

7.6 Power Supply Board

7.6.1 Functional Specifications

The Power Supply Assembly for the Tandy 6000/6000HD is a 140 watt switching power supply. The Printed Circuit Board is mounted to the electronic chassis bracket. Line input to the power supply module is made through an amp wafer with locking 3-pin socket header.

Pin 1	Line - Neutral
Pin 2	Blank
Pin 3	Line - High

Outputs are taken from an amp wafer with locking 15-pin PCB socket header.

Pin 1	-12 V	Pin 9	+5 V
Pin 2	-12 V	Pin 10	Common
Pin 3	Common	Pin 11	+5 V
Pin 4	Common	Pin 12	+5 V
Pin 5	Common	Pin 13	+24 V
Pin 6	Common	Pin 14	+12 V
Pin 7	Common	Pin 15	+12 V
Pin 8	+5 V		

In theory, the power supply rectifies the AC line to DC, then chops it at 20 kHz. The chopped DC voltage is then transformed to the required output voltages and rectified to low voltage isolated DC. Feedback loops are provided for voltage regulation and over-current protection.

The power supply may be jumper selected for either of the following ratings:

Vin	--	90 to 135 VAC @ 47 to 63 Hz input frequency
or		190 to 270 VAC @ 47 to 63 Hz input frequency

The Power Supply Assembly can withstand the following maximum ratings:

Vin (AC continuous)	--	140 V (input select 115 V)
or		280 V (input select 230 V)

Short Circuit, any output -- indefinite

TANDY COMPUTER PRODUCTS

		Min	Typ	Max	
Output Voltages	VO1	4.95	5.00	5.25	V
	VO2	11.40	12.00	12.60	V
	VO3	See Notes			
	VO4	21.60	24.00	26.40	V
	VO5	-11.40	-12.00	-12.60	V

VO4, no load tolerance

- Note: 1) VO3 must not change from its initial value by more than + 100 millivolts under the following load conditions on the VO4 output.
- A step increase in output current from 0.0A (initial condition) to 2.5A Max. decaying to 0.92A total within 350 msec.
 - A step increase in output current from 0.55A (initial condition) to 3.05A Max. decaying to 1.45A total within 350 msec.
- 2) The VO3 output may vary + 5% under all other conditions of rated line, load, and temperature.

		Min	Typ	Max	
Output Loads	IO1	3.0	4.3	13.36	A
	IO2	0.25	0.50	0.75	A
	IO3	0.10	1.0	1.5	A
	IO4	0	1.3	2.0	A
	IO5	0.05	0.1	0.2	A
		Min	Typ	Max	Units
OCP, Current Limit					
	ICL1	14.0	15.0	16.0	A
	ICL2	1.1	1.6	2.0	A
	ICL3	1.6	2.3	3.0	A
	ICL4	2.1	2.5	3.0	A
	ICL5	---	1.0	2.0	A

Note: VO5 is a thermally protected IC regulator.

		Min	Typ	Max	
OVP, Crowbar	VCB1	5.94	6.25	7.00	V
Output Noise	VO1	---	---	50	mV p-p
	VO2	---	---	100	mV p-p
	VO3	---	---	100	mV p-p
	VO4	---	---	250	mV p-p
	VO5	---	---	50	mV p-p
Efficiency		70	80	---	%

	Min	Typ	Max	
Hold Up Time:				
Full Load Lo Line	10	18	---	mSec
Full Load Nom Line	16	30	---	mSec
Insulation Resistance				
Input to Output	100	1000	---	M ohm
Input to Ground	100	1000	---	M ohm
Output to Ground	100	1000	---	M ohm
Isolation				
Input to GND and Output	4.25	---	---	KVDC

Line Conducted EMI must meet FCC Part 155 requirement for a Class A computing device with a 10db margin.

