960421

OEM SERIES

POWER SUPPLY MODULES

SINGLE OUTPUT

OPERATING & SERVICE MANUAL

OEM MANUAL

OHIO-NUCLEAR
PART NO 960421

acdc electronics

401 JONES ROAD, OCEANSIDE INDUSTRIAL CENTER — OCEANSIDE, CALIFORNIA 92054 (714) 757-1880

5 YEAR WARRANTY

When used within specified operating conditions, every catalog listed ACDC Power Supply is unconditionally guaranteed to meet all of its published specifications for a period of five years. This guarantee covers all parts of the module, including semiconductors, capacitors and mechanical parts, without regard to the date of purchase or installation. All terms of this guarantee are fully transferable when the power supply is sold as original equipment. If at any time, the power supply is in need of warranty service or calibration, the purchaser should promptly notify ACDC or its authorized representative describing the conditions. The method and place of warranty service should be forwarded to the specified service location freight prepaid. Where, without charge, the unit will be adjusted to meet its original specifications. The sole obligation of ACDC and purchasers' exclusive remedy under this or any other warranty, expressed or implied, is the adjustment or replacement of defective modules as provided above. ACDC shall not be responsible for incidental or consequential damage whether or not foreseeable, caused by defects in the power supply.

ELECTRICAL STANDARDS

All ACDC instrument standards are either certified directly or traceable to certification by the National Bureau of Standards.

CLAIMS FOR DAMAGE IN SHIPMENT

This instrument received comprehensive visual, mechanical and electrical inspection prior to shipment from the factory. Please examine it carefully for external damage or evidence of internal damage immediately upon receipt from the carrier and prior to operation. Claims for damage should be filed with the carrier with a copy of the report forwarded to ACDC. Advice of disposition and/or arrangement for repair or replacement of the instrument will be made by ACDC or its authorized representative. Please include model and serial numbers in all correspondence.

DOCUMENTATION POLICY STATEMENT

This manual contains proprietary information which was originated by and is the property of ACDC Electronics.

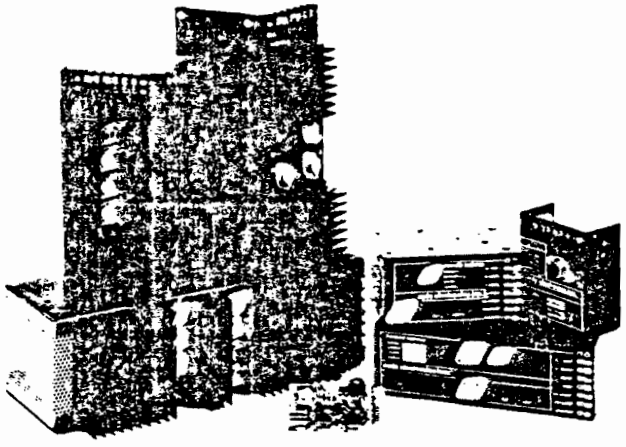
The manual may be reproduced only for the purpose of providing provisioning and/or support data for customer generated documentation.

ACDC reserves the right to change, add or delete components, materials or processes for the purpose of product improvement or replacement of obsolete material without prior notification to the customer.

TABLE OF CONTENTS

single output OEM series power supplies

- 4 to 32 volts
- Up to 36 amps
- 0.1% regulation
- U/L recognized*
- Optional overvoltage protection
- Stock delivery
- Open frame construction
- Optional cover



There are 90 single output models in the OEM series ranging from 4 volts @ 6 amps to 32 volts @ 8.1 amps. Designed specifically for high volume OEM applications, these power supplies feature low price, 0.1% regulation, excellent stability, dependable overload protection, versatile mounting and off-the-shelf delivery.

*Recognized under the Component Program of Underwriters' Laboratories, Inc. (file number E48765).

SPECIFICATIONS

Input	105-125 VAC, 47-63 Hz (Usable also at 400 Hz; consult factory for derating.) /100, 210-250 VAC input is available.
Output	See table. Output is floating; either positive or negative output terminal may be grounded. Zero to full load current ratings as shown in table.
Regulation	0.1% ±5mV NL-FL, ±0.1% ±5mV for 10% Input change.
Ripple	2mV RMS max., 20mV P-P max.
Stability	Typically 10mV for eight hour period after initial warmup.
Transient Response	Output voltage returns to within regulation limits within 50 μsec in response to a 50% load step.
Remote Sensing	Terminals are provided to maintain regulation at the load, compensating for the DC voltage drop in the load cable.
Remote Voltage Adjustment	Output voltage may be remotely adjusted over a limited range by insertion of a variable resistor in the positive sensing line.
Ambient Temperature	Operating: 0 to 71°C Storage: —55 to 85°C
Overload Protection	Inherently protected against overload and short circuit by a foldback type characteristic. Recovery is automatic.
Overvoltage Protection (Optional)	Any model can be furnished with overvoltage protection which crowbars the output in the event of a rise in the output of between 1 to 2 Volts or 10-20% (whichever is larger) above maximum adjustable output voltage. This protection circuit is completely independent of the supply and is adjustable. The addition of overvoltage protection does not add to the outline dimensions of the supply.
Construction	Integral aluminum chassis and heatsink. Three sides are open to allow unobstructed ventilation, easy inspection and accessibility. (Optional perforated cover available.)
Mounting	Units may be mounted on five surfaces for unusual mechanical versatility. Self-locking mounting hardware for all mounting variations supplied with each unit.
Connector	Barrier strip.
Output Impedance	DC-1KHz: 0.001 R_L or 0.005 ohm max. 1KHz-100KHz: 0.005R_L or 0.5 ohm max. (R_L is the rated load)
Temperature Coefficient	0.02%/°C max.
Dimensions	See Page 6

SPECIFICATIONS (CONT)

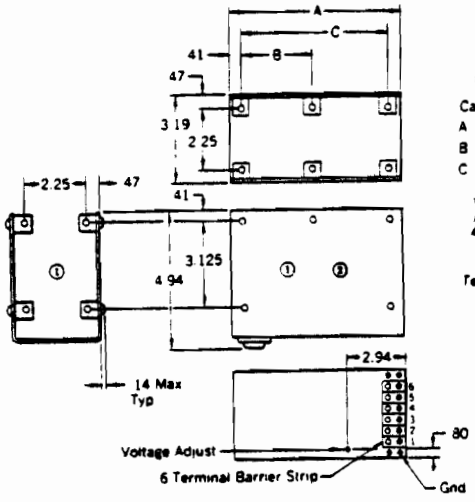
Nominal output voltage ①	Adj. range ±V	Maximum current rating (Amps) 40°C	55°C	71°C	Case size	Model Number add -1 for OVP add -2 for Cover
4	.25	6.0	5.1	3.9	R1	OEM4N6
		11	9.3	7.1	R2	OEM4N11
		18	15.3	11.7	R3	OEM4N18
		26	22.1	16.9	R4	OEM4N26
		36	30.6	23.3	R5	OEM4N36
③5	.25	3	2.5	1.9	R8	OEM5N3
		5.7	4.8	3.7	R1	OEM5N5.7
		10	8.5	6.5	R2	OEM5N10
		17	14.5	11.0	R3	OEM5N17
		25	21.2	16.3	R4	OEM5N25
		35	29.8	22.8	R5	OEM5N35
6	.25	2.7	2.3	1.7	R8	OEM6N2.7
		5.2	4.4	3.4	R1	OEM6N5.2
		9.5	8.1	6.2	R2	OEM6N9.5
		15	12.7	9.7	R3	OEM6N15
		22	18.7	14.3	R4	OEM6N22
		30.7	26.1	20.0	R5	OEM6N30.7
8	.25	4.2	3.6	2.7	R1	OEM8N4.2
		7.5	6.4	4.9	R2	OEM8N7.5
		12	10.2	7.8	R3	OEM8N12
		17.5	14.9	14.3	R4	OEM8N17.5
		24.5	20.8	15.9	R5	OEM8N24.5
10	.5	3.5	3.0	2.3	R1	OEM10N3.5
		6.5	5.5	4.2	R2	OEM10N6.5
		10.2	8.6	6.6	R3	OEM10N10.2
		14.9	12.7	9.7	R4	OEM10N14.9
		21.0	17.9	13.6	R5	OEM10N21
③12	.5	1.7	1.4	1.1	R8	OEM12N1.7
		3.2	2.7	2.1	R1	OEM12N3.2
		5.8	4.9	3.8	R2	OEM12N5.8
		9.5	8.1	6.2	R3	OEM12N9.5
		13.0	11.1	8.5	R4	OEM12N13
		18.5	15.7	12.0	R5	OEM12N18.5
14	.5	2.8	2.4	1.8	R1	OEM14N2.8
		5.2	4.4	3.4	R2	OEM14N5.2
		8.7	7.4	5.6	R3	OEM14N8.7
		12.0	10.2	7.8	R4	OEM14N12
		16.7	14.2	10.9	R5	OEM14N16.7
③15	.5	1.5	1.3	1.0	R8	OEM15N1.5
		2.7	2.3	1.7	R1	OEM15N2.7
		5.0	4.2	3.2	R2	OEM15N5
		8.2	7.0	5.3	R3	OEM15N8.2
		11.2	9.5	7.3	R4	OEM15N11.2
		15.8	13.4	10.3	R5	OEM15N15.8
16	.5	2.6	2.2	1.7	R1	OEM16N2.6
		4.7	4.0	3.0	R2	OEM16N4.7
		7.7	6.5	5.0	R3	OEM16N7.7
		10.8	9.2	7.0	R4	OEM16N10.8
		15.0	12.8	9.8	R5	OEM16N15
18	.5	2.3	1.9	1.5	R1	OEM18N2.3
		4.2	3.6	2.7	R2	OEM18N4.2
		6.9	5.9	4.5	R3	OEM18N6.9
		9.6	8.2	6.2	R4	OEM18N9.6
		13.5	11.5	8.8	R5	OEM18N13.5
20	1	2.1	1.8	1.4	R1	OEM20N2.1
		3.8	3.2	2.5	R2	OEM20N3.8
		6.2	5.3	4.0	R3	OEM20N6.2
		8.7	7.4	5.7	R4	OEM20N8.7
		12.2	10.4	7.9	R5	OEM20N12.2
22	1	1.9	1.6	1.2	R1	OEM22N1.9
		3.6	3.1	2.3	R2	OEM22N3.6
		5.9	5.0	3.8	R3	OEM22N5.9
		8.1	6.9	5.3	R4	OEM22N8.1
		11.4	9.7	7.4	R5	OEM22N11.4
③24	1	1.0	.85	.65	R8	OEM24N1
		1.8	1.5	1.2	R1	OEM24N1.8
		3.3	2.8	2.1	R2	OEM24N3.3
		5.4	4.6	3.5	R3	OEM24N5.4
		7.5	6.4	4.9	R4	OEM24N7.5
		10.6	9.0	6.9	R5	OEM24N10.6
26	1	1.7	1.4	1.1	R1	OEM26N1.7
		3.1	2.6	2.0	R2	OEM26N3.1
		5.0	4.2	3.2	R3	OEM26N5
		7.1	6.1	4.6	R4	OEM26N7.1
		10.0	8.5	6.5	R5	OEM26N10
③28	1	1.6	1.4	1.0	R1	OEM28N1.6
		2.9	2.5	1.9	R2	OEM28N2.9
		4.7	4.0	3.1	R3	OEM28N4.7
		6.7	5.7	4.4	R4	OEM28N6.7
		9.3	7.9	6.1	R5	OEM28N9.3
30	1	1.5	1.3	1.0	R1	OEM30N1.5
		2.7	2.3	1.8	R2	OEM30N2.7
		4.5	3.8	2.9	R3	OEM30N4.5
		6.3	5.4	4.1	R4	OEM30N6.3
		8.8	7.5	5.7	R5	OEM30N8.8
32	1	1.4	1.2	0.9	R1	OEM32N1.4
		2.5	2.1	1.6	R2	OEM32N2.5
		4.3	3.6	2.8	R3	OEM32N4.3
		5.7	4.9	3.7	R4	OEM32N5.7
		8.1	6.9	5.3	R5	OEM32N8.1

① Contact ACDC for any voltage not listed

③ These voltages are usually in stock at ACDC

outline and mounting dimensions

Case R1 & R2

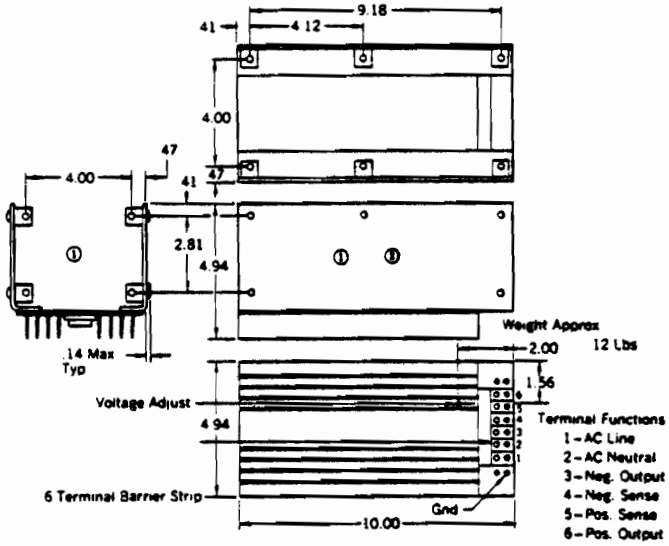


Dimension Table

	Case R1	Case R2
A	6.25	10.00
B	—	4.59
C	5.43	9.18
Weight	Approx 4.5 Lbs	Approx 7.5 Lbs.

