

their push-pull effect through the High Side bias servo devices, drive the fully complementary output stage. For more information on the LVA's, refer to section 4.2.

U106 and U107 bring in feedback information and protection muting to the Voltage Translator stages. The feedback controls gain from Voltage Translators to output jacks. The protection inputs ($\pm LH$) pull off feed to the Voltage Translators in proportion to ODEP limiting, and completely in the event of power-down or a Fault.

4.5.7 Inverting Stages

Overall the amplifier is non-inverting. Four stages within the amplifier, however, do invert the audio signal for a net non-inversion. The individual stages are: the BGS, which inverts the audio; the Variable Gain Stage, which inverts it back, the input side of U106 and U107 which drive the Voltage Translators re-inverts the audio (the Voltage Translators are a common-base configuration for high voltage gain); and finally the LVA's invert the audio for the last time for a net non-inversion through the amplifier.

4.6 PROTECTION SYSTEMS

The MA-5000VZ has several protection mechanisms to limit drive or shutdown the amplifier completely in the event of a fault of almost any kind. Mechanisms include: ODEP (covered in depth in section 4.4), current limit (covered in section 4.2.2), over-voltage (on AC mains), DC/LFI, common mode output current, output thermal, transformer thermal, FET thermal, loss of AC mains, compression (covered in section 4.5.4), LOI (covered in section 4.5.5), and slew rate limit (covered in section 4.2.2). After any non-latching fault clears which has shut down the amplifier, the amplifier will automatically power back up via soft-start. Because the fans within the MA-5000VZ cool the amplifier to (under normal conditions) prevent thermal shutdowns and ODEP limiting, the fan control circuit is also covered in this section.

Refer to Fig. 4.6, 4.7, and 4.8. Fig. 4.7 shows soft-start and fan control. Fig. 4.7 shows the soft-start control signals. Fig. 4.8 shows the over-all protection scheme of the MA-5000VZ. Each augments the others, and explode the basic block diagram of the unit (Fig. 4.9).

4.6.1 Soft-start

Soft-start circuitry controls the rate at which power is initially applied to the primary of the toroid transformers for the high-voltage power supplies. For ease of

explanation, assume the amplifier is operating properly and is just being turned on from the front panel power switch.

Before the power switch push-button is depressed, the input to the low voltage supply is open. The high voltage supply is isolated via input relay K700 and triac Q701 (which is in parallel with K700).

Several things occur immediately at turn-on. First the low voltage supply powers up and produces its main unregulated $\pm 24VDC$ and regulated $\pm 15VDC$. It also immediately produces pulsed DC via full-wave rectifier D709/D714.

As this occurs all op-amps in the amplifier receive power, including front-end stages, relay power control U111C, and standby control U111B. The output of U111C powers relay K700 via relay drive transistor Q700. When the output of this op-amp goes high, Q700 turns on and the relay closes. The output of U111C is held low until the amplifier delay times out by comparing a high voltage on its inverting input to an RC network voltage on its non-inverting input. R329 and R330 fix a window at about $+10.4VDC$. At turn-on C220 (a $10\mu F$ cap) is fully discharged. In that first instant it keeps $-15V$ on the non-inverting input of U111C, keeping its output low. As the capacitor charges it produces a ramped rise in voltage as it charges through R327. After about 4 seconds the voltage between R327 and R328 exceeds the window voltage and U111C output goes high, in turn causing relay K700 to close.

Note: Any protection signal within the amplifier which is used to shut it down will discharge this capacitor (C120) immediately causing the relay (K700) to open. Upon clearance of such shut-down protection signal, the charge will begin again with the same ramp effect and same delay.

The ramped voltage on the capacitor C120 is also sensed by Standby amplifier U111B. Its unity gain output is non-inverting. It drives the Soft-start op-amp (U701A) inverting input with its ramp to control the rate at which the field develops in the toroid. On the non-inverting input to U701A is the pulsed DC drive from the U701B/Q708 pulse circuit. Jumper JP1 may be set to 50 or 60Hz, but must be set properly to have the correct pulse width for soft-start. Pulse width is determined by C717 and either R777 (50Hz) or R777 in parallel with R806 (60Hz).

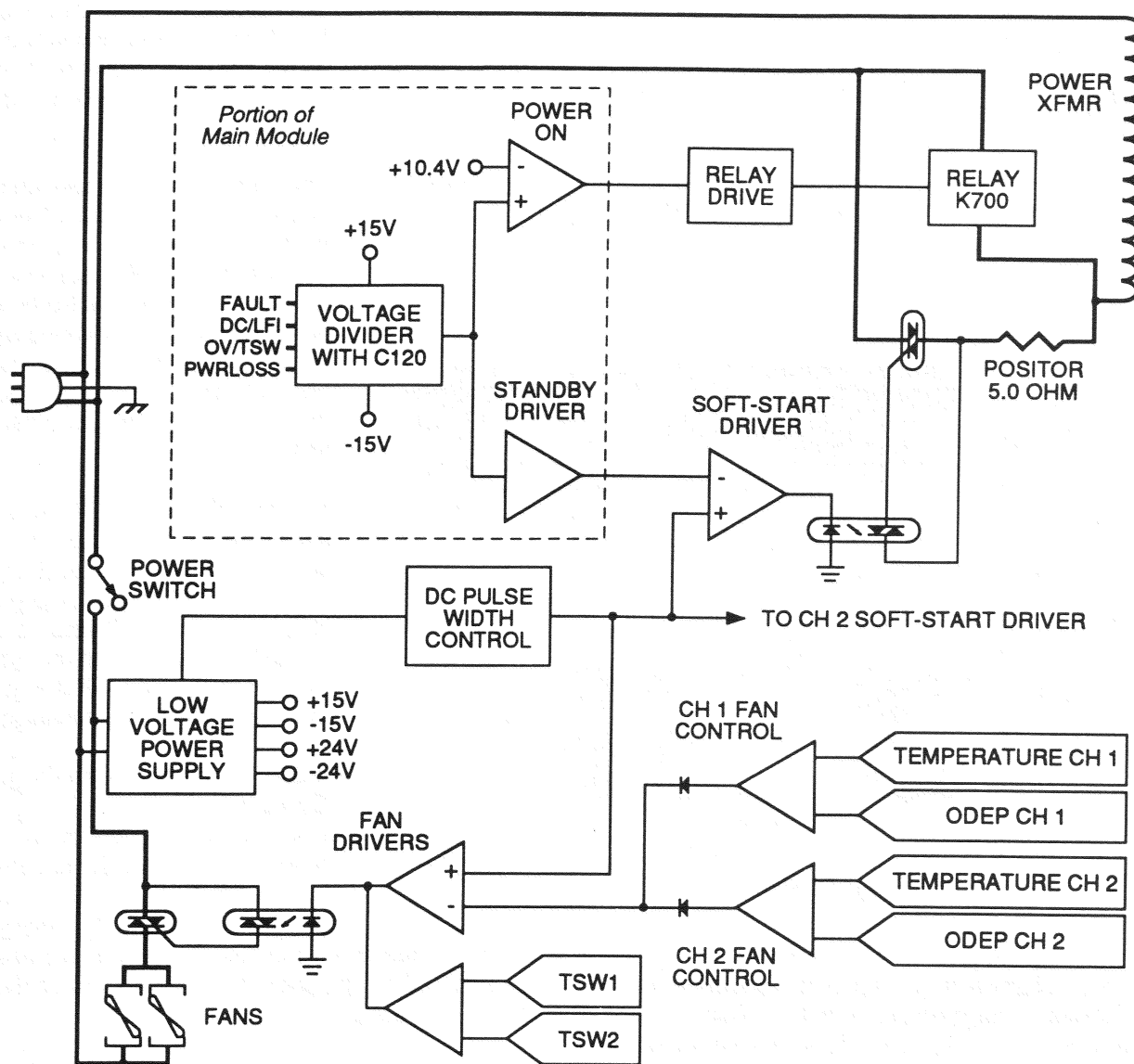


Fig. 4.6 Soft-start and Fan Control

The output of U701A controls the Soft-start. Refer to Fig. 4.6 for a graphic of Soft-start operation.

When the output of U701A goes low, the opto-triac device U700 turns on. While on the input triac Q700 conducts. Positor R702 limits peak input current to the toroid to a maximum of 22A peak (with 120VAC mains). U701A combines the sloped input from the C120 circuitry on the main module with the pulsed DC. As the portion of time which the output of U701A goes low increases, the amount of time where AC mains conduct to the transformer (via Q700 and R702) increases until it remains on. When the U111C PWR circuit times out, the relay closes bypassing the current

limiting soft-start circuit. Soft-start control signals are shown in Fig. 4.7. The upper signal is that produced by C120. At time 0 the amplifier is off. At time 1: the power switch is pressed (on). At time 2: C120 has fully charged, the magnetic fields have built up in the high voltage supply, and the main relay closes. At time 3: a protective action occurs; note that the DC supply remains. At time 4: the condition clears and the restart begins. Time 5 is akin to time 2, and time 6 is another protective action. The lower graph shows Q701 operation (high = on).

Any time a protection mechanism has acted and the condition then clears, this entire process repeats.

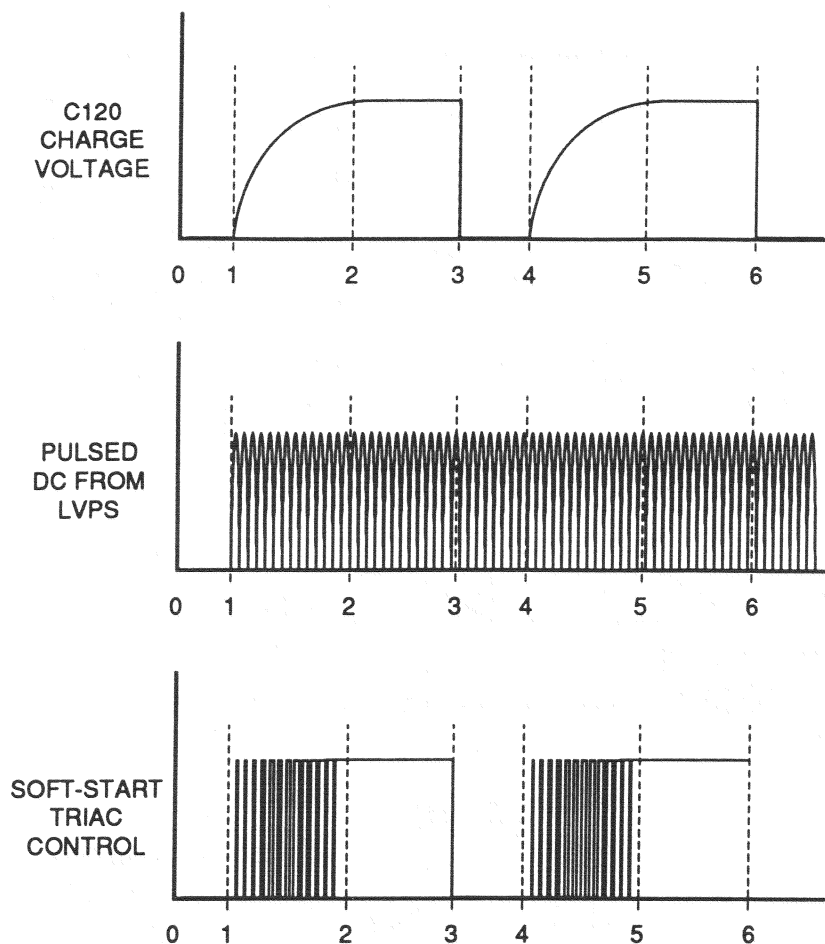


Fig. 4.7 Soft-start Signal

4.6.2 Over-voltage

One mode of amplifier protection is a shutdown in the event of over-voltage on the AC mains. This is sensed by the pulsed DC signal produced by the full-wave rectifier in the low voltage supply.

