TECHRON®

TECHNICAL MANUAL

INCLUDES SERVICE INFORMATION

5530
POWER SUPPLY AMPLIFIER

Techron Division of Crown International, Inc. 1718 W. Mishawaka Road, Elkhart, IN 46517

K80139-7
6/86

AE TECHRON®

Limited One-Year Warranty

SUMMARY OF WARRANTY

AE TECHRON, of Elkhart, Indiana (Warrantor) warrants to you, the ORIGINAL COMMERCIAL PURCHASER ONLY of each NEW ***AE 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 ***AETECHRON*** 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 ***AE 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 warranty 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.

AE TECHRON Customer Service Department
2507 Warren St. Elkhart IN 46516-0000 U.S.A.
(574) 295-9495

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5530 POWER SUPPLY AMPLIFIER

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SECTION 1: GENERAL INFORMATION

1-1 Introduction

The TECHRON Model 5530 is a mono or dual channel power supply amplifier designed for use in the most demanding high power systems. To become familiar with its many features, study this manual thoroughly.

Model 5530 provides precision amplification of frequencies from DC to 20KHz, with extremely low harmonic and intermodulation distortion, low noise, and high "damping factor". Output capability is 155 watts per channel minimum RMS into an 8 ohm load. When the amplifier is bridged and operating as a mono unit, output power reaches 310 watts minimum RMS into a 16 ohm load.

1-2 General Operation

Push-button ON switch activates amber ON lamp.

Massive black-anodized heatsinks thermally joined with the chassis enable the entire amplifier to function as a heatsink. Optional forced air cooling is available.

The output transistors operate in the TECHRON designed AB + B configuration where quiescent current is carried by the driver stages until the output transistors are summoned by a large current demand. 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.

In the event of overheating, a pair of thermal switches will remove power from the unit. After cooling, the unit will return to normal operation. Frequent overheating may indicate the need for optional forced air cooling system (Model # 55C01).

Total direct coupling provides perfect, instantaneous, thump-free overload recovery even on non-symmetrical wave forms. There is no turn-on delay.

Conventional BNC connectors provide input signal back to the unit. Standard MDP "banana" jacks provide connection for output signal.

An external mono/dual slide switch provides quick and easy conversion for either mono or dual channel operation.

1-3 Service Policies

Due to the sophisticated circuitry of the Model 5530, have only qualified and fully trained technicians perform service work, or return to the factory in original packing for service. Replacement packing is obtainable from TECHRON. When returning the Model 5530, enclose a brief letter explaining as completely as possible the problem or problems. For any service performed outside the TECHRON factory, be sure to read, understand, and follow instructions in this manual.

1-4 Accessories Supplied

Model 5530 comes complete with a user's manual and four rack mount screws. See Section 3-2 for proper rack clearance.

SECTION 2: SPECIFICATIONS AND PERFORMANCE

2-1 General Specifications

Hum and Noise: 110dB below rated output.

Phase Response: +0, -15 degrees 0 - 20KHz at 1 watt.

Input Impedance: 25Kohms.

Amplifier Output Protection: Short, mismatched, and open circuit proof. Limiting is instantaneous with no flyback pulses, thumps, cutouts, etc. No premature limiting on transients.

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

Turn-On: Instantaneous, with minimum thumps and no program delay.

Power Supply: 1 kilowatt transformer with massive computer-grade filter capacitors storing over 48 joules of energy. Two regulated supplies for complete isolation and stability.

Power Requirements: Requires 50-400Hz AC with selectable taps for 100, 120, 200, 220, and 240V +/- 10% operation. Draws 40 watts or less on idle, 500 watts at 300 watts total output.

Heatsinking: Massive black-anodized heatsinks are thermally joined with the chassis, thereby utilizing the entire amplifier as a heatsink.

Chassis: All aluminum construction for maximum heat conduction and minimum weight. Heavy aluminum front panel is a single extrusion.

Controls: Independent input level controls are on front panel. Power switch with pilot light is on front panel. Non-interacting DC balance controls are mounted behind front panel. A mono-dual switch is located below the input jacks on the rear panel.

Connectors: Input - BNC jack; output - color-coded binding posts; AC line - three-wire (grounded) male connector on 5 foot cable.

Dimensions: 19" (48.26 cm) standard rack mount (W.E. hole spacing), 7" (17.78 cm) high, 9-3/4" (24.81 cm) deep (from mounting surface).

Weight: 45 pounds (20.25 kg).

Finish: Polyurethane enamel coated aluminum tan and brown.

Output Power: 155 watts per channel minimum RMS (both channels operating) into an 8 ohm load over a bandwidth of 1Hz-20KHz at a rated RMS sum total harmonic distortion of 0.05% of the fundamental output voltage.

Maximum AC Current Draw: 10 amps at 120 volts.

2-2 Dual Channel Specifications

Frequency Response: +/-0.1dB DC-20KHz at 1 watt into 8 ohms; +/-1dB DC - 100KHz.

1KHz Power: 180 watts RMS into 8 ohms, per channel, both channels operating, 0.1% total harmonic distortion.

Harmonic Distortion: Less than 0.001% from 20Hz-400Hz and increasing linearly to 0.05% at 20KHz at 155 watts RMS per channel into 8 ohms.

I.M. Distortion (60Hz - 7KHz 4:1): Less than 0.05% from 0.01 watts to 0.25 watts and less than 0.01% from 0.25 watts to 155 watts into 8 ohms, per channel.

Slewing Rate: 8 volts per microsecond (slewing rate is the maximum value of the first derivative of the output signal, or the maximum slope of the output signal).

Damping Factor: Greater than 750, DC-400Hz into 8 ohms.

Output Impedance: Less than 7 milliohms in series with less than 3 microhenries.

Load Impedance: Rated for 8 and 16 ohm usage; drives any load including completely reactive loads without danger of harm to amplifier. Highly reactive loads will require external compensation. TECHRON engineering can provide detailed information.

Voltage Gain: 20.6 +/- 2% or 26.3 +/- 0.2dB at maximum gain.

Input Sensitivity: 1.75 volts +/-2% for 155 watts into 8 ohms.

Output Signal: Unbalanced, dual channel.

2-3 Mono Channel Specifications

Output Power: 310 watts minimum RMS into a 16 ohm load over a bandwidth of 1Hz-20KHz at a rated RMS sum total harmonic distortion of 0.05% of the fundamental output voltage.

Frequency Response: +/- 0.15dB, DC-200KHz at 1 watt into 16 ohms; +/- 1dB, DC-60KHz at 1 watt into 16 ohms.

1KHz Power: 360 watts RMS into 16 ohms.

Harmonic Distortion: Less than 0.001% from 20 - 400Hz and increasing linearly to 0.05% at 20KHz at 310 watts into 16 ohms.

I.M. Distortion: Less than 0.05% from 0.01 watts to 0.25 watts and less than 0.01% from 0.25 watts to 310 watts into 16 ohms.

Slewing Rate: 16 volts per microsecond.

Damping Factor: Greater than 700, DC-400Hz into 16 ohms.

Output Impedance: Less than 15 milliohms in series with less than 6 microhenries.

Load Impedance: Rated for 8 and 16 ohm usage; drives any load including completely reactive loads without danger of harm to amplifier. Highly reactive loads will require external compensation. TECHRON engineering can provide detailed information.

Voltage Gain: 41.2 +/-2% or 32.3 +/-0.2dB at maximum gain.

Input Sensitivity: 1.75 volts for 310 watts into 16 ohms.

Output Signal: Balanced, mono.

Displays:
POWER (amber) - indicates power on.
IOC (red) - indicates amplifier overload conditions for either channel.

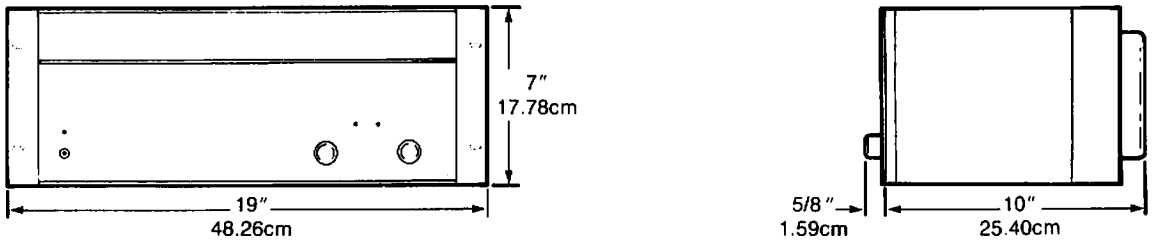
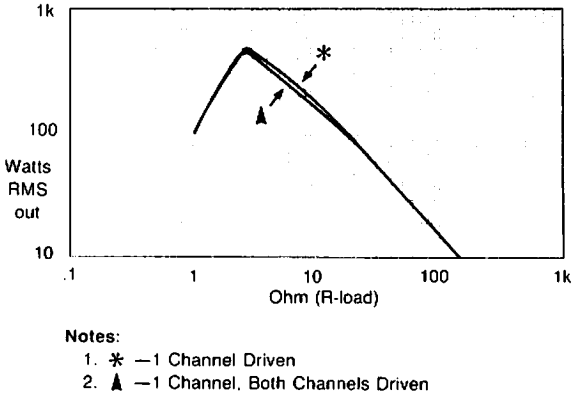


Illustration 2-1
Mounting Dimensions



Notes:
1. * —1 Channel Driven
2. ▲ —1 Channel, Both Channels Driven

Illustration 2-2
Output vs. Load at 1KHz

One Channel Measured, Both Channels Driven

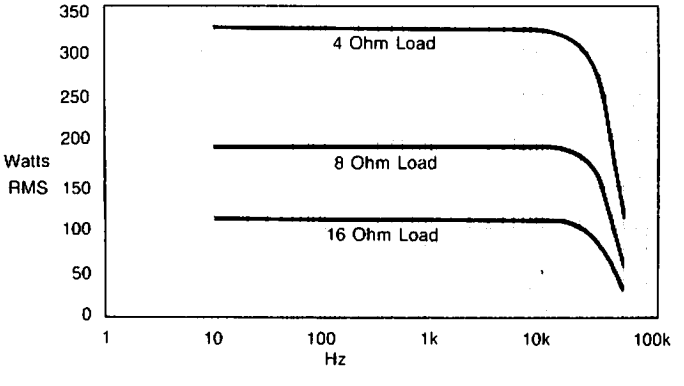


Illustration 2-3
Typical Power Output at Clip Point

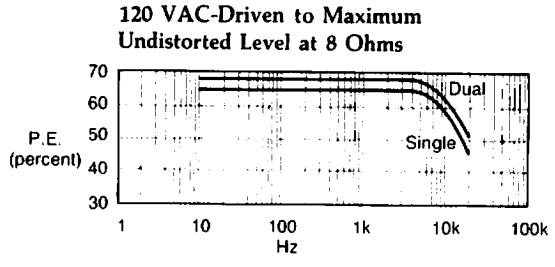
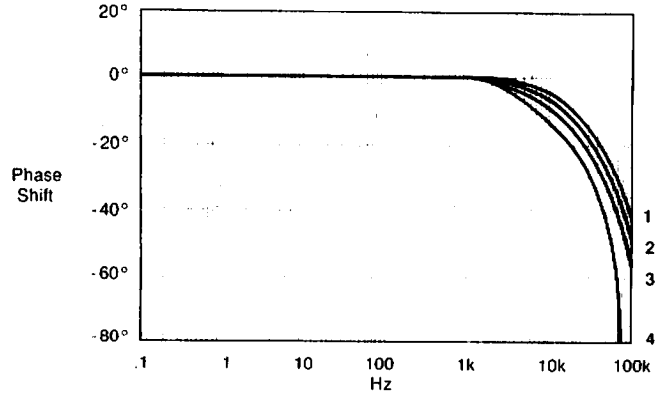


Illustration 2-4
Typical Power Efficiency



Notes:

1. Curve 1 — 16 Ohm Load
2. Curve 2 — 8 Ohm Load
3. Curve 3 — 4 Ohm Load
4. Curve 4 — Worst Case
5. Effective Signal Delay Td = 1.4 uSEC — 16 Ohms
   = 1.5 uSEC — 8 Ohms
   = 1.65 uSEC — 4 Ohms
   = 2.5 uSEC — Worst Case
6. Output 1 Watt All Loads

Illustration 2-5
Phase Response

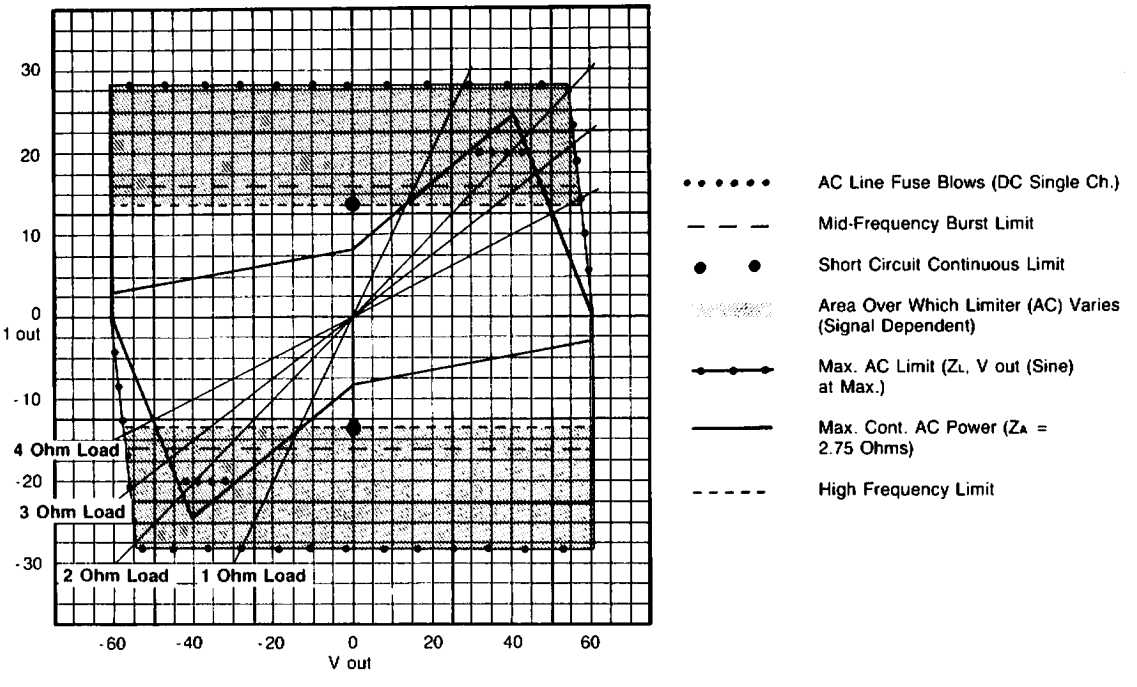


Illustration 2-6
V-I Graph
(See Illustration 4-1 for more detailed information on the 5530 V-I Graph)

SECTION 3: INSTALLATION AND OPERATION

3-1 Unpacking

Every TECHRON Model 5530 is carefully inspected and tested prior to leaving the factory. Carefully unpack and inspect the unit for damage in shipment. 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 packing.