7.6.2. Equipment for Test Set-Up

1. Isolation Transformer (minimum of 500 VA rating)

CAUTION

Dangerously high voltages are present in this power supply. For the safety of the individual doing the testing, please use an isolation transformer. The 500 VA rating is needed to keep the AC waveform from being clipped off at the peaks. These power supplies have peak charging capacitors and draw full power at the peak of the AC waveform.

2. 0-140 V Variable Transformer (Variac) -- used to vary the input voltage. Recommend 10 amp, 1.4 KVA rating, minimum.
3. Voltmeter -- Need to measure DC voltages to 50 VDC and AC voltages to 200 VAC. Recommend two digital multimeters.
4. Oscilloscope -- Need X10 and X1 probes.
5. Load board with connectors -- See Table 7-5 for values of loads required. The entry on the table for Safe Load Power is the minimum power ratings for the load resistors used.

Note: Because of its design, this power supply must have a load present or damaging oscillations may result. Never test the power supply without at least the minimum load shown in Table 7-5.

6. Ohmmeter

7.6.3 Set-Up Procedure

1. Set up as shown in Figure 7-15. You will want to monitor the input voltage and the output voltage of the regulated bus, which is the +5 V output, with DVMs. Also monitor the +5 V output with the oscilloscope using 50 mV/div sensitivity. The DVM monitoring the +5 V output can also be used to check the other outputs. See Paragraph 7.3.4 for test points within the power supply.

Output	Min Load Amps	R for Min Load	Max Load Amps	R for Max Load	J2 Pins
+5V V01	3.0	1.66 ohm 30 W	13.36	.34 ohm 130 W	8,9, 11,12
+12 V02	.25	48 ohm 6 W	.75	16 ohm 20 W	15
+12 V03	.10	120 ohm 4 W	1.5	8 ohm 40 W	14
+24 V04	0	Infinity	2.0	12 ohm 100 W	13
-12 V05	.05	2.4 ohm 1 W	.2	60 ohm 5 W	1,2

Table 7-9. Power Supply Voltage Chart

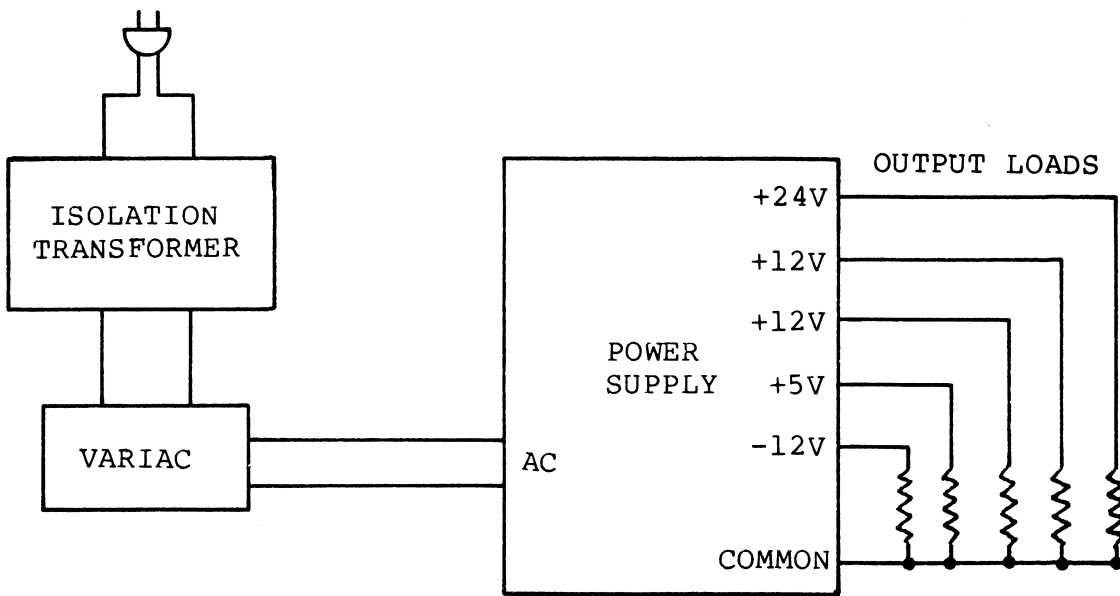


Figure 7-15. Test Layout, Power Supply

2. Visual Inspection

Check power supply for any broken, burned, or obviously damaged components. Visually check the fuse. If any questions, check with an ohmmeter.

