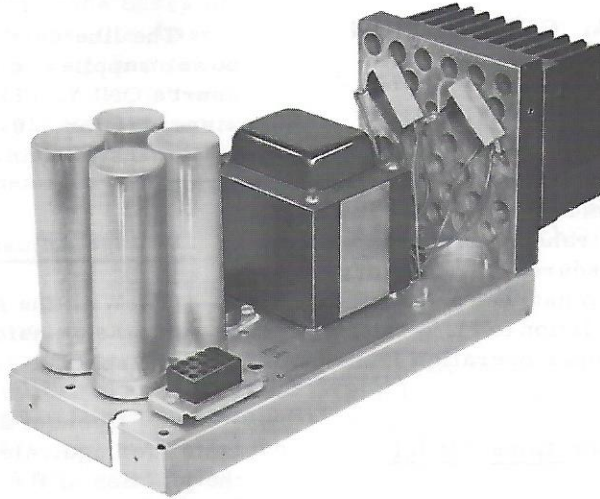


POWER SUPPLY

MODELS TPN1084B, TPN1088B,
TPN1084A & TPN1088A



AEPS-4432-O

TECHNICAL CHARACTERISTICS

PRIMARY POWER SOURCE	TPN1084A	120 volts rms $\pm 20\%$; 60 Hz ac
	TPN1084B	
	TPN1088A TPN1088B (Optional)	120, 220, 240 volts rms $\pm 20\%$; 50/60 Hz ac (factory set for 120 V operation)
OUTPUT RATING		13.5 volts dc at 15 amps (regulated)
LOAD REGULATION		13.5-0.5 volts for 0 to 15 amp load
LINE REGULATION		13.5 ± 0.5 volts for $+20-10\%$ variation of line voltage
WEIGHT		approximately 14 lbs.
DIMENSIONS		5-5/8" high x 13" long x 4-1/2" wide, overall

1. DESCRIPTION

These power supplies are compact, fully transistorized dc power sources for solid-state "Consolette" base stations. The 120-volt only (Model TPN1084) power supply is supplied with all stations unless the 120-, 220-, 240-volt

(Model TPN1088) supply is ordered as an optional accessory. Both power supplies are similar--power transformers are different and a primary voltage selection terminal strip is used with the Model TPN1088. The power supplies provide 13.5 volts (nominal) dc regulated output to the base station.

A 15-pin receptacle on the power supply chassis provides all necessary power and control connections to the base station front panel and the transmitter-receiver chassis via the station intercabling facilities. The power supplies are designed as self-contained units and are easily removed from the base station chassis assembly for maintenance purposes.

The power supply consists of a power transformer, four bridge-connected silicon diode rectifiers, capacitive filter, series transistor regulator, over-voltage and short circuit protection circuitry. The two regulator transistors are mounted on an efficient head radiator to ensure safe operating temperature. Overload protection

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Communications Division

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for the primary circuit is provided by a 5-amp fuse. Overload protection for the secondary is provided by a 20-ampere fuse. A three-conductor line cord provides 120-volt ac primary power connections to the power supply. The line cord plug must be removed and a proper connection made to the power source for 220- or 240-volt operation.

2. PRE-OPERATIONAL CONNECTION AND ADJUSTMENT

a. General

Power supply A+ output voltage has been accurately adjusted at the factory for optimum operation of the associated transmitter and receiver from a 120-volt ac power source. A+ output voltage of the power supply must be checked and adjusted at the time of installation to 13.5-volts dc, if necessary, to insure proper operation from the specific power source.

b. Transformer Tap Connections (Model TPN1088 Only)

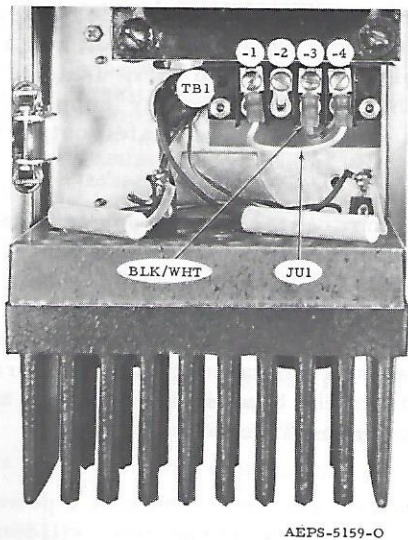


Figure 1.
Transformer Tap Connections
(Model TPN1088 Only)

Refer to Figure 1 and verify proper connections as shown in the following table.

POWER SOURCE	CONNECTIONS	
	JU1	BLK/WHT LEAD
120 V ac	Between TB1-1 & -4	To TB1-3
220 V ac	Not Used	To TB1-2
240 V ac	Not Used	To TB1-1

c. Line Cord Plug Removal (220- and 240-Volt Operation Only)

The line cord plug supplied with both model power supplies is for use with a 120-volt power source ONLY. This plug must be removed and discarded for 220- and 240-volt operation and the station installed in accordance with local electrical codes.

d. Voltage Adjustment Procedure

(1) With the Model TPN1088 Power Supply, be sure the transformer tap connections are correct for specific power source voltage being used.

(2) Connect a Motorola solid-state dc multimeter (or equivalent) between chassis ground and the junction of the red-white wire and R219 on the heat radiator.

(3) Switch "on" the base station. During "receive" conditions the voltmeter should read 13.5 volts.