3-2 Mounting

Model 5530 may be mounted in a standard 19" rack. Use mounting washers and screws supplied with unit whenever possible. For proper cooling, allow a rack clearance of 1-3/4" above and below the unit, along with adequate ventilation in the mounting rack area. If two or more Model 5530 amplifiers are mounted above one another, allow 1-3/4" clearance below the bottom amplifier, 1-3/4" above the top amplifier and 3" between amplifiers. In applications requiring long sustained signals at high power levels, use optional cooling fan unit Model 55C01, which is custom designed and easy to install. See Section 4-3.

CAUTION

Do not operate Model 5530 in a small sealed chamber of any kind. Improper operation and overheating will result.

3-3 Operating Precautions

1. **Use care in making connections, selecting signal sources, and controlling output level.** Model 5530 is capable of causing serious damage to improper loads or through improper connections. See Section 3-10 for information on load protection.

2. **Never directly parallel the output of Model 5530 with any other amplifier's output.** This connection may cause serious damage to the amplifier and/or load and will not result in increased power output.
Note: The two channels of Model 5530 may be operated in parallel under certain specific conditions. See Section 4-2-2, "Paralleling Channels for Increased Current".

3. **Do not short the ground lead of an output cable to the input signal ground.** Oscillations may result.

4. **Operate Model 5530 from proper AC current.** Supply voltage must be 50 to 400Hz (cooling fan package requires 60Hz maximum) 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 invalidate the warranty.

5. **Never connect the output to a power supply output, battery, or power main.** These connections will cause serious damage to the amplifier.

6. **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.

7. **Follow all instructions for proper amplifier operation.**

WARNING

NEVER OPERATE MODEL 5530 WITH COVER PANELS REMOVED. SEE SECTION 6 FOR PROPER SERVICE PROCEDURES INCLUDING SERVICE OPERATIONS WITH COVERS REMOVED.

3-4 Connecting Input Lines

Model 5530 incorporates BNC type connectors for input. When connecting input lines, observe the following precautions:

1. To avoid "ground loops" or undesirable circulating currents in the grounding circuit, tie input cables together along their length, keeping them away from power supply lines and from output cables.
2. To protect against feedback oscillation from load current flowing in a loop, provide proper grounding and isolation of input from devices using the same AC line supply as the amplifier.

3-5 Connecting Output Lines

Model 5530 output connectors are located at the rear of the amplifier as shown in Illustration 3-1. While making connections, follow this procedure:

1. Turn unit power off.
2. Turn input level controls fully counterclockwise
3. Connect output lines via "banana plugs" or via binding post direct connection. When using banana plugs, be sure connections are snug-fitting.

CAUTION

TECHRON is not liable for damage to any transducer due to overpowering.

4. Use proper output wire gauge and length. Keep wires as short as possible. At higher power levels, larger diameter wire is preferable.
5. To prevent spurious oscillations and undesired feedback, carefully lace output cables together. For the same reasons, never route output cables with input cables.
6. Do not join amplifier input and output grounds externally to the unit.
7. In installations where the output and input signals are attached to AC powered devices, it may be necessary to low-pass filter the input to the amplifier in order to eliminate capacitive coupling through AC mains.

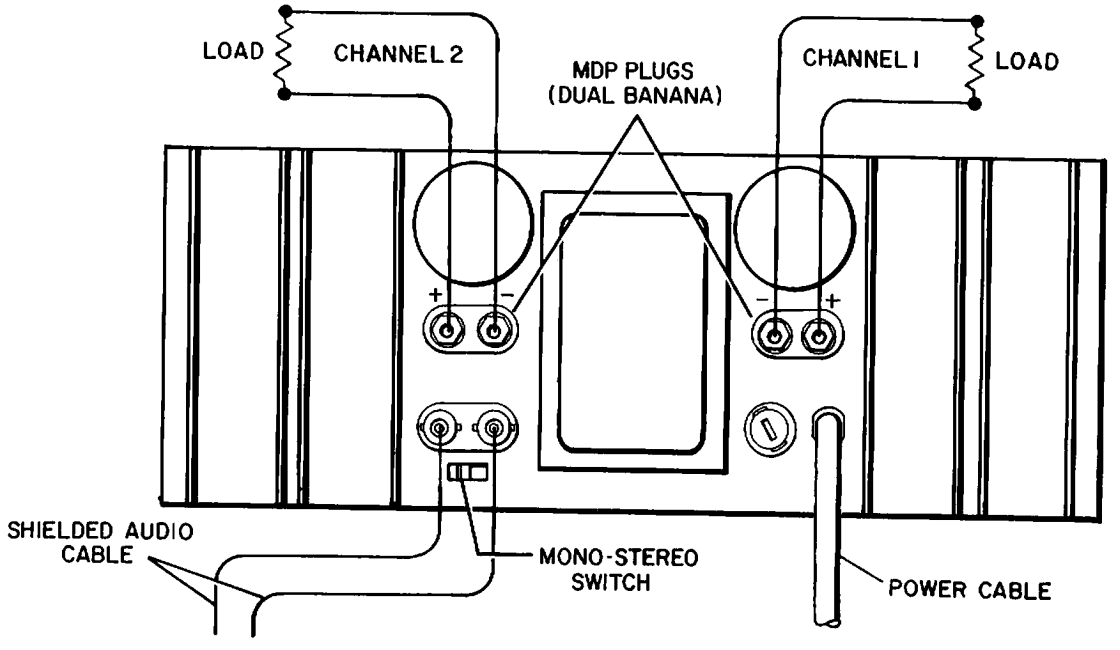


Illustration 3-1
Rear Panel Connectors: Dual Channel

3-6 Mono Channel Operation

A mono-dual slide switch on the rear panel below input jacks allows Model 5530 to operate in either dual channel or mono configuration, with no internal modification. Switching to the mono position alters input circuitry of Model 5530 so that the two internal amplifiers work as a team for mono output. Follow this procedure for mono operation:

1. Connect input line to channel 1 input connector. Adjust level with channel 1 input level control only.
2. Disconnect any input from channel 2 and turn channel 2 input level control (front panel) fully counterclockwise.

Note: In mono operation, channel 2 input jack and level control are not defeated but may not be used. Adding channel 2 input to channel 1 input will result in distortion, while channel 2 input alone will result in low power output.

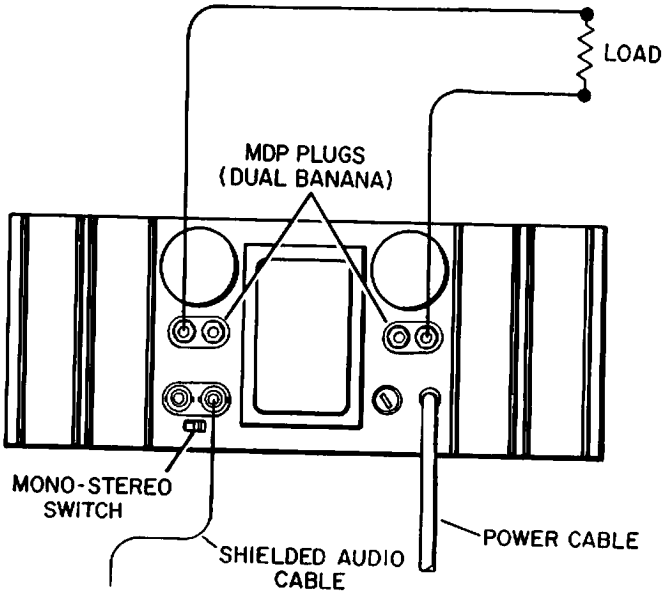


Illustration 3-2
Output Connections: Mono Channel

3. Connect output lines as shown in Illustration 3-2, connecting positive terminals of one channel to positive terminal of load and positive terminal of the other channel to negative terminal of load.

Note: Mono output is balanced and is isolated from the chassis and from the input grounds. Thus, both output leads are connected to the red or "hot" connectors only.

CAUTION

Be certain that all equipment (meters, switches, etc.) connected to the mono output lines is ungrounded. Both sides of the line must be totally isolated from the input grounds to the Model 5530. Failure to observe this precaution will result in severe oscillation.

Note: Use of ungrounded test equipment may violate local codes.

3-7 Connecting Power

3-7-1 AC Connector

Model 5530 uses a three-wire AC line system. At times, the third wire ground may introduce a ground loop into the system. If ground loop is present, use 3-2 adapter at AC connection.

Note: Operating amplifier without third wire ground may violate local codes.

CAUTION

Power supply must be at 50-400Hz AC (60Hz maximum with optional cooling fan package).

Model 5530 may be operated at various line voltages. The serial plate indicates factory voltage wiring. To convert from one voltage to another, see Section 3-7-2.

CAUTION

Only a competent technician should attempt to convert from one voltage to another. Follow instructions given in Section 3-7-2 thoroughly.

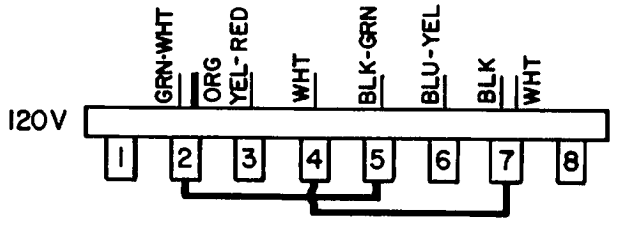
3-7-2 Line Voltage Conversion

Model 5530 may be operated at various line voltages. The serial plate indicates factory voltage wiring.

CAUTION

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

1. Make appropriate change in jumpers for the desired operation voltage. (See Table 3-1.)
2. For 100 or 120 VAC, the fuse is a 10A fuse. For 200, 220, or 240 VAC, the fuse is a 5A type MTH fuse.
3. Change the line cord tag to read the correct voltage.



LINE VOLTAGE	JUMPER	ORANGE WIRE	FUSE REQUIRED
100	3-6, 4-7	NO. 3	10A
120	2-5, 4-7	NO. 2	10A
200	4-6	NO. 3	5A
220	4-5	NO. 3	5A
240	4-5	NO. 2	5A

Table 3-1
Line Voltage Conversion Table

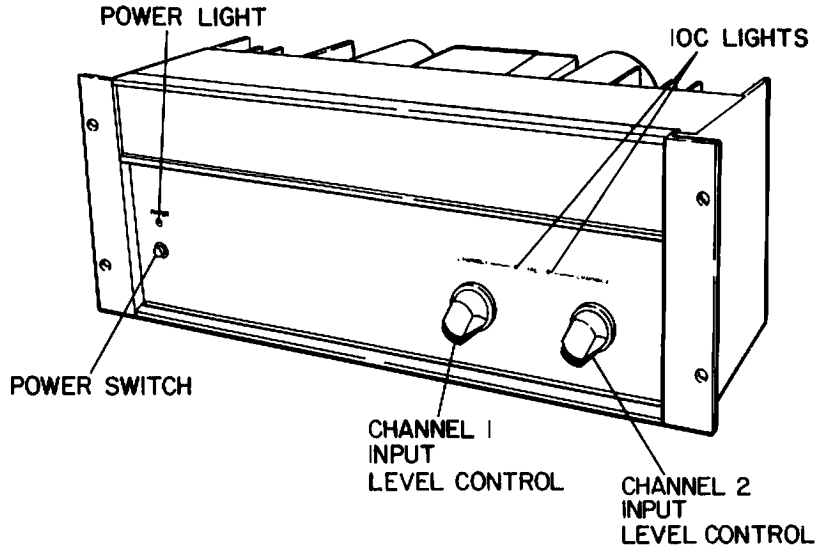


Illustration 3-3
Front Panel Controls

3-8 Controls and Adjustments

Model 5530 front panel controls include an AC power switch, a channel 1 input level control and a channel 2 input level control. LEDs inform operator of power on and IOC status. See Illustration 3-3.

3-8-1 Front Panel Controls

AC Power Switch: Push-button On/Off control. When AC Power Switch is ON, power indicator light should be on unless power is disconnected or an internal problem is present.

Level Control Channel One:
Level Control Channel Two: Controls for input levels, each channel.

IOC (Input/Output Comparator) Indicators: Will light at times of excessively high input level, improper load impedance, or when amplifier develops internal problem. Will light when power is turned off and will stay lit about one minute.

3-8-2 Rear Panel Connections and Controls (See Illustration 3-1)

Standard Input Connectors: BNC connectors provide for easy connection and disconnection of input signals.

Mono/Dual Slide Switch: Determines dual channel or mono operation. See Sections 3-4 through 3-6 for proper input/output connection.

Main Output Connectors: Model 5530 includes standard binding posts which accommodate MDP "dual-banana" plugs.

Fuse: Replace fuse whenever AC voltage conversion is made (see Section 3-9-4), or when it has blown for any reason.

AC Line Cord: Model 5530 is furnished with a three-wire, heavy-duty plug as standard equipment. Follow instructions in Section 3-7 for connecting power. Model 5530 may be operated on 5 different AC operating voltages. Only a competent technician should convert AC voltage. See Section 3-7-2 for conversion instructions.