3. Start-Up

Load power supply with minimum load as specified in Table 7-5. Bring up power slowly with the variable transformer while monitoring the +5 V output with the oscilloscope and DVM. The power supply should start with approximately 40-60 volts applied, and should regulate when 95 VAC is reached. If the output has reached 5 volts, complete a performance test as shown in Section 7.3.5. If there is no output, refer to Section 7.3.4.

4. Bracket Removal

The main PCB is held to the bracket with screws and uses spacers to separate the PCB from the bracket. An insulator is inserted between the PCB and the mounting bracket to ensure that the bracket cannot short any of the pins of the PCB.

7.6.4. No Output

1. Check Fuse

If a fuse is blown, replace it but do not apply power until the cause of the failure is found.

2. Preliminary Check on Major Primary Components

Check diode bridge (DB1), power transistor (Q7), and catch diode (Q7) for shorted junctions. If any component is found shorted, replace it.

3. Preliminary Check of Major Secondary Components

Use an ohmmeter to check for shorted outputs on the various output lines. If the +5 V output is shorted, check also crowbar SCR (SCR1) and zener diode (Z1).

4. Check for B+

Set up power supply and attach the X10 scope probe ground to the cathode side of D5. Slowly turn up the power and check for B+ on the cathode side of D9. With an input of 95 VAC, this point should be between 130 and 170 VDC. If this is not correct, check DB1, the fuse (F1), and if necessary, R5, D12, and D13. Also check input capacitors C5, C6, C7 and C8.

CAUTION

Your scope should be powered by an isolation transformer.

5. Check Q1 Waveforms

Using X10 probe on the case of TO-3 package of Q7, check the collector waveform. The transistor should be switching. The correct waveform is shown in Figure 7-16. If switching is not present, check for shorted junctions on Q7. If Q7 is not shorted, check the base waveform.

The base of Q7 (looking under the PCB) is the pin from the center of Q7 closest to the PCB edge. The correct waveform is shown in Figure 7-17. If the waveform is there, the problem is on the secondary side of the supply. If the wave form is not correct, the problem is in the control section of the supply and the supply should be returned to the repair depot.

100V/Div
 100ns/Div
 Input-95VAC
 Load-minimum

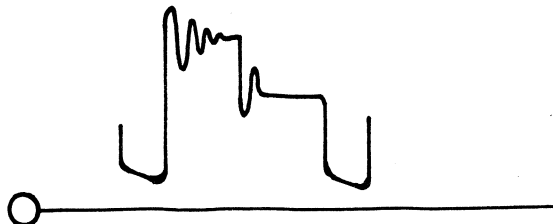


Figure 7-16. Q7 Collector Waveform

2V/Div
 10 uSec/Div

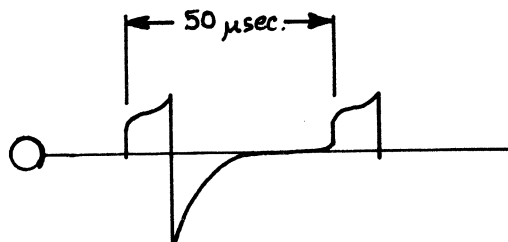


Figure 7-17. Q7 Base Waveform

7.6.5 Performance Test

Each of these test conditions should be set up and noted to be within the limits specified in Table 7-9.

Test	Input	+5 Load	+12 Load	+24 Load	-12 Load
1	95 VAC	Max	Max	Max	Max
2	135 VAC	Max	Max	Max	Max
3	*135 VAC	Max	Max	Max	Max
4	135 VAC	Min	Min	Min	Min
5	95 VAC	Min	Min	Min	Min

*On Test 3, input voltage should be varied over the full range to search for instability after correct outputs are noted at 135 VAC.