(4) If the A+ output voltage is not 13.5 volts, turn the VOLT ADJ control R208 to provide a voltmeter reading of 13.5 volts. This control is accessible through a hole in the top of the power supply chassis adjacent to the power receptacle as shown in Figure 2.

3. CIRCUIT OPERATION

a. Rectifier and Filter Circuit

The secondary voltage (18 volts ac nominal) from power transformer T201 is rectified by the full wave bridge rectifier CR201, CR202, CR203, CR204 and filtered by capacitors C202, C203, C204, resulting in a positive dc voltage of 24 volts. This filtered voltage is used as the collector voltage for the series regulator consisting of Q205 and Q207, and operating voltage for the remaining stages of the power supply.

b. First and Second Driver, and Turn-On

The 24 volts developed by the bridge is applied to the first driver, Q201, which with its hard bias

is a constant current generator. Transistor Q201 supplies the constant current to second driver Q203 driving it into saturation. When Q203 turns on, a full drive is applied to Q204 because its base is pulled closer to ground. When Q204 turns on, series pass transistors, Q205 and Q207, turn on and supply the output voltage. As the output voltage increases the reference amplifier then will maintain the regulated output at the set voltage.

c. Series Regulator

Resistor R217, connected to the bases of transistors Q205 and Q207, develops the base-bias voltage for the transistors, causing them to conduct. With the transistors conducting, the filtered dc voltage existing at the bridge rectifier output is first regulated to 13.5 volts by the transistors and then applied to the transmitter and receiver circuitry as the A+ voltage.

d. Reference Amplifier

If the power supply loading decreases so that the output voltage starts to increase, the base bias voltage at reference amplifier transistor Q202 is also increased. This rise in base bias voltage drives the transistor towards saturation which causes its collector voltage to decrease. The collector output is fed to the base of the first driver transistor, Q203, to reduce its base-bias voltage. Consequently, transistor Q203 conducts less current, which causes second-driver transistor Q204 and series-regulator transistors Q205 and Q207 to be driven towards cut-off. When this happens, the impedance of the series regulator transistors increase proportionately, causing the output (A+) voltage applied to the associated transmitter and receiver to decrease to its initial level of 13.5 volts. Should the output voltage decrease as a result of power supply loading, the circuit action previously described is reversed, causing the output voltage to increase to its normal operating point.

Variable resistor R208 in the base circuit of reference amplifier transistor Q202, permits adjustment of the output voltage to the required operating level of 13.5 volts in the receive condition.

e. Over-Voltage Protection

Over-voltage protection is provided by Q206. When the power supply is operating normally, the 16-volt Zener diode does not conduct, leaving the base-bias circuit of Q206 open and held to the emitter by R214. If the output voltage exceeds 16 volts, the 16-volt Zener diode starts to conduct and supplies a turn-on voltage for Q206 when the output voltage reaches a level high enough to provide at least

0.6 volt drive across R214. This drive turns on Q206 which applies a current to the gate of CR205 and turns it on. When CR205 turns on, the bridge circuit and capacitors C202, C203 and C204 are shorted to ground thru F202.

This blows the fuse and shuts off the power supply.

f. Short Circuit Protection and Current Limiting

Short circuit protection and current limiting is provided by the control circuit comprised of Q208 and CR210. The output current of one of series-pass transistor Q207 is monitored via R219. When the current reaches a high enough level, the voltage across R219 turns on Q208. A voltage-divider network consisting of R221 and R222 sets the current at which Q208 starts to conduct. When Q208 conducts, it supplies drive to CR210 through R216.

Silicon control rectifier CR210 conducts, and latches on. This pulls the base of Q203 to ground through CR209, and pulls the emitter of Q201 closer to ground than its base through the voltage divider comprised of R203 and R205. This reverse biases the base-emitter junction of both Q201 and Q203, cutting them off. This results in power-supply shut down.

When the short circuit condition is removed, the power supply can be reset by removing the 120- or 240 volt ac primary voltage (turn on-off switch to off) for approximately one minute. This allows sufficient time for filter capacitors C202, C203 and C204 to discharge to ground through R203, R205, CR209 and CR210. As the current through CR210 approaches zero, this device turns off and normal power supply operation will be restored when primary ac voltage is reapplied.