3-9 Protection Mechanisms

3-9-1 Circuitry Protection

Model 5530 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.

The CROWN-developed SPACE (Signal Programmed Automatic Current Executor) control circuit protects the amplifier against shorted and low impedance loads. It functions as an automatic current limiter at audio frequencies and as a V-I limiter at subaudio frequencies. The threshold of current limiting depends on the history of the signal, yet the no-signal threshold of current limiting is high enough to allow full power tone bursting at 4 ohms and higher. (With very low impedance loads, full power tone bursting is possible, but initial cycles in each burst are limited.) The net result is total amplifier protection with a maximum of output power.

3-9-2 Thermal Protection

Each heatsink in the output section includes a thermal switch which protects the amplifier against overheating due to insufficient ventilation. If either heatsink becomes too hot, the thermal switch will interrupt AC line power. After sufficient cooling, operation will resume automatically. During thermal shut-down, the AC power pilot light will be out and the front panel (part of chassis heatsink) will feel warm to the touch.

3-9-3 Other Protection Circuitry

All of the amplifier's voltage-amplifier circuitry is designed to be inherently current limited. If any output device should fail, no damage will occur to the rest of the stages.

The series limiting resistor protects the input stage against overdrive damage should the input signal level become excessive.

A controlled slewing rate, coupled with the SPACE controller, protects the amplifier from blowups when fed large RF input signals.

3-9-4 Fuse

The fuse protects the power supplies against overload.

For 100 or 120 VAC, the fuse is a 10 A 250V type AB fuse. For 200, 220, or 240 VAC, the fuse is a 5 A type MTH 250V fuse.

Use correct fuse sizes for proper amplifer operation and protection.

WARNING
TURN POWER OFF BEFORE CHANGING FUSES.

3-10 Load Protection Methods

The most common method of load protection is a fuse in series with the load. A single fuse may be used, or multiple fuses 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 Littlefuse 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.**

3-11 Optional Accessories

Cooling Fan (55C01): Provides extra cooling in areas of poor air circulation and enables continuous high powered operation with reduced risk of overheating. Fan package comes with complete instructions for easy installation.

SECTION 4: APPLICATIONS

4-1 Amplifier Capability

Model 5530 is a very high-powered power supply/amplifier. It is capable of delivering precision power levels in a wide range of demands and with a variety of loads.

TECHRON provides the V-I graph (Illustration 4-1) to show the range of operation tolerated by the protection circuitry in Model 5530. Study the V-I graph carefully to understand the capabilities of Model 5530. Remember, the protection circuitry will not permit harm to the amplifier, even when demands are excessive or load is mismatched, shorted, or otherwise improper. The V-I graph will allow the user to tailor the demands to the amplifier's capability or to explain operation of the protection circuitry.

Further, when protection circuitry cuts power to the unit, normal operation will resume immediately when the excessive demand or other problem is removed.

There is never any danger to the amplifier when protection circuitry is activated.

When demands exceed the limits shown in the V-I graph, it may be necessary to use one of two special operating modes described in Section 4-2 for increased output capability. 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.

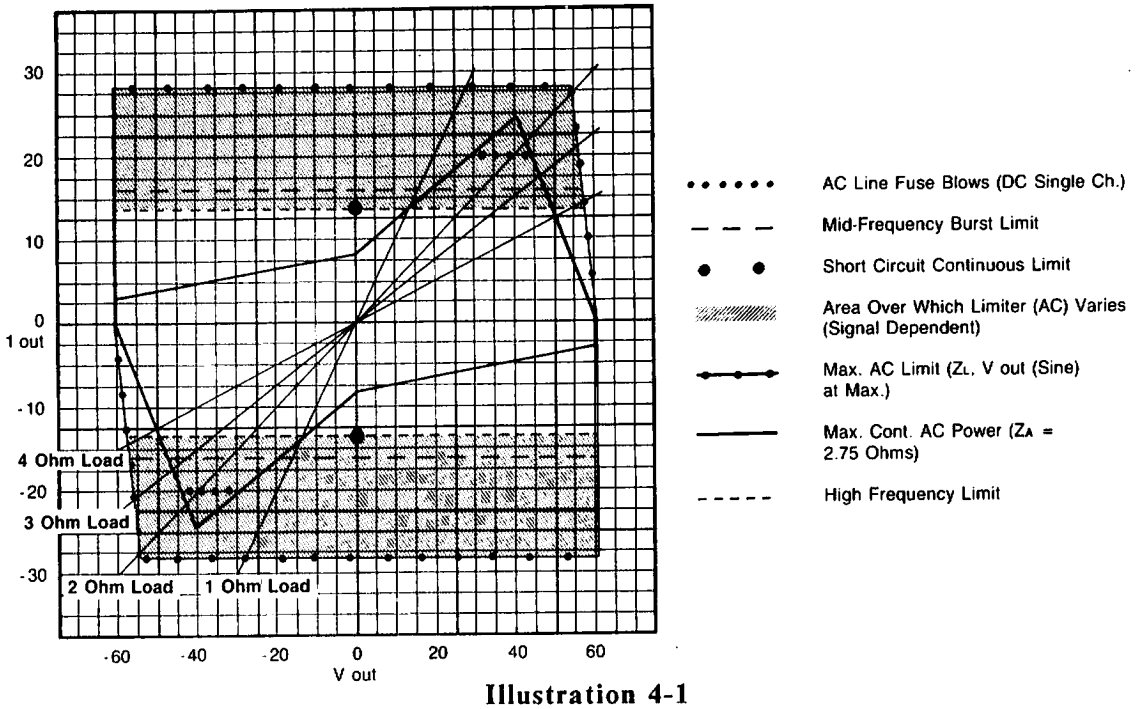


Illustration 4-1
V-I Graph

Definition & Explanation of V-I Graph Terms

AC Line Fuse Blows: A demand for continuous DC, 10 amp output will cause the line fuse to blow. Protection circuitry allows excursions of AC (even square wave) output demands well beyond this point.

Mid-Frequency Burst Limit: Varied signal burst demands will generate varied results. This is a "medium" level of demand. At loads below 4 ohms, and with a low duty cycle, a "step" effect will occur, as protection circuitry monitors output signal history to set limits. With higher duty cycle, the "step" effect decreases, and with loads over 4 ohms, amplifier response is instantaneous.

Short Circuitry Continuous Limit: The 5530's protection circuitry will permit a short circuit at the output up to 11 amps. However, overheating will result and the 5530's thermal switches will turn unit off.

Shaded Area: AC signals, because of their constantly varying strength, allow a larger output range than DC. With AC signals, the limiting circuitry constantly varies, depending on the history of the output. The graph is most helpful here, where output limits will vary constantly.

Max AC Limit: With a sine wave input, and low load impedance, the protection circuitry allows this output for a very short time.

Max. Continuous AC Power: Self-explanatory. Applies to loads above 2.7 ohms.

Min. AC Limit: With extremely low impedance loads, the AC limit might be this low in a worst-case burst mode of use.

Load Impedance and Inductance: Because input signal frequency, load inductance, load impedance all affect output limits, use the V-I Graph as a guide to amplifier performance. Contact **TECHRON** Engineering for assistance in difficult or innovative applications.

4-2 Special Operation Modes for Increased Output

Model 5530 may be operated in the usual, dual-channel mode or in one of two special modes.

4-2-1 Push-Pull Operation for Increased Voltage

Switching the "Dual-Mono" switch to the "Mono" position automatically places Model 5530 in the Push-Pull configuration. The load will be balanced in reference to ground. Connect the load across both red ("hot") terminals when using the Mono mode. See Section 3-6 for complete instructions on Mono operation.

4-2-2 Paralleling Channels for Increased Current

Ordinarily, the two channels of dual-channel amplifier may not be operated in parallel. However, parallel operation of the two channels of Model 5530 is possible if the following steps are taken:

1. Connect a .1 to .25 ohm, 50 watt, 1% resistor to the (+) output of each channel.
2. Connect (+) outputs, after resistors, together, and then to (+) terminal of load.
3. Connect (-) outputs together, and then to (-) terminal of load.
4. Connect input to input filter, if any is used, and then to the input of each channel.
5. Adjust channel 1 input knob to the "3 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.

Illustration 4-2 shows proper connections and formulas for value changes.

CAUTION

Never attempt to operate more than ONE dual-channel amplifier in parallel. The absence of an interlock circuit exposes amplifiers to severe damage from such operation.

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

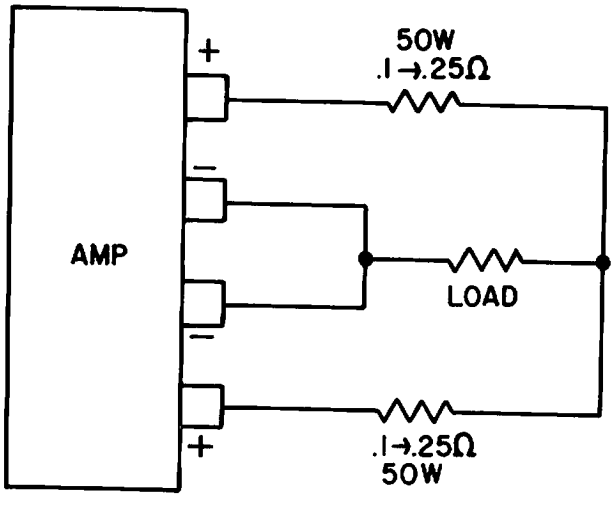


Illustration 4-2
Parallel Channel Operation

4-3 Cooling Needs

Model 5530 uses convection cooling in normal operation. An optional fan package, (55C01) provides extra cooling capacity in installations where this is needed (crowded rack mountings, high ambient temperatures, constant high power demands, etc.).

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 mountings, 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 Model 5530 away from other heat-producing devices whenever possible.

CAUTION

When the optional fan package is installed, AC current must be at 50-60Hz.

SECTION 5: THEORY OF OPERATION

5-1 General Information

Model 5530 has two totally direct-coupled amplifier circuits which employ two op amps (U100, U200) and silicon transistors in all stages. The two op amps are of a low noise type, having a large gain bandwidth. This results in a maximum amount of feedback being applied, with distortion reduced to record low values. Since both channels are essentially identical, the circuitry of channel 1 is described here. See Illustration 7-7 for schematic diagram.

The output stage is a quasi-complementary format employing the TECHRON-developed Class AB+B technique which uses no bias current in the output transistors. The result is maximum efficiency with minimum crossover notch distortion and amplifier idling heat. Since the output circuit is not temperature-tolerance critical, there is no bias current adjustment. Bias servos, mounted on the heatsinks, further control temperature drifts.

In the AB+B output circuit, the driver transistors carry the bias current, while the output transistors serve only boosters. The output transistors sense when the driver transistors are delivering significant current to the load and take over to deliver the large load currents.

The CROWN-developed SPACE (Signal Programmed Automatic Current Executor) control circuit provides protection against shorted and low impedance loads. It functions as an automatic current limiter at most frequencies, and as a V-I limiter at very low frequencies. The threshold of current limiting is dependent on the history of the signal, yet the no-signal threshold of current limiting is high enough to allow full power tone bursting. The net result is total protection with a maximum of output power, while requiring no extraordinary load matching techniques.

5-2 Input Circuitry

The signal at the input jacks is applied through level controls R315, to the IC operational amplifier U100. The output of U100 is fed to signal translator Q100, Q200 where it is amplified for use in the +/- 60V output circuits and applied to the base circuit of LVA Q104, Q204.

+/- 10V reference voltages, derived from voltage dividers R3/D4 for +10V; R8/D5 for -10V, and the +/-10V supplies are used to adjust the output offset voltage R105, R205. The +/- 10V voltages are also used to supply operating power to the IC.

The monolithic input amplifier stages result in extremely low DC drift. The input terminal bias current is offset by a unique temperature-compensated source resulting in a laboratory-quality amplifier needing no user-accessible offset controls.

The input amplifiers are powered by zener-regulated power supplies. The bias transistors are also powered by zener-regulated current sources with the result that line voltage variations do not cause noise or distortion due to misbiasing.

The power supply is a continuous-duty type, capable of 1KW loading. The power transformer is constructed of special grain-oriented steel. The main DC supplies are full-wave capacitor input type with heavy-duty, chassis heatsinked diodes. Computer grade electrolytics furnish over 48 joules of energy storage. A half-wave voltage doubler circuit produces a higher voltage at low current. This voltage is then used in the amplifier's driver circuit.

5-3 Output Circuitry

The output transistors Q302-Q309 draw no current in the quiescent state. The driver transistor Q300 is biased on in the

quiescent state. However, the bias current is not sufficient to turn on the outputs. Any demand for large amounts of current from Q300 causes the voltage across bias resistor R302 to rise, turning on output transistors Q302-Q309 and supplying the heavy current through resistors R304, R306, R308, R310 required for high-power operation.

Predriver Q106 is a complementary stage cascaded with driver Q300 to provide sufficient current gain to turn on the outputs. The bias voltage supply acts as a current source to bias Q106 which in turn biases Q300.

The bias level voltage is adjusted by changing the pot R129 until a bias voltage of 310-345mV appears across bias resistor R302 in the emitter circuit of driver Q300.

5-4 LVA, LVA Current Source and Bias Servo Circuits

A 42V AC voltage from the primary power supply is applied to voltage doubler circuit D1-D2 to produce a zener-regulated +70V DC for use in the amplifier driver/ output circuitry. The current path for the last voltage amplifer/bias servo circuits is through LVA Q104 bias servo Q310, LVA current source Q101, to the +70V DC supply. This current is available at the base circuit of predrivers Q106, Q107. Q105 is an LVA limiter tied to the -60V DC supply. C114 and C124 are amplifier slew rate limiting capacitors.

