	3M ohm .25W Resistor
R247	C 5215-6	22M ohm .25W Resistor
R248	C 5215-6	22M ohm .25W Resistor
U4	C 4345-2	LM339N I.C.
U5	C 5902-9	MC14073 I.C.
U6	C 4833-7	MC14070 I.C.
	C 3450-1	14–Pin IC Socket
—	C 5868-2	0 ohm .25W 0% Jumper
—	C 6312-0	PC Board Resistor Sockets - Teflon
—	P10427-6	PC Board

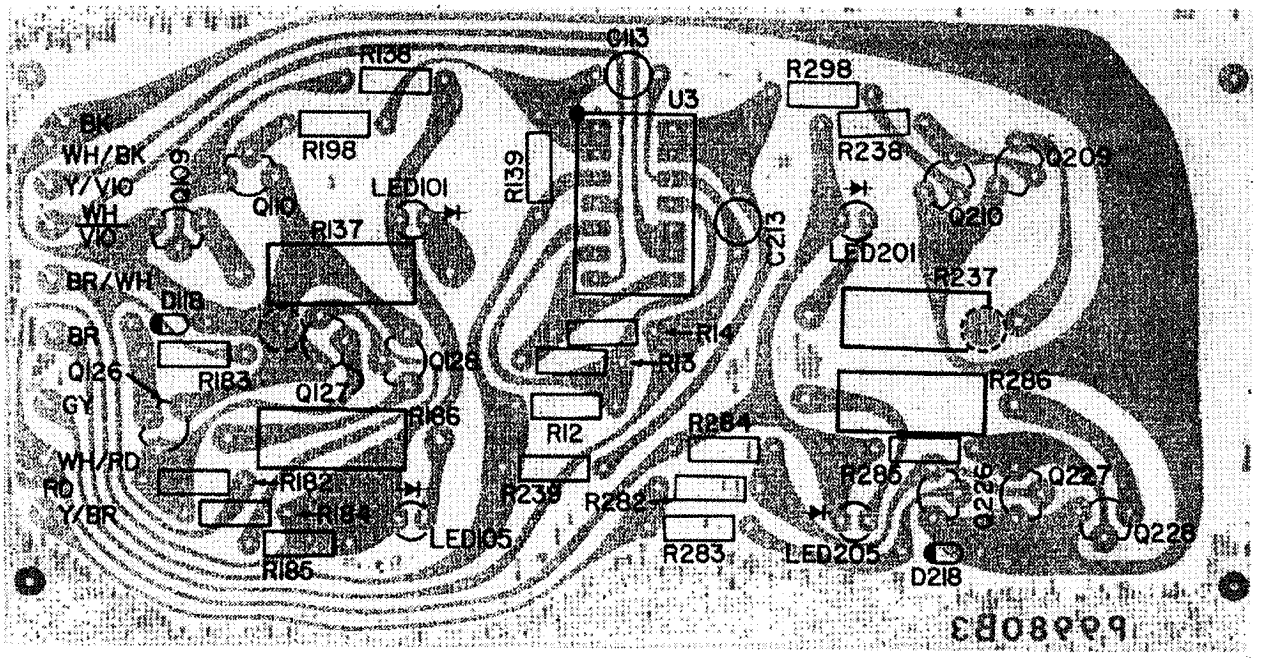


Amplifier Control Board

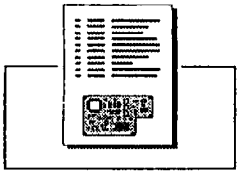
7.12 Display Board Parts

LOCATION #	PART #	DESCRIPTION
C113	C 8897-8	.1UF 100V 20% Z5U Capacitor
C213	C 8897-8	.1UF 100V 20% Z5U Capacitor
LED101	C 7135-4	LED, RED T1 1/10"
LED105	C 7733-6	LED, GREEN T1 1/10"
D118	C 3181-2	DIODE, 1N4148
LED201	C 7135-4	LED, RED T1 1/10"
LED205	C 7733-6	LED, GREEN T1 1/10"
D218	C 3181-2	DIODE, 1N4148
Q109	D 2961-7	2N3859A NPN Transistor
Q110	D 2961-7	2N3859A NPN Transistor
Q126	D 2961-7	2N3859A NPN Transistor
Q127	D 2961-7	2N3859A NPN Transistor
Q128	D 2961-7	2N3859A NPN Transistor
Q209	D 2961-7	2N3859A NPN Transistor
Q210	D 2961-7	2N3859A NPN Transistor
Q226	D 2961-7	2N3859A NPN Transistor
Q227	D 2961-7	2N3859A NPN Transistor
Q228	D 2961-7	2N3859A NPN Transistor
R12	A10266-1031	10. KOHM .25W 5% CF Resistor
R13	A10266-6831	68. KOHM .25W 5% CF Resistor
R14	A10266-1031	10. KOHM .25W 5% CF Resistor
R137	C 3617-5	3.3 KOHM 1W 5% MO Resistor
R138	A10266-5631	56. KOHM .25W 5% CF Resistor
R139	A10266-1541	150. KOHM .25W 5% CF Resistor
R182	A10266-3331	33. KOHM .25W 5% CF Resistor
R183	A10266-3331	33. KOHM .25W 5% CF Resistor
R184	A10266-1051	1.0 MOHM .25W 5 CF Resistor
R185	A10266-5631	56. KOHM .25W 5% CF Resistor
R186	C 3617-5	3.3 KOHM 1W 5% MO Resistor
R198	A10266-4721	4.7 KOHM .25W 5% CF Resistor

LOCATION #	PART #	DESCRIPTION
R237	C 3617-5	3.3 KOHM 1W 5% MO Resistor
R238	A10266-5631	56. KOHM .25W 5% CF Resistor
R239	A10266-1541	150. KOHM .25W 5% CF Resistor
R282	A10266-3331	33. KOHM .25W 5% CF Resistor
R283	A10266-3331	33. KOHM .25W 5% CF Resistor
R284	A10266-1051	1.0 MOHM .25W 5 CF Resistor
R285	A10266-5631	56. KOHM .25W 5% CF Resistor
R286	C 3617-5	3.3 KOHM 1W 5% MO Resistor
R298	A10266-4721	4.7 KOHM .25W 5% CF Resistor
U3	C 4345-2	LM339N VOLT COMPARATOR
	C 3450-1	IC SOCKET, 14PIN
	C 5914-4	LED Mounts
	P 9980B3	PC Board



Display Board



7.13 Schematics

Model 7520: J0264-2
Model 7540: J0265-9