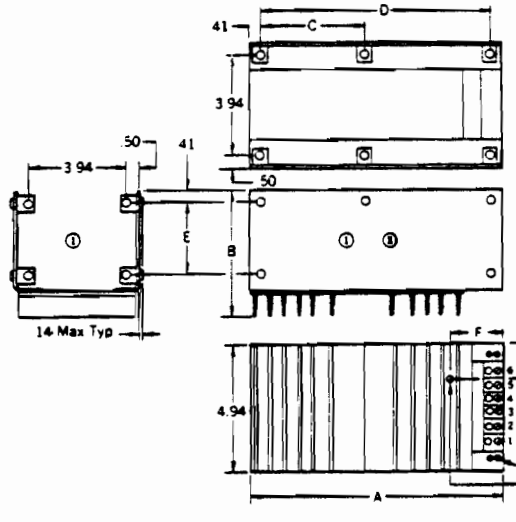
Terminal Functions
1 – AC Line
2 – AC Neutral
3 – Neg. Output
4 – Neg. Sense
5 – Pos. Sense
6 – Pos. Output

Case R3



Terminal Functions
1 – AC Line
2 – AC Neutral
3 – Neg. Output
4 – Neg. Sense
5 – Pos. Sense
6 – Pos. Output

Case R4 & R5

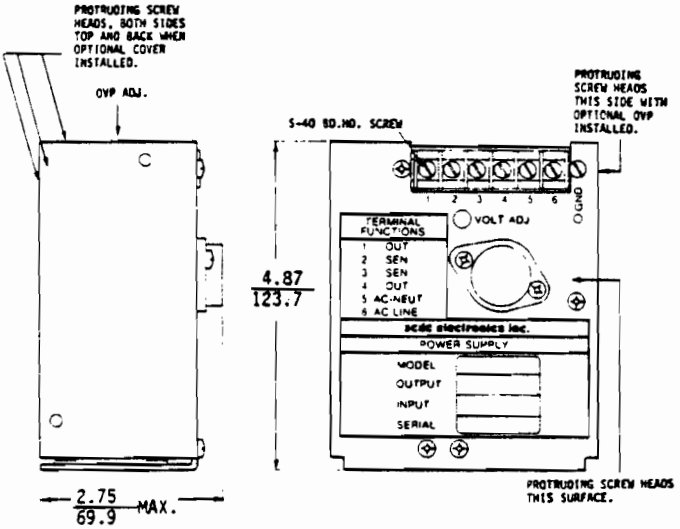


Dimension Table

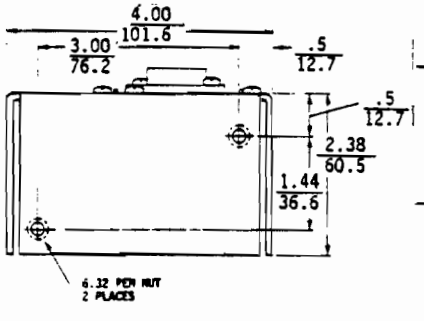
	Case R4	Case R5
A	12.00	16.00
B	6.62	7.25
C	4.56	8.06
D	11.18	15.18
E	3.87	4.25
F	3.10	4.50
G	80	83
Weight	Approx 19.5 Lbs.	Approx 27.5 Lbs.

Terminal Functions
1 – AC Neutral
2 – AC Line
3 – Neg. Output
4 – Neg. Sense
5 – Pos. Sense
6 – Pos. Output

Case R8



Weight (approx): 36 ozs. (1.02 Kg)



TERMINAL FUNCTIONS

1 — Pos. Output
2 — Pos. Sense
3 — Neg. Sense
4 — Neg. Output
5 — AC Neutral
6 — AC Line

INSPECTION AND TEST PROCEDURE

Physical
Check unit for any physical damage. If the unit has a cover, check that the cover has not been damaged, possibly causing a short to the internal components.

Dielectric Breakdown Test

There shall be no breakdown between AC input to ground at 1000VAC.

Insulation Resistance Test

Insulation resistance between input to ground, input to output, or output to ground at 500VDC should be 10 megohms minimum.

Test Procedure
Connect power supply as shown in figure 1.

Sense leads must be connected to the power leads. All instrumentation must be connected directly to the sense leads with separate twisted pairs, or shielded cable, to avoid coupling and pickup problems.

The power supply has an output impedance less than 1 milliohm and sense terminations must be made with care. The use of clip leads or similar terminations are not acceptable.
Apply AC input slowly to nominal AC input voltage and check for nominal DC output voltage at no load.

Voltage Adjustment
Adjust output voltage with potentiometer labled (Volts Adj. or Volts). Verify the specified adjustment range (refer to Specification sheet) page-5. Adjust to nominal output voltage.

Load Regulation
With input voltage at minimum, measure the change in output voltage as the load is changed from no load to full load. Repeat with AC input voltage at maximum. Regulation limit is 0.1% plus 5Mv.

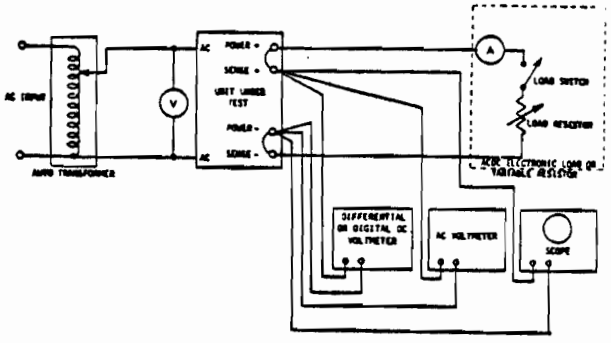
Line Regulation
Set OEM for full load and measure change in output voltage as input AC voltage is varied from minimum to nominal and nominal to maximum (Typical 105-115-125VAC). Repeat at no load. Regulation limit is ±0.1% plus ±5Mv.

Ripple
Vary the AC input voltage from minimum to maximum and the load from no load to full load. Monitor the ripple voltage. Ripple limits are 2 Mv RMS and 20 Mv peak to peak maximum.

Overload
With AC input voltage at nominal, increase the load current until the output voltage decreases and ripple increases. The maximum current should be 115 to 140% of rated output current. Reduce load current to rated value.

Overvoltage (Optional)
With nominal AC input and no load, increase the output voltage until the overvoltage trips (output drops to approximately 1 volt.) The trip point should be 10 to 20% or 1 to 2 volts (whichever is greater) above maximum rated output voltage. Example: A OEM 5N5.7-1 is normally adjusted to 7.25 volts.

Short Circuit
With nominal AC input and no load, short the output terminals for a short period of time. Remove the short and the output should recover to nominal output voltage.



PERFORMANCE AND ADJUSTMENT TEST SET UP
FIGURE 1

REQUIRED TEST EQUIPMENT

A.C. power source (VARIAC) 0-140VAC and 0-7AC amps. Example: ELCO MOD. 1078.

DC differential voltmeter. 0-100VDC with 1 Mv F.S. sensitivity. Example: PSC MOD. 240A.

AC voltmeter 1Mv and 3Mv RMS range. Example: Hewlett Packard MOD. 400F.

Variable resistor. Appropriate resistance and wattage rating. Note: ACDC Electronics manufacturers a electronic load (EL 750) with meter ranges of 0-60VDC. Voltmeter, 0-10-50-100-200A ammeter, and maximum loading power of 750 watts.

Megometer 50 to 500VDC. Example: General Radio MOD. 1862.

Oscilliscope, 1Mv peak to peak vertical sensitivity. Bandwidth 0-500 Khz minimum range. Example: Tectronix MOD. 504.

Volt-Ohm-Multimeter. Example: Triplett MOD. 630NA.

ADJUSTMENT OF OVERLOAD AND OVERVOLTAGE PROTECTION CIRCUITS

1. General

The overload and overvoltage adjustments are normally set at the factory and should not require adjustment.

If these adjustments have been changed or require calibration. The following procedure can be used by personnel familiar with circuit operation.

2. Overload

The overload circuit is adjusted using a potentiometer located on the printed circuit board and accessible through a hole in the chassis.

ADJUSTMENT PROCEDURE:

a. Adjust the potentiometer fully clockwise.
b. Connect the power supply as shown in the test set up.
c. Apply nominal input AC voltage and adjust the output voltage to the lowest voltage of the specified adjustment range.
d. Adjust the load current to 120 ±5% of rated output current Example: A 5.7 Amp unit should be set at 6.84 Amps.
e. Slowly turn the overload adjustment potentiometer counter clockwise until the output voltage decreases and ripple increases.

3. Overvoltage

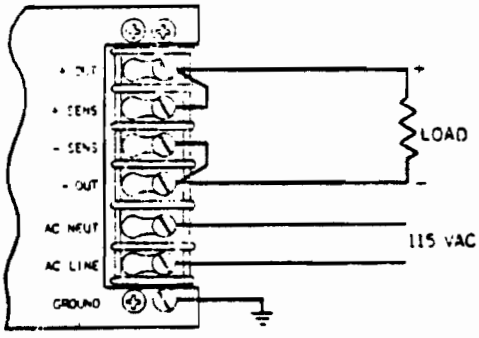
Single output units should have the overvoltage circuit adjusted at 2 volts or 10% (whichever is greater) above the maximum rated output voltage. Example: OEM 5N5.7-1 is adjustable 4.75 to 5.25 VDC and should be adjusted to 7.25 volts. Dual output units should be adjusted to 4 volts or 20% (whichever is greater) above the sum of both nominal output voltages. Example: The OEM 12D1.5-1 is adjusted to 28.8 volts. The response time of the overvoltage circuit will not allow adjustment close to the rated output voltage. Noise or transients across the output from any source can cause nuisance tripping.

The overvoltage circuit is located on the main printed circuit board or a separate OVP module depending on model number.

PROCEDURE:

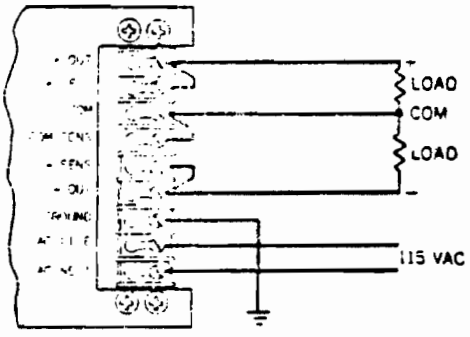
a. Adjust OVP adjustment potentiometer fully clockwise.
b. Connect the power supply as shown in the test setup at no load.
c. Adjust the output voltage to the desired overvoltage trip point.
d. Adjust the overvoltage adjustment potentiometer counterclockwise until the output voltage is crowbarred to approximately 1 Volt.
e. Turn the AC input off and adjust the output voltage down. Reapply AC input power and adjust the output voltage up to verify the set point. Repeat the process if required and readjust the output voltage to nominal.

hook-up instructions



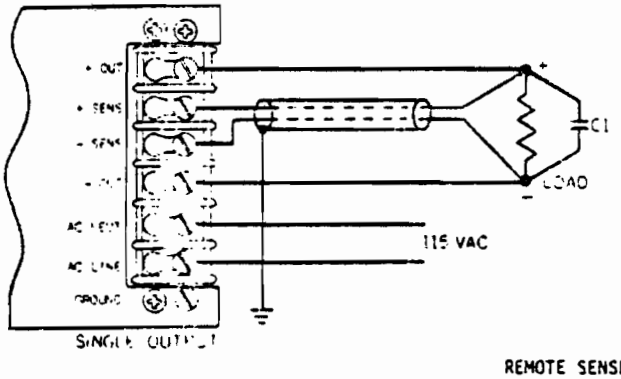
SINGLE OUTPUT, LOCAL SENSE

THE POSITIVE OR NEGATIVE OUTPUT MAY BE GROUNDED. A VOLTAGE ADJUSTMENT POTENTIOMETER IS ACCESSIBLE THROUGH A HOLE IN THE CASE. REGULATION SHOULD BE MEASURED AT THE BARRIER STRIP. THE POWER SUPPLY IS EQUIPPED WITH AUTOMATIC OVERLOAD PROTECTION.

