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COMPONENT LOCATION DIAGRAM

SCHEMATIC

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17.1 GENERAL DESCRIPTION

The Power Supply Module is designated as A14-A1. It converts an AC or a DC input voltage to the DC voltages required to power the Analyzer,

A 110/220VAC selection switch is accessible through the Analyzer's bottom cover.

17.2 SIGNALS SUMMARY**17.2A Signal Descriptions****17.2A.1 J1 (Back Panel)**

DC INPUT + and DC INPUT – are the connections for optionally supplying the Analyzer with a +11 to +18 Vdc source. Max current is 8A.

AC Input, AC Return are the connections for supplying the Analyzer with either 90-132 Vac or 184-264 Vac at 47-440 Hz. Max current is 2.5A rms.

17.2A.2 J2 (Processor/Front Panel)

AC/(DC)* DRIVE CONTROL output to the Processor Module indicates the power supply is operating in either AC or DC mode. This signal is buffered at the Processor Module where it becomes the DC OPERATION signal to drive a front panel LED.

AUX POWER output is a +12Vdc standby voltage routed to the front panel on/off switch.

DC INPUT + output to the Processor Module is the externally applied positive DC voltage from J1.

POWER ON input is the +12Vdc control line from the front panel on/off switch.

+5Vdc, -5Vdc, +12Vdc, -12Vdc, and +40Vdc are the output voltages that supply power to the Analyzer system.

17.2B Connector Descriptions**17.2B.1 J1 (Back Panel)**

pin	
1	DC Input - (optional)
2	DC Input + (optional)

3	not used
4	AC Return
5	AC Input

17.2B.2 J2 (Processor Module/Front Panel)

pin	
1	POWER ON (+12VDC In)
2	AC/(DC)* Drive Control
3-5	+5VDC
6,7	-5VDC
8-11	+12VDC
12-14	-12VDC
15	+40VDC
16	AUX POWER (+12VDC Out)
17	DC INPUT + (Battery Voltage)
18	+5VDC
19-21	GND
22	-5VDC
23	+12VDC
24-30	GND

17.3 BLOCK DIAGRAM DESCRIPTION

In AC mode, the power supply is operated as an off-line, half bridge converter for inputs of 90-132Vac rms or 184-264Vac rms at 47 to 440Hz. When connected to an AC power source, the power supply automatically switches to AC operating mode.

In the DC mode, the power supply operates as a push-pull converter for inputs of +11 to +18Vdc.

The power supply contains protection circuitry for:

- Shorts on the power supply output lines
- Transients on the input lines
- Input overvoltage protection when the 115/230 voltage selection switch is in the 115 position
- Output overvoltage protection on the +5V output
- Thermal overload of Line Transformer T1.

115 VAC	230 VAC	Battery
90-132VAC	184-264VAC	+11 to + 18 VDC
47-440 Hz	47-440 HZ	

Figure 17.3 Prime Power Inputs

17.4 DETAILED DESCRIPTION

17.4.1 Line Transformer/Housekeeping Supply

The line transformer (T1) has two primary windings and a single, center-tapped secondary. The two primary windings are connected in series. Switch S1 connects the AC input across both windings (in 220 mode) or one winding (in 110 mode), maintaining the same volts per turn on the Primary. This provides the same voltage on the secondary winding for 110 and 220 Vac input operation. The secondary output is full wave rectified and filtered by C13 and is used as the power source for two voltage regulators (U3 and U7). The regulators are set at +12 volts.

U3 provides a housekeeping supply for the power supply unit. The housekeeping supply is output to the AUX POWER line. AUX POWER is connected to the front panel on/off switch along with return line POWER ON. When the switch is in the ON position, the AUX POWER voltage is returned on the POWER ON line.

The return line is then used to power the pulse width modulator U1 and driver U2. When the power switch is in the OFF position, the input bridge rectifier and housekeeping supply are still active but the output drivers are turned off. U7 provides an "AC Present" supply used for AC/DC switch-over.

