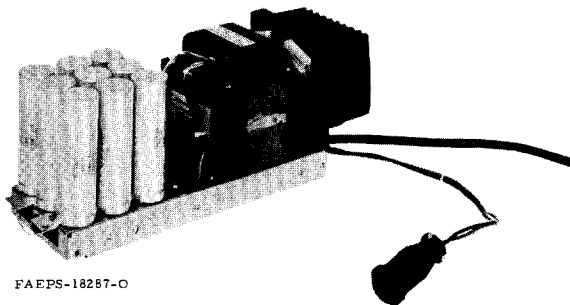


# POWER SUPPLY

MODEL TPN1144A



FAEPS-18287-0

## 1. DESCRIPTION

### NOTE

If the 242 V ac source is unbalanced, contact your nearest Motorola Systems Engineer for assistance prior to connecting the power supply to the source.

The TPN1144A Power Supply provides a dc output of 14.0 V. Output regulation is maintained by a negative side, series pass regulator. The collectors of the series pass transistors are grounded to facilitate efficient heat dissipation. Fully transistorized circuits protect the supply from damage due to excessive output current. The supply also has circuitry that protects connected units from damage due to excessive output voltage.

The TPN1144A Power Supply:

- has an output voltage of 14 V  $\pm 0.1$  V with a maximum intermittent load current of 25 A. Intermittent load is defined as 1 minute of 25 A output current and 4 minutes of 3.5 A (or less) output current for every 5 minute interval at +25°C. One minute of 25 A output current should be linearly derated to 30 seconds at +60°C.

- has a continuous output current capability of 10 A at +25°C, derated linearly to 6.0 A at +60°C.
- has less than 25 mV (peak-to-peak) of ripple at a continuous output current of 10 A.

"All specifications are measured at the power supply chassis.

## 2. PRELIMINARY CONNECTIONS & ADJUSTMENTS

### 2.1 INPUT TRANSFORMER

Before ac input power is applied to the unit, terminal board TBI must be wired to accommodate the input level of the ac source. When the level of the ac source has been determined connect the black and white wires and JU1, JU2, and JU3 as shown in Table 1. When TBI has been properly connected, connect the unit to the ac source. If the power supply is connected to an ac source of 200 V or more, the three-prong plug must be cut off and replaced with a high voltage plug.

### NOTE

If the unit has just been repaired or if there is a possibility of unit malfunction, check the resistance values at points 1 through 11 (as indicated on the schematic diagram) before applying ac power. If any of the readings are incorrect, refer to the troubleshooting table for this unit.

### 2.2 Output Level Adjustment

Connect a dc voltmeter between pin 1 of J1 and ground. Adjust R18, located on the power supply circuit board, for a meter reading of 14.0 volts.



**MOTOROLA INC.**  
Communications Division

**Service publications**

1301 E. Algonquin Road, Schaumburg, IL 60196

POWER SUPPLY

TABLE 1.  
INPUT TRANSFORMER CONNECTIONS

SOURCE VOLTAGE	WHITE WIRE	BLACK WIRE	JU1	JU2	JU3*
100	TB1-2	TB1-1	TB1-1 to TB1-4	TB1-2 to TB1-5	NC
110*	TB1-6	TB1-1	TB1-1 to TB1-4	TB1-2 to TB1-5	TB1-3 to TB1-7
121	TB1-3	TB1-1	TB1-1 to TB1-4	TB1-3 to TB1-7	NC
200	TB1-5	TB1-1	TB1-2 to TB1-4	NC	NC
210	TB1-6	TB1-1	TB1-2 to TB1-4	NC	NC
221	TB1-7	TB1-1	TB1-2 to TB1-4	NC	NC
231	TB1-6	TB1-1	TB1-3 to TB1-4	NC	NC
242	TB1-7	TB1-1	TB1-3 to TB1-4	NC	NC

\*Unit is shipped strapped for 242 V ac input. A 4 A line fuse and a spare 40 A fuse is in a bag stapled to line cord.