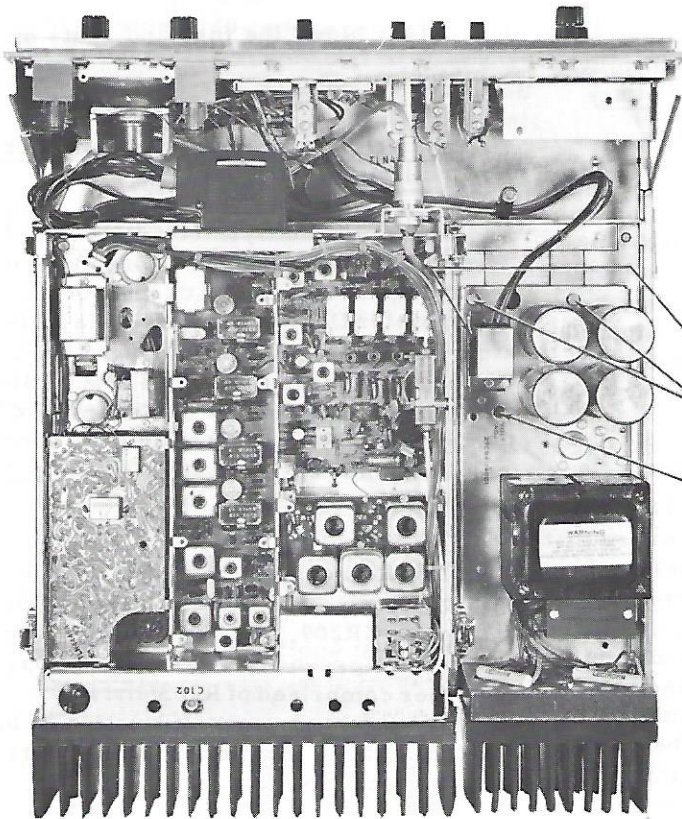
4. MAINTENANCE

a. Removal and Replacement of Power Supply

Refer to Figure 2 for instructions to remove and replace the power supply from the base station.

b. Removal and Replacement of Circuit Board

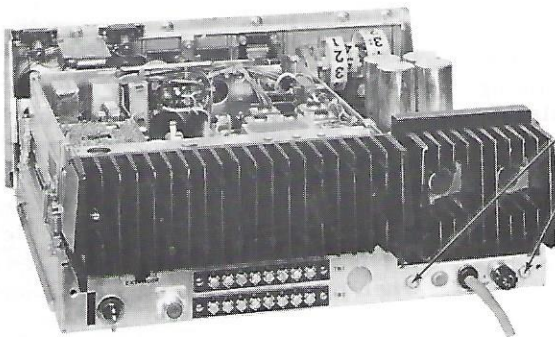
Refer to Figure 3 for instructions to remove and replace the circuit board from the power supply.



REMOVAL PROCEDURE

1. TURN OFF BASE STATION POWER
2. UNPLUG BASE STATION FROM SOURCE.
3. REMOVE THE BASE STATION CABINET (DESCRIBED ELSEWHERE).
4. DISCONNECT THE 15-PIN POWER CABLE PLUG.
5. REMOVE THE TWO SCREWS FROM THE TOP OF THE POWER SUPPLY CHASSIS.

VOLT
ADJ



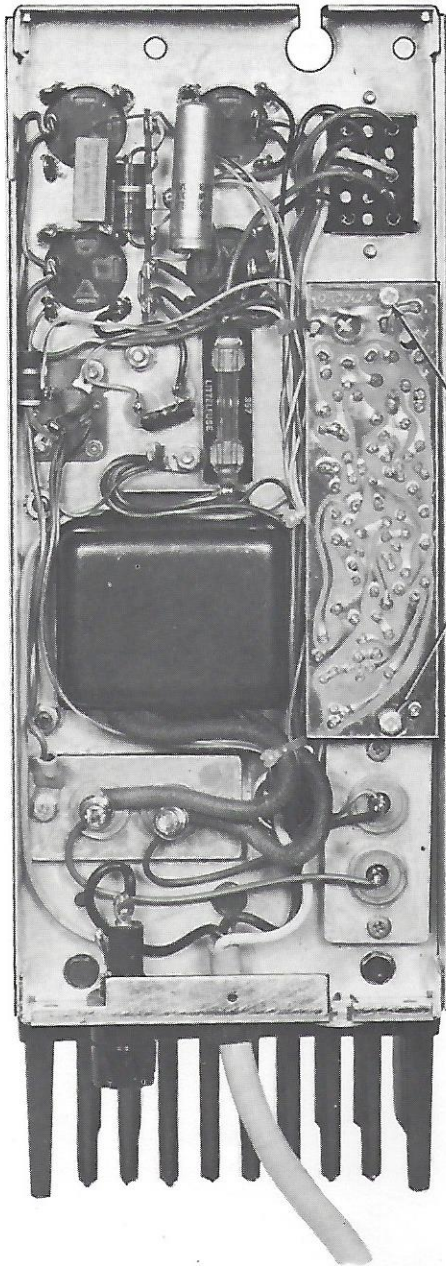
6. REMOVE TWO SCREWS AT THE BACK OF THE BASE STATION BELOW THE POWER SUPPLY HEAT SINK.
7. LIFT THE POWER SUPPLY CHASSIS WITH THE AC LINE CORD ATTACHED STRAIGHT UP AND AWAY FROM THE BASE STATION CHASSIS.

REPLACEMENT PROCEDURE

8. REPLACE THE POWER SUPPLY IN THE REVERSE ORDER.

BEPS-4430-A

Figure 2.
Removal and Replacement of Power Supply



REMOVAL PROCEDURE

1. REMOVE THE POWER SUPPLY FROM THE BASE STATION CHASSIS AS DESCRIBED IN FIGURE 1.
2. UNSCREW THE TWO MOUNTING SCREWS.
3. CAREFULLY LIFT OUT BOARD.