5-5 Protection Circuits

Resistors R304, R306, R308, R310 are positive current sensing resistors which carry the output current from output transistors Q302, Q304, Q306, Q308. Before the output current becomes dangerously high, the voltage induced across these resistors turns on the positive limiting transistor Q106, which in turn limits the signal level whenever it threatens to push the output transistors too hard. When the predriver current plus the limiter current equals the current available from the voltage amplifier Q101, the current is limited and remains so until the overload is removed. This current limiting begins instantly at the beginning of any overload and is cancelled instantly when the overload is removed.

SECTION 6: MAINTENANCE AND CHECKOUT PROCEDURES

6-1 Introduction

This section contains technical information which will guide the technician through effective service and repair of Model 5530. It includes disassembly and reassembly procedures, lists of required test equipment, and checkout procedures. Along with this section, consult schematic/board layout diagrams, parts lists, and exploded view drawings. See Section 7.

Note: Model 5530 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.

6-2 Required Test Equipment

Most service and repair procedures for Model 5530 require only limited test equipment. However, in order to return the unit to its factory new specifications, use the equipment listed in the table below. When the "suggested supplier and model" is not available, use "requirements" to determine a proper substitute.

CAUTION

To avoid ground loops in test equipment, do not connect output ground to input ground. This is especially important when measuring distortion.

CROWN AUTHORIZED SERVICE CENTER: RECOMMENDED TEST EQUIPMENT LIST

ITEM	RECOMMENDED
1. Oscilloscope Dual Channel Vert. Sensitivity-2mv/div Vert. Frequency DC-15MHz Ext. Sync DC-25MHz	Tektronix SC501, 2213A Hewlett-Packard 1740A Phillips PM3207
2. Audio Signal Generator Sine/Square 10Hz-100Khz Output+3V into 600 ohm load 1% THD	Wavetek 131A, 180 Series Krohn-Hitc 1000, 1200
3. AC Voltmeter 20Hz-4MHz Sensitivity-100 microvolt FS +1% Accuracy 20-20KHz	Hewlett-Packard 400F Amber 3501 Sound Technology 170B/1710A
4. Digital Multimeter (DMM) AC/DC Volts-1 mv-100v Range AC/DC amps-10 MA- 10 A Range OHMS-.1 ohm-10 M ohms	Data Precision 248/1350, 1351 Fluke 70 series, 8020B series Fluke 8060 series
6. Intermodulation Distortion Analyzer or THD Analyzer IMA capable of .003% readings 60Hz/7Khz THD capable of .01% readings 20Hz to 20 KHz	Amber 3501 Technology 17701A, 1700 series Hewlett-Packard 339A
7. Variac, Autotransformer 0-140 V 20 Amp Cap	Various Gen. Rad. Models Superior Electric Models or equivalent
9. Peak Equivalent Line Voltage Monitor 0-200 V Scale	See Schematic 6-9 for details on circuit construction
10. Band pass Filter 20-20 KHz 18 db/octave rolloff	Sound Technology 170 or equivalent
11. Resistive Loads-2 for stereo 1-250W @8 ohms 1-500W @4 ohms Bridging for 500 W @16 ohms Bridging for 1000 W @ 8 ohms	4 Dale 8 ohms @250 per channel

Table 6-1

6-3 Disassembly and Discharge

WARNING

MODEL 5530 CONTAINS POSSIBLY HARMFUL OR FATAL ELECTRIC CHARGES EVEN WHEN POWER SUPPLY IS DISCONNECTED. DISCHARGE CAPACITORS WHENEVER COVERS ARE REMOVED. FOLLOW DISCHARGE INSTRUCTIONS EXACTLY. SEE SECTION 6-3-2.

6-3-1 Visual Inspection

Visually inspect Model 5530 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 that none are missing.
2. Check fuse.
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 cover as outlined in Section 6-3-3.
6. Check all attaching parts for internal circuits. Be sure these 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 5530 normally looks very 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.

6-3-2 Front Panel Removal

1. Turn unit off and disconnect AC supply line.
2. Remove four phillips head screws (2 each side) from ends of front panel just behind rack mounting brackets.
3. Remove 8 mounting screws (4 top, 4 bottom) from top and bottom panels along front panel.

Note: These screws are extremely short.

4. Carefully pull front panel away from unit, taking care not to damage wires behind front panel.

Note: Front panel wires will allow front panel to be moved approximately 4" away from unit and front panel may rest on top of unit without damaging wires.

5. Place a 50 ohm 10 watt resistor across the positive and negative terminals of each capacitor for at least 5 seconds. Do not touch capacitor terminals or resistor leads during discharge procedure. Terminals are located just below and just to either side of the main circuit board. Capacitor terminals are also capacitor mounting screws.

WARNING

FAILURE TO FOLLOW DISCHARGE PROCEDURE MAY CAUSE SERIOUS INJURY TO SERVICE PERSONNEL AND SEVERE DAMAGE TO ELECTRICAL COMPONENTS.

Front Panel Installation

6. Set front panel carefully in place, taking care not to damage wires behind front panel.
7. Install 8 (4 top, 4 bottom) mounting screws through top and bottom covers into top and bottom edges of front panel.
8. Install four (2 each side) mounting screws into ends of front panel through side panels, just behind rack mounting brackets.

Note: End screws are self tapping. Use care not to cross threads when reinstalling.

6-3-3 Removal of Top Chassis Cover

1. Remove 12 phillips head mounting screws from top cover.

Note: These screws are extremely short.

2. Lift cover off unit.

Top Cover Installation

3. Set cover in place, aligning screw holes.
4. Install 12 phillips head mounting screws.

Note: Mounting screws are self-tapping. Use care not to cross threads when reinstalling.

6-3-4 Bottom Cover Removal

Note: Bottom cover removal is rarely necessary. Bottom cover removal procedure is identical to the procedure for Top Cover Removal with the following exception:
Center phillips head screw in bottom cover holds bridge rectifier block in place. Do not loosen this screw when removing bottom cover.

Bottom Cover Installation

See Section 6-3-3, "Top Cover Installation".

6-3-5 Servicing Main Board Components

1. Remove front panel and top cover as described in Sections 6-3-2 and 6-3-3.
2. Remove four mounting screws from corners of main PC board.
3. Carefully lift main PC board away from mounting position, taking care not to disturb wire connections on edge of PC board.
4. For complete removal of main PC board, note wire locations along edge of board, unsolder, and remove.

Main Board Installation

5. If wires have been disconnected, attach to previously noted locations.
6. Place main PC board in position, aligning screw holes.
7. Install four mounting screws and tighten carefully.

6-3-6 Removal of Input Level Controls

1. Grasp input level knobs firmly and pull off.
2. Loosen, but do not remove, mounting nut from level control to be replaced.
3. Remove front panel as described in Section 6-3-2.
4. Remove mounting nut from input level control to be replaced.
5. Note wire locations, unsolder, and remove.

Input Level Controls Installation

6. Connect wires to previously noted locations.
7. Insert control in mounting hole, and hand tighten mounting nut.
8. Install control knob, observing knob position so that indication on knob will be correct, and tighten.
9. Install front panel as described in Section 6-3-2.

6-3-7 Removal of Power Switch

1. Remove front panel as described in Section 6-3-2.

Note: Power switch mounting is a simple straightforward mechanical installation.

2. Note wire locations for future reconnection and disconnect.
3. Remove power switch from mounting position.

Power Switch Installation

4. Mount new power switch in place.
5. Connect wires to previously noted locations.
6. With front panel still removed from unit, test operation of On/Off push-button and verify proper operation of push-button and switch. Be sure internal parts are not bent. Be sure push-button fully activates switch when button is pressed, and be sure push-button does not exert pressure on switch when button is not depressed.

Note: Verify switch operation by visual inspection. Power on is not necessary.

7. Install front panel as described in Section 6-3-2.

6-3-8 Replacement of Output and Driver Transistors

1. Remove front panel and top chassis cover as described in Section 6-3-2 and 6-3-3.
2. Slide transistor cover up and out of channels in the heatsink.
3. Locate terminals of transistor to be replaced, and unsolder.
4. Holding hex nut with 1/4" nut driver, unscrew transistor mounting screws.

CAUTION

To prevent damage to heatsink foil, hold nut while unscrewing mounting screw. This will prevent star washer rotation and possible foil damage.

5. Remove defective transistor, retaining insulating wafer for reuse.

Installation of Output and Driver Transistors

6. Coat both sides of insulating wafer with heatsink compound.
7. Install insulating wafer and transistor on heatsink, holding nut with hex driver and turning screw until evenly tightened.
8. Solder new transistor in place.
9. Install perforated transistor cover.
10. Replace top and front panels. See Sections 6-3-2 and 6-3-3.

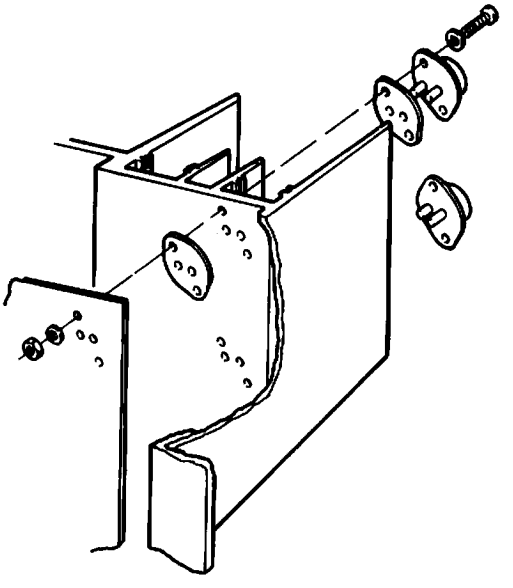


Illustration 6-1
Output and Driver Transistor

6-3-9 Capacitor Removal

1. Remove front panel and top cover as decribed in Section 6-3-2 and 6-3-3.

WARNING

FOLLOW DISCHARGE PROCEDURE BEFORE ATTEMPTING TO SERVICE CAPACITORS. SEE SECTION 6-3-2.

2. Unscrew capacitor mounting screws, observing position of washers and solder lugs. See Illustration 6-2 for details.
3. If necessary, remove Main Board and shield from behind Main Board. See Section 6-3-5.
4. Remove capacitor.

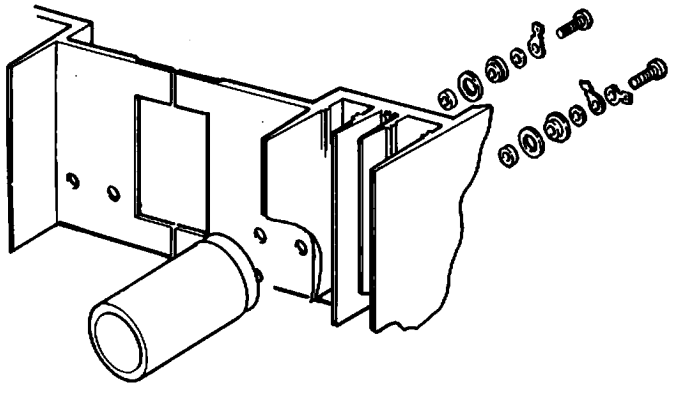


Illustration 6-2
Detail, Capacitor Mounting Screw

Capacitor Installation
4. Place capacitor in position.
5. Install mounting screws and associated washers and lugs, referring to Illustration 6-2 for proper position.

Note: Use capacitor on opposite side as a guide if needed.

6. Install Main Board shield and Main Board. See Section 6-3-5.
7. Tighten mounting screws.

6-3-10 Thermal Switch Removal
1. Disconnect two (2) push-on wire connectors from thermal switch to be removed. Polarity is not important.
2. Remove two (2) mounting screws, then remove switch.

Thermal Switch Installation
3. Apply heatsink compound to thermal switch, then place switch in position.
4. Install two (2) mounting screws and tighten.
5. Connect two wires via push-on connectors. Polarity is not important.

6-3-11 Bridge Rectifier Removal
1. Remove front panel as described in Section 6-3-2.
2. Note wire locations on bridge terminals and disconnect.
3. Remove mounting screw, hex nut, and washer.
4. Unsolder capacitor from bridge and retain for installation on new bridge.

Bridge Rectifier Installation
5. Solder capacitor on bridge.
6. Install bridge using mounting screw, hex nut, and washer.
7. Connect wires to previously noted location.
8. Install front panel as described in Section 6-3-2.

6-3-12 Main Transformer Removal

Note: Transformer replacement is a major undertaking. Carefully note all wiring connections and wiring paths from transformer to terminal of each wire. Observe these connections and wiring paths exactly when installing new transformer:
1. Remove front panel and top cover as described in Section 6-3-2 and 6-3-3.
2. Trace wires from transformers to terminals away from transformer, note locations and disconnect.
3. Carefully clear path for transformer wires to be removed without disturbing nearby circuitry and wiring.
4. Remove Main PC Board as described in Section 6-3-5.

Note: Unsoldering of wires from Main PC Board is not necessary. Use care not to disturb these wires.

5. Remove four mounting screws from mounting bracket behind main PC board.
6. Remove four long brass spacers from transformer mounting screws, along with associated washers and solder lugs. Observe order and position of washers, lugs, and nuts for easier reinstallation.

7. Loosen and remove transformer mounting screws and remove transformer.

Transformer Installation

8. Set new transformer in place and install mounting screws and associated washers.
9. Attach solder lugs, hex nuts, washers, and brass spacers to inside end of transformer mounting screws.
10. Carefully route wires according to noted routings and attach to previously noted locations. Refer to Table 3-1 for details of voltage conversion.
11. Install mounting bracket for main PC board on transformer mounting brass spacers.

12. Install Main PC Board as described in Section 6-3-5.
13. Install front panel and top cover as described in Sections 6-3-2 and 6-3-3.

6-4 CHECKOUT 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.

6-4-1 Test Quiescent Power Consumption

PROCEDURE:

1. Turn amplifier on with no input signal and no load.
2. Test power consumption at the output.
3. Amplifier should draw less than 40 watts (typically 30 watts) with AC line voltage at 120V.

6-4-2 Bias Level Check and Adjustment

PROCEDURE:

1. Remove front panel. See Section 6-3-2.
2. Turn on AC power and allow amplifier to warm up fully (at least 15 minutes).
3. Measure voltage across R302 (channel 1), R402 (channel 2).