### 3. TROUBLESHOOTING

#### 3.1 VOLTAGE AND RESISTANCE MEASUREMENTS

Nominal voltage measurements in the power supply circuit are shown on the schematic diagram. Voltages are given for no output current (no load condition), 5 amps of output current, and 25 amps of output current. Resistance measurements to ground are also shown on the schematic diagram.

#### 3.2 LOCATING TROUBLES

3.2.1 If the power supply is malfunctioning, disconnect the ac power cord immediately. Use an ohmmeter set on the RX100 scale to check the resistance to ground at points 1 through 11 (as noted on the schematic diagram). When measuring resistances, allow enough time for the meter to fully charge any capacitors in the circuit. If the charging time is too slow, switch to the RX 10 scale to speed up charging, then switch back to the RX 100 scale for the resistance reading.

3.2.2 After checking the circuit resistances, check the symptom column of the troubleshooting table for the symptoms that have been observed in the unit. Using the schematic diagram as reference, troubleshoot each of the components or circuits listed as possible causes of the trouble. When the defective component is found, apply the remedy described in the third column. Check the resistances at points 1 through 11 before reapplying ac power following a repair. Adjust the dc output level as described in paragraph 2.2.

#### NOTE

The line fuse is usually weakened by the increased line current drawn when the crowbar fuse blows. When ever the crowbar fuse blows, replace both the line fuse and the crowbar fuse.

3.2.3 Figures showing the locations of chassis mounted components are adjacent to the parts list.

# TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE	REMEDY
A. Crowbar fuse open	Q9 or Q10 is shorted	Check, and replace if necessary, Q9 and/or Q10.
	Short circuit in output	Locate and remove short, replace both fuses.
	Excessive output current	Disconnect any loads that would cause the output current to exceed 40 amps.
	Rectifier diode shorted to chassis	Locate faulty diode with ohmmeter and replace.
B. Line fuse open	TB1 wire for wrong input voltage	Rewire TB1 and replace both fuses.
C. No dc output	Crowbar fuse blown	See A above
	Line fuse blown	See B above
	Q9 and/or Q10 are defective	Check Q9 and Q10 and replace if necessary.
	Q5 is shorted	Check Q5 and replace, if necessary.
D. Low output voltage	Improper wiring of T1	Check T1 wiring, reconnect if necessary
	R18 adjusted improperly	Readjust R18
E. Output voltage is not adjustable	A 6 defective	Check Q6; replace if necessary
	R18 open	Check R18; replace if necessary
F. Points 1 or 2 measure zero ohms to ground.	Q9 or Q10 are shorted	Check Q9 and Q10; replace if necessary
G. Points 3 through 6 measure zero ohms to ground	Q11 is shorted	Replace Q11
H. Point 5 measures zero ohms to ground and ohm-meter shows no evidence of output capacitor charging.	Shorted output capacitor	Check output capacitors; replace if necessary
	Insufficient ohmmeter current.	Check ohmmeter
I. Point 8 measures zero ohms to ground	Q9 or Q10 is shorted from base to collector or Q8 is shorted	Check Q8, Q9, and Q10 and replace if necessary.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