Output	Min	Max	No Load	Ripple
V01/+5 Volt	4.90V	5.10V	-	50 mV P-P
V02/+12 Volt	11.40V	12.60V	-	100 mV P-P
V03/+12 Volt	See Note 1	See Note 1	-	100 mV P-P
V04/+24 Volt	21.20V	26.40V	30.0V	250 mV P-P
V05/-12 Volt	-11.40	-12.60V	-	50 mV P-P

Table 7-10. Voltage and Ripple Specifications

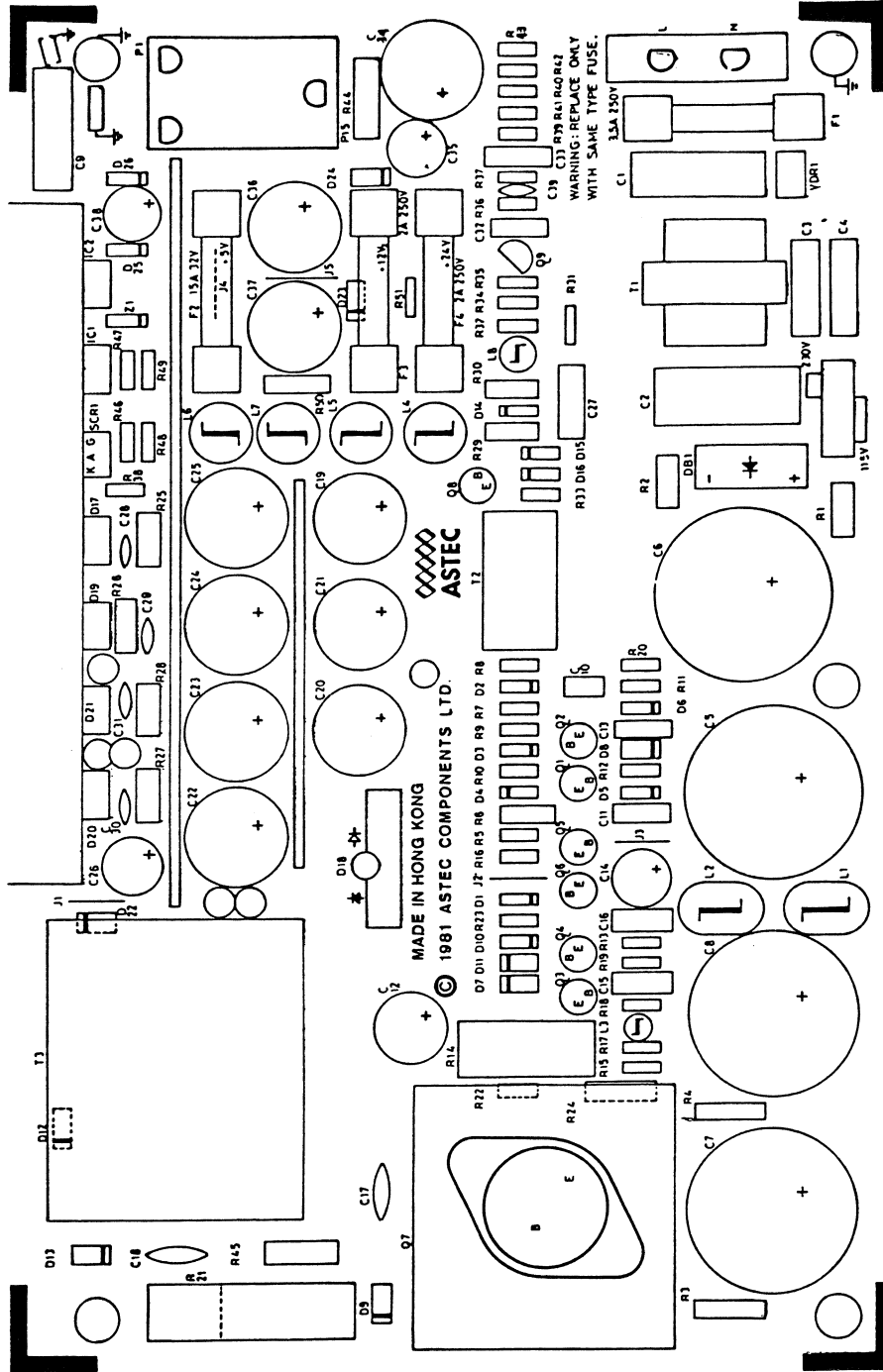
Notes:

- V03 must not change from its initial value by more than +/- 100 mV under the following load conditions on the V04 output.

A step increase in output current from 0.0A to 2.5A maximum decaying to 0.92A total within 350 ms.

A step increase in output current from .55A to 3.05A maximum decaying to 1.45A total within 350 ms.

- V03 output voltage may vary +/-5% under all other conditions of rated line load and temperature.



Component Layout, Power Supply 8790047

Parts List, Power Supply 8790047 (Astec Components AAll082)

Ref No.	Description	Mfr. Part No.
Capacitors		
C1	Capacitor, 0.1 uF, 250VAC, 20%	068-10400010
C2	Capacitor, 0.22 uF, 250VAC, 10%	068-22400010
C3	Capacitor, 2200 pF, 400VAC, 20%4)	055-22220001
C4	Capacitor, 2200 pF, 400VAC, 20%	055-22220001
C5	Capacitor, 220 uF, 250V, +100/-10%	057-22120200
C6	Capacitor, 220 uF, 250V, +100/-10%	057-22120200
C7	Capacitor, 220 uF, 250V, +100/-10%	057-22120200
C8	Capacitor, 220 uF, 250V, +100/-10%	057-22120200
C9	Capacitor, 0.01 uF, 250VAC, 20%	068-10300010
C10	Capacitor, 2200 pF, 50V, 10%	058-22200020
C11	Capacitor, 0.047 uF, 250V, 10%	058-47300090
C12	Capacitor, 330 uF, 25V, 20%	057-33120160
C13	Capacitor, 0.22 uF, 100V, 10%	058-22400120
C14	Capacitor, 220 uF, 10V, 20% SxA	059-22120300
C15	Capacitor, 0.22 uF, 100V, 10%	058-22400120
C16	Capacitor, 0.1 uF, 100V, 10%	058-10400110
C17	Capacitor, 1000 pF, 3KV, 20% Z5P	055-10267728
C18	Capacitor, 0.01 uF, 1KV, 20% Z5V	055-10368925
C19	Capacitor, 470 uF, 35V, 20% SxA	057-47120230
C20	Capacitor, 470 uF, 25V, 20% SxA	057-47120220
C21	Capacitor, 470 uF, 25V, 20% SxA	057-47120220
C22	Capacitor, 2200 uF, 25V, 20% SxA	057-22220130
C23	Capacitor, 2200 uF, 25V, 20% SxA	057-22220130
C24	Capacitor, 2200 uF, 25V, 20% SxA	057-22220130
C25	Capacitor, 2200 uF, 25V, 20% SxA	057-22220130
C26	Capacitor, 100 uF, 25V, 20% SxA	057-10120270
C27	Capacitor, 0.22 uF, 100V, 10%	058-22400120
C28	Capacitor, 1000 pF, 100V, 10%	055-10250528
C29	Capacitor, 0.01 uF, 100V, +80/-20%	055-10382125
C30	Capacitor, 0.01 uF, 100V, +80/-20%	055-10382125
C31	Capacitor, 0.01 uF, 100V, +80/-20%	055-10382125
C32	Capacitor, 0.022 uF, 100V, 20%	058-22300080
C33	Capacitor, 0.022 uF, 100V, 10%	058-22400120
C34	Capacitor, 1000 uF, 35V, 20% SM	057-10220190
C35	Capacitor, 100 uF, 25V, 20% SxA	057-10120270
C36	Capacitor, 1000 uF, 16V, 20% SxA	057-10220180
C37	Capacitor, 470 uF, 25V, 20% SxA	057-47120220
C38	Capacitor, 100 uF, 25V, 20% SxA	057-10120270
C39	Capacitor, 1000 pF, 100V, 10%	055-10250528
Coils		
L1	Toroid	124-00000110
L2	Toroid	124-00000110
L3	Choke, 1.5 mH	328-00100010