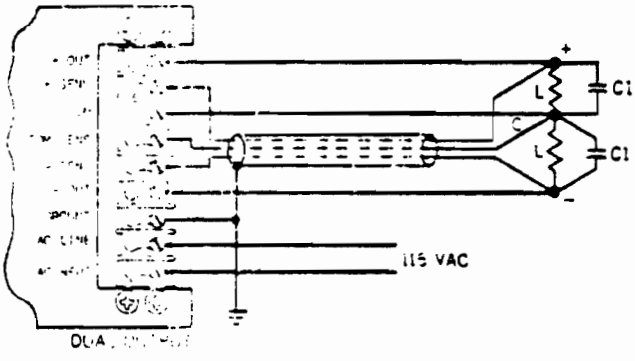


DUAL OUTPUT. LOCAL SENSE

THE POSITIVE AND NEGATIVE OUTPUTS ARE REFERENCED TO THE COMMON. THE OUTPUTS MAY BE ADJUSTED BY POTENTIOMETERS ACCESSIBLE THROUGH HOLES IN THE COVER. THE POWER SUPPLY IS EQUIPPED WITH AUTOMATIC OVERLOAD PROTECTION.. THE POSITIVE OUTPUT IS THE MASTER, WHEN THE POSITIVE OUTPUT IS SHORTED BOTH OUTPUTS WILL BE TURNED OFF.



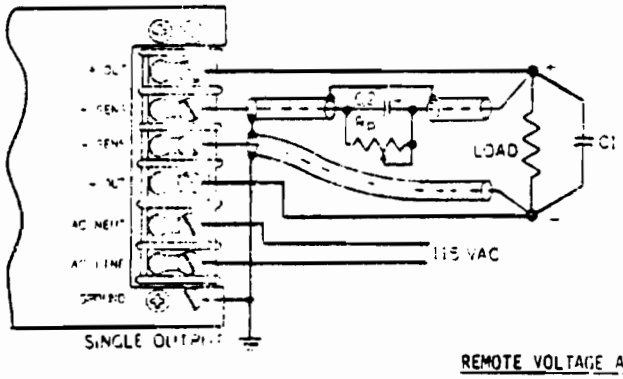
SINGLE OUTPUT



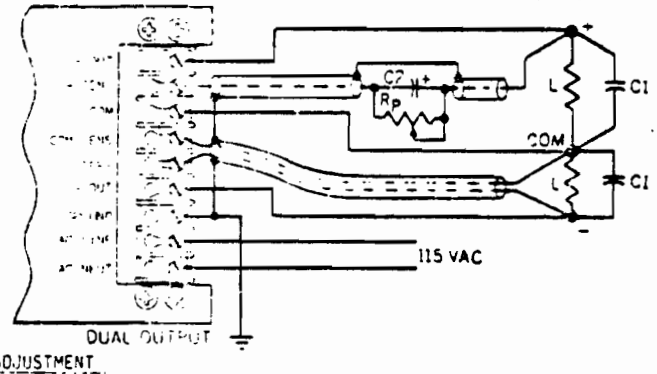
DUAL OUTPUT

REMOTE SENSE

USE SHIELDED SENSE LEADS AND ROUTE FOR MINIMUM PICKUP. RUN POWER LEADS CLOSE TO EACH OTHER. CAPACITOR (C1) IS SUGGESTED TO REDUCE THE OUTPUT IMPEDANCE AND IMPROVE CIRCUIT STABILITY. CAPACITOR VALUE SHOULD BE APPROXIMATELY 1000MFD/AMP.



SINGLE OUTPUT



DUAL OUTPUT

REMOTE VOLTAGE ADJUSTMENT

OBSERVE ALL INSTRUCTIONS FOR REMOTE SENSING. TO PROGRAM OUTPUTS, ADJUST VOLTAGE ADJUSTMENT POTENTIOMETERS FOR MINIMUM DC OUTPUT. CONNECT THE PROGRAMMING RESISTANCE (Rp) AS SPECIFIED, USING EXTREME CARE THAT LEADS ARE PERMANENTLY CONNECTED. DO NOT SWITCH. DO NOT ATTEMPT TO PROGRAM ABOVE OR BELOW SPECIFIED ADJUSTMENT RANGE. THE VALUE OF Rp SHOULD BE APPROXIMATELY 2000 OHMS PER VOLT. Rp MUST BE A LOW NOISE, TC TYPE RESISTOR. SHIELDED LEADS AND A CAPACITOR (C2) ARE NECESSARY TO MAINTAIN LOW RIPPLE. THE CAPACITOR SHOULD HAVE LOW LEAKAGE AND ESR.

GENERAL NOTES

THE OVERLOAD AND OVERVOLTAGE ADJUSTMENTS ARE CONSIDERED FACTORY ADJUSTMENTS. DO NOT MAKE ANY ADJUSTMENT WITHOUT CONSULTING FACTORY.
IF OVERVOLTAGE PROTECTION IS INCLUDED A LINE FUSE SHOULD BE INSTALLED BY THE USER FOR PROTECTION AGAINST CATASTROPHIC FAILURE.

COMMON APPLICATION PROBLEMS

NO OUTPUT: NO AC INPUT, DEFECTIVE LINE FUSE, OUTPUT SHORTED, INCORRECT HOOK UP.
LOW OUTPUT: EXCESSIVE LOAD CURRENT, OVERVOLTAGE OPERATING, OUTPUT VOLTAGE ADJUSTED TOO HIGH, OPEN SENSE LEADS OR PROGRAMMING RESISTANCE.
HIGH OUTPUT: OPEN SENSE LEADS.

TO RECYCLE OVERVOLTAGE PROTECTION, THE AC INPUT MUST BE REMOVED FOR APPROXIMATELY 2 SECONDS AND THEN REAPPLIED.

APPLICATION CONSIDERATIONS

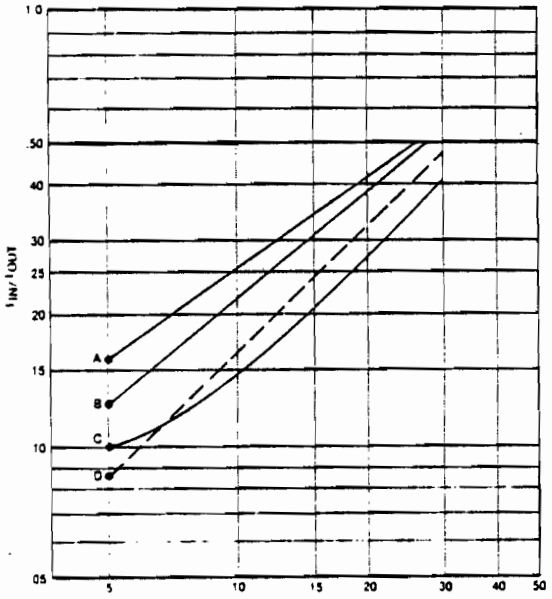
Input:

The input cable should be rated for expected input current. The IZ drop of the cable should be less than 1% of the input voltage.

The input source must have a current rating at least 200% of rated input current.

Waveform should be sinusiodal with no distortion, square wave, and higher frequency inputs can cause problems. Consult the factory.

Primary overload protection, fuse or magnetic type circuit breaker is required on all units with overvoltage protection.



CURVE (A) Low-Power CD type, single and dual-output printed circuit assemblies.

CURVE (B) Standard OEM type single and dual-output modules.

CURVE (C) 300 to 500 watt HCM type power supplies.

CURVE (D) 300 and 500 watt high-efficiency switching JP type power supplies.

EXAMPLES: Our OEM15N17 power supply is a 5 volt, 17 amp output, 85 watt unit. Using curve B, the input/output current ratio is .125. The input current is .125 x 17 = 2.1A RMS. Use a 3A fuse.

For dual OEM15D2.4, use twice the rated output current. A ±15V, 2.4A module has an input/output current ratio of .30. The input current is .30 x 2.4 x 2 = 1.44A RMS. Use a 3A fuse.

Output:

Reference hook up instructions page for proper termination. The sense leads must be connected local or remote. OPEN SENSE LEADS IS ONE OF THE MOST SERIOUS APPLICATION PROBLEMS.

The load line must be selected to limit the voltage drop within the power supply capability. The voltage drop in the power leads reduces the voltage available at the load and can affect the current limit circuit.

The load line has a significant effect on the output impedance and transient response. Load line termination may be required for stability and low output impedance at high frequency.

The current limit circuit is foldback type. The current limit is normally 120±10% of rated current.

Start problems could result on some motor, selenoid or filament leads which exhibit a high ratio of 10-to-1 between actual load and starting impedance. This problem can be corrected by adjustment of the short circuit current. The short circuit current should not be adjusted above 50% of rated current.

The output is floating, either positive or negative can be grounded. The output is isolated from the chassis and can be floated at 250VDC maximum.

Overvoltage Protection:

Overvoltage protection is an electronic crowbar circuit. Operation time is microseconds. This circuit should be adjusted to allow a margin for noise and transients to avoid nuisance tripping. The SCR has a maximum I^2T rating. If the load contains a lot of capacitance the SCR could be damaged.

Remote Programming:

Remote programming capability is provided on most models. The termination must receive special attention to reduce noise. The programming should not be switched or open circuited because this condition, similiar to open sense leads, cause high output voltage.

Dual Outputs:

Dual output modules are designed to provide a positive and negative output. The outputs are tracking and exhibit a high degree of temperature stability. A dual contains a master and slave output. The master determines the amplitude and performance of the slave. The slave can have a temperature coefficient that is the summation of both outputs. The outputs are normally connected so that if one output is shorted the other will be reduced also. Overvoltage protection if provided is connected from the positive to negative outputs and will detect a failure of either output and reduce both outputs.

Parallel Operation:

Parallel operation of identical OEM modules is not possible without circuit modification. OEM type modules have been paralleled but they do not current share. One supply is then operating in current limit or 120% of rated load which is not recommended. The HCM model has parallel capability that requires a special inter-connection. Strict control of the load line and circuit is necessary for proper current sharing.

Redundant Operation:

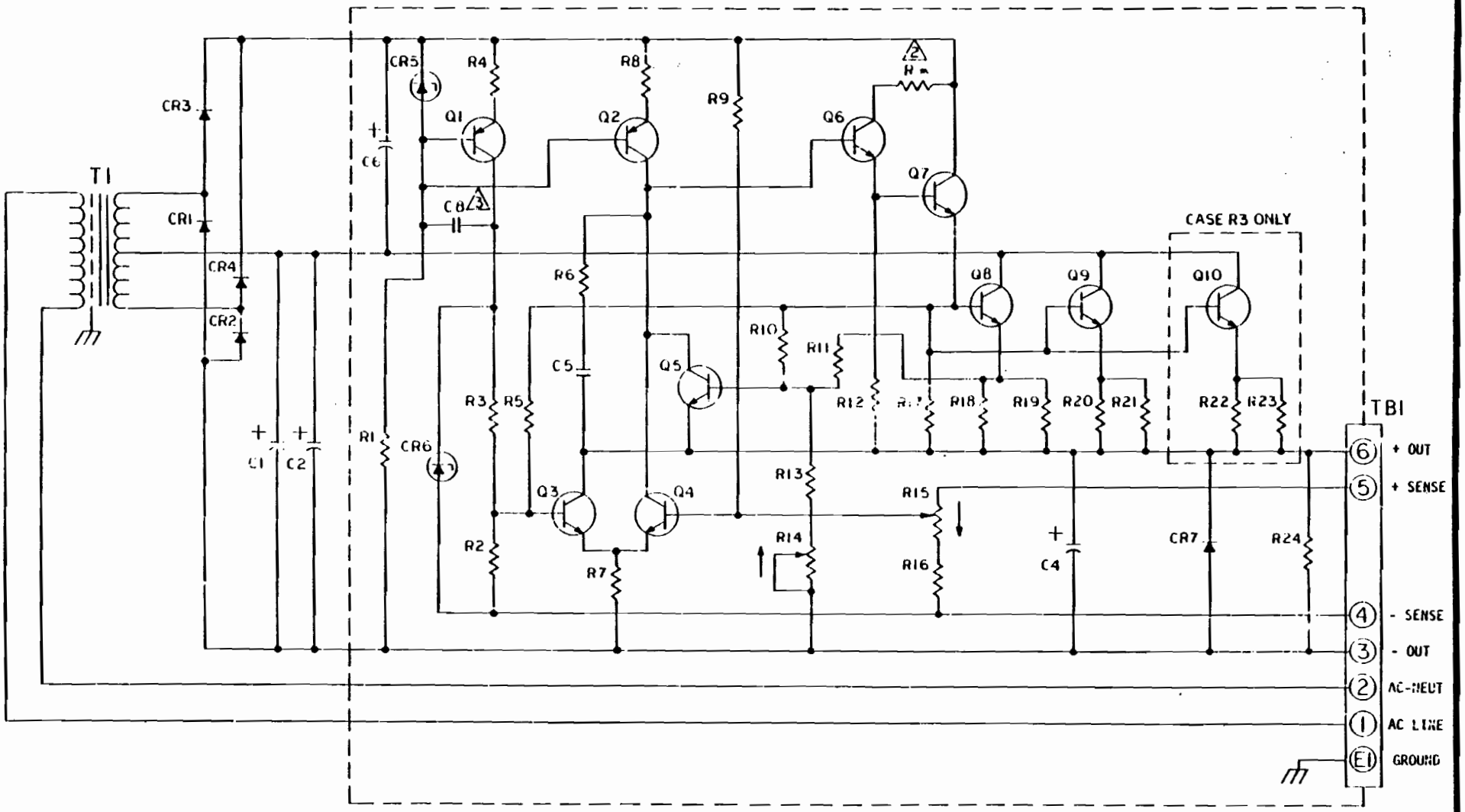
When power supplies are connected for redundant operation some complex problems exist. Because of these problems you should contact the factory for assistance.