## PARTS LIST

TRN6248A Power Supply Chassis PL-3642-C		
C15 thru 21 C22, 23 C24	23-83093G20 23-83093G14 21-82187B14	CAPACITOR, fixed: $\mu$ F; unless otherwise stated 17500 $\pm$ 10%; 20 V 8000 $\pm$ 10%; 35 V .001 $\pm$ 10%; 100 V
CR9 CR10 CR11 CR12 CR13 CR15, 16	1V80778B30 1V80778B31 1V80778B30 1V80778B31 1V80778B30 48-82525G14	DIODE (SEE NOTE) silicon silicon silicon silicon silicon silicon
F1 F2	65-84161B01 65-135212 or 65-061688	FUSE: 40 amp (See note below) 8 amp; 25 V (120 V AC) 4 amp; 250 V; slow-blow type (240 V AC)
J2		CONNECTOR, receptacle: consists of 14-83799G01 INSULATOR, male 39-83798G01 TERMINAL, female
Q7 Q8 Q9, 10 Q11	48-869807 48-869700 1V80778B15 48-84973C01	TRANSISTOR (SEE NOTE) PNP; type M9807 PNP; type M9700 NPN; type M9698 silicon control rectifier
R22 R23 R24 thru 27 R28 R29	6-124A45 6-124A49 17-82177B50 6-124A49 30-10286D01	RESISTOR, fixed: $\pm$ 5%; 1/4 W; unless otherwise stated 680 0.10 $\pm$ 10%; 7 W 1k wire lead; No. 16 gr; 4-1/2" req'd.
T1	25-83814K01	TRANSFORMER, power: pri #1: pins 1 and 3 with 2 tapped pri #2: pins 3 and 7 with 5 and 6 tapped sec: pins 8 and 9
NON-REFERENCED ITEMS		
14-83967A03 14-84548A01 43-84115C03 42-850861 9-82083C01 42-10217A02 9-83472K03 9-83472K04 26-83854K01 29-859665 14-84268A01 9-83662A01 7-82867K01 64-83562D01 64-83562D03 31-83927K01 14-83813K01	WASHER, shoulder; 8 req'd. INSULATOR, washer; 4 req'd. SPACER, threaded; 3 req'd. RETAINER, cable HOLDER, fuse STRAP, cable harness; 8 req'd. CONNECTOR, female CONNECTOR, female HEATSINK LUG, ring-tongue; 6 req'd. INSULATOR, transistor SOCKET, transistor BRACKET, mounting PLATE, heatsink PLATE, heatsink reworked TERMINAL, fuse block INSULATOR, capacitor; 3 req'd.	

NOTE:  
For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

Note: The 40A fuse is a Buss KBJ-G40.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
------------------	-------------------	-------------