AUX POWER output control line

Voltage: +11VDC $\pm 5\%$

Load Current Max: 100mA

POWER ON input control line

Voltage: +11VDC $\pm 5\%$

Load Current Max: 100mA

17.4.2 AC/DC Switchover

When there is an AC input source, line transformer (T1) is active and diode D2 is turned on. The "AC Present" regulator (U7) output energizes relay K1 and disconnects the DC CENTER TAP drive. When there is no AC input source, the relay de-energizes and switches the DC input to the chopping transformer.

The "AC Present" regulator output is also used as a logic control signal to enable the correct pair of drivers in U2 for the AC or DC switching transistors. Q2 acts as an inverter such that when AC is present, U2 pins 11 and 13 are enabled while U2 pins 10 and 12 are disabled. The (AC/DC)* drive control output (J2 pin 2) is controlled by Q1 which uses the power supply +5V output for its supply so that no voltage is present on the line if the power supply is not on.

17.4.3 Latch, Pulse Width Modulator (PWM)

Pulse Width Modulator IC U1 uses the +12V output as a reference. The PWM controls the duty cycle of the two 50KHz complimentary outputs depending on the error signal. The +12V is used as the reference since several modules require $\pm 1\%$ on the +12V. It can be adjusted using R40.

U1 uses the timing capacitor C2 to soft-start the power supply. When the on/off switch is on, the reset circuitry (R37, C21, D8) holds the output of latch U6 low (inactive) while U1, U5, and U6 are powering up. This holdoff ends prior to the soft-start of the PWM. If an overcurrent or overvoltage (+5V) condition occurs, the output of U6 is latched high to shut down the power supply until it is reset.

17.4.4 Chopping Transformer

The chopping transformer T3 has two primary windings. (one for AC, and one for DC operation) and a multiple output secondary which provides +5V, -5V, +12V, -12V, and +40V.

17.4.4.1 During AC Operation

The half bridge switching transistors (Q5 and Q6) drive the chopping transformer. The transistors alternate pulling the ends of the primary low, while the center tap remains high (push/pull). To ensure that both Q5 and Q6 are off, dead time between these two transistors is maintained. Without dead time, there would be a short circuit across the primary winding.

The primary current is monitored by the current sensing transformer T4. The ratio for the current sensing transformer is 100 to 1, and the secondary is loaded with 221 ohms. This produces a secondary output of 2VA of primary current in the chopping transformer. If the primary current in the chopping transformer rises above 1.5A (due to an excessive load or a short on the secondaries), the power supply will shut down until the condition is removed.

17.4.4.2 During DC Operation

The push/pull switching transistors Q7 and Q8 drive the chopping transformer and a DC voltage is applied to the center tap from relay K1. The nominal DC voltage at the DC CENTER TAP is 11.7Vdc for an input of 12.0Vdc. The primary current in DC operation is monitored using R9 and U5.

17.4.5 Outputs

The secondary winding outputs of the chopping transformer are all full wave, center tapped rectified.

Each of the outputs is filtered by an LC lowpass filter. All the output filter inductors are wound on the same core to improve cross regulation.

The output voltages and rated currents are shown in figure 17.4.5. The voltages specified are with the +12V output adjusted to +12.1V±1%.

17.4.6 Overvoltage Protection

The +5V output is monitored by a programmable zener (U4), which is set to conduct when the +5V output reaches +6.2V. Q3 and Q4 are then turned on, pulling “+5V O.V.” (+5V OverVoltage) low and setting latch U6 high, thereby shutting down the PWM (U1).

Nominal Output Voltage	Minimum	LOW	Nominal	High	Maximum
+5V ±5%	300mA	320mA	490mA	2.71A	4.8A
-5.2V ±5%	100mA	530mA	800mA	890mA	990mA
+12.1V ±1%	1A	2.51A	3.8A	4.4A	4.8A
- 12.3V ±5%	100mA	380mA	570mA	680mA	740mA
+45V ±1 0%	10mA	40mA	60mA	70mA	75mA
Approx Output Power	16W	40W	60W	80W	98W