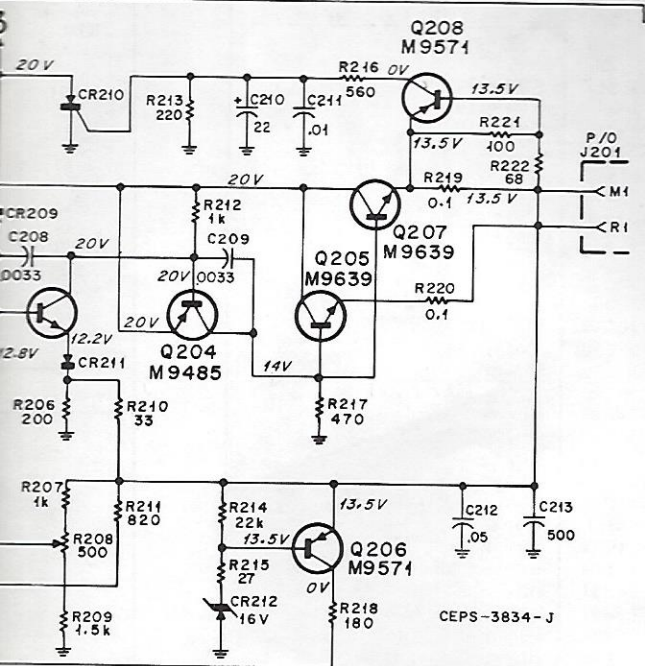
REPLACEMENT PROCEDURE

4. REPLACE THE CIRCUIT BOARD IN THE REVERSE ORDER.

AEPS-4431-A

Figure 3.
Removal and Replacement of Circuit Board

H MODELS



VOLTAGES TAKEN DURING FOLLOWING CONDITIONS:
 1. NOMINAL RATED LINE VOLTAGE.
 2. R208 SET TO PRODUCE AN OUTPUT VOLTAGE OF 13.5 VOLTS DC AT 4 AMPERE.

NOTES:

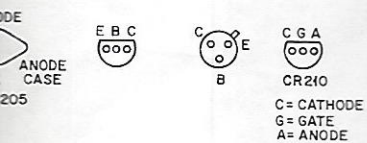
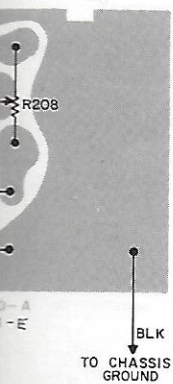
- 201. UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICROFARADS. RESISTOR VALUES ARE IN OHMS.
- 202. UNLESS OTHERWISE STATED, VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES MEASURED WITH A MOTOROLA SOLID-STATE DC MULTIMETER.

EPS-4423-B

MODEL TABLE

MODEL	SUFFIX	SUB-MODELS	SUFFIX	DESCRIPTION
TPN1084A		TLN4404A		CHASSIS KIT
120 VOLT		TLN4405A	2	CIRCUIT BOARD
TPN1088A		TLN4478A		CHASSIS KIT
120, 220, 240 VOLT		TLN4405A	2	CIRCUIT BOARD

EPS-5164-B



PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Power Supply
 Schematic Diagram & Circuit Board Detail
 Motorola No. 63P81010E92-K
 3/22/76-UP