Correct reading is between 310 and 345mV. If voltage is outside this range, adjust R129 (channel 1), R229 (channel 2).

6-4-3 Output/Offset-Bias Adjustment

PROCEDURE:

Refer to Illustration 6-3. Adjustments are located in the Main PC Board and are sometimes called DC balance controls. Channel 1: R105; Channel 2: R205. These seldom, if ever, need adjustment, but may be adjusted by following this procedure:

1. Remove front panel from amplifier. See Section 6-3-2.
2. Turn AC power on and allow at least 15 minutes for full warm-up.
3. Set Channel 1 input level control fully counterclockwise.
4. Remove input signal from channel 1.
5. Place a sensitive DC voltmeter across Channel 1 output terminals.
6. Adjust R105 with a small, flat-bladed screwdriver, until 0 reading shows on DC voltmeter.
7. Repeat steps 3 through 6 for Channel 2.

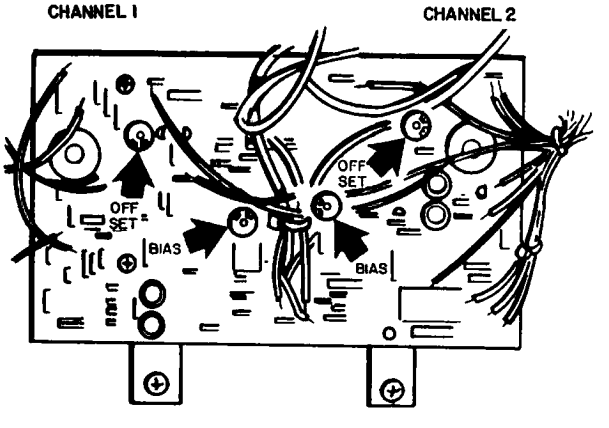


Illustration 6-3
Output/Offset-Bias Adjustment

6-4-4 Test 1KHz Operation Without Load

PROCEDURE:
1. Monitor output with an oscilloscope and an accurate AC voltmeter. Monitor at the output terminals and not along the output cables.
2. Connect an 1KHz 2V RMS sine wave to the input. Turn up the level of the channel being tested.

CORRECT OPERATION:
The output should clip above 39 volts. Waveform should be clean throughout the test, and clipping should be even and symmetrical with no ringing or other distortion.

6-4-5 Test 1KHz Operation with Load

PROCEDURE:
1. Connect an 8 ohm resistive load, having less than 10% reactive components at any frequency up to five times the highest test frequency, to the output.
2. Monitor output with an oscilloscope and an accurate AC voltmeter. Monitor at the output terminals, and not along the output cables.
3. Connect an 1KHz 2V sine wave to the input. Turn up the level of the channel being tested.

CORRECT OPERATION:
The output should clip above 155 watts or 35V RMS. Waveform should be clean throughout the test, and clipping should be even and symmetrical with no ringing or other distortion.

6-4-6 1KHz Clip Test

PROCEDURE:
This test is similiar to previous test 6-4-5, but with different load and output values.

1. Connect a 4 ohm resistive load, having less than 10% reactive components at any frequency up to five times the highest test frequency, to the output.
2. Monitor output with an oscilloscope and an accurate AC voltmeter. Monitor at the output terminals, and not along the output cables.
3. Connect an 1KHz 2V sine wave to the input. Turn up the level of the channel being tested.

CORRECT OPERATION:
The output should clip above 250 watts or 31.5V RMS. Wave form should look like Illustration 6-4.

6-4-7 Test Limiting Portion of Protection Circuit

PROCEDURE:
1. Set amplifier output at approximately 35V.
2. Switch load to 2 ohms.
3. Slow oscilloscope tract to look for power supply ripple at the clip level. If present, this indicates that power supply sag is causing clipping rather than the protection circuit. If power supply appears to be causing clipping, continue:
4. Switch load to 1 ohm. If oscilloscope still shows only power supply clipping, protection circuitry is defective.
5. The waveform should look sharp and clean with no oscillations as in Illustration 6-5.

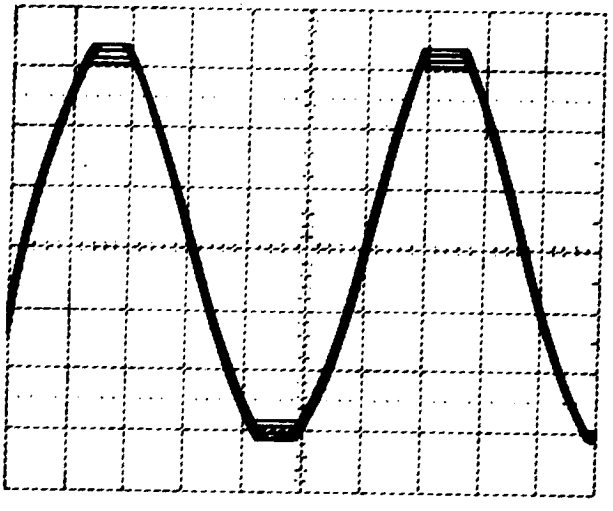


Illustration 6-4
Clip Test Waveform

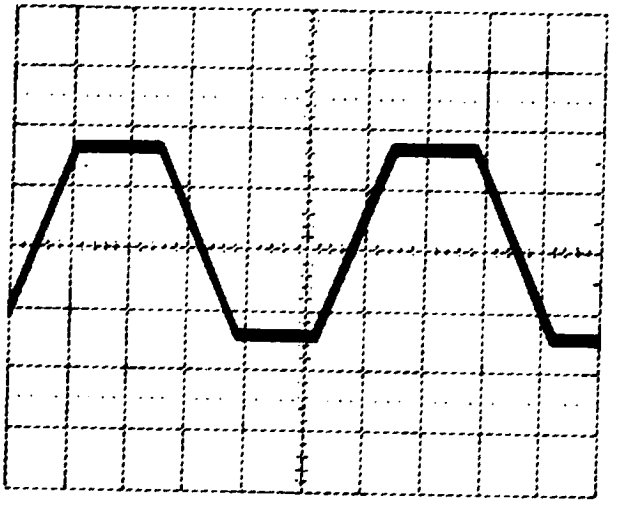


Illustration 6-5
Test Limiting Waveform

6-4-8 Test Memory Portion of Protection Circuit

PROCEDURE:

1. Connect 1KHz signal to the input.
2. Connect an 8 ohm load to the output.
3. Connect a 155mH coil in parallel with an 8 ohm load.
4. Waveform should match Illustration 6-6.

6-4-9 Test 10KHz Square Wave Operation

PROCEDURE:

1. Connect 10KHz square wave, 20V peak to peak, to the input.
2. Connect an 8 ohm load to the output.
3. Set input level at maximum.
4. See Illustration 6-7 for proper waveform.

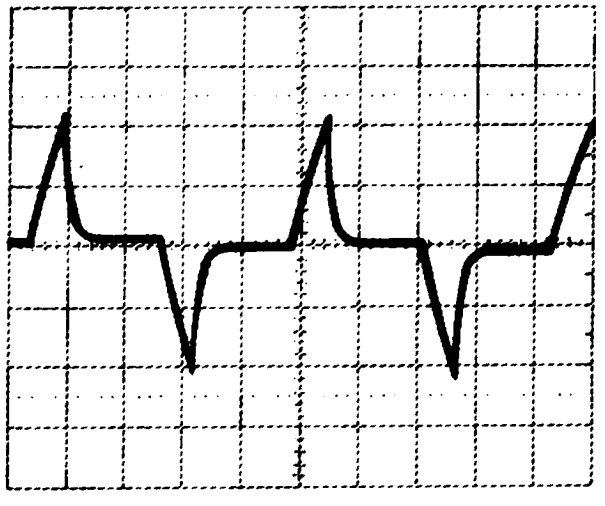


Illustration 6-6
Protection Circuit Memory Waveform

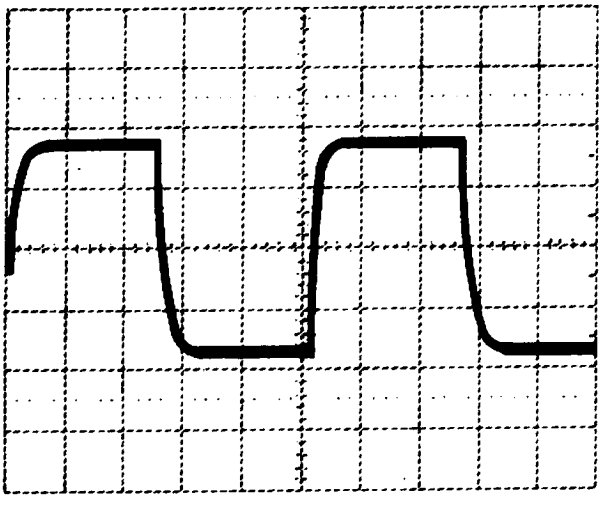


Illustration 6-7
Correct Square Wave Operation

6-4-10 Test 20KHz Operation

PROCEDURE:

1. Connect 20KHz sine wave to the input.
2. Connect 8 ohm load to the output.
3. Monitor output with oscilloscope.
4. Turn input level up until clipping occurs. Clipping must occur at over 150 watts (34.6V).
5. Waveform must not distort anywhere before clipping occurs.

6-4-11 IM (Inter-modulation) Distortion Test

PROCEDURE:

1. Use the IM distortion test setup shown in your IM analyzer manual.
2. Calibrate the distortion analyzer and set up the IM input signal at 60 - 7KHz, 4:1 ratio.
3. Connect an 8 ohm load to the output of the amplifier.
4. Measure the IM distortion at 5dB intervals from 155 watts output to 15mW as shown in Table 6-2. Readings must correspond to values shown in Table 6-2.

DB OF ATTENUATION	WATTS AT OUTPUT	AMPLIFIER OUTPUT IN VOLTS	MAXIMUM DISTORTION
0 DB	155W	35.2V	.004%
- 5	49	19.8	.01
-10	15.5	11.1	.01
-15	4.9	6.2	.01
-20	1.55	3.52	.01
-25	0.490	1.98	.01
-30	0.155	1.11	.03
-35	0.049	0.62	.03
-40	0.015	0.35	.03

Table 6-2
IM Test Values

6-4-12 20-20KHz Hum and Noise Test

PROCEDURE:

1. Use the noise test set-up shown in Illustration 6-8.
2. Short inputs from the amplifier.
3. Set level controls fully clockwise.
4. Measure the noise level relative to 150 watts.

The hum and noise level must be 110dB or more below the full 150 watt output power. A typical value is -115 to -120dB.

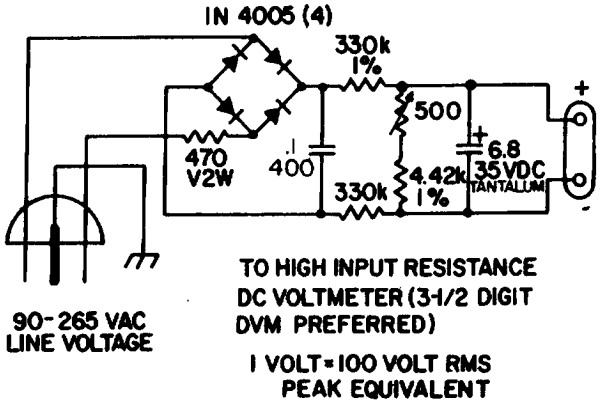


Illustration 6-9
Peak Equivalent Line Voltage Monitor

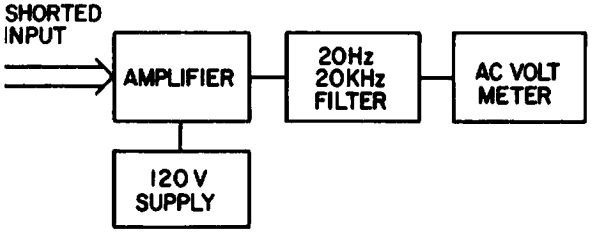


Illustration 6-8
Noise Test Setup

SECTION 7: ILLUSTRATED PARTS LIST

7-1 General Information

Section 7 contains illustrations and parts lists for the 5530. This information should be used with the service, repair and adjustment procedure in Section 6.

Most of the mechanical and structural type parts are illustrated and indexed on exploded view drawings. Electrical and electronic parts on these illustrations are also identified by the circuit schematic designation next to the illustration. Both the index number and the schematic designation are included in the parts list in separate columns. The schematic designations correspond to these shown in schematic diagrams in the Review Section.

Electrical and electronic parts located on printed circuit boards are illustrated by schematic symbols on the component side. Schematic designations also appear on these diagrams.

7-2 Standard and Special Parts

Many electrical and electronic parts used in the 5530 are standard items stocked by and available from electronic supply houses. However, some electronic parts that appear to be standard, are actually special. A part ordered from Techron will assure an acceptable replacement. Structural items, covers and panels are available from Techron only.

7-3 Ordering Parts

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

7-4 Shipment

1. Shipment will be made by UPS or best method unless you specify a preferred method.

2. Shipments are made F.O.B. Elkhart, Indiana only.

3. Established Techron accounts will be freight prepaid and billed unless shipped by truck or air freight.

4. All others will be shipped freight collect.

7-5 Terms

NOTE: Part prices are subject to change without notice.