R780 picks off the pulsed DC and U707D will, if the voltage is too high, shift its output to a low. When this happens the over-volt/therm red LED on the control module lights and signal OV1 goes low to the main module.

A low (over-voltage condition) on OV1 causes U211C to shift to a low output. This low, through D1, causes C120 to discharge immediately. This in turn causes the main relay to drop out, soft-start to reset, and the \pm LL and \pm LH to clamp audio drive. Over-voltage is a non-latching fault condition.

4.6.3 DC/LF

The amplifier senses its own output for DC or very low frequency and will interrupt the amplifier channel in the event of DC or low frequency.

The feedback loop is sensed for voltage and the current sense signal provides current information. An RC network at the input to U109C/D will prevent the LF circuit from activating with normal audio frequency material, and will ensure activation with high level subsonic currents or voltages.

If U109C/D sense a DC (or LF) level, it will output a low which will, through D102, discharge C120 and initiate power supply shutdown. A low will also cause the DC/LF red LED on the main module to light. DC/LF is a non-latching protection mechanism.

4.6.4 Common Mode Output Current

Common mode current in the output stage can only be due to an output stage failure, or full power output of RF energy.

Common mode current occurs when a high current level exists in both the positive and the negative halves of the output stage.

U115 is a specialty device. It serves as both an Opto-SCR, and as a conventional SCR. It must have both an optic gate and conventional gate firing at the same time in order to latch. The conventional gate is fired by current sense of the output stage Low-side. The optic gate is fired by the High-side current sense. If high currents exist in both sides simultaneously, the SCR will latch on, and remain on until the unit is turned off.

When the SCR latches, low voltage causes the red LED (labeled Output Module) to light, and places a low on the FAULT signal line. A low on the FAULT line is sensed, via D112, by C120. Once again, a low here discharges C120 and shuts down the amplifier. FAULT is a latching protection mechanism (the only one in the amplifier).

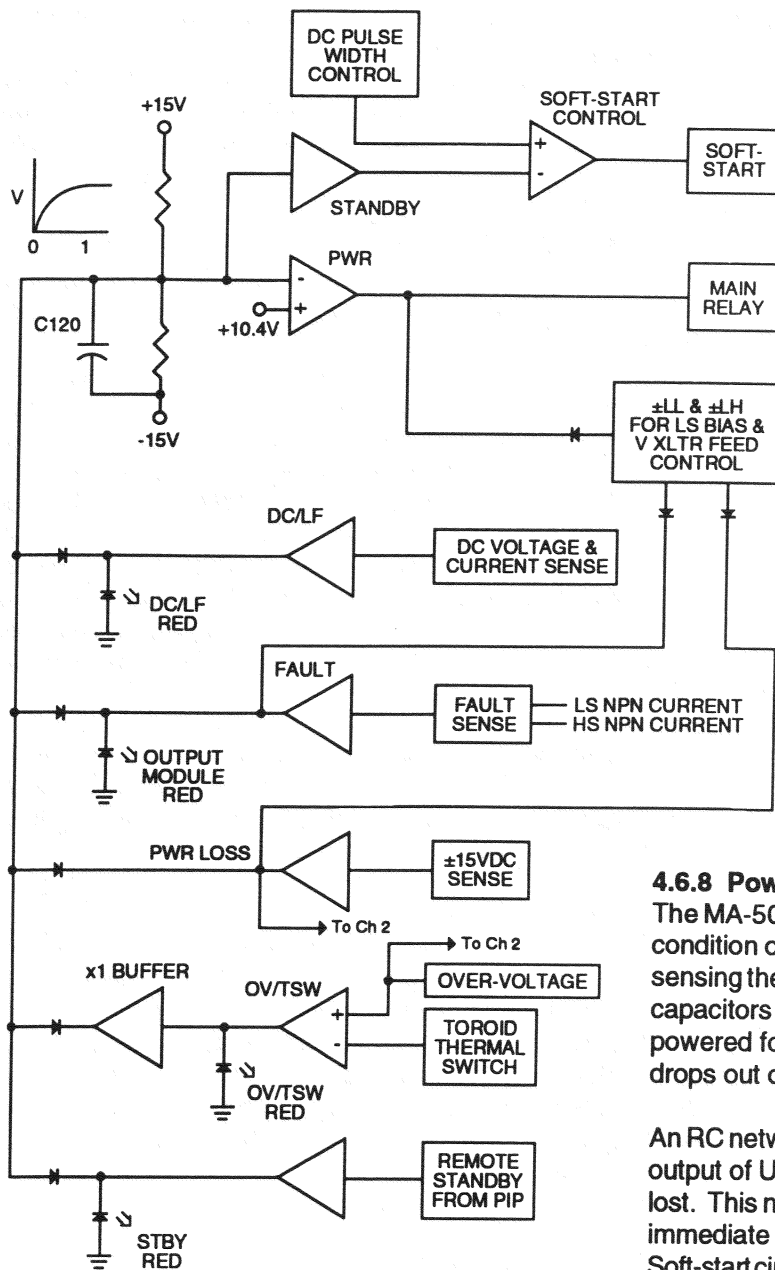


Fig. 4.8 Over-all Protection Scheme

4.6.5 Output Thermal

Output over-temperature protection has been covered, to a degree, in section 4.4.2 ODEP Circuitry. The calibrated temperature sense from the positive half of the output stage drives an over-temperature amp, U117A. If heatsink temperature exceeds a limit of about 130°C, the amplifier will go into hard ODEP. This does not shut down the amplifier, but does clamp the audio. Refer to section 4.4.2.

4.6.6 Transformer Thermal

The main power transformers have built-in thermal switches which open in the event of transformer over-temperature. In the event that the thermal switch opens in the channel 1 toroid, Q709 turns on causing U707D to go low. When it does, the over-voltage/thermal switch LED on the control module is energized and the OV1 signal is tripped; the fans are also forced to high speed. Transformer thermal protection is self-resetting. This results in amplifier shutdown by way of shared over-voltage circuitry. Refer to section 4.6.2.

4.6.7 FET Thermal

A special circuit has been designed into the MA-5000VZ to protect the MOSFET switches in the VZ supply. The voltage drop across the FETs (while conducting) is proportional to device temperature. Control circuitry senses the voltage and if necessary, the supply will be forced into low voltage (high current) mode to allow the FET devices to cool.

4.6.8 Power Loss

The MA-5000VZ has the ability to sense a "brown-out" condition on the AC service. This is accomplished by sensing the low-voltage power supply at U111A. Local capacitors on the $\pm 15\text{VDC}$ supply to this chip keep it powered for a short time after the low voltage supply drops out on power-down/loss.

An RC network, consisting of C1 and R6, will cause the output of U111A to shift low the instant low voltage is lost. This negative potential discharges C120 causing immediate opening of the main relay, and reset of the Soft-start circuitry. It is essential that C120 be discharged immediately in the event that power is restored before C120 would otherwise discharge. The power-loss circuit is common to both channels. Its output goes to $\pm LL$ and $\pm LH$ to immediately mute audio upon power-down or power-loss, thus preventing turn-off audio noise.

4.6.9 Fan Control

The MA-5000VZ, unlike other members of the Macro-Tech family, has two onboard fans. They are mounted to the chassis divider assembly and pull cool air from the front and discharge it across the output stage heatsinks to the rear of the amplifier. Also unlike the

other Macro-Techs, the fans are fully ODEP proportional (operate in proportion to output stage temperature and calibrated ODEP control voltage).

U713B combines channel 1 temperature and ODEP level, U713A for channel 2. D706 and D707 form a diode OR gate. The output of the OR gate drives one input to U707B. The other input to U707B is from the DC pulse width control circuit (U701B). U707B operates in a fashion similar to that of U707A, the Soft-start control amplifier. A graphic example of the fan control waveforms would look a good deal like those in Fig. 4.7, except that the thermal drive would be unique from that of the Soft-start ramp.

The fans will also be forced to operate at full speed in the event a toroid transformer thermal switch trips open. Note that very early units did not include this additional circuit.

4.7 DISPLAY

Amplifier front panel indication includes a total of 7 LED's. These include Enable, ODEP, SPI/IOC, and ILOAD/LIMIT.

The Enable indicator is an amber light which indicates presence of the low voltage supply. It is powered by the unregulated +24VDC supply. It will be on any time the power switch is depressed (unless the low voltage fuse blows).

ODEP indicators provide an on-line indication of amplifier thermal reserve. The LED's are amber (although they may have a reddish appearance) and are normally on. They dim and/or extinguish in the event that the amplifier's thermal reserve is exhausted. ODEP indicators will also extinguish whenever the main supply relays are open (such as a protection action being activated, or during Soft-start time-out).

Green SPI/IOC LED's show signal presence (SPI) and any form of distortion (IOC). They flash dimly with the audio to show signal. In the event of an IOC condition (output waveform differs from input by >0.05%, or input overload) the light will be on brightly. An occasional flash of IOC usually indicates clipping. If the IOC light locks in it usually indicates a protective action, or "hard" ODEP limiting.

ILOAD/LIMIT LED's flash green with the audio when program material is being delivered to a load. Its

function is similar to that of the SPI, except that SPI is voltage driven and does not require a load. ILOAD comes on when the amplifier is loaded, and brightness in proportion to the output current. This is the ILOAD function. In the event of current limiting action, the light will flash to red. This is the LIMIT function.