Stability:

Stability is the change in output voltage for a eight hour period after a 30 minute warm up at CONSTANT LINE, LOAD AND AMBIENT TEMPERATURE. The stability specifications of the instrumentation must be at least an order of magnitude (10 times) better than the change to be measured. Line, load and temperature must be constant.

Temperature Coefficient:

Temperature coefficient is the change in output voltage per degree centigrade in ambient temperature. The AC INPUT, OUTPUT VOLTAGE SETTING and LOAD must BE CONSTANT. The power supply must be allowed to stabilize at each temperature of measurement.



NOTES:

1. THIS IS A COMPOSITE SCHEMATIC. NOT ALL COMPONENTS SHOWN ARE USED IN EVERY MODEL. REFER TO L/M FOR COMPONENTS USED.
2. R22 ON CASE 1 & 2. R25 ON CASE 3.
3. C8 USED ONLY ON CASES R1 & R2.

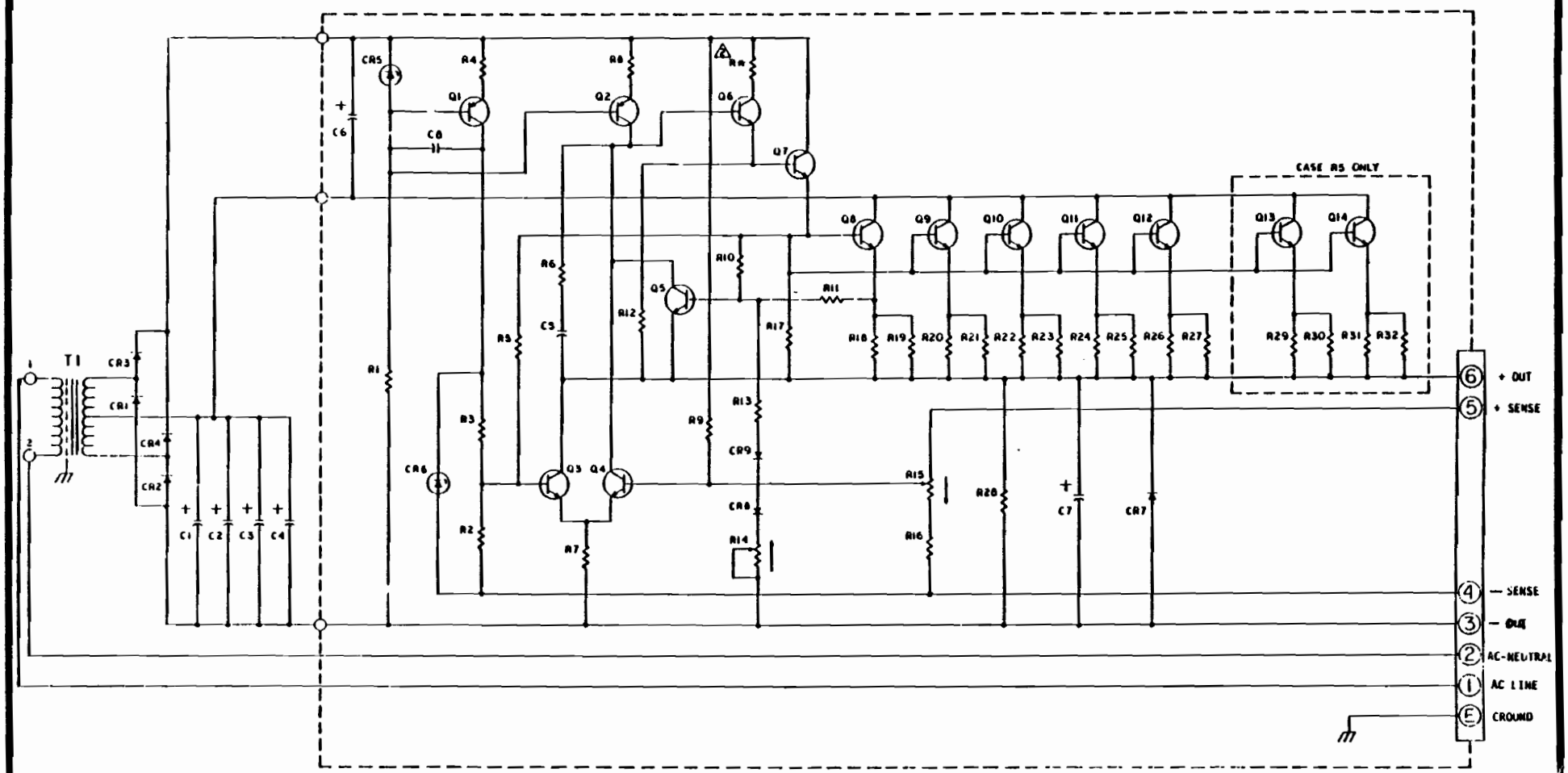
SCHEMATIC 59-397-000
4-8 VOLT
CASE SIZE R1, R2, & R3

OEM

OEM 4 to 8 Volt — Electrical Component Parts List — Schematic 59-397-000

	SYMBOL	DESCRIPTION	SUGGESTED MFG /TYPE	CASE R1 4N6	CASE R1 5N5 7	CASE R1 6N5 2	CASE R1 8N4 2	CASE R2 4N11	CASE R2 5N10	CASE R2 6N9 5	CASE R2 8N7 5	CASE R3 4N18	CASE R3 5N17	CASE R3 6N15	CASE R3 8N12
				FINAL ASSEMBLY											
	C1,2	CAPACITOR	STM 61C	11K/15V	11K/15V	11K/15V	11K/15V								
	C1,2	CAPACITOR	STM 71C									44K/15V	44K/15V	44K/15V	44K/15V
	C1,2	CAPACITOR	STM 91C					16K/15V	16K/15V	16K/15V	7500/30V				
	CR1,2	DIODE	WESTINGHOUSE 1N1200A	●	●	●	●	●	●	●	●	●	●	●	●
	CR3,4	DIODE	SEMTECH 1N4004	●	●	●	●	●	●	●	●	●	●	●	●
	T1	TRANSFORMER	ACDC	95382	95274	95280	95387	95383	95275	95385	95388	95384	95769	95386	95389
	Q7	TRANSISTOR	RCA 40250	●	●	●	●	●	●	●	●	●	●	●	●
	Q8	TRANSISTOR	RCA 2N3771	●	●	●	●	●	●	●	●	●	●	●	●
	Q9	TRANSISTOR	RCA 2N3771	OMIT	OMIT	OMIT	OMIT	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771
	Q10	TRANSISTOR	RCA 2N3771	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2N3771	2N3771	2N3771	2N3771
				P.C. BOARD ASSEMBLY											
	C4	CAPACITOR	SPRAGUE 39D	1200/15V	1200/15V	1200/15V	1200/15V	1200/15V	1200/15V	1200/15V	1200/15V				
	C4	CAPACITOR	MALLORY TCG									4400/10V	4400/10V	4400/10V	4400/10V
	C5	CAPACITOR	SPRAGUE 415D5	332/25V	●	●	●	●	●	●	●	●	●	●	●
	C6	CAPACITOR	SPRAGUE 39D	1500/15V	●	●	●	●	●	●	●	●	●	●	●
	C8	CAPACITOR	CENTRALAB DCD50	68pF	68pF	68pF	68pF	68pF	68pF	68pF	68pF	n/a	n/a	n/a	n/a
	CR5	DIODE	MOTOROLA 1N748A	●	●	●	●	●	●	●	●	●	●	●	●
	CR6	DIODE	MOTOROLA 1N8.3A	●	●	●	●	●	●	●	●	●	●	●	●
	CR7	DIODE	SEMTECH 1N4004	●	●	●	●	●	●	●	●	●	●	●	●
	R1	RESISTOR	RC20	1 [illegible]	●	●	●	●	●	●	●	●	●	●	●
	R2	RESISTOR	RN60C	[illegible]	5.62K	5.62K	5.62K	[illegible]	5.62K	5.62K	5.62K	2.49K	5.62K	5.62K	5.62K
	R3	RESISTOR	RN60C	2.49K	●	●	●	●	●	●	●	●	●	●	●
	R4	RESISTOR	RC20	33	●	●	●	●	●	●	●	●	●	●	●
*	R5	RESISTOR	RC20	820K	820K	820K	820K	820K	820K	820K	820K	OMIT	OMIT	220K	220K
*	R6	RESISTOR	RC20	33	33	33	33	330	330	330	330	68	68	68	68
	R7	RESISTOR	RC20	1K	1.5K	1.5K	1.5K	1K	1.5K	1.5K	1.5K	1K	1.5K	1.5K	1.5K
	R8	RESISTOR	RC20	1.0	●	●	●	●	●	●	●	●	●	●	●
*	R9	RESISTOR	RC20	1 MEG	1 MEG	4.7MEG	4.7MEG	1 MEG	1 MEG	1 MEG	n/a	1.5MEG	1 MEG	1 MEG	4.7MEG
	R10	RESISTOR	RC20	680	●	●	●	●	●	●	●	●	●	●	●
	R12	RESISTOR	RC20	10	●	●	●	●	●	●	●	●	●	●	●
	R13	RESISTOR	RC20	910	1.5K	1.5K	5.6K	1.8K	1.5K	1.5K	7.5K	1K	1.8K	1.8K	4.7K
	R14,15	POTENTIOMETER	CTS115A	5K	●	●	●	●	●	●	●	●	●	●	●
	R16	RESISTOR	RN60C	6.65K	6.65K	6.65K	4.53K	6.65K	6.65K	6.65K	4.53K	6.65K	6.65K	6.65K	4.53K
	R17	RESISTOR	RC20	47	●	●	●	●	●	●	●	●	●	●	●
	R18	RESISTOR	RW69	2 ww 3W	2 ww 3W	.2 ww 3W	2 ww 3W	2 ww 3W	2 ww 3W	.2 ww 3W	.3 ww 2W	.2 ww 2W	.2 ww 2W	.2 ww 2W	.2 ww 2W
	R19	RESISTOR	RW69	OMIT	OMIT	OMIT	OMIT	2 ww 3W	2 ww 3W	.2 ww 3W	.3 ww 2W	.1 ww 3W	.1 ww 3W	.1 ww 3W	.1 ww 3W
	R20	RESISTOR	RW69	OMIT	OMIT	OMIT	OMIT	2 ww 3W	2 ww 3W	.2 ww 3W	.3 ww 2W	.2 ww 2W	.2 ww 2W	.2 ww 2W	.2 ww 2W
	R21	RESISTOR	RW69	2 ww 3W	.2 ww 3W	2 ww 3W	.2 ww 3W	2 ww 3W	2 ww 3W	2 ww 3W	.3 ww 2W	.1 ww 3W	.1 ww 3W	.1 ww 3W	.1 ww 3W
	R22	RESISTOR	RC20	270	270	270	270	270	270	270	270				
	R22	RESISTOR	RW69									.2 ww 2W	.2 ww 2W	.2 ww 2W	.2 ww 2W
	R23	RESISTOR	RC20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	.1 ww 3W	.1 ww 3W	.1 ww 3W	.1 ww 3W
	R24	RESISTOR	RC20	240	OMIT	OMIT	OMIT	240	OMIT	OMIT	470	240	240	240	240
	R25	RESISTOR	RC20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	270	270	270	270
	Q1,2	TRANSISTOR	MOTOROLA 2N2907A	●	●	●	●	●	●	●	●	●	●	●	●
	Q3-5	TRANSISTOR*	MOTOROLA 2N2222A	●	●	●	●	●	●	●	●	●	●	●	●
	Q6	TRANSISTOR	MOTOROLA 2N2219A	●	●	●	●	●	●	●	●	●	●	●	●

NOTES: 1 SYMBOL ● DENOTES PARTS USED ON ALL MODELS. 2 ALL CAPACITOR VALUES IN MICROFARADS AND RESISTORS IN OHMS UNLESS OTHERWISE NOTED. 3 * DENOTES TYPICAL VALUE ONLY. PART MAY VARY OR BE OMITTED. 4 MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY. EQUIVALENT PARTS MAY BE USED.