Figure 17.4.5 Output Voltages and Load Levels

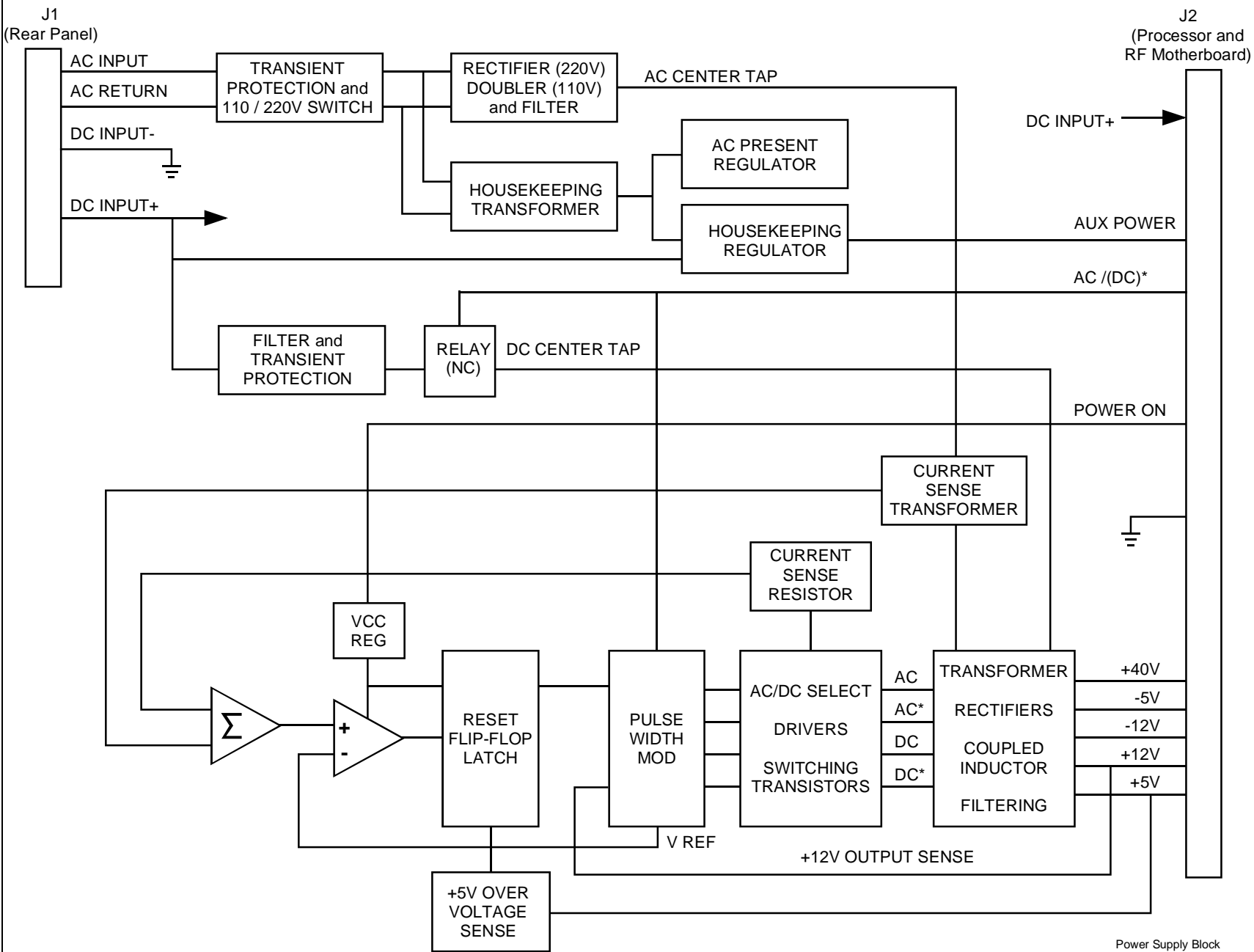
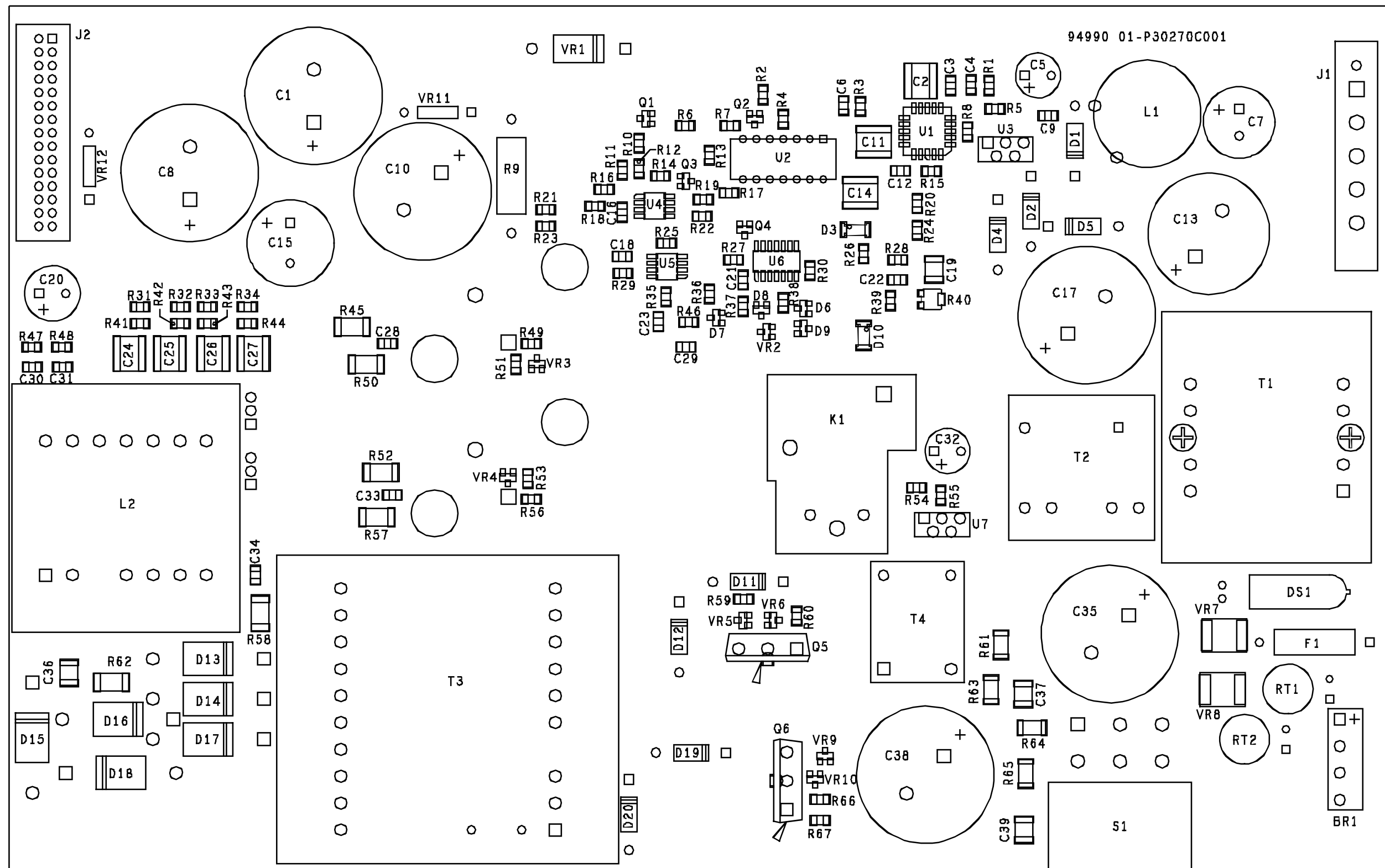