4.8 MONO MODES

The MA-5000VZ has three main operating modes, namely dual (stereo), bridge mono, and parallel mono.

There are a number of precautions which should be taken when operating the amplifier in either mono mode. The VZ mode switches for each channel must be set the same. Sensitivity, LOI, and Compressor switches for channel 2 make no difference. The input must be to channel 1 only. The input to channel 2 and controls for channel 2 are NOT defeated in either mono mode, therefore no connection to channel 2 may be made in either mono mode. The channel 2 level control should be turned down (counterclockwise) fully in either mono mode.

Monaural amplifier operating modes are covered in detail in the MA-5000VZ Owner's Manual. The discussion below primarily aids in understanding how the mono modes work for testing purposes.

4.8.1 Bridge Mono

Bridge mono is intended for loads of 4 ohms or greater. The feedback loop for channel 1 also drives the input to channel 2 in this mono mode. The input to channel 2 is, however, inverted. This causes the output of channel 2 to be of equal magnitude and opposite polarity (for double voltage output) the output of the amplifier is balanced, and channel hot output is connected to load hot (+), channel 2 hot output is connected to load return (-).

4.8.2 Parallel Mono

Parallel mono is intended for loads less than 4 ohms (as low as 1 ohm) in a monaural amplifier configuration. The channel 1 and 2 amplifier hot outputs must be shorted by an external shorting buss (10 AWG or larger). The amplifier output to the load(s) is taken from either channel's hot output to load hot, and either channel's negative output to the load return (-). The shorting buss must be removed prior to changing from parallel mono to either other mode.

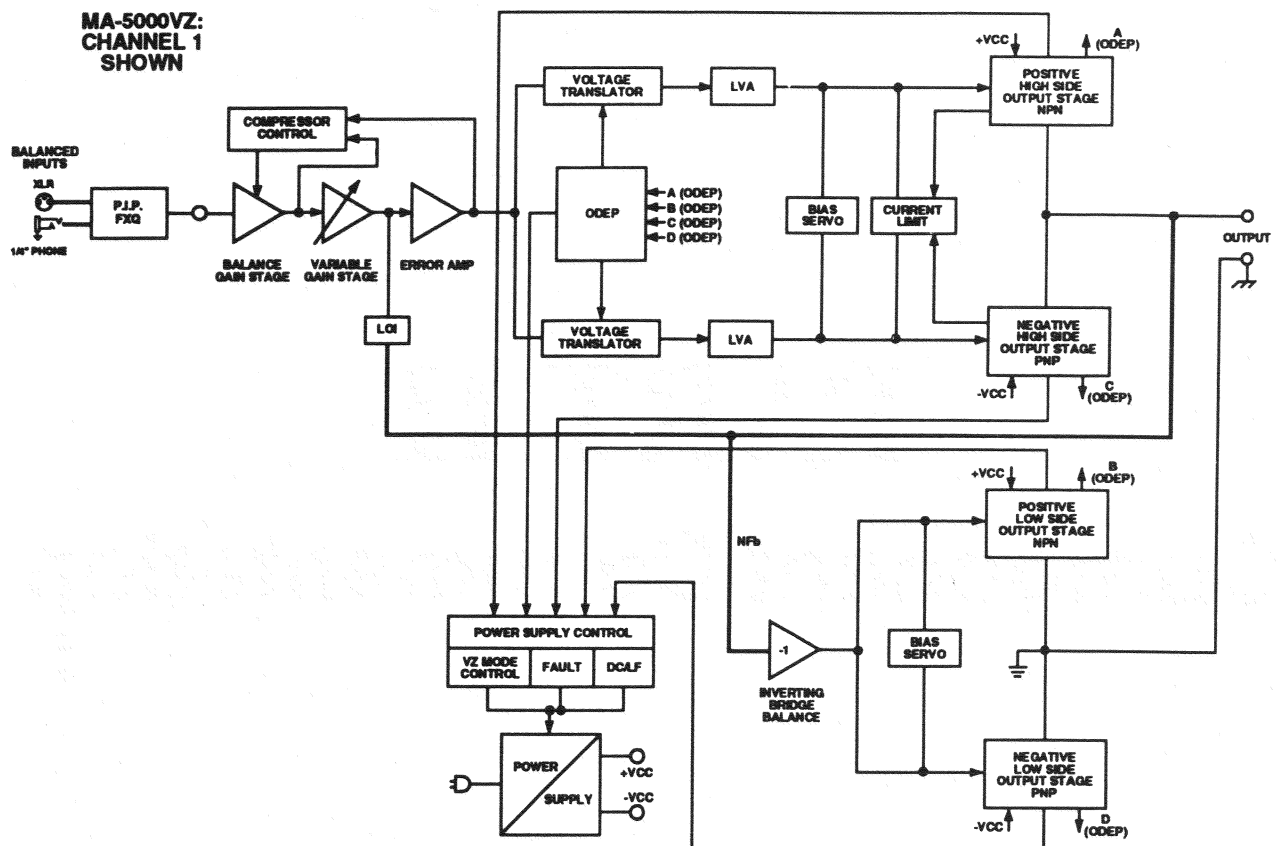


Fig. 4.9 Macro-Tech 5000VZ Amplifier Block Diagram

PART II

Component Documentation

5 Parts

5.1 GENERAL INFORMATION

Chapter 6 includes schematics used for referencing the circuit board components found in chapter 8. Chapter 7 contains exploded view drawings and artwork with associated parts listings.

Most mechanical and structural items are illustrated and indexed in the exploded view drawings. Where electronic parts are shown in these drawings the schematic designations are also given.

Electronic parts located on printed circuit boards are illustrated by schematic symbols on the trace side and by component shape symbols on the component side. Where applicable, quantities of parts are also given.

5.2 STANDARD AND SPECIAL PARTS

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

5.3 ORDERING PARTS

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

5.4 SHIPMENT

Shipment will be normally made by UPS or best other method unless you specify otherwise. Shipments are made to and from Elkhart, In, only. Established accounts with Crown will receive shipment freight prepaid and will be billed. All others will receive shipment on a C.O.D. or pre-payment (check or credit card) basis.

5.5 TERMS

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

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6 Schematics

J 0489-5 Main Module Rev B
J 0488-7 Output Modules Rev C
J 0491-1 Display Module Rev A
J 0490-3 Control Module
J 0490-3 Control Module Rev C
J 0487-9 Terminator (Current Sense Module)
J 0492-9 P.I.P.-FXQ

Note: Interconnections are mapped on the individual schematics.

7 EXPLODED VIEW DRAWINGS

The **Exploded Views** section of this service manual is the compilation of drawings of the chassis parts and components found within the Macro-Tech 5000VZ amplifier. For schematic drawings see section 6 and for circuit board layouts along with parts lists see **Modules**, section 8.

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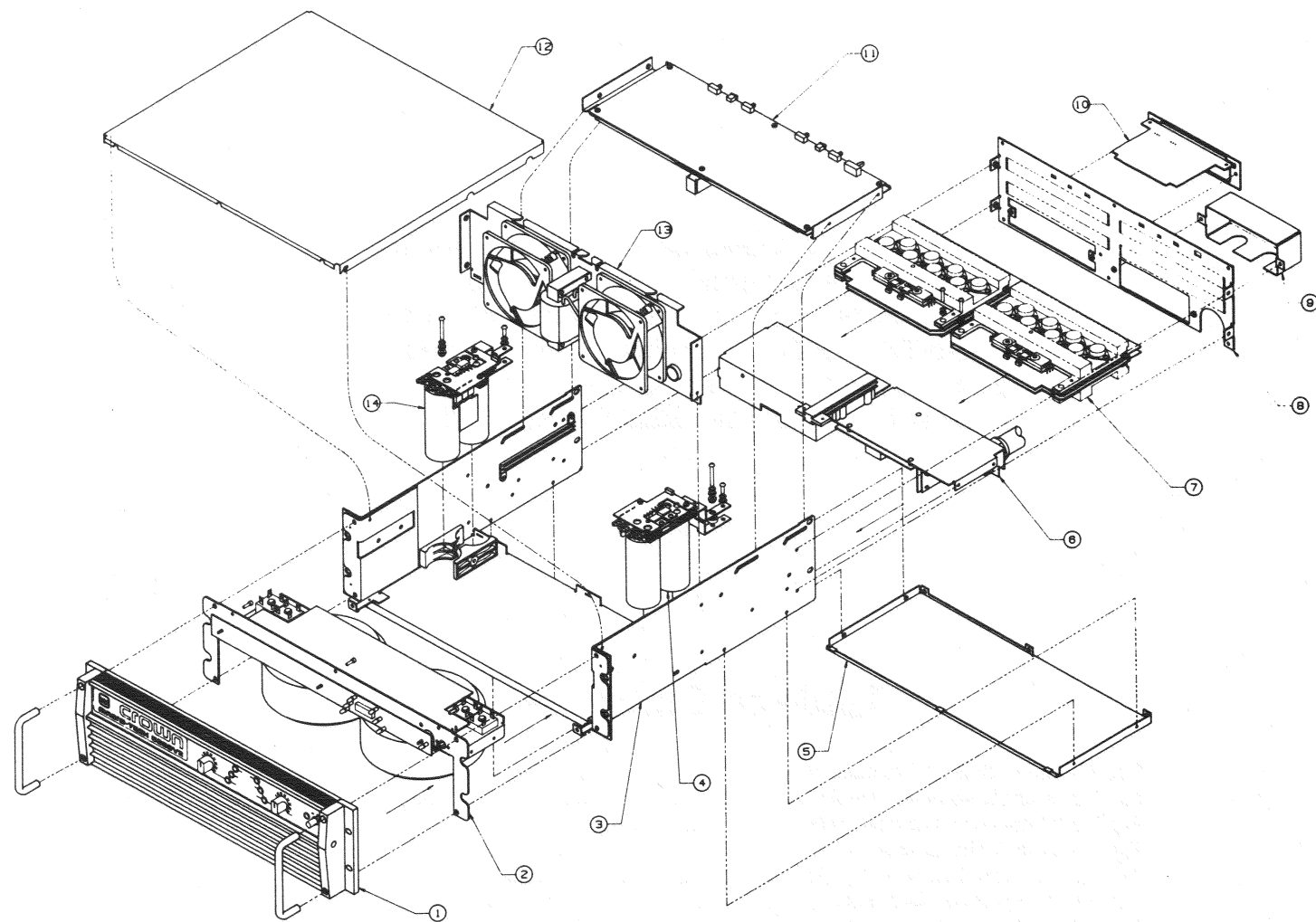