1. Normal terms are C.O.D. unless the order is prepaid.

2. Net 30 days terms apply only to those firms who have an established line of credit with Techron.

3. If prepaying please add an amount for the freight charge. $2.50 is average for an order under one pound.

4. New parts returned for credit are subject to a 10% restocking charge.

5. You must receive authorization from the Parts Dept. before returning parts for credit.

6. We are not a general parts warehouse! Parts are available for servicing Techron products only.

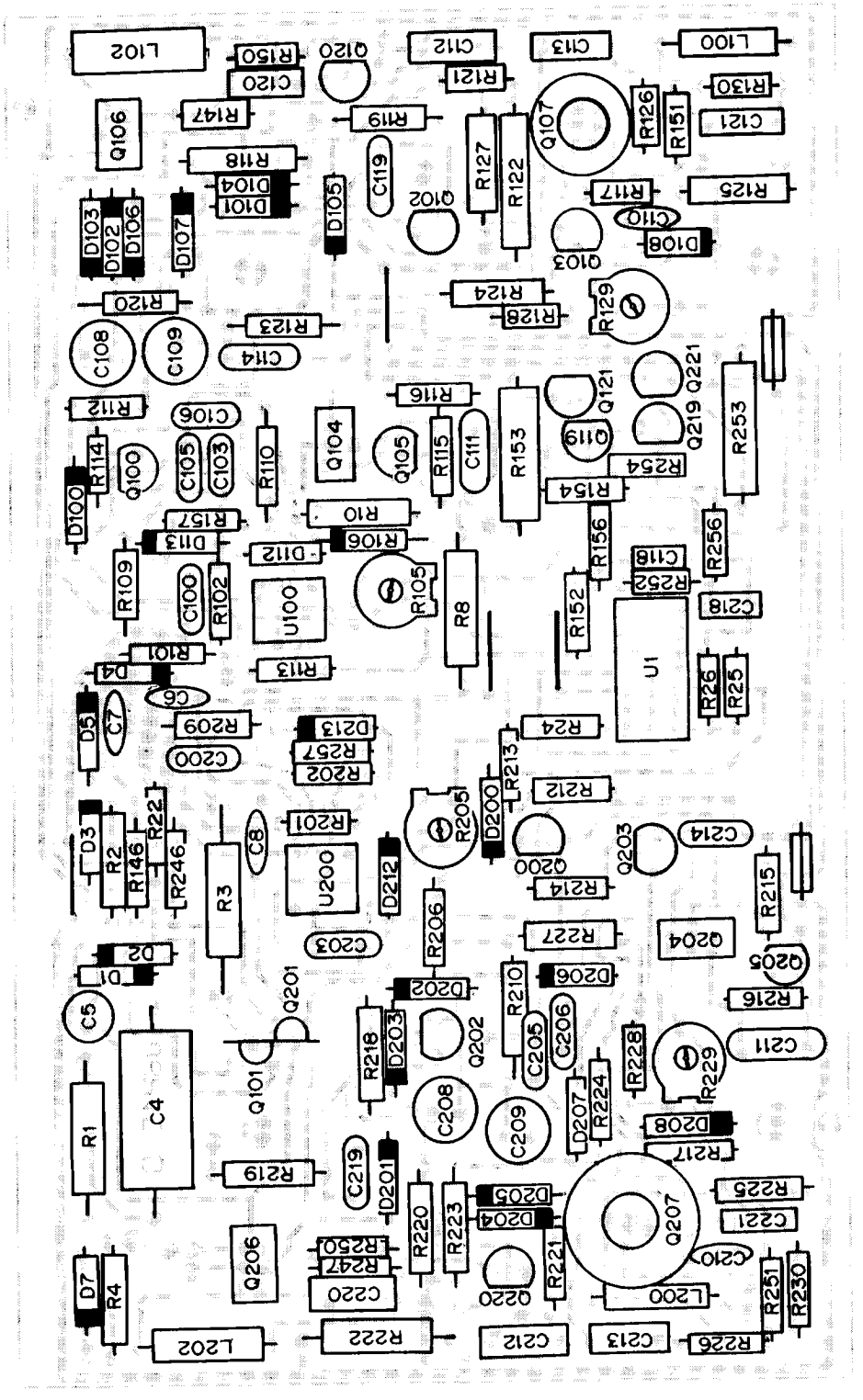


Illustration 7-1
Main Board Component Side

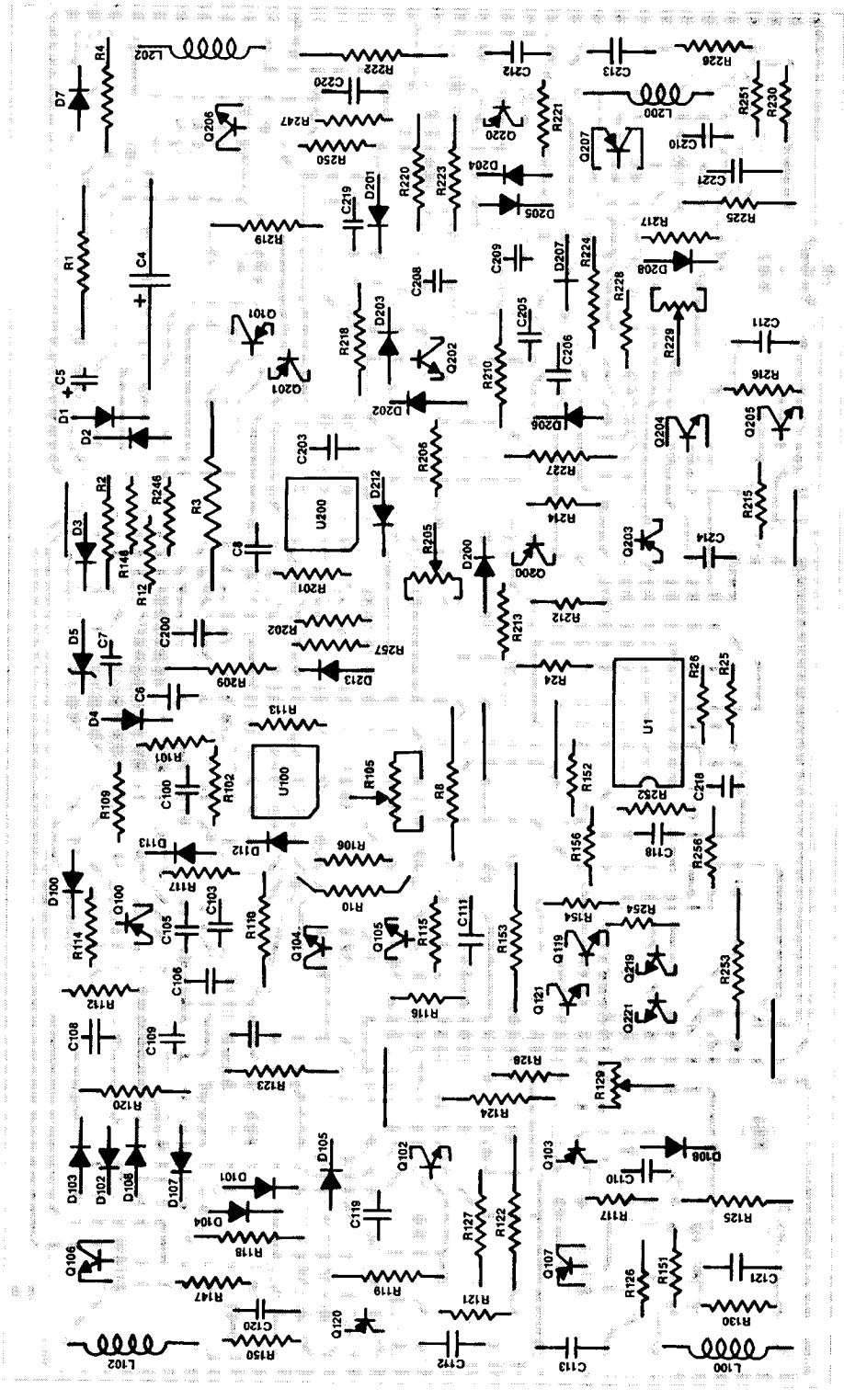


Illustration 7-2
Main Board Foil Side

SECTION 7: PARTS LIST

5530 MA1N BOARD ASSEMBLY

Location #	Description	Part #
CAPACITORS		
C4	10 MF 160V	C 2796-8
C5	10 MF 50V Vertical	C 3728-0
C6	.01MF Disc OLD UNITS C8576-8 (100Mf 35V)	C 1751-4
C7	.01MF Disc	C 1751-4
C8	.01MF Disc	C 1751-4
C100	100PF Mica	C 3410-5
C103	47PF Mica	C 3409-7
C105	120PF Mica	C 3290-1
C106	82PF Mica	C 3627-4
C108	22MF 50V Vertical	C 5311-3
C109	22MF 50V Vertical	C 5311-3
C110	.01MF Disc	C 1751-4
C111	.001MF 200V Film	C 3480-8
C112	.012MF 200V Film	C 3219-0
C113	.0027MF 200V Film	C 3481-6
C114	200PF Mica	C 3411-3
C118	.1MF 63V	C 5639-7 OR C8897-8
C119	200PF Mica	C 3411-3
C120	.0047MF	C 3996-3
C121	.001MF 200V Film	C 3480-8
C200	100PF Mica	C 3410-5
C203	47PF Mica	C 3409-7
C205	120PF Mica	C 3290-1
C206	82PF Mica	C 3627-4
C208	22MF 50V Vertical	C 5311-3
C209	22MF 50V Vertical	C 5311-3
C210	.01MF Disc	C 1751-4
C211	.001MF 200V Film	C 3480-8
C212	.012MF 200V Film	C 3219-0
C213	.0027MF 200V Film	C 3481-6

5530 MA1N BOARD ASSEMBLY (cont'd)

Location #	Description	Part #
CAPACITORS (cont'd)		
C214	200PF Mica	C 3411-3
C218	.1MF 63V	C 5639-7 C 8897-8
C219	200PF Mica	C 3411-3
C220	.0047MF	C 3996-3
C221	.001MF 200V Film	C 3480-8
COILS		
L100	.5 Microhenry Axial Lead (Green)	C 3510-2
L102	.5 Microhenry Axial Lead (Green)	C 3510-2
L200	.5 Microhenry Axial Lead (Green)	C 3510-2
L202	.5 Microhenry Axial Lead (Green)	C 3510-2
DIODES		
D1	1N4003	C 2851-1
D2	1N4003	C 2851-1
D3	1N961B 10V Zener	C 3549-0
D4	1N961B 10V Zener	C 3549-0
D5	1N961B 10V Zener	C 3549-0
D7	1N4148	C 3181-2
D100	1N4148	C 3181-2
D101	1N4148	C 3181-2
D102	1N4148	C 3181-2
D103	1N4148	C 3181-2
D104	1N4148	C 3181-2
D105	1N4148	C 3181-2
D106	1N4148	C 3181-2
D107	1N4148	C 3181-2
D108	1N270	D 6212-1
D112	1N4148	C 3181-2
D113	1N4148	C 3181-2
D200	1N4148	C 3181-2
D201	1N4148	C 3181-2
D202	1N4148	C 3181-2
D203	1N4148	C 3181-2
D204	1N4148	C 3181-2
D205	1N4148	C 3181-2
D206	1N4148	C 3181-2

5530 MA1N BOARD ASSEMBLY (cont'd)

Location #	Description	Part #
DIODES (cont'd)		
D207	1N4148	C 3181-2
D208	1N270	D 6212-1
D212	1N4148	C 3181-2
D213	1N4148	C 3181-2
INTEGRATED CIRCUITS		
U1	LM339N	C 4345-2
U100	LF357H	C 6527-3
U200	LF357H	C 6527-3
RESISTORS		
R1	1K ohm 1W 10%	C 3615-9
R2	2.2K ohm .5W 5%	C 1036-0
R3	~~2.7K ohm 2W 10%~~ 2K 2W	~~C 4740-4~~ C 7322-8
R4	2.2K ohm .5W 5%	C 1036-0
R8	~~2.7K ohm 2W 10%~~ 2K 2W	~~C 4740-4~~ C 7322-8
R10	10K ohm .5W 1%	C 2343-9
R12	200K ohm .25W 5%	C 3622-5
R14	33K ohm .25W 5%	C 4346-0
R15	150K ohm .25W 5%	C 4216-5
R16	33K ohm .25W 5%	C 4346-0
R101	2M ohm .25W 5%	C 3199-4
R102	1K ohm .25W 5%	C 2627-5
R105	100K ohm Trim Pot	C 5062-2
R106	160K ohm .25W 5%	C 4217-3
R109	511 ohm .5W 1% Film	C 3304-0
R110	10K ohm .5W 1% Film	C 2343-9
R112	5.6K ohm .25W 5%	C 3220-8
R113	8.2K ohm .25W 5%	C 2877-6
R114	68K ohm .25W 5%	C 3620-9
R115	820 ohm .25W 5%	C 3301-6
R116	82 ohm .25W 5%	C 3960-9
R117	470 ohm .25W 5%	C 2626-7
R118	120 ohm .5W 5%	C 3837-9
R119	120 ohm .5W 5%	C 3837-9
R120	15K ohm .5W 5%	C 1064-2

UPDATE

5530 MA1N BOARD ASSEMBLY (cont'd)

Location #	Description	Part #
RESISTORS (cont'd)		
R121	820 ohm .25W 5%	C 3301-6
R122	3.3K ohm 1W 5%	C 3617-5
R123	15K ohm .5W 5%	C 1064-2
R124	120 ohm .5W 5%	C 3837-9
R125	120 ohm .5W 5%	C 3837-9
R126	15 ohm .25W 5%	C 3614-2
R127	2.2K ohm .5W 5% Film	C 1036-0
R128	750 ohm .25W 5%	C 3803-1
R129	500 ohm Trim Pot	C 6048-0
R130	47 ohm .25W 5%	C 1011-3
R146	2.4K ohm .25W 5%	C 3616-7
R147	100 ohm .25W 5%	C 2872-7
R150	13K ohm .25W 5%	C 4300-7
R151	13K ohm .25W 5%	C 4300-7
R152	150K ohm .25W 5%	C 4216-5
R153	3.3K ohm 1W 5%	C 3617-5
R154	56K ohm .25W 5%	C 2882-6
R156	47K ohm .25W 5%	C 3939-3
R157	402K ohm .25W 1%	C 6554-7
R158	(For .775VRMS Jumpers)	
R201	2M ohm .25W 5%	C 3199-4
R202	1K ohm .25W 5%	C 2627-5
R205	100K ohm Trim Pot	C 5062-2
R206	160K ohm .25W 5%	C 4217-3
R209	511 ohm .5W 1% Film	C 3304-0
R210	10K ohm .5W 1% Film	C 2343-9
R212	5.6K ohm .25W 5%	C 3220-8
R213	8.2K ohm .25W 5%	C 2877-6
R214	68K ohm .25W 5%	C 3620-9
R215	820 ohm .25W 5%	C 3301-6
R216	82 ohm .25W 5%	C 3960-9
R217	470 ohm .25W 5%	C 2626-7
R218	120 ohm .5W 5%	C 3837-9
R219	120 ohm .5W 5%	C 3837-9
R220	15K ohm .5W 5%	C 1064-2