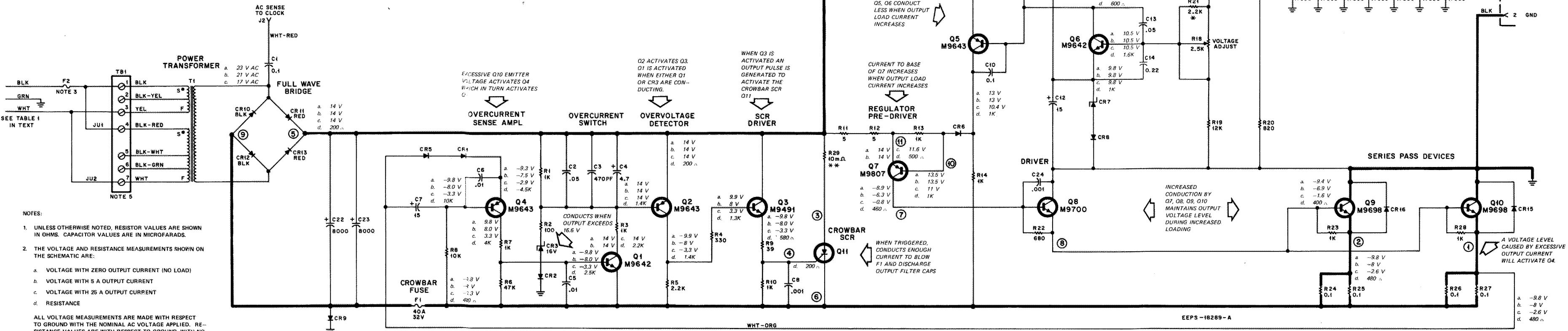
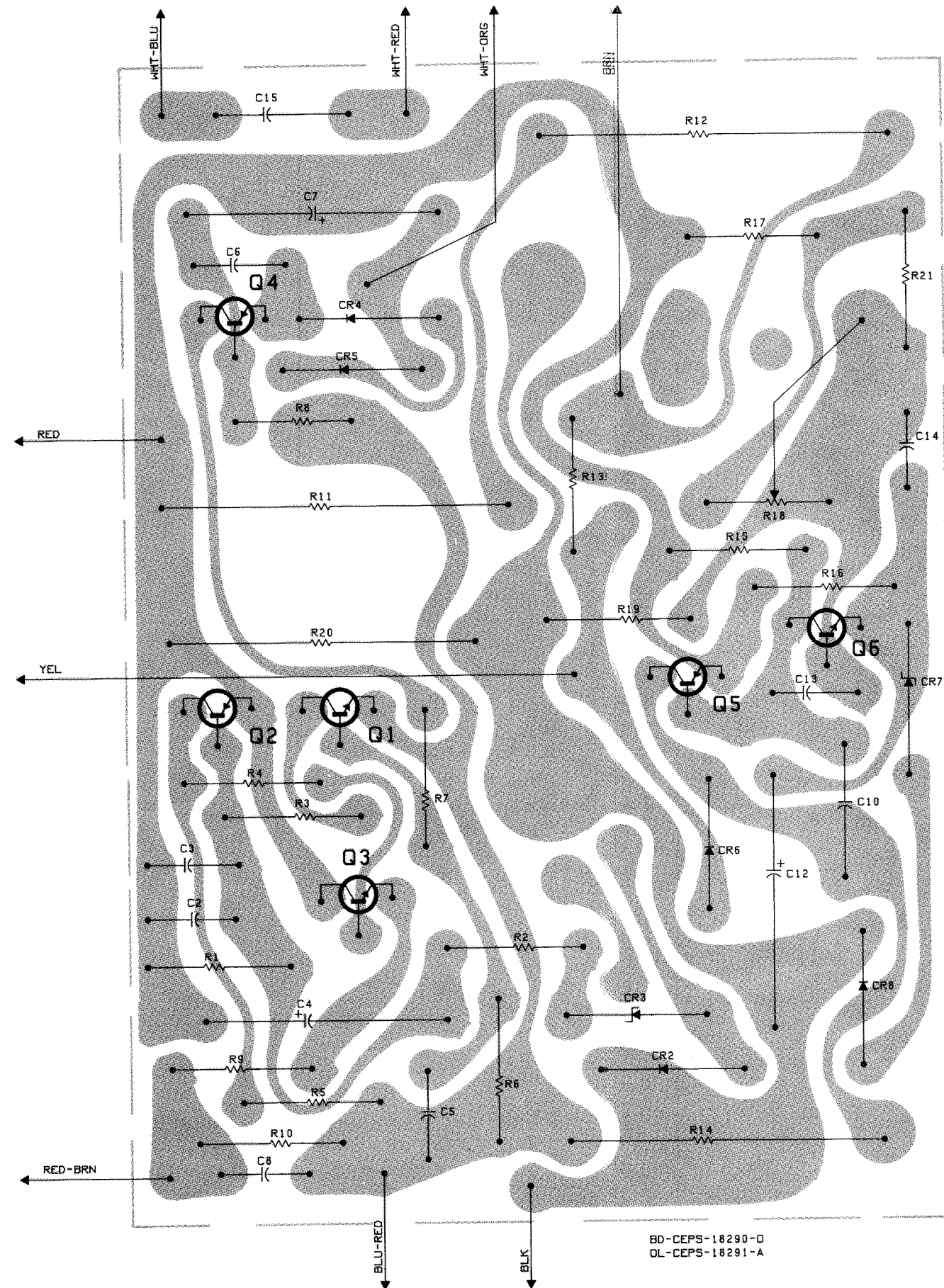
## PARTS LIST