POWER SUPPLY

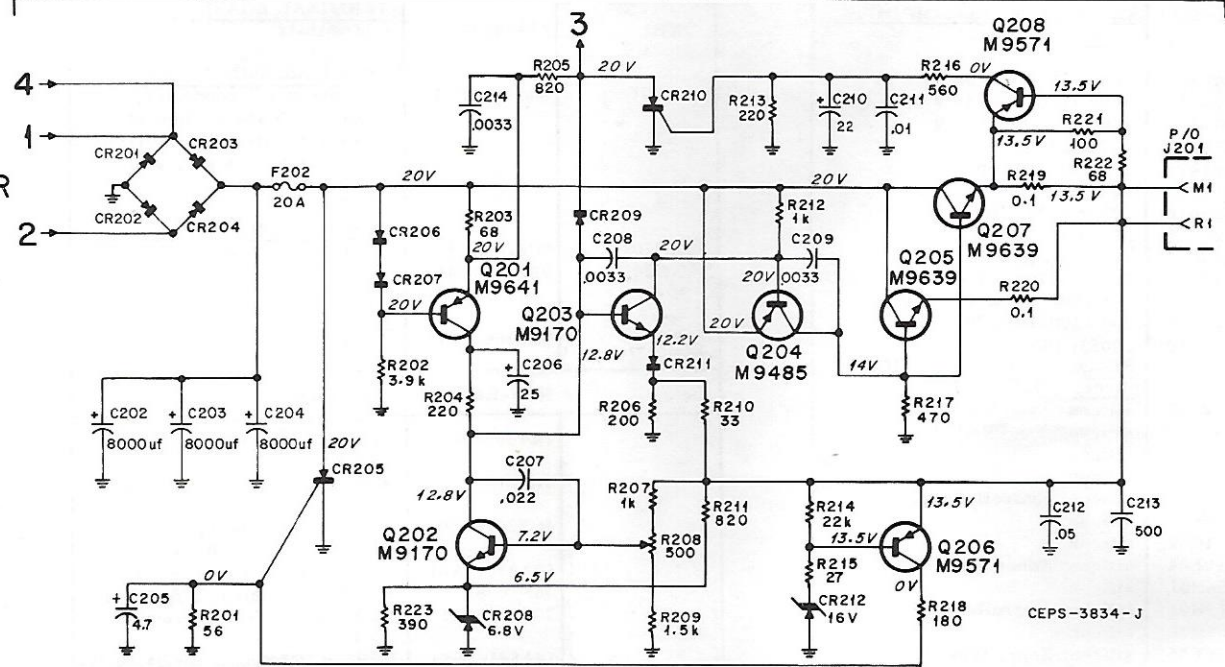
→ 4
→ 3
→ 1
→ 2

→ 3

→ 1
→ 2
→ 4

OR

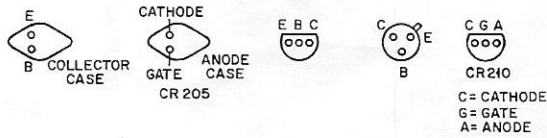
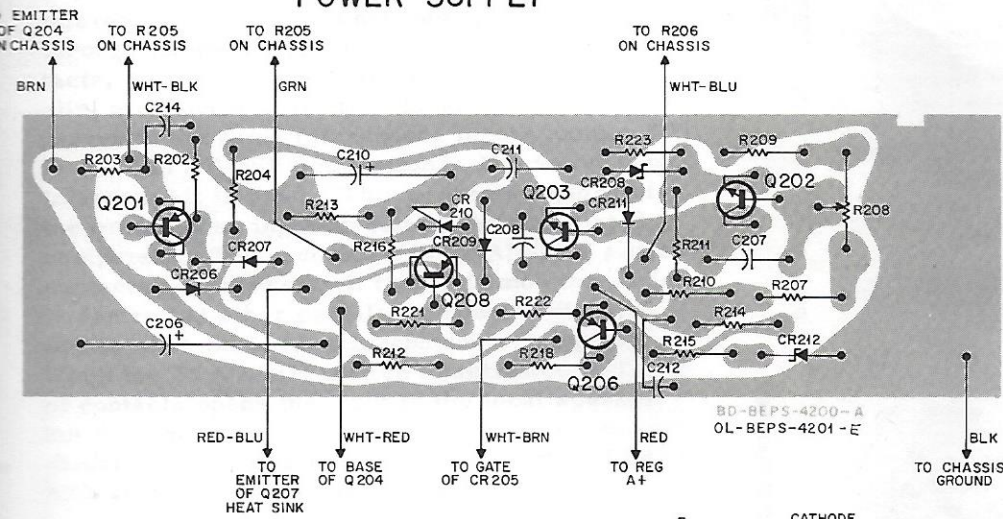
BOTH MODELS



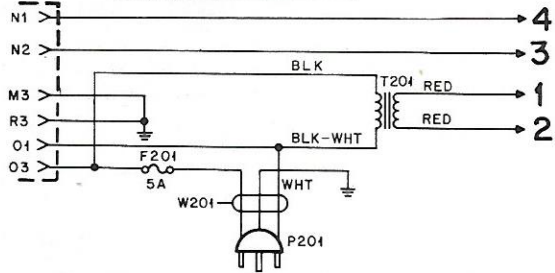
CONNECTIONS	
U1	BLK-WHT LEAD
WEEN -1 & 4	TO TB1-3
USED	TO TB1-2
USED	TO TB1-1

VOLTAGES TAKEN DURING FOLLOWING CONDITIONS:
1. NOMINAL RATED LINE VOLTAGE.
2. R208 SET TO PRODUCE AN OUTPUT VOLTAGE OF 13.5 VOLTS DC AT 1 AMPERE.