NOTES:

1. THIS IS A COMPOSITE SCHEMATIC. NOT ALL COMPONENTS SHOWN ARE USED IN EVERY MODEL. REFER TO L/M FOR COMPONENTS USED.

2. R29 ON CASE SIZE R4 - R33 ON CASE SIZE R5

SCHEMATIC 59-963-000
4-8 VOLT
CASE SIZE R4, R5

OEM

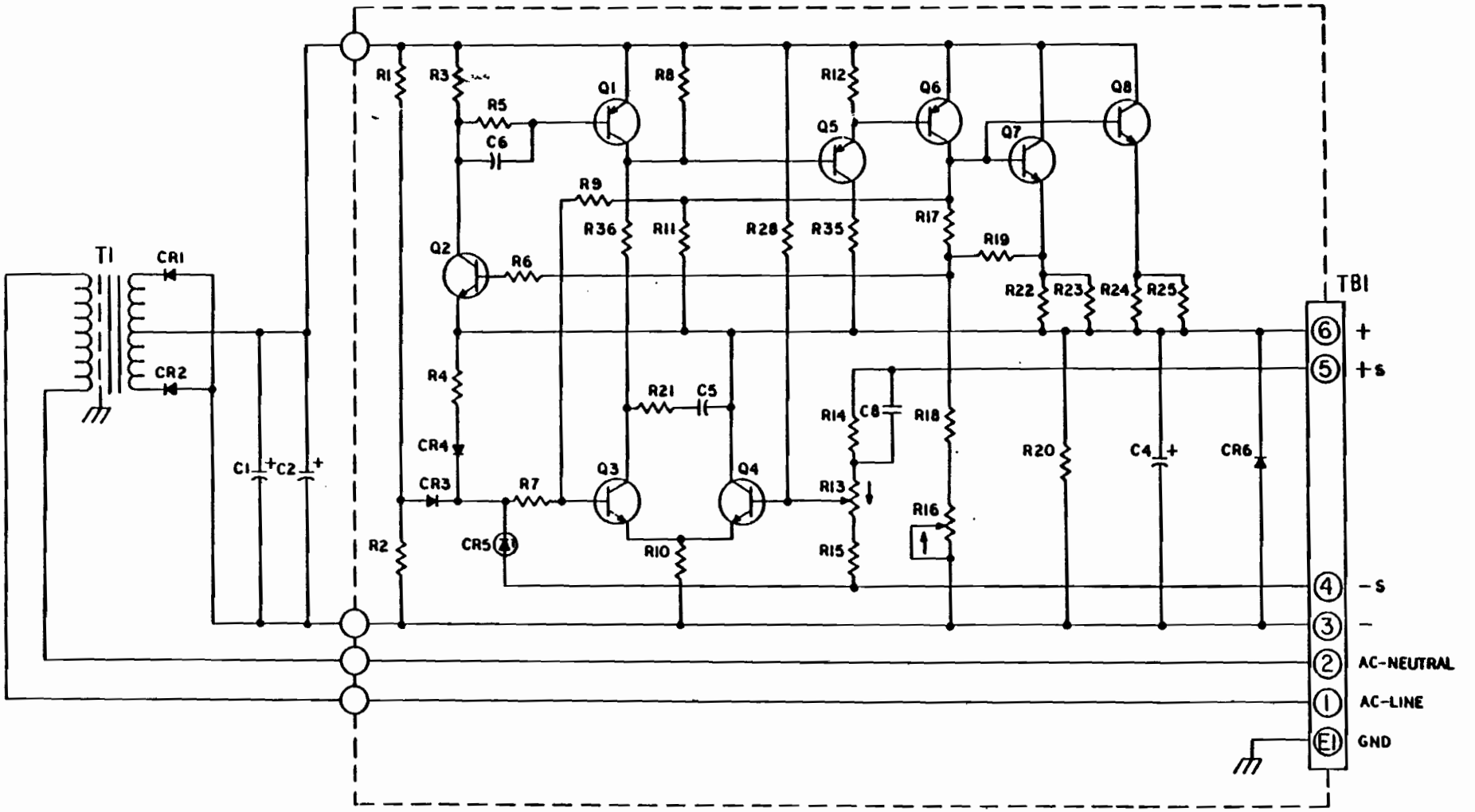
			CASE R4					CASE R5						
SYMBOL	DESCRIPTION	SUGGESTED MFG./TYPE	4N26	5N35	[illegible]	[illegible]		4N36	5N35	6N30.7	8N24.5			
						FINAL ASSEMBLY								
C1,2,3	CAPACITOR	STM7IE	44K/15V	44K/15V	[illegible]	[illegible]		44K/15V	44K/15V	44K/15V	23K/25V			
C4	CAPACITOR	STM7IC	OMIT	OMIT	OMIT	OMIT		44K/15V	44K/15V	44K/15V	23K/25V			
CR1,2	DIODE	RCA IN1183A	●	●	●	●		●	●	●	●			
CR3,4	DIODE	SEMTECH IN4720	●	●	●	●		●	●	●	●			
Q7,8,9,10,11,12	TRANSISTOR	RCA 2N3771	●	●	●	●		●	●	●	●			
Q13,14	TRANSISTOR	RCA	n/a	n/a	n/a	n/a		2N3771	2N3771	2N3771	2N3771			
T1	TRANSFORMER	ACDC	95777	94644	[illegible]	[illegible]		95778	95547	95780	95782			
						P.C.BOARD ASSEMBLY								
C5	CAPACITOR	SPRAGUE HI525	.0047/[illegible]	.01/[illegible]	[illegible]	[illegible]		.022/25V	.022/25V	.022/25V	.022/25V			
C6	CAPACITOR	SPRAGUE [illegible]	1.0/15V	1/15V	[illegible]	[illegible]		4000/15V	4000/15V	4000/15V	4000/15V			
C6A	CAPACITOR	SPRAGUE 39C	1200/15V	1200/15V	1200/15V	[illegible]		OMIT	OMIT	OMIT	OMIT			
C7	CAPACITOR	SPRAGUE 39D	4400/10V	4400/10V	[illegible]	[illegible]		8000/15V	8000/15V	8000/15V	8000/15V			
C7A	CAPACITOR	SPRAGUE 39D	4400/10V	4400/10V	4400/10V	[illegible]		OMIT	OMIT	OMIT	OMIT			
C8	CAPACITOR	CENTRALAB 300B9D	68pF	●	●	●		●	●	●	●			
CR5	DIODE	MOTOROLA IN4148	●	●	●	●		●	●	●	●			
CR6	DIODE	MOTOROLA IN823A	●	●	●	●		●	●	●	●			
CR7	DIODE	SEMTECH IN4728	●	●	●	●		●	●	●	●			
CR8,9	DIODE	SEMTECH IN4734	●	●	●	●		●	●	●	●			
R1	RESISTOR	RC20	1 M	●	●	●		●	●	●	●			
R2	RESISTOR	RN60C	2.49K	5.62K	5.62K	5.62K		2.49K	5.62K	5.62K	OMIT			
R3	RESISTOR	RN60C	2.49K	●	●	●		●	●	●	●			
R4	RESISTOR	RC20	330	●	●	●		●	●	●	●			
R5	RESISTOR	RC20	690K	690K	690K	690K		270K	270K	270K	270K			
R6	RESISTOR	RC20	150	150	150	68		68	330	330	330			
R7	RESISTOR	RC20	1.0K	1.5K	1.5K	1.5K		1.0K	1.5K	1.5K	1.5K			
R8	RESISTOR	RC20	3.3K	●	●	●		●	●	●	●			
R9	RESISTOR	RC20	1.5M	1.5M	1.5M	1.5M		1.5M	OMIT	OMIT	OMIT			
R10	RESISTOR	RC20	300	●	●	●		●	●	●	●			
R11	RESISTOR	RC20	2.2K	●	●	●		●	●	●	●			
R12	RESISTOR	RC20	560	●	●	●		●	●	●	●			
R13	RESISTOR	RC20	510	510	510	1 M		JUMPER	JUMPER	JUMPER	JUMPER			
R14,15	POTENTIOMETER	CTS115	5K	●	●	●		●	●	●	●			
R16	RESISTOR	RN60C	6.65K	6.65K	6.65K	4.53K		6.65K	6.65K	6.65K	6.65K			
R17	RESISTOR	RC20	27	●	●	●		●	●	●	●			
R18-27	RESISTOR	RW69	15 ww 3W	15 ww 3W	15 ww 3W	3 ww 3W		.15 ww 3W	.15 ww 3W	.15 ww 3W	.15 ww 3W			
R28	RESISTOR	RC20	240	●	●	●		●	●	●	●			
R29	RESISTOR	RC20	1K	1K	1K	1K								
R29	RESISTOR	RW69						.15 ww 3W	.15 ww 3W	.15 ww 3W	.15 ww 3W			
R30	RESISTOR	RW69	n/a	n/a	n/a	n/a		.15 ww 3W	.15 ww 3W	.15 ww 3W	.15 ww 3W			
R31	RESISTOR	RW69	n/a	n/a	n/a	n/a		.15 ww 3W	.15 ww 3W	.15 ww 3W	15 ww 3W			
R32	RESISTOR	RW69	n/a	n/a	n/a	n/a		.15 ww 3W	.15 ww 3W	.15 ww 3W	15 ww 3W.			
R33	RESISTOR	RC20	n/a	n/a	n/a	n/a		1K	1K	1K	1K			
Q1,2	TRANSISTOR	MOTOROLA 2N2907A	●	●	●	●		●	●	●	●			
Q3,4,5	TRANSISTOR	MOTOROLA 2N2222A	●	●	●	●		●	●	●	●			
Q6	TRANSISTOR	MOTOROLA 2N2219A	●	●	●	●		●	●	●	●			

NOTES: SYMBOL ● DENOTES PARTS USED ON ALL MODELS

ALL CAPACITOR VALUES IN MICROFARADS AND RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED

DENOTES TYPICAL VALUE ONLY. PART MAY VARY OR BE OMITTED.

MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY. EQUIVALENT PARTS MAY BE USED.



NOTE: THIS IS A COMPOSITE SCHEMATIC. NOT ALL COMPONENTS SHOWN ARE USED IN EVERY MODEL. REFER TO L/M FOR COMPONENTS USED.

SCHEMATIC 59-396-000
10-32 VOLT
CASE R1, R2, & R3.