Fig. 7.1 Main Chassis Exploded View

MAIN CHASSIS ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|----------|--------------------------|-------------|
| 1 | 1 | --- | Front Panel Assembly | See Page 4 |
| 2 | 1 | --- | Transformer Assembly | See Page 11 |
| 3 | 1 | M21193J3 | Chassis | |
| 4 | 1 | --- | Ch 1 Capacitor Assembly | See Page 13 |
| 5 | 1 | F12174J2 | Bottom Cover | |
| 6 | 1 | --- | Terminator Assembly | See Page 17 |
| 7 | 1 | --- | Output Assembly | See Page 21 |
| 8 | 1 | --- | Back Panel | See Page 17 |
| 9 | 1 | F12302J9 | Output Cover | |
| 10 | 1 | M45059-9 | P.I.P.-FXQ | |
| 11 | 1 | --- | Main Board Tray Assembly | See Page 20 |
| 12 | 1 | F12176J7 | Top Cover | |
| 13 | 1 | --- | Chassis Divider Assembly | See Page 10 |
| 14 | 1 | --- | Ch 2 Capacitor Assembly | See Page 15 |

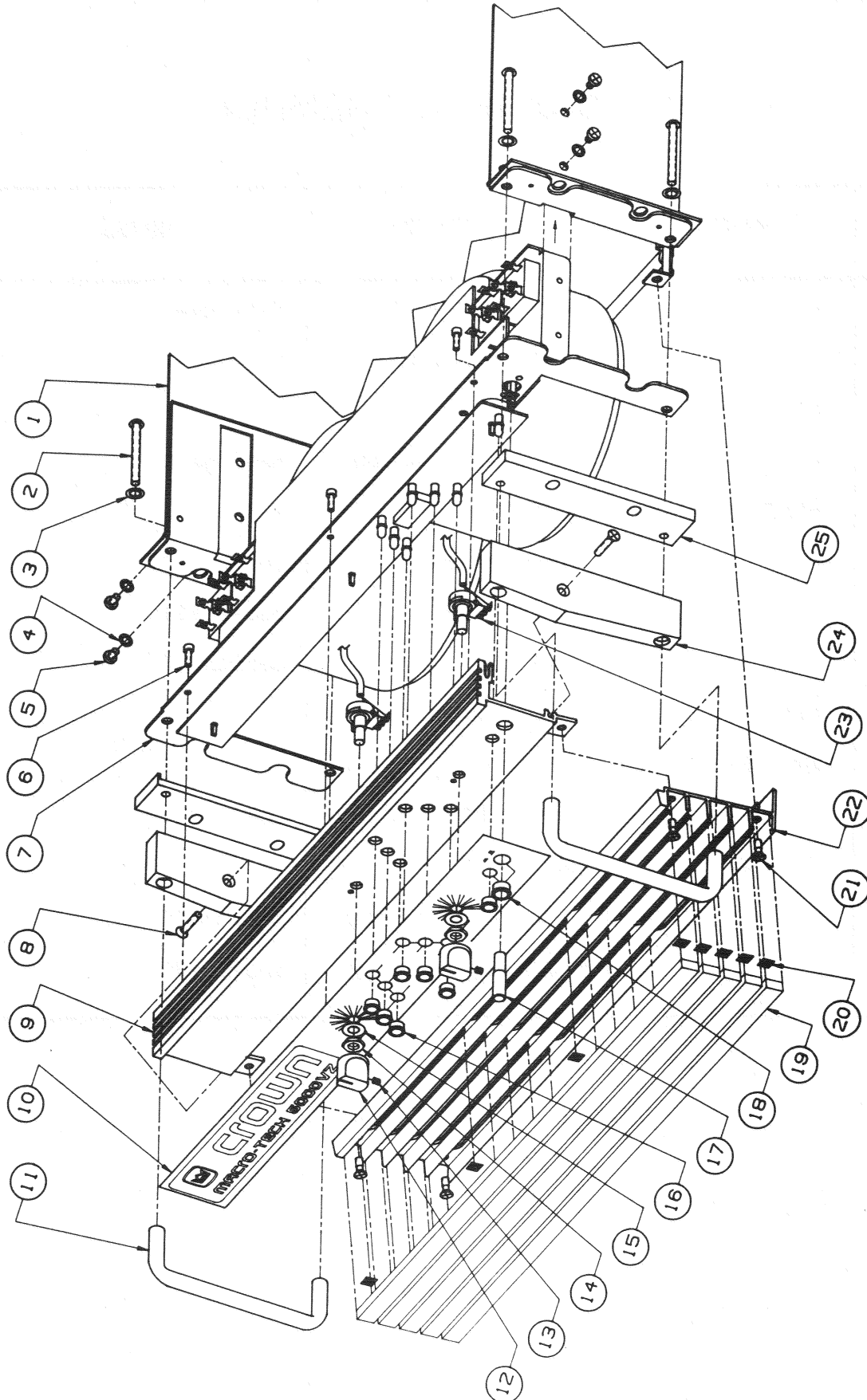


Fig. 7.2 Front Chassis Assembly

FRONT CHASSIS ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|-------------------------|-----------------------------------|
| 1 | 1 | M21193J3 | Chassis | |
| 2 | 4 | A10089-11032 | Screw | |
| 3 | 4 | A10094-8 | Washer | |
| 4 | 4 | A10094-5 | Washer | |
| 5 | 4 | C 8874-7 | Screw | |
| 6 | 3 | A10094-5 | Screw | |
| 7 | 1 | --- | Transformer Bracket | See Transformer Assembly, Page 11 |
| 8 | 2 | A10091-10812 | Screw | |
| 9 | 1 | D 8066J0 | Front Panel | Silver color |
| 10 | 1 | F12163J5 | MA-5000VZ Lexan Overlay | Crown |
| | 1 | F12164J3 | MA-5000VZ Lexan Overlay | Amcron |
| 11 | 2 | F12159J3 | Handle | |
| 12 | 2 | D 6265-9 | Knob | |
| 13 | 2 | C 6005-0 | Lockscrew | |
| 14 | 2 | --- | Nut | Part of item 23 |
| 15 | 2 | --- | Washer | Part of item 23 |
| 16 | 7 | D 7937-2 | LED Collar | |
| 17 | 1 | D 7872-1 | Pushbutton | |
| 18 | 1 | D 4108-3 | Pushbutton Collar | |
| 19 | 5 | D 7696-4 | Foam | |
| 20 | 20 | B 5796-6 | Velcro .5" x .25" | |
| 21 | 4 | C 7965-4 | Screw | |
| 22 | 1 | F12161J9 | Grille Extrusion | |
| 23 | 2 | C 7280-8 | 5K ohm Level Pots | Includes hardware items 14 and 15 |
| 24 | 2 | F12160J1 | Panel Cap | |
| 25 | 2 | F12296J3 | End Cap | |