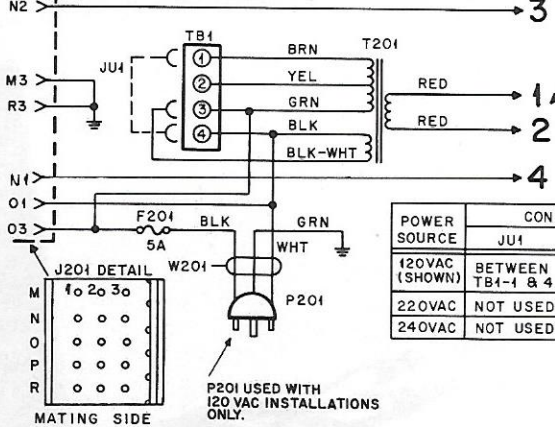
SHOWN FROM SOLDER SIDE
POWER SUPPLY



120V 60Hz MODEL ONLY



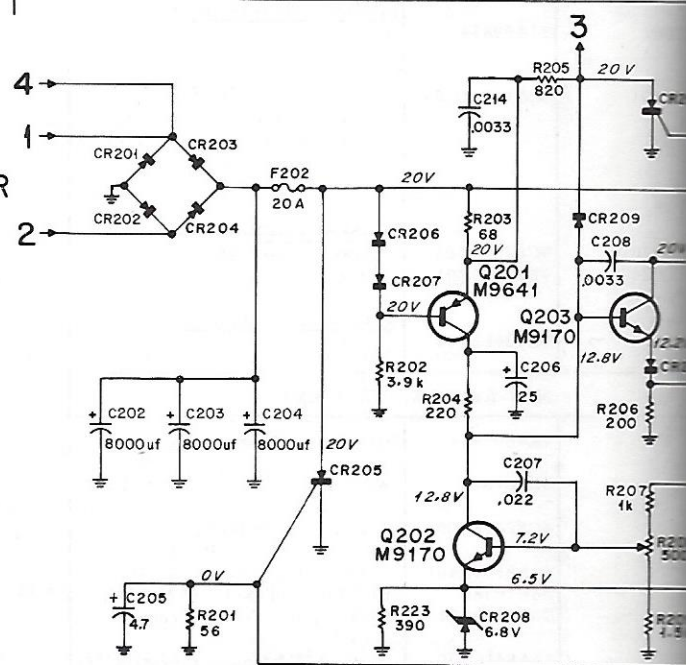
120, 220, 240V 50/60Hz MODELS ONLY



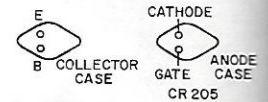
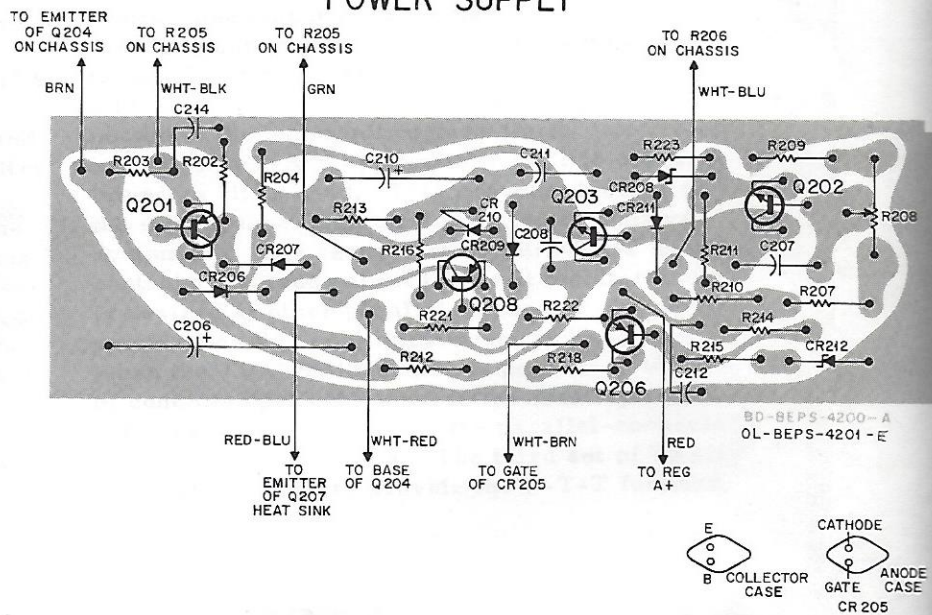
POWER SOURCE	CONNECTIONS	
	JU1	BLK-WHT LEAD
120VAC (SHOWN)	BETWEEN TB1-1 & 4	TO TB1-3
220VAC	NOT USED	TO TB1-2
240VAC	NOT USED	TO TB1-1

P201 USED WITH 120 VAC INSTALLATIONS ONLY.

BOTH MODELS



SHOWN FROM SOLDER SIDE POWER SUPPLY



REVISIONS

63P81010E92-K

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4405A-1	C210	WAS 23D83214C15; 4.7 uF	Q208 COL-LECTOR
	C212	ADDED .05 uF	Q206 EMITTER
	R213	WAS 6S129233; 47 OHMS	Q208 COL-LECTOR
	R216	WAS 6S129662; 180 OHMS	Q208 COL-LECTOR
TLN4405A-2		CHANGED OUTPUT LEAD COLORS AS FOLLOWS: BRN WAS BRN-YEL WHT-BLK WAS YEL-BLK GRN WAS YEL-GRN WHT-BLU WAS YEL-BLU WHT-RED WAS YEL-RED WHT-BRN WAS YEL-BRN	CIRCUIT BOARD
TLN4405A-1	CR206, CR207, CR209, CR211	WERE 48D82392B03	PARTS LIST
TPN1084B AND TPN1088B		REPLACES MODELS TPN1084A, TPN1088A	CHASSIS

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TPN1084B Power Supply (120-Volt, 60 Hz)
TPN1088B Power Supply (120-, 220-, 240-Volt, 50/60 Hz)

PL-1104-m

		CAPACITOR, fixed: uF: ±10% 50 V; unl. stated
C202	23-83093G13	8000 +150-10%; 35 V
C203	23-83093G13	8000 +150-10%; 35 V
C204	23-83093G13	8000 +150-10%; 35 V
C205	23D83214C15	4.7 ±20%; 25 V
C206	23D82601A08	25 +150-10%; 50 V
C207	8D82905G02	.022 ±10%; 50 V
C208	21D82428B10	.0033 ±10%; 100 V
C209	21D82428B10	.0033 ±10%; 100 V
C210	23D83214C07	22 ±20%; 15 V
C211	21C82372C05	0.2 +80-20%; 25 V
C212	21C82372C04	.05 +80-20%; 25 V
C213	23D83210C19	500 +100-10%; 20 V
C214	21D82428B10	.0033; 100 V SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR201	48C82732C07	silicon
CR202	48C82732C07	silicon
CR203	48C82732C10	silicon
CR204	48C82732C10	silicon
CR205	48D84242C01	silicon; controlled type
CR206	48-83654H01	silicon
CR207	48-83654H01	silicon
CR208	48D83696E01	silicon; Zener type; 6.8 V
CR209	48-83654H01	silicon
CR210	48D84755H01	silicon; controlled type
CR211	48-83654H01	silicon
CR212	48D83696E05	silicon; Zener type; 16.0 V
F201	65S52293	FUSE, cartridge: 1-1/4" x 1/4" 5 A; 250 V
F202	65S4637	20 A; 32 V
J201		CONNECTOR, receptacle: includes: 14C83783A04 BODY, connector 29C82336A01 TERMINAL, contact
P201		CONNECTOR, plug: (part of W201)
Q201	48R869641	TRANSISTOR: (SEE NOTE) P-N-P; type M9641
Q202	48R869170	N-P-N; type M9170
Q203	48R869170	N-P-N; type M9170
Q204	48R869485	P-N-P; type M9485
Q205	48R869639	N-P-N; type M9639
Q206	48R869571	P-N-P; type M9571
Q207	48R869639	N-P-N; type M9639
Q208	48R869571	P-N-P; type M9571
R201	6S129860	RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R202	6S129232	56
R203	6S129861	3.9K
R204	6S127800	68
R205	6-127C47	220
R206	17D82177B08	820; 2 W
R207	6S127802	200; 5 W
R208	18-82943G02	1K
R209	6S129235	variable: 500 ±20%; 3 W
R210	6S129754	1.2K
R211	6S129235	33
R212	6S127802	1.2K
R213	6S127800	1K
R214	6S128685	220
R215	6S131594	22K
R216	6S129620	27
R217	6S5593	560
R218	6S129662	470; 1 W
R219	17C84377B50	180
R220	17C84377B50	0.1; 7 W
R221	6S131524	0.1; 7 W
R222	6S124A21	100 ±5%
R223	6S124A39	68 ±5%
T201	25D84112C01	390 ±5%
	or 25D84638C01	TRANSFORMER, power: pri; BLK-WHT, BLK; res 1.3 ohms; sec; RED, RED; res .033 ohm (TPN1084A only) pri; GRN, BRN with pri No. 1; GRN, BRN with YEL tap pri No. 2; BLK/WHT, BLK total res