5530 MA1N BOARD ASSEMBLY (cont'd)

Location #	Description	Part #
RESISTORS (cont'd)		
R221	820 ohm .25W 5%	C 3301-6
R222	3.3K ohm 1W 5%	C 3617-5
R223	15K ohm .5W 5%	C 1064-2
R224	120 ohm .5W 5%	C 3837-9
R225	120 ohm .5W 5%	C 3837-9
R226	15 ohm .25W 5%	C 3614-2
R227	2.2K ohm .5W 5% Film	C 1036-0
R228	750 ohm .25W 5%	C 3803-1
R229	500 ohm Trim Pot	C 6048-0
R230	47 ohm .25W 5%	C 1011-3
R246	2.4K ohm .25W 5%	C 3616-7
R247	100 ohm .25W 5%	C 2872-7
R250	13K ohm .25W 5%	C 4300-7
R251	13K ohm .25W 5%	C 4300-7
R252	150K ohm .24W 5%	C 4216-5
R253	3.3K ohm 1W 5%	C 3617-5
R254	56K ohm .25W 5%	C 2882-6
R256	47K ohm .25W 5%	C 3939-3
R257	402 ohm .25W 1%	C 6554-7
R258	(For .775VRMS Jumpers)	
TRANSISTORS		
Q100	~~2N4250A~~ PNP MPSA93 (UPDATE)	~~C 3786-8~~ C 3578-9
Q101	MPS A93 PNP	C 3578-9
Q102	2N3859A (selected) NPN	D 2961-7
Q103	2N4125 PNP	C 3625-8
Q104	NSD128 NPN	C 4061-5
Q105	2N3859A (selected) NPN	D 2961-7
Q106	D40P3 NPN	C 5065-5
Q107	2N4929 PNP	C 2923-7
Q119	2N3859A NPN	D 2961-7
Q120	2N4125 PNP	C 3625-8
Q121	2N3859A NPN	D 2961-7
Q200	~~2N4250A~~ PNP MPSA93	~~C 3786-8~~ C 3578-9
Q201	MPS A93 PNP	C 3578-9
Q202	2N3859A (selected) NPN	D 2961-7
Q203	2N4125 PNP	C 3625-8

5530 MA1N BOARD ASSEMBLY (cont'd)

Location #	Description	Part #
TRANSISTORS (cont'd)		
Q204	NSD128 NPN	C 4061-5
Q205	2N3859A (selected) NPN	D 2961-7
Q206	D40P3 NPN	C 5065-5
Q207	2N4929 PNP	C 2923-7
Q219	2N3859A NPN	D 2961-7
Q220	2N4125 PNP	C 3625-8
Q221	2N3859A NPN	D 2961-7
MISCELLANEOUS		
	Heatsink TO5	C 4414-6
	Heatsink Dual TO-92	C 3493-1
	Mounting Pad TO-5	C 1250-7
	8-Pin IC Socket	C 3451-9
	14-Pin IC Socket	C 3450-1
	O ohm Jumper	C 5868-2

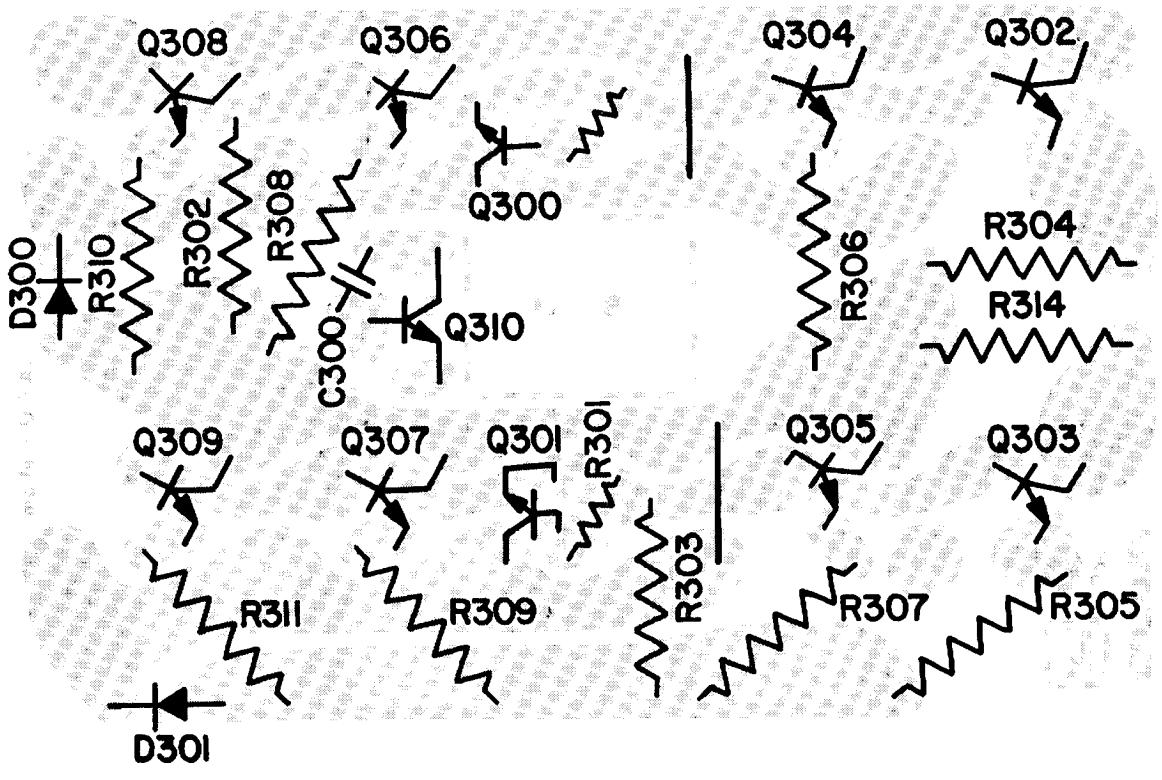


Illustration 7-3
Output Board

300 Series Components refer to Ch. 1 (shown)
400 Series Components refer to Ch. 2

OUTPUT BOARD

Location #	Description	Part #
RESISTORS		
R300	180 ohm .25W 5%	C 2873-5
R301	180 ohm .25W 5%	C 2873-5
R302	5.6 ohm 1W 5%	~~C 2355-3~~ A10266-5R64
R303	5.6 ohm 1W 5%	~~C 2355-3~~
R304	.33 ohm 5W 5%	C 3583-9
R305	.33 ohm 5W 5%	C 3583-9
R306	.33 ohm 5W 5%	C 3583-9
R307	.33 ohm 5W 5%	C 3583-9
R308	.33 ohm 5W 5%	C 3583-9
R309	.33 ohm 5W 5%	C 3583-9
R310	.33 ohm 5W 5%	C 3583-9
R311	.33 ohm 5W 5%	C 3583-9
R312	2.7 ohm 2W 10%	C 3613-4
R314	.33 ohm 5W 5% Wire	C 3583-9
R400	180 ohm .25W 5%	C 2873-5
R401	180 ohm .25W 5%	C 2873-5
R402	5.6 ohm 1W 5%	~~C 2355-3~~ A10266-5R64
R403	5.6 ohm 1W 5%	~~C 2355-3~~
R404	.33 ohm 5W 5%	C 3583-9
R405	.33 ohm 5W 5%	C 3583-9
R406	.33 ohm 5W 5%	C 3583-9
R407	.33 ohm 5W 5%	C 3583-9
R408	.33 ohm 5W 5%	C 3583-9
R409	.33 ohm 5W 5%	C 3583-9
R410	.33 ohm 5W 5%	C 3583-9
R411	.33 ohm 5W 5%	C 3583-9
R412	2.7 ohm 2W 10%	C 3613-4
R414	.33 ohm 5W 5% wire	C 3583-9
CAPACITORS		
C300	.01MF Disc	C 1751-4
C301	.1MF 200V Film	C 2938-6
C302	4.7MF 100V	C 5050-7
C400	.01MF Disc	C 1751-4
C401	.1MF 200V Film	C 2938-6
C402	4.7MF 100V	C 5050-7

OUTPUT BOARD (cont'd)

Location #	Description	Part #
DIODES		
D300	1N4003	C 2851-1
D301	1N4003	C 2851-1
D400	1N4003	C 2851-1
D401	1N4003	C 2851-1
TRANSISTORS		
Q300	25D555 NPN	C 5869-0
Q301	25D555 NPN	C 5869-0
Q302	MJ15150 NPN	D 5841-8
Q303	MJ15150 NPN	D 5841-8
Q304	MJ15150 NPN	D 5841-8
Q305	MJ15150 NPN	D 5841-8
Q306	MJ15150 NPN	D 5841-8
Q307	MJ15150 NPN	D 5841-8
Q308	MJ15150 NPN	D 5841-8
Q309	MJ15150 NPN	D 5841-8
Q310	2961 NPN	D 2961-7
Q400	25D555 NPN	C 5869-0
Q401	25D555 NPN	C 5869-0
Q402	MJ15003 NPN	C 7064-6
Q403	MJ15003 NPN	C 7064-6
Q404	MJ15003 NPN	C 7064-6
Q405	MJ15003 NPN	C 7064-6
Q406	MJ15003 NPN	C 7064-6
Q407	MJ15003 NPN	C 7064-6
Q408	MJ15003 NPN	C 7064-6
Q409	MJ15003 NPN	C 7064-6
Q410	2961 NPN	D 2961-7
MISCELLANEOUS		
	Output Module PC Board	P 7954-4

IOC BOARD

Location #	Description	Part #
E300	Red LED	C 5905-2
E400	Blank IOC LED PC Board	P 9988-0

PILOT LED BOARD

Location #	Description	Part #
E500	Amber LED	C 4343-9
	Blank Pilot LED PC Board	P10068B4

MISCELLANEOUS ELECTRICAL PARTS NOT INCLUDED ON PC BOARDS

Item #	Description	Part #
C301	.1MF 200V	C 2938-6
C302	4.7MF 100V	C 5050-7
C303	4.7MF 100V	C 5050-7
C401	.1MF 200V	C 2938-6
C402	4.7MF 100V	C 5050-7
C403	4.7MF 100V	C 5050-7
C500	.1MF 200V	C 2938-6
C501	13,000MF 70V	C 3436-0
C502	13,000MF 70V	C 3436-0
R9	2.7 ohm .5W	C 2857-8
R312	2.7 ohm 2W	~~C 3613-4~~ 2) A10266-5R64 IN PAR.
R313	1 ohm .5W	C 3612-6
R315	100K ohm Level Control	D 5696-6
R412	2.7 ohm 2W	~~C 3613-4~~ 2) A10266-5R64 IN PAR.
R413	1 ohm .5W	C 3612-6
R415	100K ohm Level Control	D 5696-6
D500	35A Rectifier	C 4305-6
T500	Power Transformer	D 5781-6
F500	10A Fuse	C 2819-8
	5A Fuse	C 3774-4
S503	DPDT Mono Switch	C 4110-0

MISCELLANEOUS ELECTRICAL PARTS NOT INCLUDED ON PC BOARDS (cont'd)

Item #	Description	Part #
E300	Red LED Ch. 1	C 5905-2
E400	Red LED Ch. 2	C 5905-2
E500	Amber LED	C 4342-9
L300	3 Microhenry Coil ASM	M43115-1
L400	3 Microhenry Coil ASM	M43115-1

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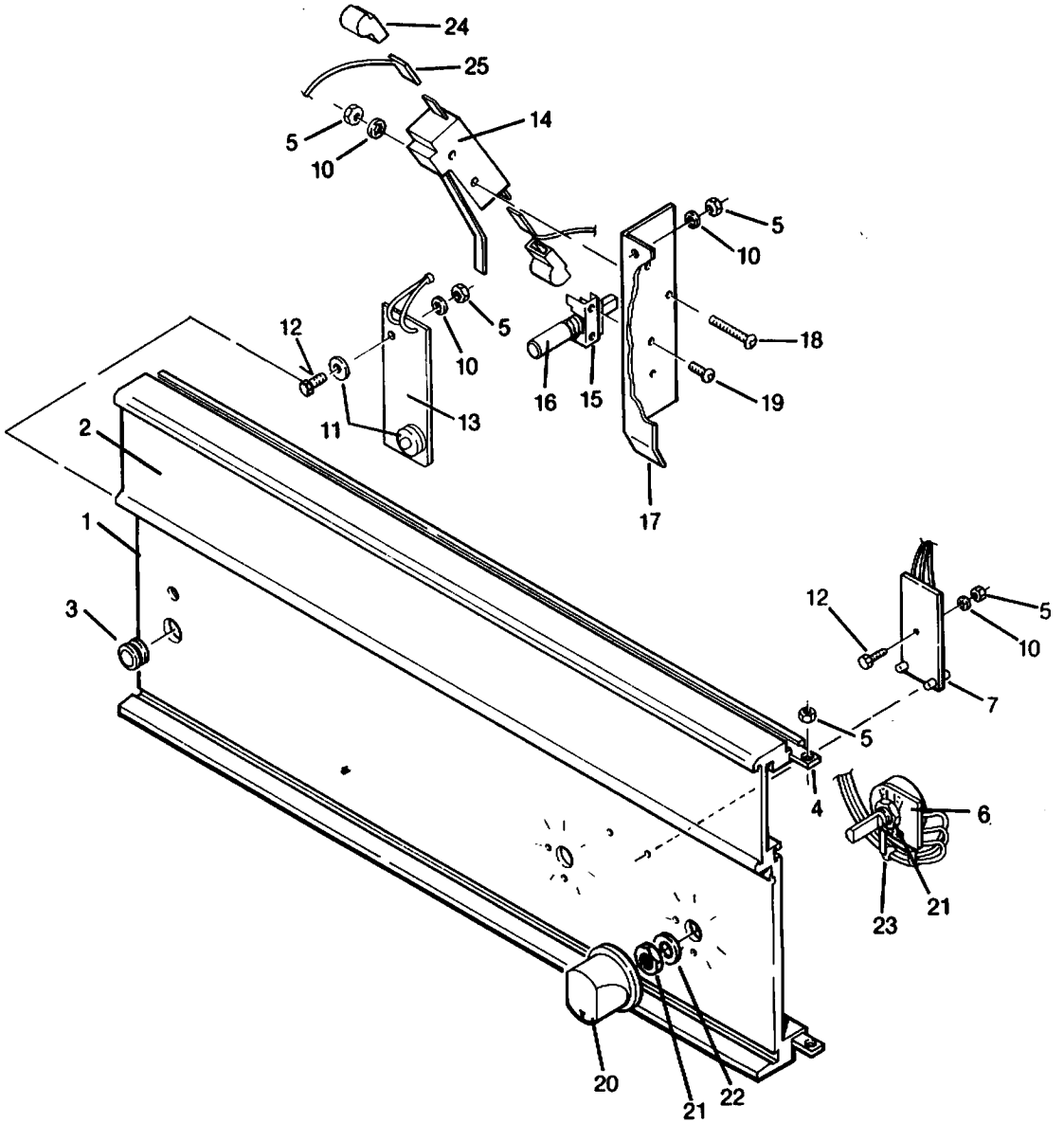