Parts List, Power Supply 8790047 (Astec Components AAll082)

Ref No.	Description	Mfr. Part No.
Coils (con't)		
L4	Choke Coil Assy	852-20100010
L5	Choke Coil Assy	852-20100010
L6	Filter Choke Coil Assy	852-20100220
L7	Filter Choke Coil Assy	852-20100220
Diodes		
D1	Diode, 1N4606	212-10700210
D2	Diode, 1N4606	212-10700210
D3	Diode, 1N4606	212-10700210
D4	Diode, 1N4606	212-10700210
D5	Diode, 1N4606	212-10700210
D6	Diode, 1N4606	212-10700210
D7	Rectifier, 1N4001GP	226-10400080
D8	Diode, 1N4606	212-10700210
D9	Rectifier, RGP10J	226-10400060
D10	Diode, 1N4606	212-10700210
D11	Rectifier, 1N4001GP	226-10400080
D12	Rectifier, RGP10J	226-10400060
D13	Rectifier, RGP10J	226-10400060
D14	Diode, 1N4606	212-10700210
D15	Diode, 1N4606	212-10700210
D16	Diode, 1N4606	212-10700210
D17	Rectifier, S6K20	226-11300010
D18	Rectifier, RG3B	226-10700010
D19	Rectifier, S6K20	226-11300010
D20	Diode, SCK S10SC3M	211-10300210
D21	Diode, SCK S10SC3M	211-10300210
D22	Rectifier, RGP10B	226-10400070
D23	Rectifier, 1N4001GP	226-10400080
D24	Rectifier, 1N4001GP	226-10400080
D25	Rectifier, 1N4001GP	226-10400080
D26	Rectifier, 1N4001GP	226-10400080
DB1	Bridge Rectifier, KBL08	226-30800010
Z1	Diode, Zener, 5.6V, 5%, 40mA	222-56086002
Fuses		
F1	Fuse, 3.5A, 250V, 3AG	084-00300110
F2	Fuse, 15A, 32V	084-00400020
F3	Fuse, 2A, 250V, 3AG	084-00300020
F4	Fuse, 2A, 250V, 3AG	084-00300020

Parts List, Power Supply 8790047 (Astec Components AAll082)