Fig. 17.5 Power Supply Block Diagram



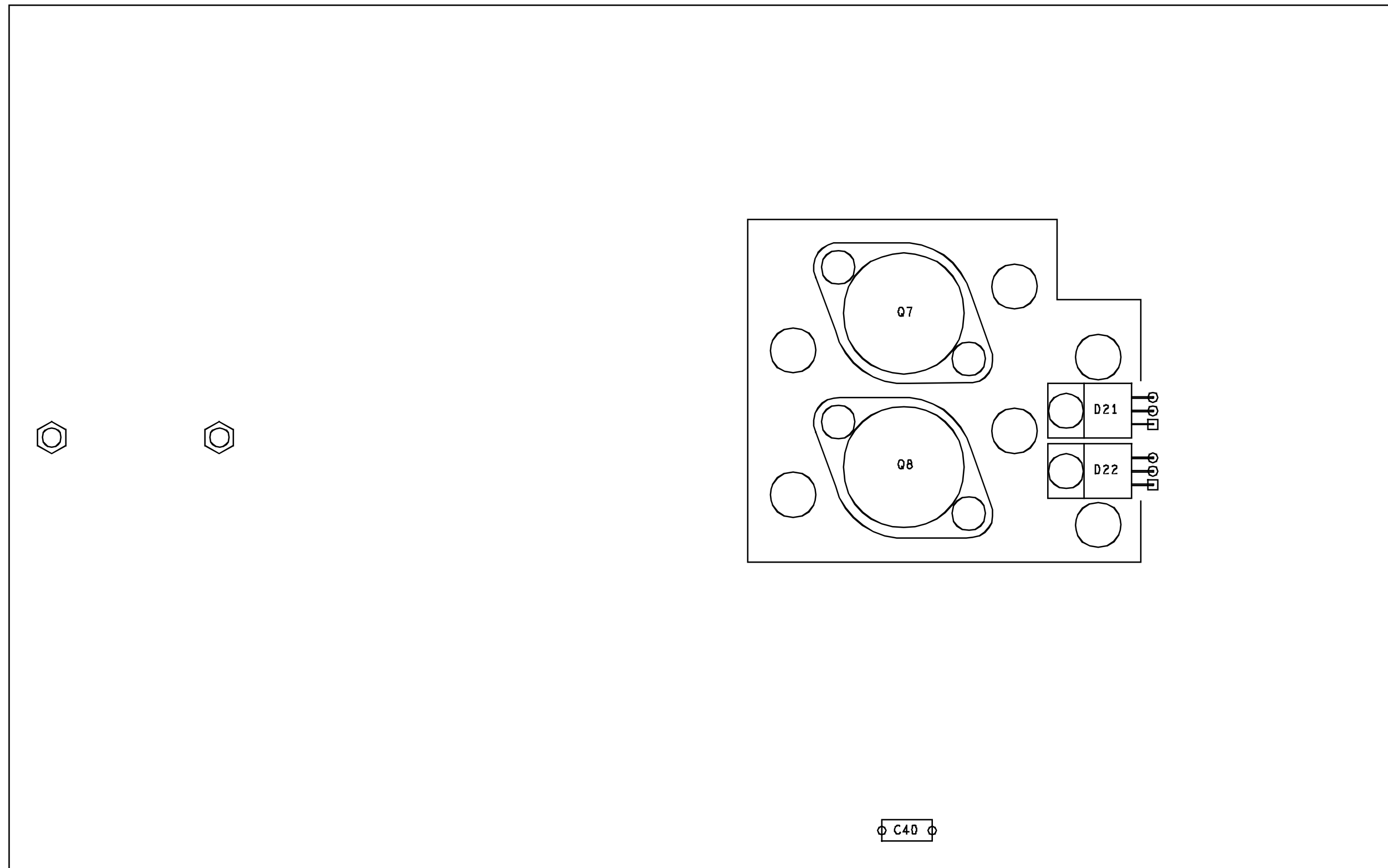
COMPONENT SIDE

CAUTION
THIS ASSEMBLY CONTAINS ITEMS
WHICH ARE SUBJECT TO DAMAGE
FROM ELECTROSTATIC DISCHARGE (ESD)


CIRCUIT CARD ASSEMBLY
POWER SUPPLY

01-P30270C REV. D

SHEET 1 OF 2



SOLDER SIDE

 CAUTION
THIS ASSEMBLY CONTAINS ITEMS
WHICH ARE SUBJECT TO DAMAGE
FROM ELECTROSTATIC DISCHARGE (ESD)

CIRCUIT CARD ASSEMBLY
POWER SUPPLY

01-P30270C REV. D

SHEET 2 OF 2