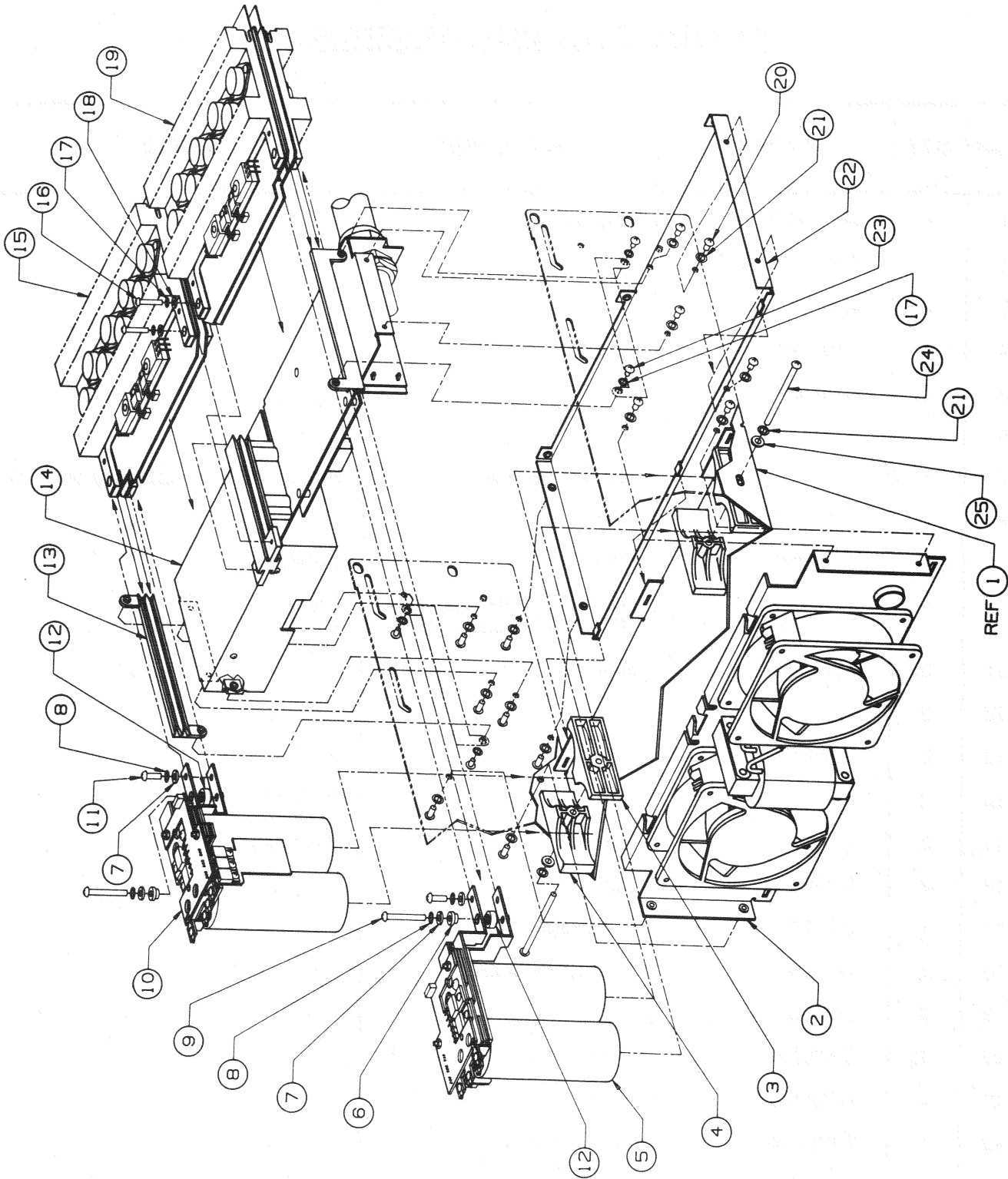


Fig. 7.3 Middle Chassis Assembly

MIDDLE CHASSIS ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|----------------------------|-----------|
| 1 | 1 | M21193J3 | Chassis | See Pg 10 |
| 2 | 1 | --- | Divider Assembly | |
| 3 | 2 | D 7927-3 | Capacitor Holder, Inner | |
| 4 | 2 | D 7928-1 | Capacitor Holder, Outer | |
| 5 | 1 | M45110-0 | Ch 2 Bi-Level Switch Assby | See Pg 15 |
| 6 | 2 | D 7870-5 | Valox Washer | |
| 7 | 6 | A10100-10 | Flat Washer | |
| 8 | 6 | A10094-6 | Lock Washer | |
| 9 | 2 | A10089-70820 | Screw | See Pg 13 |
| 10 | 1 | M45109-2 | Ch 1 Bi-Level Switch Assby | |
| 11 | 2 | A10089-10808 | Screw | |
| 12 | 4 | D 7871-3 | Valox Spacer | |
| 13 | 2 | D 7818-4 | Output Slide Guide | See Pg 17 |
| 14 | 1 | --- | PIP Terminator Assembly | |
| 15 | 1 | --- | Ch 1 Output Assembly | |
| 16 | 2 | A10089-10612 | Screw | |
| 17 | 2 | A10094-4 | Lock Washer | See Pg 21 |
| 18 | 2 | A10100-4 | Flat Washer | |
| 19 | 1 | --- | Ch 2 Output Assembly | |
| 20 | 13 | C 8874-7 | Screw | |
| 21 | 15 | A10094-5 | Lock Washer (Black) | |
| 22 | 15 | F12174J2 | Bottom Cover | |
| 23 | 4 | A10109-70604 | Screw | |
| 24 | 2 | A10089-70844 | Screw | |
| 25 | 2 | A10100-12 | Flat Washer | |

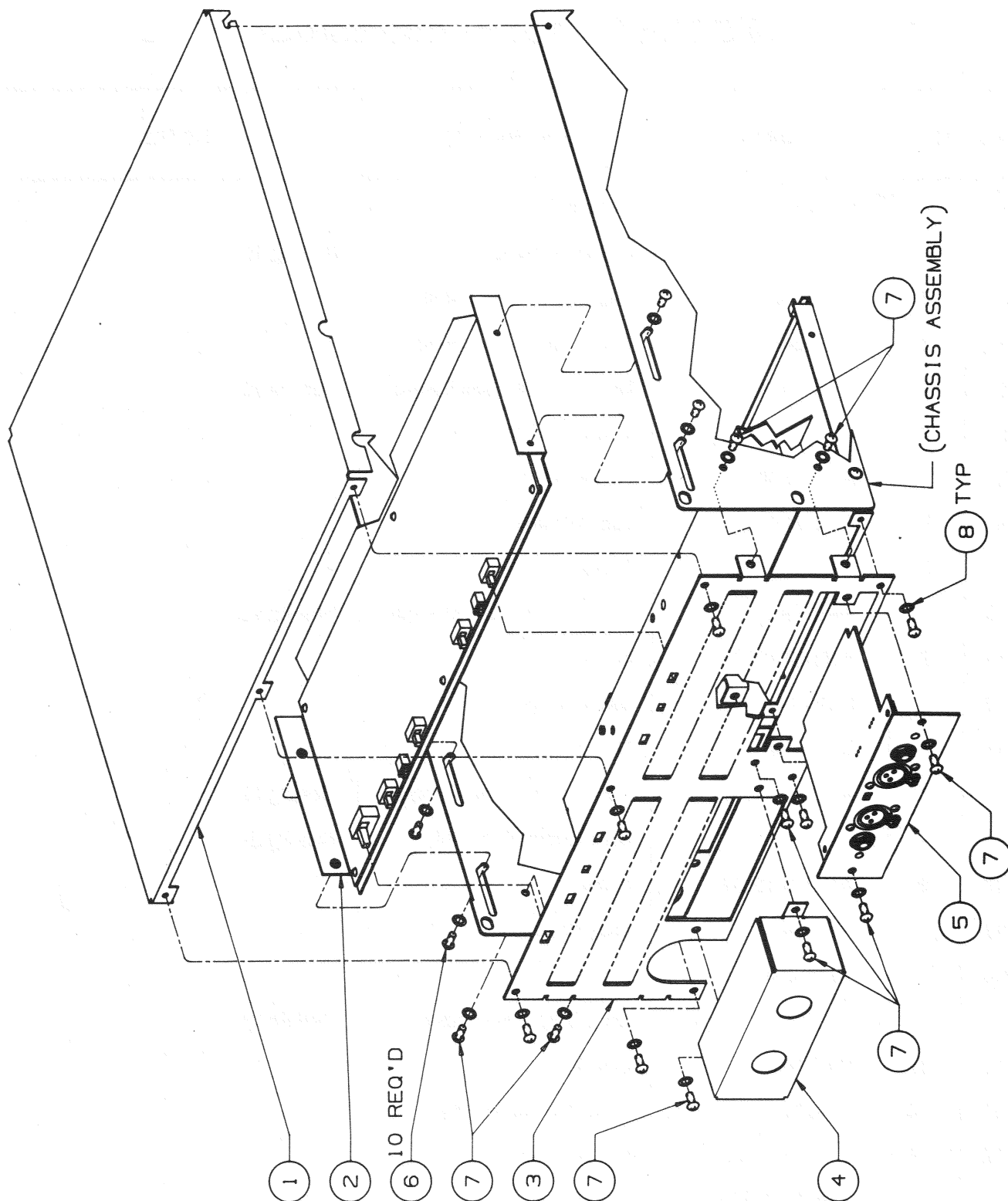


Fig. 7.4 Rear Chassis Assembly

REAR CHASSIS ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|--------------------------|---|
| 1 | 1 | F12176J7 | Top Cover | See Pg 20 Output post protective cover |
| 2 | - | --- | Main Board Tray Assembly | |
| 3 | 1 | M21192J5 | Back Panel | |
| 4 | 1 | F12302J9 | Box Shield | |
| 5 | 1 | M45059-9 | P.I.P.-FXQ | |
| 6 | 4 | C 8874-7 | Screw | |
| 7 | 13 | A10089-70806 | Screw | |
| 8 | 17 | A10094-5 | Lock Washer | |

CHASSIS DIVIDER (FAN) ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|--------------------------|---|
| 1 | 1 | F12175J9 | Divider Plate | Low Voltage Transformer Phillips, pan-head, tri-lobe |
| 2 | 2 | C 7858-1 | Fan | |
| 3 | 1 | D 7883-8 | XFMR | |
| 4 | 1 | C 9069-3 | Bushing, Universal 0.875 | |
| 5 | 8 | A10110-10808 | 8-32x.5 Screw | |