OEM

CASE: R1

	SYMBOL	DESCRIPTION	SUGGESTED MFG./TYPE	10N3.5	11N3.2	14N2.8	15N2.7	16N2.6	18N2.3	20N2.1	22N1.9	24N1.8	26N1.7	28N1.6	30N1.5	32N1.4
							FINAL ASSEMBLY									
	C1,2	CAPACITOR	SPRAGUE 32D	4600/30V	4600/30V	4600/30V	4600/30V	4600/30V								
	C1,2	CAPACITOR	STM 71C						2500/50V	2500/50V	2500/50V	2500/50V	2500/50V	2500/50V	2500/50V	2500/50V
	CR1,2	DIODE	WESTINGHOUSE IN1200A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q6	TRANSISTOR	RCA 2N5956	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q7	TRANSISTOR	RCA 2N3055	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	T1	TRANSFORMER	ACDC	95516	95287	95519	95276	95522	95525	95374	95530	95288	95533	95280	95536	95539
							P.C BOARD ASSEMBLY									
	C4	CAPACITOR	SPRAGUE 39D	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/50V	500/50V	500/50V	500/50V	500/50V
	C5	CAPACITOR	MALLORY SM250	.005/500V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C6	CAPACITOR	MALLORY GP312	120pf	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C8	CAPACITOR	SPRAGUE 192P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	.1/80V	.1/80V	.1/80V	.1/80V	.1/80V
	CR3,4	DIODE	T.I. IN4454	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR5	DIODE	MOTOROLA 1N823A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR6	DIODE	SEMTECH 1N4004	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R1	RESISTOR	RC20	10K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R2	RESISTOR	RC20	2K	2K	2K	2K	2K	2K	2K	1K	1K	1K	1K	1K	1K
	R3	RESISTOR	RC20	470	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R4	RESISTOR	RC20	430	680	1.1K	1.1K	1.5K	1.5K	1.8K	2.2K	2.2K	2.2K	2.7K	2.7K	3.3K
	R5,6	RESISTOR	RC20	1.5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R7	RESISTOR	RC20	2K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R8	RESISTOR	RC20	2.2K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R9	RESISTOR	RC20	560K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R10	RESISTOR	RC20	2.7K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R11	RESISTOR	RC20	100	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R12	RESISTOR	RC20	330	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R13	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R14	RESISTOR	RN60C	8.06K	12.4K	19.1K	19.1K	22K	22.6K	30.1K	34.8K	41.2K	43.2K	51.1K	54.9K	57.6K
	R15	RESISTOR	RN60C	13K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R16	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R17	RESISTOR	RC20	300	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
*	R18	RESISTOR	RC20	1.8K	2.7K	3.9K	4.7K	5.1K	4.3K	5.6K	6.8K	6.8K	8.2K	9.1K	10K	12K
	R19	RESISTOR	RC20	1K	1K	1K	1K	1K	1K	1K	1.5K	3.3K	3.3K	1.5K	2K	2.0K
	R20	RESISTOR	RC20	1K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R21	RESISTOR	RC20	150	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R22	RESISTOR	RC20	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W
	R25	RESISTOR	IRC BWH	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W	OMIT	OMIT	OMIT	OMIT	OMIT
	R35	RESISTOR	RC20	200	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R36	JUMPER		EC22	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q1	TRANSISTOR	MOTOROLA 2N2907	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q2,3,4	TRANSISTOR	MOTOROLA 2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2484	2N2484	2N2484	2N2484	2N2484
	Q5	TRANSISTOR	MOTOROLA 2N2907	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NOTES: 1. SYMBOL ◆ DENOTES PARTS USED ON ALL MODELS

2. ALL CAPACITOR VALUES IN MICROFARADS AND RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED

3. * DENOTES TYPICAL VALUE ONLY. PART MAY VARY OR BE OMITTED.

4. MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY EQUIVALENT PARTS MAY BE USED

Electrical Component Parts List

CASE R-2

SYMBOL	DESCRIPTION	SUGGESTED MFG./TYPE	10N6.5	12N5.8	14N5.2	15N5	16N4.7	18N4.2	20N3.8	22N3.6	24N3.3	26N3.1	28N2.9	30N2.7	32N2.5
FINAL ASSEMBLY															
C1,2	CAPACITOR	STM 91C	7500/30V	7500/30V	7500/30V	7500/30V	7500/30V	4500/50V	4500/50V	4500/50V	4500/50V	4500/50V	4500/50V	3000/75V	3000/75V
CR1,2	DIODE	WESTINGHOUSE 1N1200A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Q6	TRANSISTOR	RCA 2N5956	2N5956	2N5956	2N5956	2N5956	2N5956	2N5956	2N5956	2N5956	2N5956	2N5956	2N5956	OMIT	OMIT
Q6	TRANSISTOR	MOTOROLA 2N3740												2N3740	2N3740
Q7	TRANSISTOR	RCA 2N3055	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Q8	TRANSISTOR	RCA 2N3055	2N3055	2N3055	2N3055	2N3055	2N3055	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT
T1	TRANSFORMER	AC,C	95517	95365	95520	95277	95523	95526	95528	95531	95367	95534	95281	95537	95540
P C BOARD ASSEMBLY															
C4	CAPACITOR	SPRAGUE 39E	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/50V	500/50V	500/50V	500/50V	500/50V
C5	CAPACITOR	MALLORY SM250	.005/500.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
C6	CAPACITOR	MALLORY GP312	120pf	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
C8	CAPACITOR	SPRAGUE 192P	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	.1/80V	.1/80V	.1/80V	.1/80V	.1/80V
CR3,4	DIODE	T.I 1N4454	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
CR5	DIODE	MOTOROLA 1N 5L3A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
CR6	DIODE	SEMTECH 1N4004	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R1	RESISTOR	RC20	[illegible]	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R2	RESISTOR	RC20	[illegible]	2K	2K	2K	2K	1K	1K	1K	1K	1K	1K	1K	1K
R3	RESISTOR	RC20	470	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R4	RESISTOR	RC20	430	680	1K	1.1K	1.1K	1.5K	1.8K	1.8K	2.2K	2.4K	2.7K	2.7K	3.3K
R5,6	RESISTOR	RC20	1.5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R7	RESISTOR	RC20	2K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R8	RESISTOR	RC20	[illegible]	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R9	RESISTOR	RC20	240K	240K	240K	240K	240K	240K	240K	240K	5.60K	5.60K	5.60K	5.60K	5.60K
R10	RESISTOR	RC20	2.7K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R11	RESISTOR	RC20	47	47	47	47	47	100	100	100	100	100	100	100	100
R12	RESISTOR	RC20	330	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R13	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R14	RESISTOR	RN60C	9.09K	12.4K	17.4K	19.1K	21K	22.6K	30.9K	34.8K	34.8K	46.4K	45.3K	46.4K	57.6K
R15	RESISTOR	RN60C	[illegible]	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R16	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R17	RESISTOR	RC20	300	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R18	RESISTOR	RC20	1.5K	2.2K	3.3K	3.9K	4.7K	3.9K	5.1K	6.2K	4.7K	8.2K	6.2K	6.8K	8.2K
R19	RESISTOR	RC20	1K	1K	1K	1K	1K	1K	1K	1K	1.5K	1.5K	2.2K	2.2K	2.2K
R20	RESISTOR	RC20	1K	1K	1K	1K	1K	1.8K	2.2K	2.2K	2.7K	2.7K	2.7K	2.7K	2.7K
R21	RESISTOR	RC20	150	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R22,25	RESISTOR	IRC BWH	.27 3W	.27 3W	.27 3W	.27 3W	.27 3W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W
R35	RESISTOR	RC20	200	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
R36	JUMPER		#22	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Q1	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Q2,3,4	TRANSISTOR	MOTOROLA 2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2484	2N2484	2N2484	2N2484	2N2484
Q5	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NOTES. 1 SYMBOL ◆ DENOTES PARTS USED ON ALL MODELS.

2 ALL CAPACITOR VALUES IN MICROFARADS AND RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED.

3. DENOTES TYPICAL VALUE ONLY. PART MAY VARY OR BE OMITTED.

4 MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY. EQUIVALENT PARTS MAY BE USED.

OEM 10 to 32 Volt — Electrical Component Parts List — Schematic 59-396-000

CASE R-3

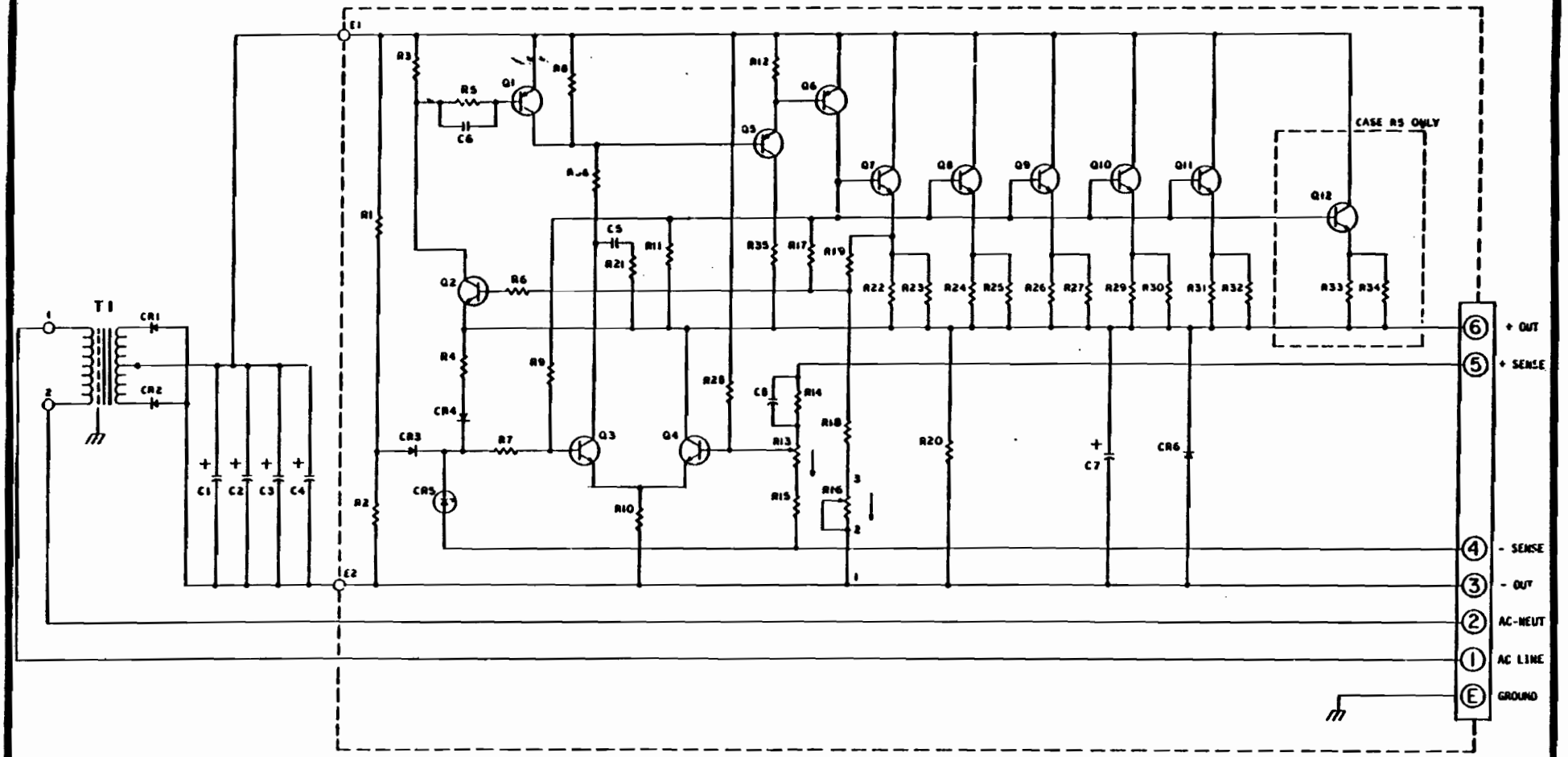
	SYMBOL	DESCRIPTION	SUGGESTED MFG./TYPE	10N10.2	12N9.5	14N8.7	15N8.2	16N7.7	18N6.9	20N6.2	22N5.9	24N5.4	26N5	28N4.7	30N4.5	32N4.3
				FINAL ASSEMBLY												
	C1,2	CAPACITOR	STM 71C	10K/30V	10K/30V	10K/30V	10K/30V	10K/30V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V
	CR1,2	DIODE	WESTINGHOUSE 1N1200A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q6	TRANSISTOR	RCA 2N5956	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q7,8	TRANSISTOR	RCA	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3055	2N3055	2N3055	2N3055	2N3055	2N3055
	T1	TRANSFORMER	RCOC	99518	95366	99521	95278	95524	95527	95529	95532	95368	95535	95282	95538	95541
				PC BOARD ASSEMBLY												
	C4	CAPACITOR	SPRAGUE 390	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/30V	500/50V	500/50V	500/50V	500/50V	500/50V
	C5	CAPACITOR	MALLORY SM250	.005/500V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C6	CAPACITOR	MALLORY GP312	120pF	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C8	CAPACITOR	SPRAGUE 192P	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	.1/80V	.1/80V	.1/80V	.1/80V	.1/80V
	CR3,4	DIODE	T.I. 1N4454	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR5	DIODE	MOTOROLA 1N823A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR6	DIODE	SEMTECH 1N4004	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R1	RESISTOR	RC20	10K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R2	RESISTOR	RC20	2K	2K	2K	2K	2K	2K	1K	1K	1K	1K	1K	1K	1K
	R3	RESISTOR	RC20	470	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R4	RESISTOR	RC20	470	680	1K	1.1K	1.1K	1.5K	1.8K	2.2K	2.2K	2.2K	2.7K	2.7K	3.3K
	R5,6	RESISTOR	RC20	1.5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R7	RESISTOR	RC20	2K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R8	RESISTOR	RC20	4.7K	4.7K	2.2K	2.2K	2.2K	2.2K	2.2K	2.2K	2.2K	2.2K	2.2K	2.2K	2.2K
	R9	RESISTOR	RC20	240K	240K	240K	240K	240K	240K	240K	240K	560K	560K	560K	560K	560K
	R10	RESISTOR	RC20	2.7K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R11	RESISTOR	RC20	47	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R12	RESISTOR	RC20	330	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R13	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R14	RESISTOR	RN60C	7.68K	12.4K	17.8K	19.1K	21K	22.6K	30.9K	34.8K	41.2K	43.2K	51.1K	54.9K	59.0K
	R15	RESISTOR	RN60C	13K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R16	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R17	RESISTOR	RC20	300	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R18	RESISTOR	RC20	1.5K	2.4K	2.0K	2.7K	3.0K	3.9K	5.1K	6.8K	5.6K	6.8K	7.5K	8.2K	10K
	R19	RESISTOR	RC20	2.2K	1K	1K	2.2K	1K	1K	680	1K	1K	1K	1K	1K	1K
	R20	RESISTOR	RC20	1K	1K	1K	1K	1K	1.8K	2.7K	2.7K	2.7K	2.7K	2.7K	2.7K	2.7K
	R21	RESISTOR	RN69	150	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R22,23	RESISTOR	RN69	.2/3W	.2/3W	.3/3W	.3/3W	.3/3W	.3/3W	.3/3W	.3/3W	.51/2W	.51/2W	.51/2W	.51/2W	.51/2W
	R24,25	RESISTOR	RC20	.2/3W	.2/3W	.3/3W	.3/3W	.3/3W	.3/3W	.3/3W	.3/3W	.51/2W	.51/2W	.51/2W	.51/2W	.51/2W
	R35	RESISTOR	RC20	200	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R36	JUMPER		22TC	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q1	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q2,3,4	TRANSISTOR	MOTOROLA	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2484	2N2484	2N2484	2N2484	2N2484
	Q5	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NOTES: 1 SYMBOL ◆ DENOTES PARTS USED ON ALL MODELS