NOTE:

Repla
Motor

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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RTS LIST

1084B Power Supply (120-Volt, 60 Hz)
 1088B Power Supply (120-, 220-, 240-Volt, 60 Hz)

PL-1104

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		<u>CAPACITOR, fixed: uF: ±10% 50 V; unl. stated</u>
202	23-83093G13	8000 +150-10%; 35 V
203	23-83093G13	8000 +150-10%; 35 V
204	23-83093G13	8000 +150-10%; 35 V
205	23D83214C15	4.7 ±20%; 25 V
206	23D82601A08	25 +150-10%; 50 V
207	8D82905G02	.022 ±10%; 50 V
208	21D82428B10	.0033 ±10%; 100 V
209	21D82428B10	.0033 ±10%; 100 V
210	23D83214C07	22 ±20%; 15 V
211	21C82372C05	0.2 +80-20%; 25 V
212	21C82372C04	.05 +80-20%; 25 V
213	23D83210C19	500 +100-10%; 20 V
214	21D82428B10	.0033; 100 V
		<u>SEMICONDUCTOR DEVICE, diode: (SEE NOTE)</u>
201	48C82732C07	silicon
202	48C82732C07	silicon
203	48C82732C10	silicon
204	48C82732C10	silicon
205	48D84242C01	silicon; controlled type
206	48-83654H01	silicon
207	48-83654H01	silicon
208	48D83696E01	silicon; Zener type; 6.8 V
209	48-83654H01	silicon
210	48D84755H01	silicon; controlled type
211	48-83654H01	silicon
212	48D83696E05	silicon; Zener type; 16.0 V
		<u>FUSE, cartridge: 1-1/4" x 1/4" 5 A; 250 V 20 A; 32 V</u>
01	65S52293	
02	65S4637	
		<u>CONNECTOR, receptacle: includes: 14C83783A04 BODY, connector 29C82336A01 TERMINAL, contact</u>
		<u>CONNECTOR, plug: (part of W201)</u>
		<u>TRANSISTOR; (SEE NOTE)</u>
	48R869641	P-N-P; type M9641
	48R869170	N-P-N; type M9170
	48R869170	N-P-N; type M9170
	48R869485	P-N-P; type M9485
	48R869639	N-P-N; type M9639
	48R869571	P-N-P; type M9571
	48R869639	N-P-N; type M9639
	48R869571	P-N-P; type M9571
		<u>RESISTOR, fixed: ±10%; 1/4 W; unl. stated</u>
	6S129860	56
	6S129232	3.9K
	6S129861	68
	6S127800	220
	6-127C47	820; 2 W
	17D82177B08	200; 5 W
	6S127802	1K
	18-82943G02	variable: 500 ±20%; 3 W
	6S129235	1.2K
	6S129754	33
	6S129235	1.2K
	6S127802	1K
	6S127800	220
	6S128685	22K
	6S131594	27
	6S129620	560
	6S5593	470; 1 W
	6S129662	180
	17C84377B50	0.1; 7 W
	17C84377B50	0.1; 7 W
	6S131524	100 ±5%
	6S124A21	68 ±5%
	6S124A39	390 ±5%
		<u>TRANSFORMER, power: pri; BLK-WHT, BLK; res 1.3 ohms; sec; RED, RED; res .033 ohm (TPN1084A only)</u>
	25D84112C01	
	25D84638C01	pri; GRN, BRN with pri No. 1; GRN, BRN with YEL tap pri No. 2; BLK/WHT, BLK total res