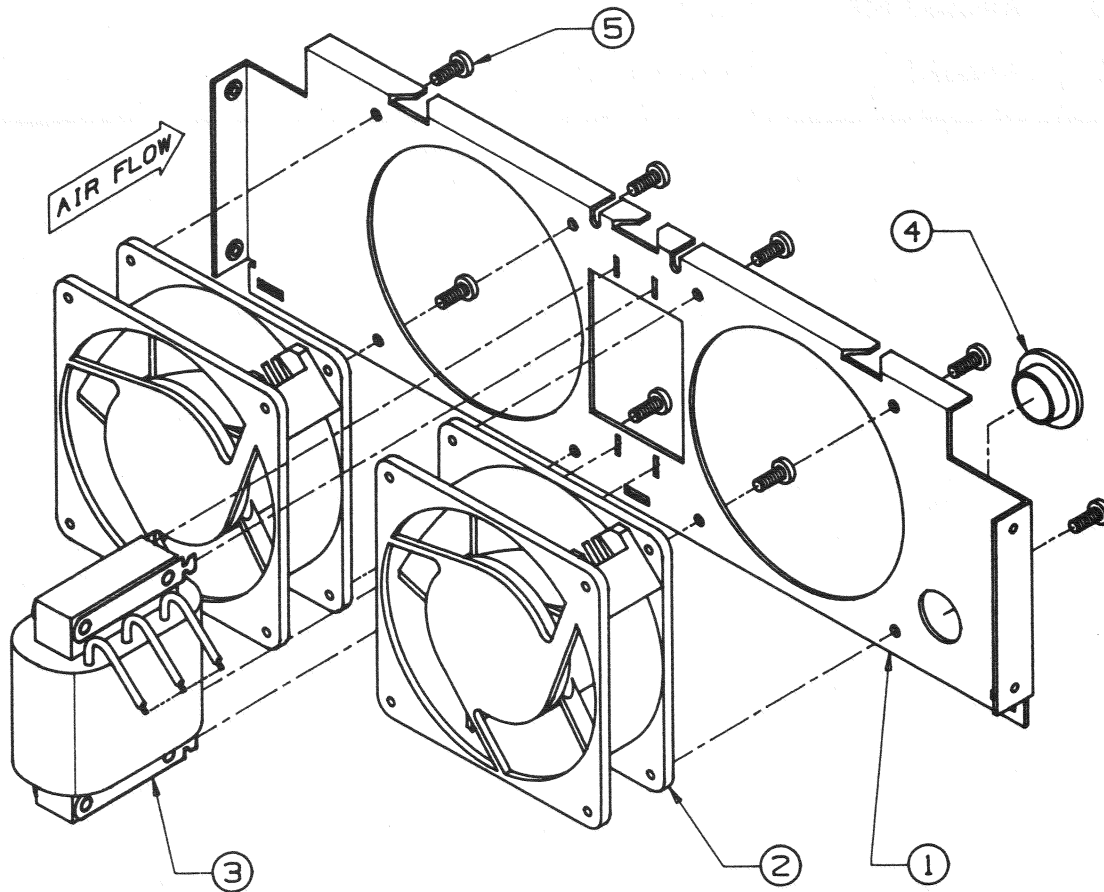


Fig. 7.5 Chassis Divider (Fan) Assembly

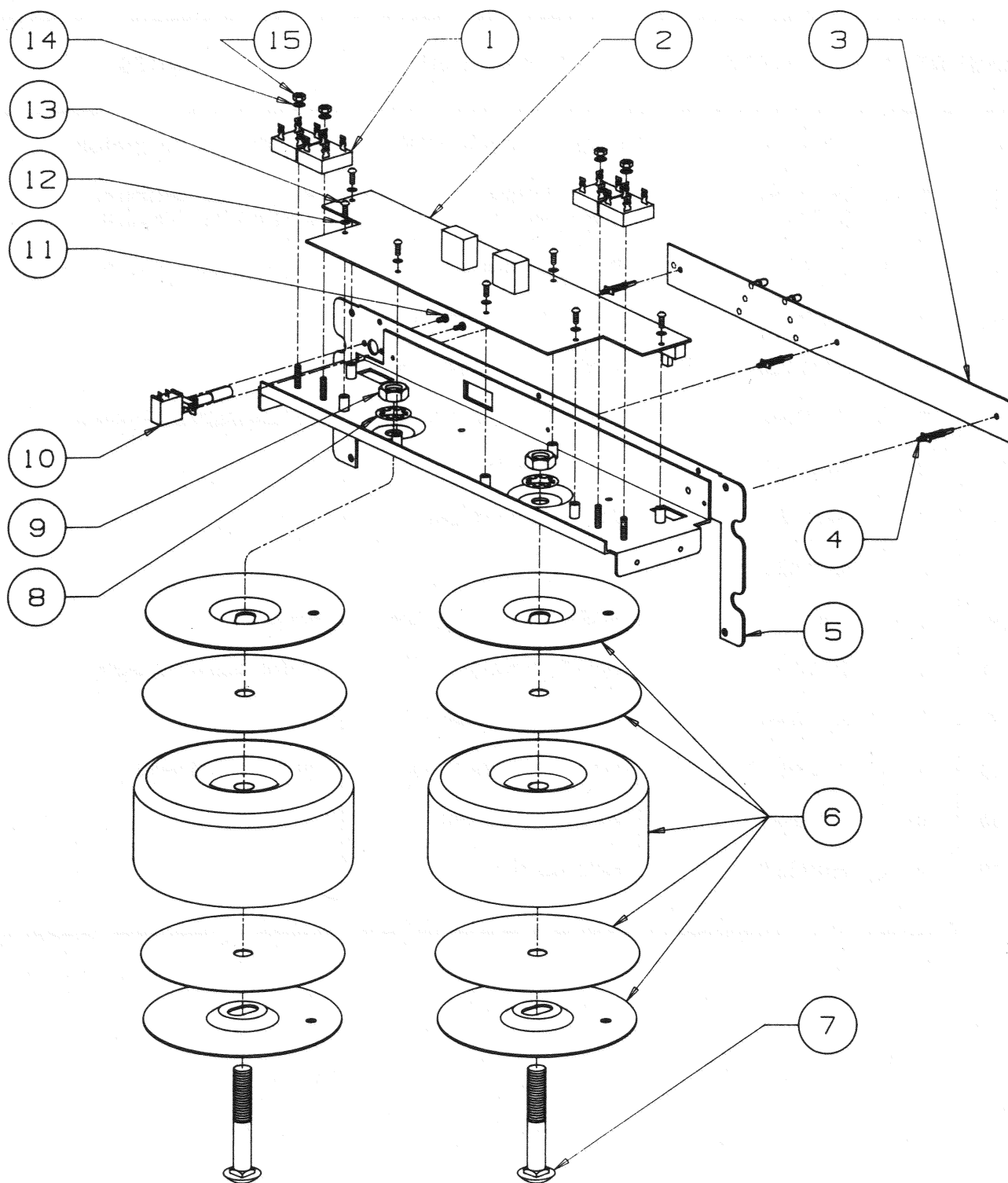


Fig. 7.6 Transformer Assembly

TRANSFORMER ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|---------------------------|---------------------------|
| 1 | 4 | C 8962-0 | Bridge Rectifier 35A 200V | No Schematic Designations |
| 2 | 1 | Q42930-0 | Control Module | See Modules, Section 8. |
| | 1 | Q43096-9 | Control Module | See Modules, Section 8. |
| 3 | 1 | Q42929-2 | Display Module | See Modules, Section 8. |
| 4 | 3 | C 8852-3 | 0.5" PC Board Support | |
| 5 | 1 | M41063J8 | XFMR/Sub-front Bracket | |
| 6 | 2 | D 7775-6 | Main Power Toroid XFMR | No Schematic Designations |
| 7 | 2 | C 8919-0 | 0.5" Steel Bolt | |
| 8 | 2 | A10095-7 | 0.5" Ext. Lockwasher | |
| 9 | 2 | A10102-21 | 0.5" Hex Nut | |
| 10 | 1 | C 8810-1 | SPST Pushbutton Switch | Power Switch |
| 11 | 2 | D 7261-7 | 3x.5x7mm Screw | Phillips, pan-head, black |
| 12 | 7 | A10094-4 | #6 Int. Star Washer | |
| 13 | 7 | A10086-10608 | 6-32x.5 Machine Screw | Phillips, round-head |
| 14 | 4 | A10094-6 | #8 Int. Star Washer | |
| 15 | 4 | A10102-6 | 8x32 Hex Nut | |

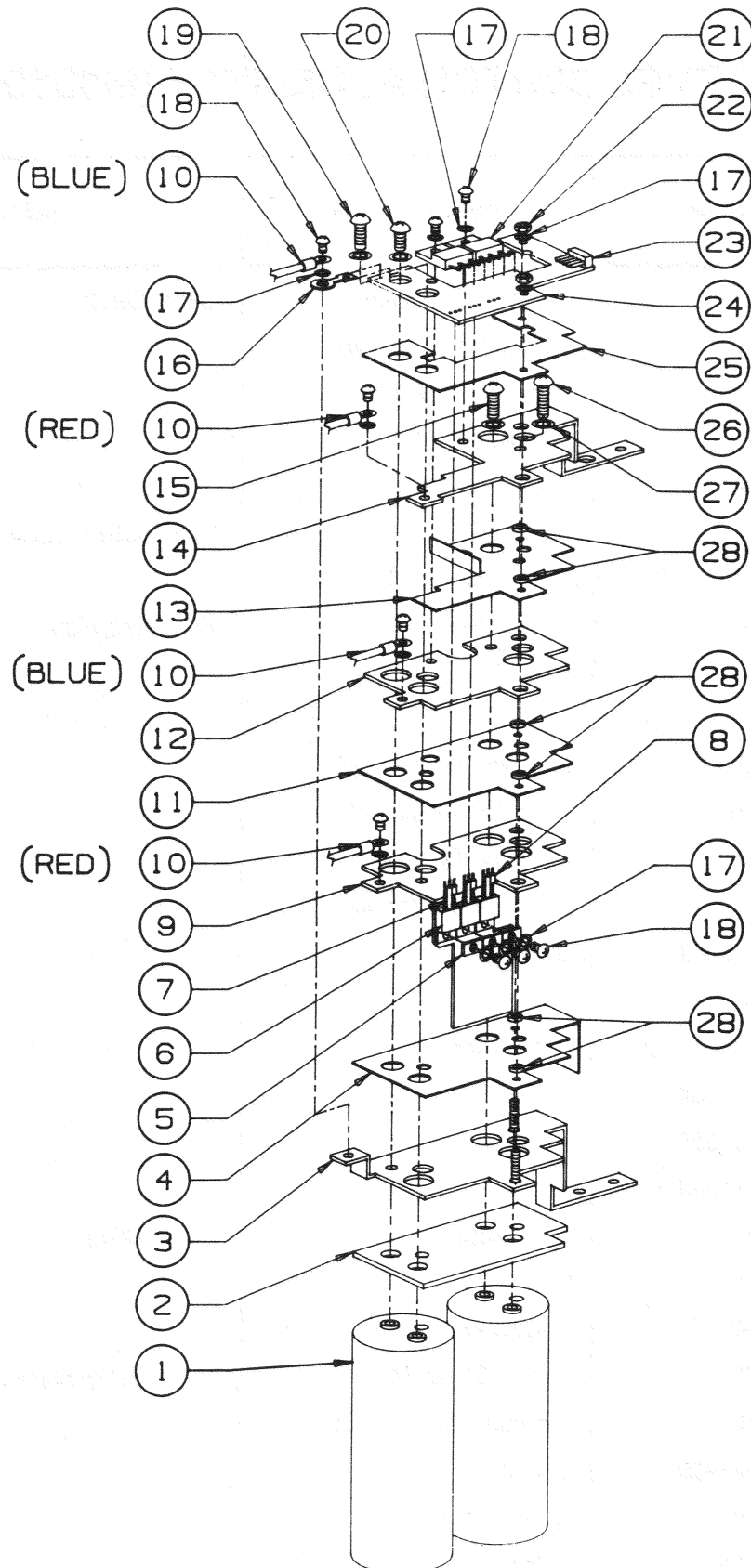


Fig. 7.7 Channel 1 Bi-Level Switch Assembly

CH 1 BI-LEVEL SWITCH ASSEMBLY (M45109-2)

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|-------------------------|------------------------------------|
| 1 | 2 | D 7882-0 | 15000 μ F Capacitor | C810, C812 |
| 2 | 1 | P10357-5 | Insulator: Ch 1 & 2 #1 | |
| 3 | 1 | M21070-4 | Plate: Ch 1 -Vcc #1 | |
| 4 | 1 | D 7821-8 | Insulator: Ch 1 #2 | |
| 5 | 3 | C 6541-4 | Torque Spreader | Q810, Q811, Q812 |
| 6 | 3 | C 8516-4 | MOSFETs | |
| 7 | 3 | H43224-7 | Lead Insulation Tube | |
| 8 | 3 | C 8341-7 | Ferrite Bead | |
| 9 | 1 | M21071-2 | Plate: Ch 1 FET #2 | FB1, FB2, FB3 |
| 10 | - | --- | Wires | |
| 11 | 1 | D 7825-9 | Insulator: Ch 1 & 2 #3 | |
| 12 | 1 | M21072-0 | Plate: Ch 1 Diode #3 | |
| 13 | 1 | D 7822-6 | Insulator: Ch 1 #4 | |
| 14 | 1 | M21073-8 | Plate: Ch 1 +Vcc #4 | |
| 15 | 1 | A10086-11008 | Screw | |
| 16 | 1 | D 2934-4 | Solder Lug | |
| 17 | 11 | A10094-4 | Lock Washer | |
| 18 | 9 | A10086-10604 | Screw | |
| 19 | 1 | A10086-11006 | Screw | |
| 20 | 1 | A10086-11005 | Screw | |
| 21 | 2 | C 8855-6 | Dual Diode | D810, D811 |
| 22 | 2 | A10102-5 | Hex Nut | |
| 23 | 1 | H43171-0 | Header (with wires) | (Ch 1 half of blank part D 7843-2) |
| 24 | 1 | D 7843-2 | Switch Board Ch 1 | |
| 25 | 1 | D 7880-4 | Insulator: Ch 1 & 2 #5 | |
| 26 | 1 | A10086-11009 | Screw | |
| 27 | 4 | A10094-8 | Lock Washer | |
| 28 | 8 | A10101-26 | Nylon Washer | |