2 ALL CAPACITOR VALUES IN MICROFARADS AND RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED.

3 DENOTES TYPICAL VALUE ONLY. PART MAY VARY OR BE OMITTED.

4 MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY. EQUIVALENT PARTS MAY BE USED.



NOTE: THIS IS A COMPOSITE SCHEMATIC. NOT ALL COMPONENTS SHOWN ARE USED IN EVERY MODEL. REFER TO L/M FOR COMPONENTS USED.

SCHEMATIC 59-962-000
10-32 VOLT
CASE R4 & R5

OEM

CASE R-4

	SYMBOL	DESCRIPTION	SUGGESTED MFG/TYPE	10N14.9	12N13	14N12	15N11.2	16N10.8	18N9.6	20N8.7	22N8.1	24N7.5	26N7.1	28N6.7	30N6.3	32N5.7
			FINAL ASSEMBLY													
	C1,2	CAPACITOR	STM71C	18K/30V	18K/30V	18K/30V	18K/30V	18K/30V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V
	C3	CAPACITOR	STM71C	18K/30V	18K/30V	18K/30V	18K/30V	18K/30V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	n/a	n/a	n/a
	CR1,2	DIODE	WESTINGHOUSE 1N1184A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R37	RESISTOR	RN67	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1K	1K
	Q6	TRANSISTOR	MOTOROLA 2N4901	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q7	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Q8	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772
	Q9	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772
	Q11	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772
	T1	TRANSFORMER	ACDC	95783	95279	95785	95787	95789	95791	95793	95795	95797	95799	95283	95949	95951
			PC BOARD ASSEMBLY													
	C5	CAPACITOR	MALLORY SM250	.005/500V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C6	CAPACITOR	MALLORY GP31C	120pf	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C7	CAPACITOR	STM33C	1800/40V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C9	CAPACITOR	SPRAGUE 192P	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	.1/80V	.1/80V	.1/80V	.1/80V	.1/80V
	CR3,4	DIODE	T.I. 1N4454	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR5	DIODE	MOTOROLA 1N823A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR6	DIODE	SEMTECH 1N4720	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R1	RESISTOR	RC20	.0K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R2	RESISTOR	RC20	2K	2K	2K	2K	2K	2K	2K	2K	1K	1K	1K	1K	1K
	R3	RESISTOR	RC20	470	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R4	RESISTOR	RC20	680	680	1.0K	1.2K	1.5K	1.8K	1.8K	2.0K	2.2K	2.2K	2.7K	2.7K	3.3K
	R5,6	RESISTOR	RC20	1.5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R7	RESISTOR	RC20	2K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R8	RESISTOR	RC20	4.7K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R9	RESISTOR	RC20	560K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R10	RESISTOR	RC20	2.7K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	P11	RESISTOR	RC20	47	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R12	RESISTOR	RC20	330	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R13	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R14	RESISTOR	RN60C	6.81K	12.4K	17.8K	19.1K	21.0K	...6K	30.1K	34.8K	34.8K	43.2K	45.3K	54.9K	66.5K
	R15	RESISTOR	RN60C	13K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R16	POTENTIOMETER	CTS 115	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R17	RESISTOR	RC20	300	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R18	RESISTOR	RC20	1.8K	2.7K	3.9K	4.7K	5.1K	4.3K	5.1K	6.2K	5.1K	6.2K	6.8K	8.2K	9.1K
	R19	RESISTOR	RC20	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	2.4K	2.4K	2.4K	2.4K	2.4K
	R20	RESISTOR	RC20	1K	1K	1K	1K	2.0K	2.0K	2.0K	2.0K	2.0K	2.0K	2.7K	2.7K	2.7K
	R21	RESISTOR	RC20	150	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R22	RESISTOR	RC20	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT
	R23	RESISTOR	RC20	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT
	R24-27, 31,32	RESISTOR	RC20	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W	.51/2W	.51/2W
	R35	RESISTOR	RC20	200	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R36	JUMPER		TC22	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q1	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q2,3,4	TRANSISTOR	MOTOROLA	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2484	2N2484	2N2484	2N2484	2N2484
	Q5	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

NOTES: 1 SYMBOL DENOTES PARTS USED ON ALL MODELS.

2. ALL CAPACITOR VALUES IN MICROFARADS AND RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED.

3 * DENOTES TYPICAL VALUE ONLY. PART MAY BE OMITTED

4. MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY. EQUIVALENT PARTS MAY BE USED.

CASE R-5

	SYMBOL	DESCRIPTION	SUGGESTED MFG/TYPE	10N21	12N18.5	14N16.7	15N15.8	16N15	18N13.5	20N12.2	22N11.4	24N10.6	26N10	28N9.3	30N8.8	32N8.1
							FINAL ASSEMBLY									
	C1,2,3	CAPACITOR	SPRAGUE 32D	23K/25V	18K/30V	18K/30V	18K/30V	18K/30V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V	11K/50V
	C4	CAPACITOR	SPRAGUE 32D	23K/25V	18K/30V	18K/30V	18K/30V	18K/30V	11K/50V	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	CR1,2	DIODE	WESTINGHOUSE 1N1184	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q6	TRANSISTOR	MOTOROLA 2N4901	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q7	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772
	Q8	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772
	Q10	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772
	Q11	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT*	OMIT
	Q12	TRANSISTOR	RCA	2N3771	2N3771	2N3771	2N3771	2N3771	2N3771	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772	2N3772
	T1	TRANSFORMER	ACDC	95784	95702	95786	95798	95790	95792	95794	95796	95798	95800	95948	95950	95952
							PC BOARD ASSEMBLY									
	C5	CAPACITOR	MALLORY SMC50	.005/500V	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C6	CAPACITOR	MALLORY GP312	120pf	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	C7	CAPACITOR	SPRAGUE 39D	3000/30V	3000/30V	3000/30V	3000/30V	3000/30V	3000/30V	3000/30V	3000/30V	3000/30V	3000/30V	3000/30V	n/a	n/a
	C7	CAPACITOR	STM33C												1800/40V	1800/40V
	C8	CAPACITOR	SPRAGUE 192P	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	.1/80V	.1/80V	.1/80V	.1/80V	.1/80V
	CR3,4	DIODE	T.I. 1N4454	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR5	DIODE	MOTOROLA 1N823A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	CR6	DIODE	SEMTECH 1N4720	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R1	RESISTOR	RC20	10K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R2	RESISTOR	RC20	2K	3K	2K	2K	2K	1K	1K	1K	1K	1K	1K	1K	1K
	R3	RESISTOR	RC20	470	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R4	RESISTOR	RC20	470	680	680	1K	1K	1K	1.5K	2.2K	2.2K	2.2K	2.7K	2.7K	2.7K
	R5,6	RESISTOR	RC20	1.5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R7	RESISTOR	RC20	2K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R8	RESISTOR	RC20	4.7K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R9	RESISTOR	RC20	220K	560K	560K	560K	560K	560K	560K	560K	560K	560K	560K	560K	560K
	R10	RESISTOR	RC20	2.7K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R11	RESISTOR	RC20	47	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R12	RESISTOR	RC20	330	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	P13	POTENTIOMETER	CTS11S	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R14	RESISTOR	RN60C	6.65K	12.4K	17.8K	19.1K	21.0K	22.6K	30.1K	34.8K	34.8K	43.2K	45.3K	54.9K	60.4K
	R15	RESISTOR	RN60C	13K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R16	POTENTIOMETER	CTS11S	5K	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R17	RESISTOR	RC20	300	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R18	RESISTOR	RC20	2.4K	3.6K	4.7K	4.3K	4.7K	6.2K	5.6K	6.2K	7.5K	8.2K	6.8K	7.5K	9.1K
	R19	RESISTOR	RC20	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	2.2K	2.2K	2.2K	2.2K	2.2K
	R20	RESISTOR	RC20	1K	1K	1K	1K	1K	1K	1K	2.2K	2.2K	2.2K	2.2K	3.0K	2.7K
	R21	RESISTOR	RC20	150	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R22-25	RESISTOR	TRC BWH	.2/2W	.2/2W	.2/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W	.51/2W	.51/2W
	R26	RESISTOR	TRC BWH	.2/2W	.2/2W	.2/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W	.51/2W	.51/2W
	R30	RESISTOR	TRC BWH	.2/2W	.2/2W	.2/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W	.51/2W	.51/2W
	R31	RESISTOR	TRC BWH	.2/2W	.2/2W	.2/2W	.3/2W	.3/2W	.3/2W	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT
	R32	RESISTOR	TRC BWH	.2/2W	.2/2W	.2/2W	.3/2W	.3/2W	.3/2W	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT
	R33,34	RESISTOR	TRC BWH	.2/2W	.2/2W	.2/2W	.3/2W	.3/2W	.3/2W	.3/2W	.3/2W	.51/2W	.51/2W	.51/2W	.51/2W	.51/2W
	R35	RESISTOR	RC20	200	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	R36	JUMPER		TC22	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q1	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Q2,3,4	TRANSISTOR	MOTOROLA	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2222A	2N2448	2N2448	2N2448	2N2448	2N2448
	Q5	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

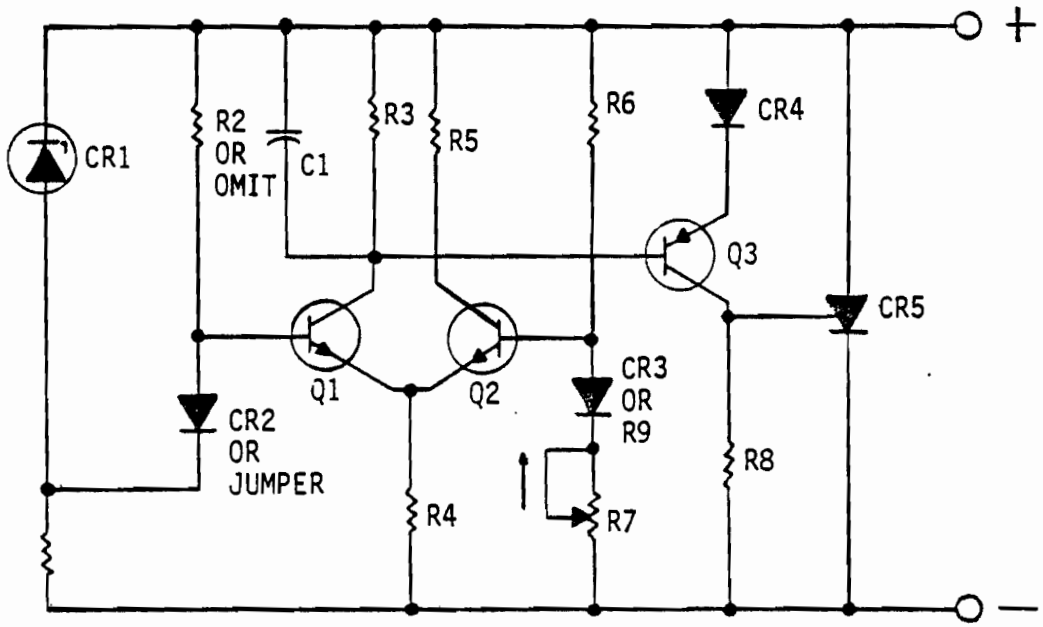
NOTES: 1. SYMBOL ◆ DENOTES PARTS USED ON ALL MODELS
R26-28 not used.