Ref No.	Description	Mfr. Part No.
Jumpers		
J1	Jumper Wire, 12.7 mm	358-80800001
J2	Jumper Wire, 12.7 mm	358-80800001
J3	Jumper Wire, 12.7 mm	358-80800001
J4	Jumper Wire, 17 mm	358-80800001
J5	Jumper Wire, 17 mm	358-80800001
Integrated Circuits		
IC1	Regulator, LM317T	211-10300100
IC2	Regulator, MC7912	211-10300210
Resistors		
R1	Thermistor, 4 ohm, 10%	258-40970015
R2	Thermistor, 4 ohm, 10%	258-40970015
R3	Resistor, 100K ohm, 5% 1W	248-10406052
R4	Resistor, 100K ohm, 5% 1W	248-10406052
R5	Resistor, 10 ohm, 5% 1/4W	240-10006022
R6	Resistor, 470 ohm, 5% 1/2W	240-47106033
R7	Resistor, 10 ohm, 5% 1/4W	240-10006022
R8	Resistor, 1K ohm, 5% 1/4W	240-10206022
R9	Resistor, 150 ohm, 5% 1/4W	240-15106022
R10	Resistor, 100 ohm, 5% 1/4W	240-10106022
R11	Resistor, 470 ohm, 5% 1/4W	240-47106022
R12	Resistor, 470 ohm, 5% 1/4W	240-47106022
R13	Resistor, 220 ohm, 5% 1/4W	240-22106022
R14	Resistor, 27 ohm, 5% 5W, WW	257-27006120
R15	Resistor, 1K ohm, 5% 1/4W	240-10206022
R16	Resistor, 18 ohm, 5% 1/4W	240-18006022
R17	Resistor, 10 ohm, 5% 1/4W	240-10006022
R18	Resistor, 56 ohm, 5% 1/4W	240-56006022
R19	Resistor, 68 ohm, 5% 1/4W	240-68006022
R20	Resistor, 100 ohm, 5% 1/4W	240-10106022
R21	Resistor, 510 ohm, 5% 1/4W	257-51106120
R22	Resistor, 10 ohm, 5% 1/4W	240-10006022
R23	Resistor, 330 ohm, 5% 1/4W	240-33106022
R24	Resistor, .33 ohm, 5% 2W	
R25	Resistor, 10 ohm, 5% 1/2W	240-10006033
R26	Resistor, 10 ohm, 5% 1/2W	240-10006033
R27	Resistor, 10 ohm, 5% 1/2W	240-10006033
R28	Resistor, 10 ohm, 5% 1/2W	240-10006033
R29	Resistor, 270 ohm, 5% 1/2W	240-27106033
R30	Resistor, 560 ohm, 5% 1/2W	240-56106033
R31	Resistor, 39 ohm, 5% 1/4W	240-39006022
R32	Resistor, 12 ohm, 5% 1/4W	240-12006022
R33	Resistor, 330 ohm, 5% 1/4W	240-33106022

Parts List, Power Supply 8790047 (Astec Components AAll082)

Ref No.	Description	Mfr. Part No.
Resistors (con't)		
R34	Resistor, 56 ohm, 5% 1/4W	240-56006022
R35	Resistor, 47 ohm, 5% 1/4W	240-47006022
R36	Resistor, 12K ohm, 5% 1/4W	240-12306022
R37	Resistor, 470 ohm, 5% 1/4W	240-47106022
R38	Resistor, 12 ohm, 5% 1/4W	240-12006022
R39	Resistor, 2.7K ohm, 2% 1/4W	247-27015022
R40	Resistor, 2.7K ohm, 2% 1/4W	247-27015022
R41	Resistor, 100K ohm, 5% 1/4W	240-10406022
R42	Resistor, 68K ohm, 5% 1/4W	
R43	Resistor, 100K ohm, 5% 1/4W	240-10406022
R44	Resistor, 330 ohm, 5% 2W	248-33106063
R45	Resistor, 0.47 ohm, 5% 1W	247-04786054
R46	Resistor, 15K ohm, 5% 1/4W	240-15306022
R47	Resistor, 220 ohm, 2% 1/4W	247-22005022
R48	Resistor, 220K ohm, 5% 1/4W	240-22406022
R49	Resistor, 2.2K ohm, 1% 1/4W	247-22014022
Transformers		
T1	Transformer Assy	852-10200680
T2	Transformer Assy	852-10200680
T3	Transformer Assy, Power	852-10201300
Transistors		
Q1	Transistor, NPN, SD467	209-11700460
Q2	Transistor, PNP, SB561	210-11700350
Q3	Transistor, PNP, SB561	210-11700350
Q4	Transistor, NPN, SD467	209-11700460
Q5	Transistor, PNP, SB561	210-11700350
Q6	Transistor, NPN, SD467	209-11700460
Q7	Transistor, NPN, 2SC1325A	209-10200040
Q8	Transistor, PNP, SB561	210-11700350
Q9	IC, TL431CLP	211-10800100
Miscellaneous		
SCR1	SCR, C1 2u	227-13000010
VDR1	VDR, 260VAC	256-26100014