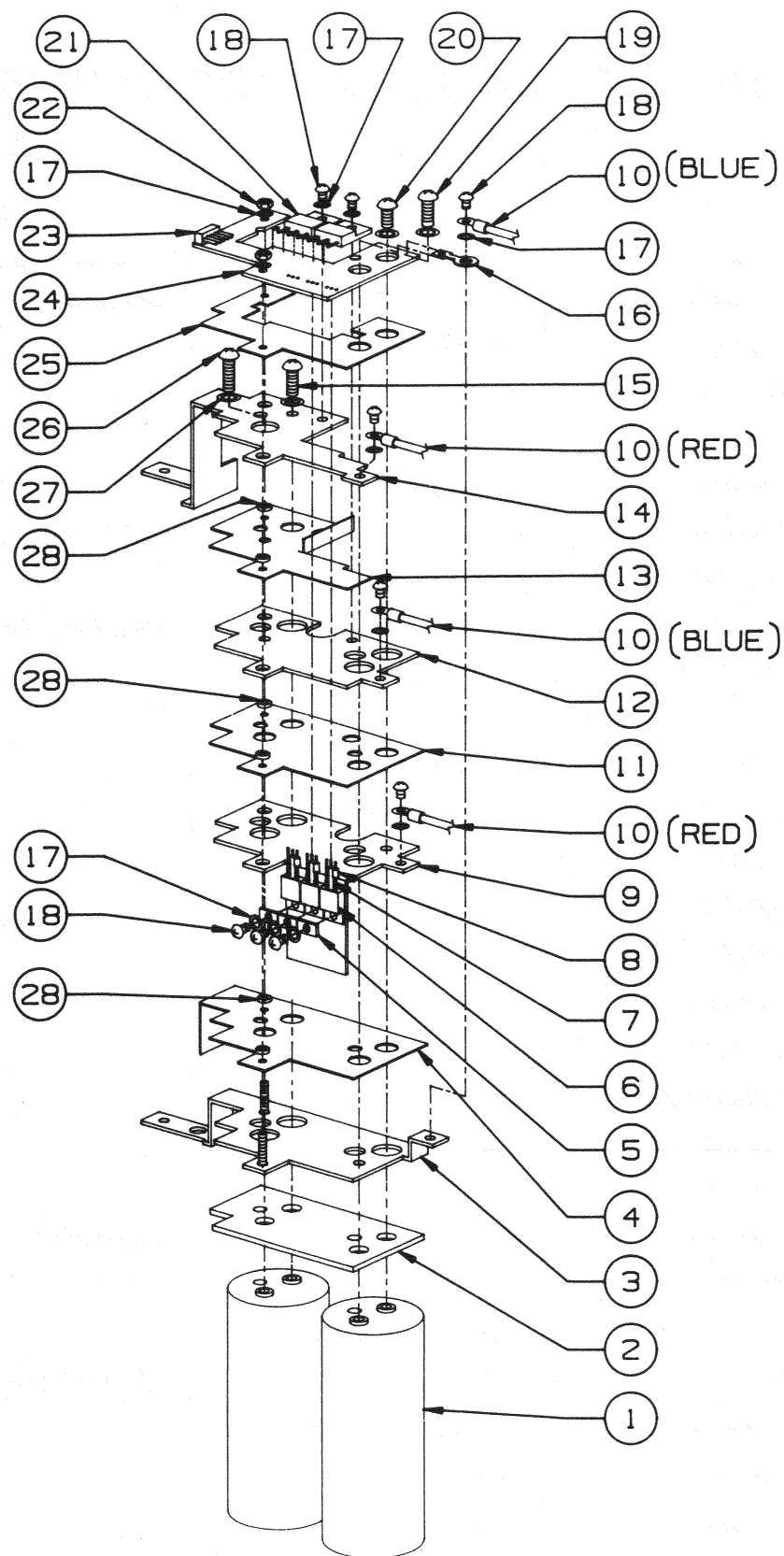


Fig. 7.8 Channel 2 Bi-Level Switch Assembly

CH 2 BI-LEVEL SWITCH ASSEMBLY (M45110-0)

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|------------------------|------------------------------------|
| 1 | 2 | D 7882-0 | 15000µF Capacitor | C800, C802 |
| 2 | 1 | P10357-5 | Insulator: Ch 1 & 2 #1 | |
| 3 | 1 | M21074-6 | Plate: Ch 2 -Vcc #1 | |
| 4 | 1 | D 7824-2 | Insulator: Ch 2 #2 | |
| 5 | 3 | C 6541-4 | Torque Spreader | Q800, Q801, Q802 |
| 6 | 3 | C 8516-4 | MOSFETs | |
| 7 | 3 | H43224-7 | Lead Insulation Tube | |
| 8 | 3 | C 8341-7 | Ferrite Bead | |
| 9 | 1 | M21075-3 | Plate: Ch 2 FET #2 | FB4, FB5, FB6 |
| 10 | - | --- | Wires | |
| 11 | 1 | D 7825-9 | Insulator: Ch 1 & 2 #3 | |
| 12 | 1 | M21076-0 | Plate: Ch 2 Diode #3 | |
| 13 | 1 | D 7820-0 | Insulator: Ch 2 #4 | |
| 14 | 1 | M21077-9 | Plate: Ch 2 +Vcc #4 | |
| 15 | 1 | A10086-11008 | Screw | |
| 16 | 1 | D 2934-4 | Solder Lug | |
| 17 | 11 | A10094-4 | Lock Washer | |
| 18 | 9 | A10086-10604 | Screw | |
| 19 | 1 | A10086-11006 | Screw | |
| 20 | 1 | A10086-11005 | Screw | |
| 21 | 2 | C 8855-6 | Dual Diode | D800, D801 |
| 22 | 2 | A10102-5 | Hex Nut | |
| 23 | 1 | H43171-0 | Header (with wires) | (Ch 2 half of blank part D 7843-2) |
| 24 | 1 | D 7843-2 | Switch Board Ch 2 | |
| 25 | 1 | D 7880-4 | Insulator: Ch 1 & 2 #5 | |
| 26 | 1 | A10086-11009 | Screw | |
| 27 | 4 | A10094-8 | Lock Washer | |
| 28 | 8 | A10101-26 | Nylon Washer | |