TRN6247A Power Supply Circuit Board PL-3643-A		
C1 C2 C3 C4 C5, 6 C7 C8 C9 C10 C12 C13 C14	8-82905C30 21-82372C07 21-82187B07 23-82783B12 21-82428B59 23-83214C26 21-82187B14 NOT USED 8-83514E02 23-83214C26 21-82372C07 8-82905C11	CAPACITOR, fixed: $\mu$ F; unless otherwise stated 0.10 $\pm$ 10%; 50 V .05 $\pm$ 10%; 25 V 470 pF $\pm$ 10%; 500 V 4.7 $\pm$ 20%; 50 V .01 $\pm$ 10%; 200 V 15 $\pm$ 10%; 25 V .001 $\pm$ 10%; 100 V NOT USED 0.1 $\pm$ 10%; 50 V 15 $\pm$ 10%; 25 V .05 $\pm$ 10%; 25 V 0.22 $\mu$ F $\pm$ 10%; 50 V
CR2 CR3 CR4, 5 CR6 CR7 CR8	48-83654H01 48-83461E01 48-83654H02 48-83654H01 48-82256C38 48-83654H01	DIODE (SEE NOTE) silicon Zener type; 16 V silicon silicon Zener type; 9.1 V silicon
Q1 Q2 Q3 Q4, 5 Q6	48-869642 48-869643 48-869491 48-869643 48-869642	TRANSISTOR (SEE NOTE) NPN; type M9642 PNP; type M9643 NPN; type M9491 PNP; type M9643 NPN; type M9642
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11, 12 R13 R14 R15 R16 R17 R18 R19 R20 R21	6-124A49 6-124A25 6-124A49 6-124A37 6-124A57 6-124A89 6-124A49 6-124A73 6-124E15 6-124A49 17-82177B04 6-124A49 6-127A49 6-124A37 6-124A41 6-124A61 18-83083G06 6-124A75 6-127A47 6-124A57	RESISTOR, fixed: $\pm$ 5%; 1/4 W; unless otherwise stated 1k 100 330 2.2k 47k 1k 10k 39 1k 5 $\pm$ 10%; 5 W 1k 1k; 2 W 330 470 3.3k var; 2.5k 12k 820; 2 W 2.2k
NON-REFERENCED ITEM		
	14-861196	INSULATOR, transistor: for (Q3)

NOTE:  
For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

## TRN6285A Power Supply Cable Kit PL-3641-O

J1	CONNECTOR, receptacle: consists of: 15-83468K01 HOUS- ING, connector; 3 contact 42-84936F01 CLIP, cable with shell 9-83472K03 female single contact 2 req'd. 9-83472K04 female single contact
NON-REFERENCED ITEMS	
29-84078B01 30-84500E01	LUG, spade; flanged CORD, AC; 108" req'd.



NOTES:  
1. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE SHOWN IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS.  
2. THE VOLTAGE AND RESISTANCE MEASUREMENTS SHOWN ON THE SCHEMATIC ARE:  
a. VOLTAGE WITH ZERO OUTPUT CURRENT (NO LOAD)  
b. VOLTAGE WITH 5 A OUTPUT CURRENT  
c. VOLTAGE WITH 25 A OUTPUT CURRENT  
d. RESISTANCE  
ALL VOLTAGE MEASUREMENTS ARE MADE WITH RESPECT TO GROUND WITH THE NOMINAL AC VOLTAGE APPLIED. RESISTANCE VALUES ARE WITH RESPECT TO GROUND, WITH NO INPUT VOLTAGE, USING RX100 SCALE.  
3. FOR 100, 110, OR 121 V AC INPUT VOLTAGES USE AN 8 AMP, 120 V, FAST BLOW, 3 AG FUSE. FOR 200, 210, 221, 231, OR 242 V AC INPUT VOLTAGES USE A 4 A, 240 V, FAST BLOW, 3 AG FUSE.  
4. LEGEND:  
- THEORY NOTE  
5. SHOWN JUMPED FOR 121 V AC OPERATION.  
6. CIRCLED NUMBERS SHOULD ALWAYS BE OHMMETER TESTED BEFORE APPLYING AC POWER.  
\* RESISTOR R21 MAY BE OMITTED AT FACTORY.  
\*\* RESISTOR R29 IS A LENGTH OF WIRE.

TPN1144A Power Supply  
Schematic Diagram and Circuit Board Detail  
Motorola No. PEPS-19584-A  
6/30/76-UP