2. ALL CAPACITOR VALUES IN MICROFARADS AND RESISTORS IN OHMS UNLESS OTHERWISE NOTED.

3. * DENOTES TYPICAL VALUE ONLY. PART MAY VARY OR BE OMITTED.

4. MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY. EQUIVALENT PARTS MAY BE USED.

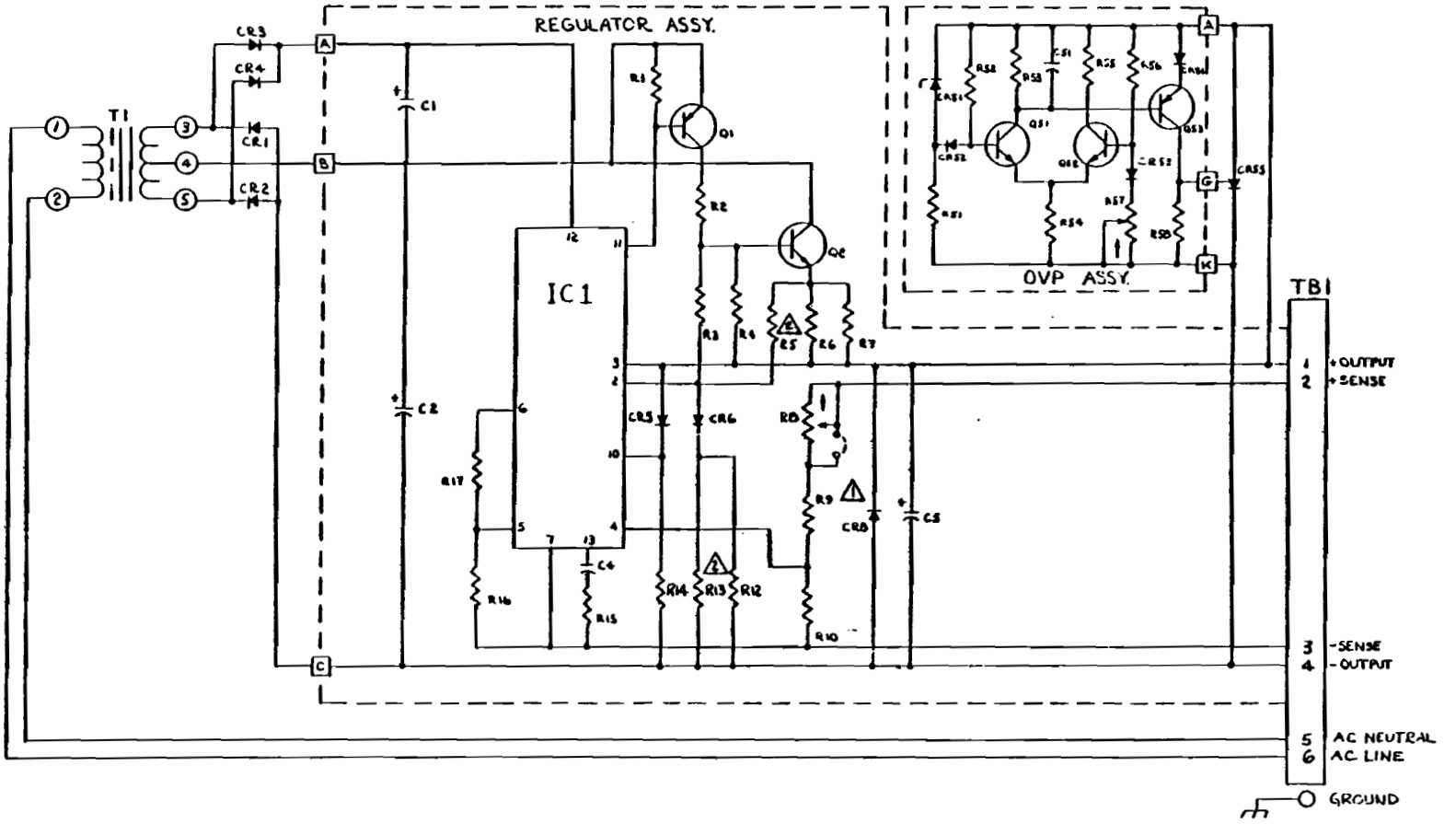
OVP SCHEMATIC AND PARTS LIST



+ TERMINAL OF OVP CONNECTS TO + OUTPUT TERMINAL OF POWER SUPPLY

- TERMINAL OF OVP CONNECTS TO - OUTPUT TERMINAL OF POWER SUPPLY

CKT SYMBOL	DESCRIPTION	4-5V MODELS	6-8V MODELS	10-20V MODELS	22-32V MODELS	MFR.,TYPE
Q1	TRANSISTOR	2N2222A	2N2222A	2N2222A	2N2222A	MOTOROLA
Q2	TRANSISTOR	2N2222A	2N2222A	2N2222A	2N2222A	MOTOROLA
Q3	TRANSISTOR	2N2907	2N2907	2N2907	2N2907	MOTOROLA
CR1	DIODE	1N751A	1N748A	1N751A	1N751A	MOTOROLA
CR2	DIODE	1N4454	JUMPER	JUMPER	JUMPER	G.E.
CR3	DIODE	1N4454	(USE R9)	(USE R9)	(USE R9)	G.E.
CR4	DIODE	1N4454	1N4454	1N4454	1N4454	G.E.
CR5	DIODE	2N682	2N682	2N682	2N682	G.E.
R1	RESISTOR	82 OHM	390 OHM	1K	2.2K	RC20
R2	RESISTOR	10K	OMIT	OMIT	OMIT	RC20
R3	RESISTOR	470 OHM	470 OHM	470 OHM	470 OHM	RC20
R4	RESISTOR	100 OHM	820 OHM	1.2K	2.7K	RC20
R5	RESISTOR	100 OHM	100 OHM	100 OHM	100 OHM	RC20
R6	RESISTOR	4.99K	3.65K	2.05K	1.5K	RN60C
R7	RESISTOR	5K POT.	5K POT.	5K POT.	5K POT.	CTS115
R8	RESISTOR	100 OHM	100 OHM	100 OHM	100 OHM	RC20
R9	RESISTOR	(USE CR3)	1.74K	2.67K	4.99K	RN60C
C1	CAPACITOR	.1MFD	.1 MFD	.1 MFD	.1 MFD	SPRAGUE HY 320



NOTES: THIS IS A COMPOSITE SCHEMATIC. NOT ALL COMPONENTS SHOWN ARE USED IN EVERY MODEL.. REFER TO L/M FOR COMPONENTS USED.

1 JUMPER ON 5 VOLT MODELS

2 MAY VARY OR BE OMITTED.

SCHEMATIC 63-176-000
CASE R8
5, 6, 12, 15, & 24 VOLT.

OEM

CASE R-8

SYMBOL	DESCRIPTION	SUGGESTED MFG/TYPE	5N3.0	6N2.7	12N1.7	15N1.5	24N1.0
					FINAL ASSEMBLY		
CR1,2	DIODE	SEMTECH 1N4720	◆	◆	◆	◆	◆
CR3,4	DIODE	SEMTECH	1N4004	1N4004	OMIT	OMIT	OMIT
Q2	TRANSISTOR	RCA 2N3055	◆	◆	◆	◆	◆
T1	TRANSFORMER	ACDC	96905	96906	96907	96908	96909
					PC BOARD ASSEMBLY		
C1	CAPACITOR	SPRAGUE 502D	500/15V	500/15V	JUMPER	JUMPER	JUMPER
C2	CAPACITOR	STM 33C	12K/15V	12K/15V	5000/35V	5000/35V	2700/50V
C4	CAPACITOR	SPRAGUE C0698	.0047/25V	◆	◆	◆	◆
C5	**CAPACITOR**	**SPRAGUE 502D**	**500/16V**	**500/15V**	**250/25V**	**250/25V**	**200/35V**
CR5	**DIODE**	**SEMTECH 1N4004**	◆	◆	◆	◆	◆
CR6	**DIODE**	**T.I.**	**1N4454**	**1N4454**	**JUMPER**	**JUMPER**	**JUMPER**
CR8	DIODE	SEMTECH 1N4004	◆	◆	◆	◆	◆
IC1	REGULATOR	FAIRCHILD 7	◆	◆	◆	◆	723DC ⚠5
R1	RESISTOR	RC07	2.7K	◆	◆	◆	◆
R2	RESISTOR	PC20	3	◆	◆	◆	◆
R3	RESISTOR	RC07	300	◆	◆	◆	◆
R4	RESISTOR	RC07	100	◆	◆	◆	◆
R5	RESISTOR	RC07	3.3K	◆	◆	◆	◆
R6	RESISTOR	IRC Bwh	.33/2W	.33/2W	3.3Ω	3.3Ω	5.2Ω
R7	RESISTOR	IRC Bwh	.33/2W	.33/2W	OMIT	OMIT	OMIT
R8	POTENTIOMETER	CTS115	5K	◆	◆	◆	◆
R9	RESISTOR	RN60C	JUMPER	2.49K	7.5K	4.3K	10K
R10	RESISTOR	RN60C	15.4K	15.4K	15.4K	15.4K	10.0K
R13	RESISTOR	RC07	1.8K	2.7K	3.3K	5.1K	10K
R14	RESISTOR	RC20	150	180	1K	1.5K	2.2K
R15	RESISTOR	RC07	68	◆	◆	◆	◆
R16	RESISTOR	RN60C	4.12K	4.12K	OMIT	OMIT	OMIT
R17	RESISTOR	RN60C	2.49K	2.49K	1K	1K	1K
Q1	TRANSISTOR	MOTOROLA 2N2905	◆	◆	◆	◆	◆
					OPTIONAL OVP MODULE		
CR55	SCR	MOTOROLA 2N1688	◆	◆	◆	◆	◆
C51	CAPACITOR	MALLORY MDL1210	01 10.	◆	◆	◆	◆
CR51	DIODE	MOTOROLA 1N751A	◆	◆	◆	◆	◆
CR52	DIODE	T.I	1N4454	1N4454	OMIT	OMIT	OMIT
CR53	DIODE	T.I.	1N4454	1N4454	OMIT	OMIT	OMIT
CR54	DIODE	T.I 1N4454	◆	◆	◆	◆	◆
R51	RESISTOR	RC20	300	300	1K	1K	2.2K
R52	RESISTOR	RC07	10K	10K	OMIT	OMIT	OMIT
R53	RESISTOR	RC07	470	◆	◆	◆	◆
R54	RESISTOR	RC20	560	◆	◆	◆	◆
R55	RESISTOR	RC07	100	◆	◆	◆	◆
R56	RESISTOR	RN60C	4.99K	4.99K	2.05K	2.05K	3.5K
R58	RESISTOR	RC07	100	◆	◆	◆	◆
R59	RESISTOR	RN60C	OMIT	OMIT	2.67K	2.67K	4.99K
Q51,52	TRANSISTOR	MOTOROLA 2N2222A	◆	◆	◆	◆	◆
Q53	TRANSISTOR	MOTOROLA 2N2907A	◆	◆	◆	◆	◆

NOTES: 1 SYMBOL ◆ DENOTES PARTS USED ON ALL MODELS.

5. SELECT FOR INPUT VOLTAGE 0.5 - 50

2. ALL CAPACITOR VALUES IN MICROFARADS AND RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED.

3. DENOTES TYPICAL VALUE ONLY PART MAY VARY OR BE OMITTED

4. MANUFACTURE AND TYPE ARE FOR REFERENCE ONLY. EQUIVALENT PARTS MAY BE USED.