Illustration 7-4
Front Panel Exploded View

FRONT PANEL ASSEMBLY *(refer to Illustration 7-4)*

Item #	Description	Part #
1	Front Panel	F10303-0
2	Lexan Inlay	F10304B4
3	Pushbutton Collar	D 4108-3
4	Carrier Strip	D 3638-0
5	6-32 Hex Nut	C 1889-2
6	Input Level Control	D 5696-6 ✱
7	Blank IOC Board	P 9988-0
8	N/A	N/A
9	N/A	N/A
10	#6 Lockwasher	C 5594-4
11	Fiber Washer	C 3575-5
12	6-32 x .37 Hex Screw	C 3322-2
13	Pilot LED Board	P10068B4
14	20A Power Switch	D 5699A8
15	1 Station Plunger	D 4808A6
16	Pushbutton	D 5954J8
17	Switch Bracket	F10043A0
18	6-32 x 1 Screw	C 2138-3
19	Self Starting Screw	C 4329-6
20	Knob	D 5953J0
21	Bright Nut	C 1288-7
22	Flat Washer	C 2189-6
23	Solder Lug	D 2828-8
24	Faston Flag Housing	C 3297-6
25	AMP Flag Terminal	C 3901-3

✱ 10-TURN LEVEL POT C 5354-3
COUNTING DIAL C 7335-0

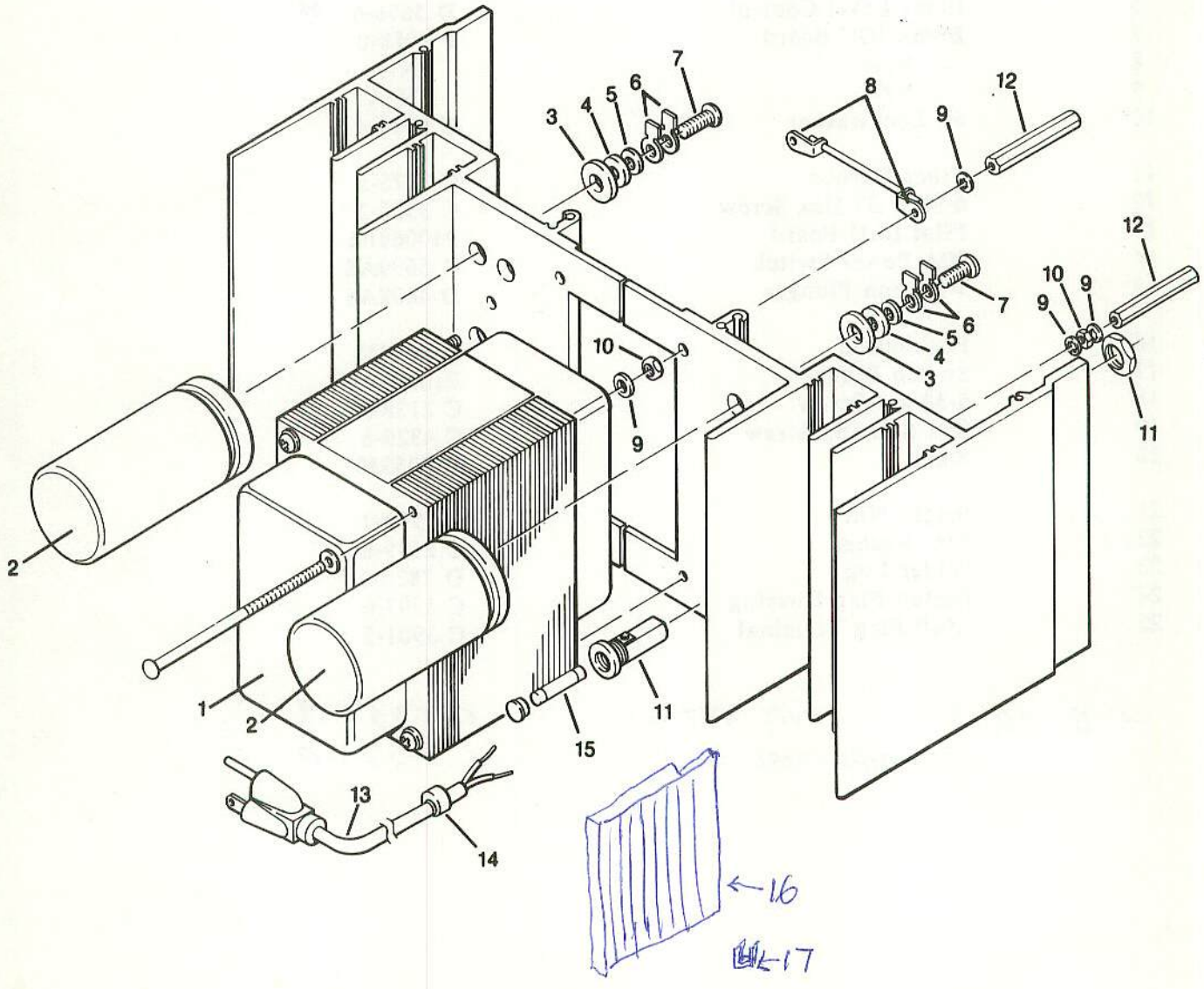

Illustration 7-5
Back Panel Exploded View

BACK PANEL ASSEMBLY *(refer to Illustration 7-5)*

Item #	Description	Part #
1	Power Transformer	D 5781-6
2	Power Supply Capacitor	C 3436-0
3	Nylon Washer	C 1657-3
4	Fiber Washer	C 3320-6
5	Flat Washer	C 3830-4
6	Solder Lug	D 2934-4
7	10-32 x .5 Screw	C 2049-2
8	#10 Solder Lug	D 3312-2
9	#10 Lockwasher	C 2279-5
10	10-32 Hex Nut	C 2170-6
11	Fuseholder	C 5597A5
12	Hex Spacer	D 3581-2
13	AC Power Cord	D 6507-4
14	Strain Relief	C 3582-1
15	10A Fuse	C 2819-8
16	OPTIONAL HEATSINK FINS	D 3955-8
17	HEATSINK CLIPS	C 3952-6

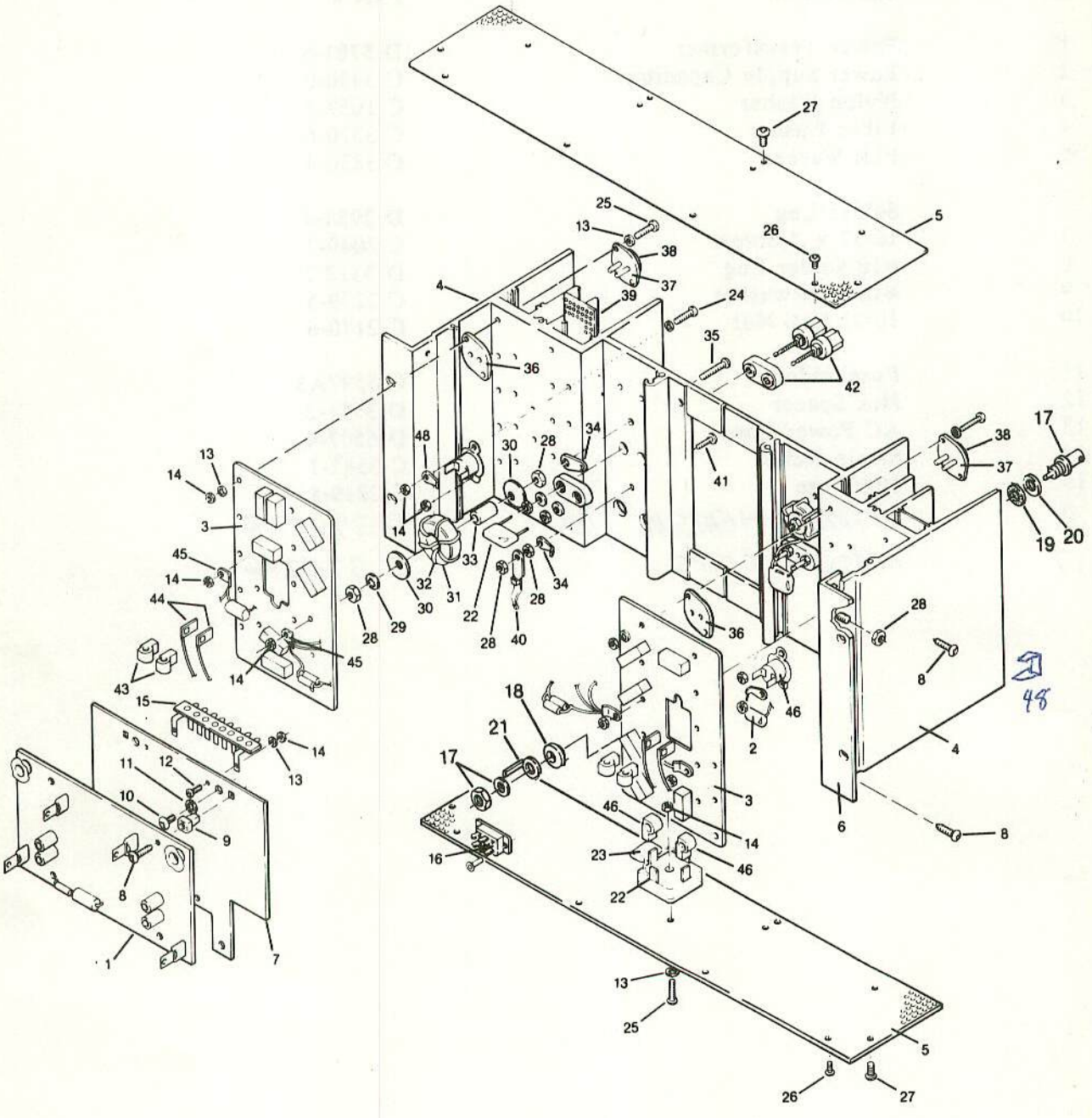

Illustration 7-6
Internal Exploded View

INTERNAL EXPLODED VIEW (refer to Illustration 7-6)

Item #	Description	Part #
1	Main Board Module	Q42532-4
2	Capacitor 4.7MF 100V	C 5050-7
3	Output Board Module	Q41207J3
4	Chassis Heatsink	D 3561-4
5	Chassis Cover	F 9561-6
6	Rack Mount Bracket	~~D 5705-5~~ M20260J1
7	Main Board Shield Plate	F 9592-1
8	Screw #8x62 Self Starting	C 6014-2
9	Nut, Nylon Expanded	C 2544-2
10	Screw 8-32 x .37	C 2155-7
11	Lockwasher #8	C 1951-0
12	Screw 6-32 x .375	C 6077-9
13	Lockwasher #6	C 5594-4
14	Nut 6-32	C 1889-2
15	Terminal Strip	D 4985-4
16	Stereo/Mono Switch	C 4110-0
17	BNC Jack	S 3249-0
18	Washer, Fiber	C 2306-7
19	Washer, Fiber	C 1646-6
20	Washer, Flat	C 2189-6
21	Nut, Bright	C 1288-7
22	Bridge Rectifier	C 4305-6
23	Capacitor .1MF 200V	C 2938-6
24	Screw 6-32 x .62	C 3879-1
25	Screw 6-32 x .75	C 2135-9
26	Screw 6-32 x .25	C 4758-6
27	Screw 10-24 x .37	C 6916-8
28	Nut 10-32 Hex	C 2170-6
29	Lockwasher	C 2279-5
30	Washer, Fiber	D 3609-1
31	Torrid Form	C 2850-3
32	Magnet Wire 13"	B 3630-9
33	Nylon Spacer	C 2762-0
34	Solder Lug #10	D 3312-2
35	Captive Stud	C 3636-5
36	TO-3 Insulator	D 4071-3
37	TO-3 Anodized Insulator	C 4039-1
38	Output Transistor MJ15150 NPN	D 5841-8

INTERNAL EXPLODED VIEW (cont'd)

Item #	Description	Part #
	Driver Transistor 2SD555 NPN	C 5869-0
39	Output Transistor Cover	F 7959-4
40	Tie Wrap	C 1813-2
41	Screw 10-32 x .5	C 2049-2
42	Dual Binding Post	C 2823-0
43	Faston Flag Housing	C 3297-6
44	AMP Flag Terminal	C 3901-3
45	Solder Lug #6	C 3163-0
46	Thermal Switch 160F	C 2799-2
47	TO-3 Insulator	D 4071-3
48	CLIPS FOR EXTRA HEATSINKS	C 3952-6