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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		4.9 ohms sec; RED, RED res 0.035 ohms (TPN1088A only)
		<u>TERMINAL BOARD: 4 terminals</u>
TB1	31A898341	
W201	30C83211C05	<u>CABLE ASSEMBLY, power: consists of a 3-conductor cable (“zip cord”) and a “molded-on” 3-contact male plug (P201); each conductor No. 18 ga., str; length overall 9 ft.</u>
		<u>FUSEHOLDER: extractor post type wafer type</u>
XF201	9C82083C03	
XF202	9B83909E01	
		<u>SOCKET, transistor: 2-contact</u>
XQ203	9C83662A01	
<u>NON-REFERENCED ITEMS</u>		
	14A865854	INSULATOR, mounting for CR205
	4K801846	WASHER, insulating; for CR205; 2 required
	4C82418B90	WASHER, insulating; for CR201, CR202, CR203, CR204
	14A83575A01	INSULATOR, mounting for Q203
	38K10388	BUTTON, plug
	7A83959A01	PLATE, heat sink; 2 required; for CR201 thru 204
	14A83168H01	INSULATOR, plate mounting for insulating CR201, CR203 mount- ing plate
	14A83967A03	WASHER, insulating; for CR201 thru 204; 4 required
	4B82345A13	WASHER, insulating; for term- inals of Q205, Q207
	29B84489B01	TERMINAL, contact; for Q205, Q207
	14K857437	INSULATOR, mounting; for Q205, Q207
	14B84634C01	INSULATOR, shield for TB1

NOTE:

Replacement diodes and transistors must be ordered by
 Motorola part number only for optimum performance.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		4.9 ohms sec; RED, RED res 0.035 ohms (TPN1088A only)
TB1	31A898341	<u>TERMINAL BOARD:</u> 4 terminals
W201	30C83211C05	<u>CABLE ASSEMBLY, power:</u> consists of a 3-conductor cable ("zip cord") and a "molded-on" 3-contact male plug (P201); each conductor No. 18 ga., str; length overall 9 ft.
XF201 XF202	9C82083C03 9B83909E01	<u>FUSEHOLDER:</u> extractor post type wafer type
Q203	9C83662A01	<u>SOCKET, transistor:</u> 2-contact

NON-REFERENCED ITEMS

14A865854	INSULATOR, mounting for CR205
4K801846	WASHER, insulating; for CR205; 2 required
4C82418B90	WASHER, insulating; for CR201, CR202, CR203, CR204
14A83575A01	INSULATOR, mounting for Q203
38K10388	BUTTON, plug
7A83959A01	PLATE, heat sink; 2 required; for CR201 thru 204
14A83168H01	INSULATOR, plate mounting for insulating CR201, CR203 mounting plate
14A83967A03	WASHER, insulating; for CR201 thru 204; 4 required
4B82345A13	WASHER, insulating; for terminals of Q205, Q207
29B84489B01	TERMINAL, contact; for Q205, Q207
14K857437	INSULATOR, mounting; for Q205, Q207
14B84634C01	INSULATOR, shield for TB1

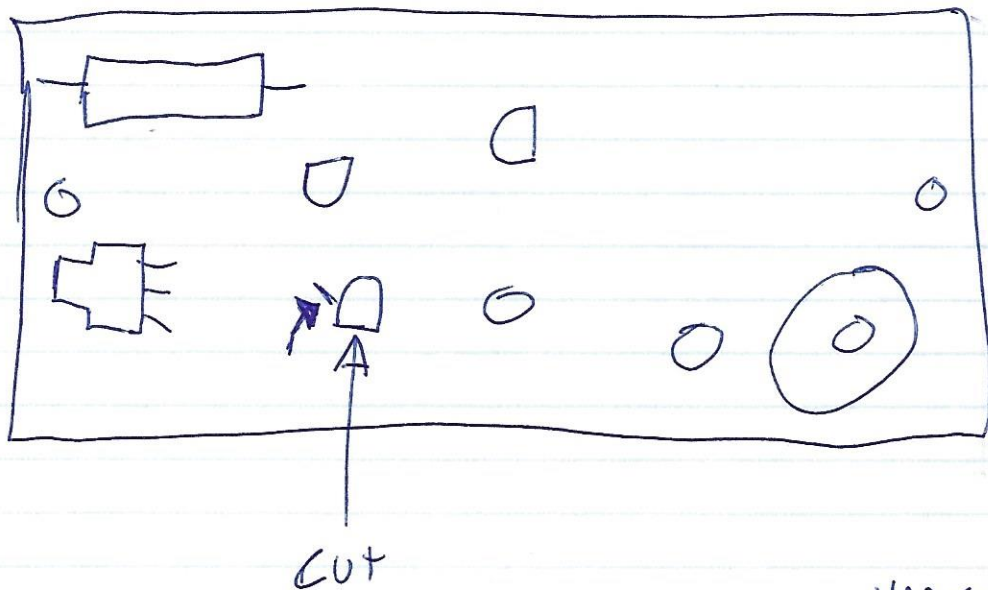
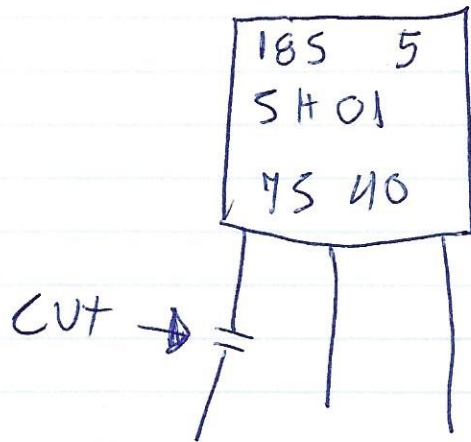
NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

MODIFICATION VE2N+M

TO DISABLE SHORT CIRCUIT PROTECTION

CUT ONE PIN OF CR ~~210~~ ²¹⁰



VA2CMB
21 MARS
2009

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