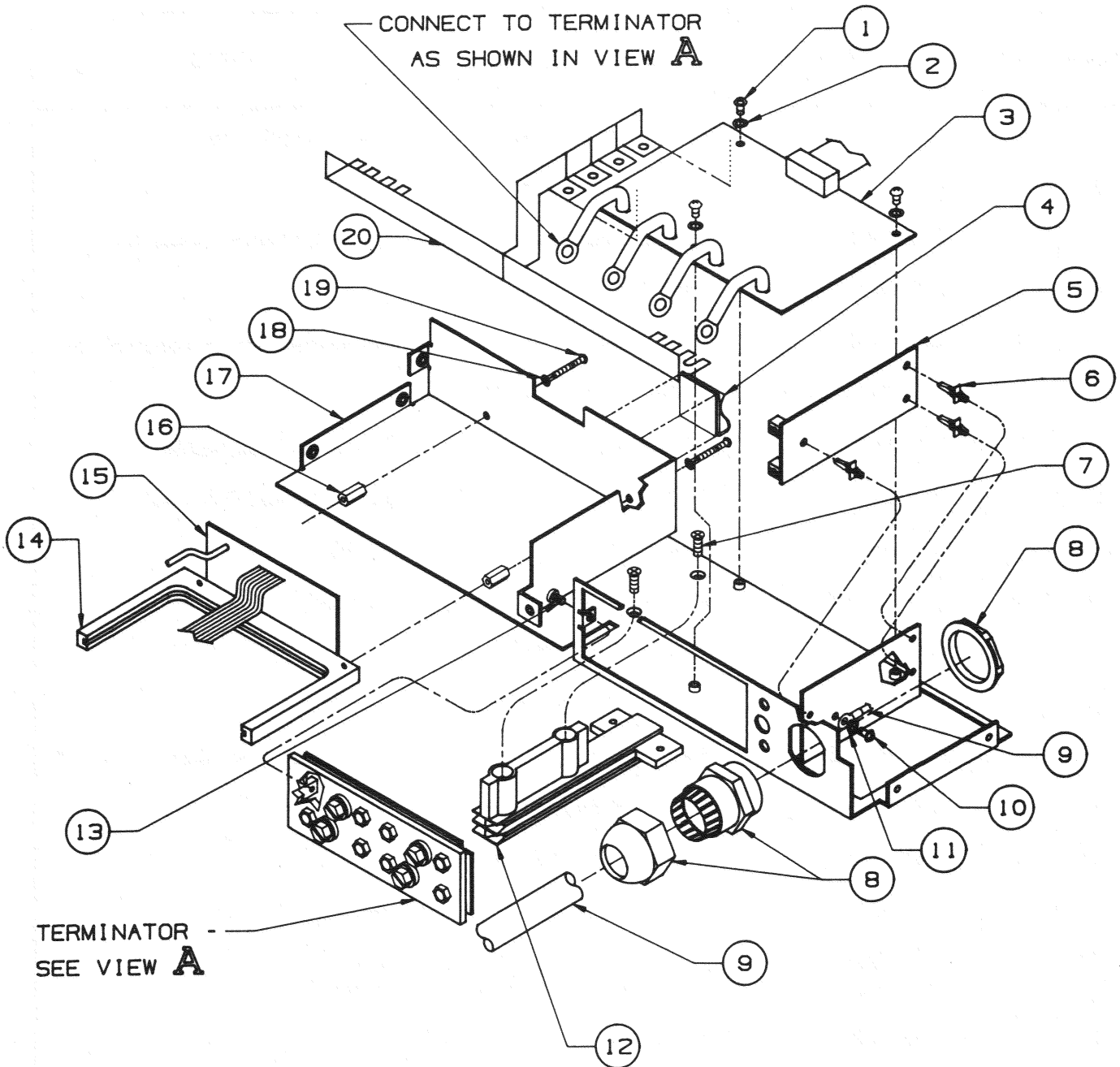


Fig. 7.9 P.I.P. Terminator Shelf Assembly

P.I.P. TERMINATOR SHELF ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|------------------------------|-----------------------------------|
| 1 | 3 | A10086-10604 | 6-32-.25 Machine Screw | Phillips, round-head |
| 2 | 3 | A10094-4 | #6 Int. Star Washer | |
| 3 | 1 | Q42932-6 | Current Sense Module | Terminator Portion of Item #5 |
| 4 | 1 | C 7705-4 | Cable Clamp | |
| 5 | 1 | Q42932-6 | Current Sense Module | Current Sense Portion of Q42932-6 |
| 6 | 3 | C 8823-4 | 0.125" PC Board Support | |
| 7 | 2 | D 5903-6 | 8-32x.5 Screw | Phillips, flat-head, taptite |
| 8 | 1 | F11160-3 | Strain Relief | For Power Cord D 7890-3 |
| 9 | 1 | D 7890-3 | Power Cord | 30A 10/3 |
| 10 | 1 | A10111-10806 | #8x.375 Sheetmetal Screw | Pan-head |
| 11 | 1 | A10095-2 | #8 Int. Star Washer | |
| 12 | 1 | D 7817-6 | Center Output Slide Guide | |
| 13 | 1 | A10109-7064 | 6-20x.25 Screw | Phillips, pan-head, black |
| 14 | 1 | C 6821-0 | 22 Pin PIP Edge Connector | |
| 15 | 1 | Q43052-2 | PIP Interconnect Board | |
| 16 | 2 | A10100-7 | Spacer, Aluminum | .250Dx.14IDx.312L |
| 17 | 1 | M21189J1 | Terminator/PIP Shelf Bracket | Crown Only |
| | 1 | M21190J9 | Terminator/PIP Shelf Bracket | Amcron Only |
| 18 | 2 | A10094-2 | #4 Int. Star Washer | |
| 19 | 2 | A10086-10410 | 4-40x.62 Machine Screw | Phillips, round-head |
| 20 | 1 | D 7826-7 | Output Flex Bar Ch 1 | |
| | 1 | D 7827-5 | Output Flex Bar Ch 2 | |
| * | 2 | C 8884-6 | Red Binding Post (w/ hdwr) | *Amcron Only - Not Shown |
| * | 2 | C 8885-2 | Black Binding Post (w/ hdwr) | *Amcron Only - Not Shown |

P.I.P. TERMINATOR SHELF ASSEMBLY, VIEW "A"

(CROWN ONLY)

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|----------|--------------------------|------------------------------|
| 1 | 16 | C 8835-8 | .25-32 Nut | |
| 2 | 12 | A10094-9 | Lockwasher | |
| 3 | 4 | M21078-7 | Terminator Bar | |
| 4 | 4 | D 7924-0 | Bushing, Steel | |
| 5 | 1 | D 7816-8 | Terminator Panel | |
| 6 | 8 | C 8794-7 | Un-insulated Banana Jack | |
| 7 | 4 | C 8900-0 | .25-20x1 Machine Screw | Output, slot hex-washer head |

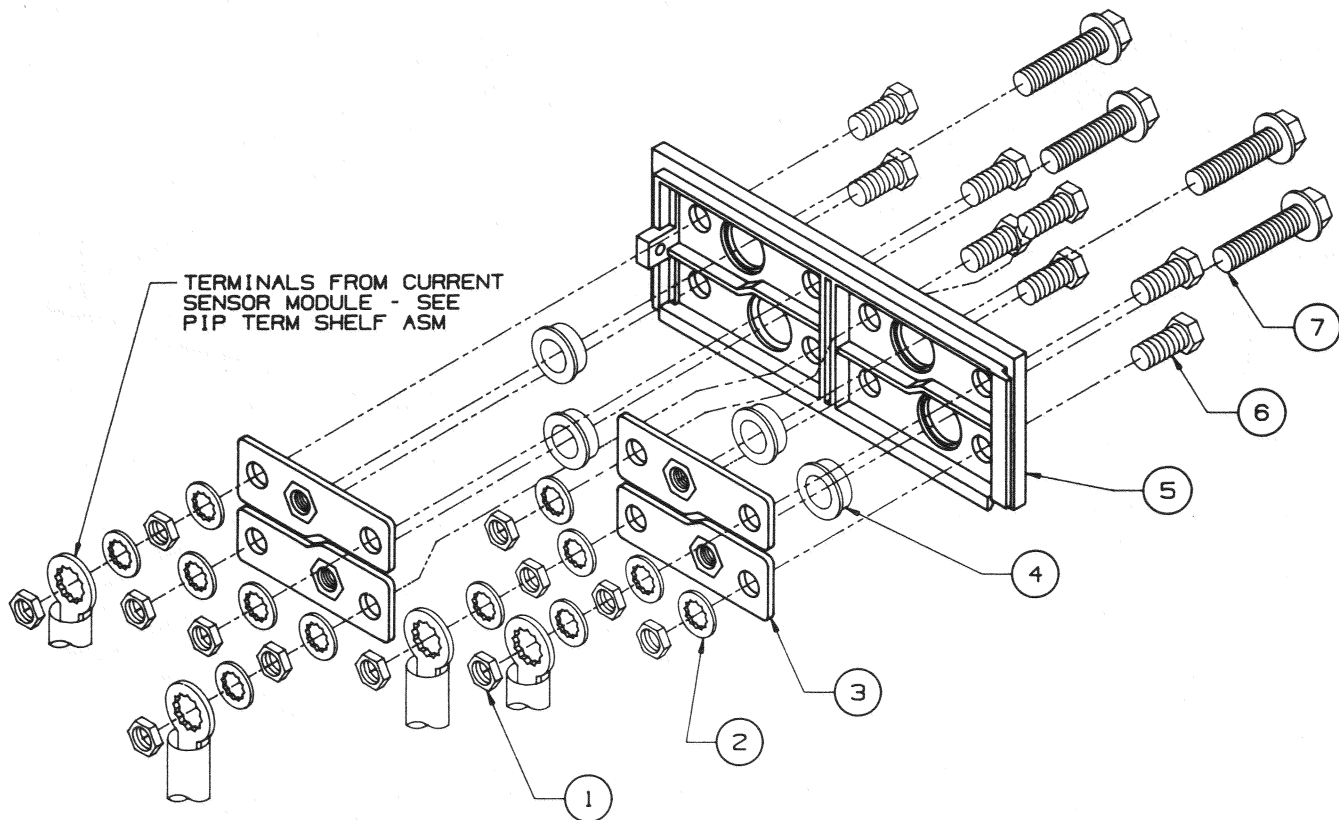


Fig. 7.10 PIP Terminator Shelf Assembly, View "A"

MAIN BOARD TRAY ASSEMBLY

| ITEM# | QTY | PART # | DESCRIPTION | NOTES |
|-------|-----|--------------|------------------------|--|
| 1 | 1 | M21201J4 | Main Board Tray | |
| 2 | 1 | Q42928-4 | Main Module | See Modules, Section 8. See Modules, Section 8. |
| | 1 | Q43095-1 | Main Module #2 | |
| 3 | 6 | A10094-4 | #6 Int. Star Washer | |
| 4 | 6 | A10086-10604 | 6-32x.25 Machine Screw | Phillips, round-head |

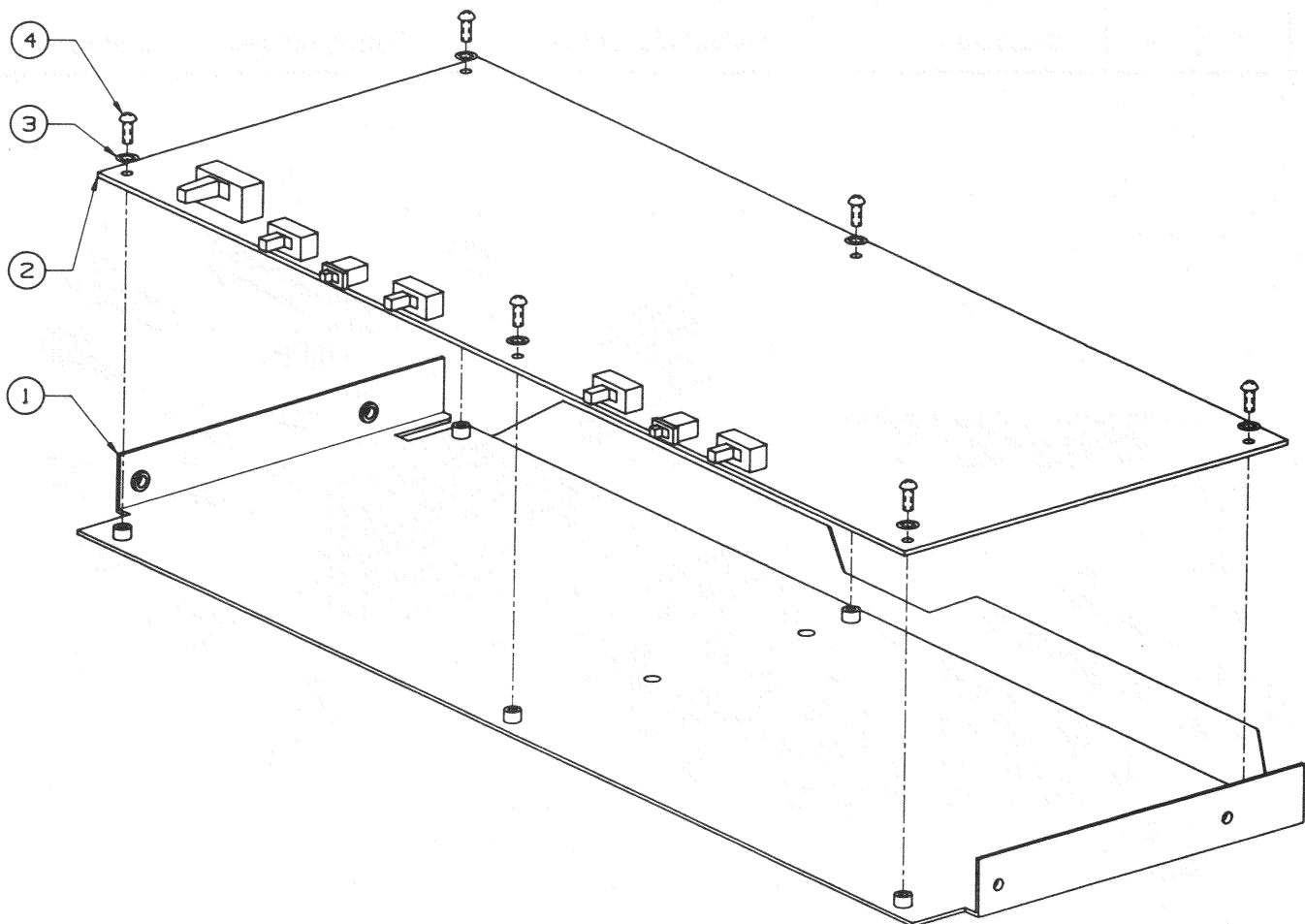


Fig. 7.11 Main Module Tray Assembly