INSTRUCTIONS

GEK-86065A
Supersedes GEK-86065

STATIC RELAY POWER SUPPLY

TYPE SSA

(0246A9983P-1 to 0246A9983P-6)

(0246A9983P-21 to 0245A9983P-26)

THIS INSTRUCTION BOOK IS FURNISHED FOR THE PURPOSE OF FACILITATING USE AND MAINTENANCE OF THIS POWER SUPPLY. THE FURNISHING OF THIS INSTRUCTION BOOK SHALL IN NO WAY BE CONSTRUED AS A LICENSE OR PERMISSION TO USE THE INFORMATION CONTAINED IN THIS INSTRUCTION BOOK FOR ANY OTHER PURPOSE.

CONTENTS

STATIC RELAY POWER SUPPLY
TYPE SSA

(0246A9983P-1 to 0246A9983P-6)
(0246A9983P-21 to 0246A9983P-26)

INTRODUCTION

The Type SSA power supply is designed for operation from the station battery to provide an isolated, regulated low voltage DC supply for use with rack mounted static relays. Components of the power supply are mounted in a metal enclosure as shown in Figure 1, which is designed for mounting on a standard 19-inch rack. The power supply unit is two rack units high (3-1/2 inches) and 14 inches deep.

APPLICATION

The Type SSA power supply is designed for use with static protective relays that require an isolated, regulated dual 15 volt DC supply (plus or minus 15 volts with midpoint reference) for logic circuit operation. It is recommended that a battery clamp be used in conjunction with static relays. One clamp should be used per battery or per physical location. The battery clamp should be connected to the battery so that it is always connected to the DC supply of the equipments that the clamp is to protect, and so that it cannot be isolated by switches or fuses in the DC distribution systems.

RATINGS

The Type SSA power supply is designed to operate from station battery voltages of 48, 110, 125, 220 and 250 volts DC, depending on the model used. The power supply output voltages have nominal values with respect to the reference bus of the plus or minus 15 volts DC. The maximum output current on each polarity is either 1.5 or 3.0 amperes, depending on the model used (see Table I). The alarm contacts will make and carry three amperes continuously, and will interrupt 180 volt-amperes resistive (60 volt-amperes inductive).

TABLE I

MODEL	INPUT VOLTAGE	OUTPUT CURRENT
246A9983P-1, 21	48 VDC	1.5 amp
246A9983P-2, 22	110/125 VDC	1.5 amp
246A9983P-3, 23	220/250 VDC	1.5 amp
246A9983P-4, 24	48 VDC	3.0 amp
246A9983P-5, 25	110/125 VDC	3.0 amp
246A9983P-6, 26	220/250 VDC	3.0 amp

BURDENS

Typical current drain of the power converters from the station battery is given in Table II below.

TABLE II

MODEL NUMBER (Input Range)	BATTERY VOLTAGES							
	38V	48V	88V	110V	125V	176V	220V	250V
P1 (48-1.5) (38V-58V)	1.84A	1.46A	X	X	X	X	X	X
P2 (125-1.5) (88V-150V)	X	X	0.8A	0.64A	0.56A	X	X	X
P3 (250-1.5) (176V-300V)	X	X	X	X	X	0.4A	0.32A	0.28A
P4 (48-3) (38V-58V)	3.68A	2.92A	X	X	X	X	X	X
P5 (125-3) (88V-150V)	X	X	1.6A	1.23A	1.12A	X	X	X
P6 (250-3) (176V-300V)	X	X	X	X	X	0.8A	0.64A	0.56A

DESCRIPTION

The major components of the power converters are divided into six functional subassemblies:

A1 - Input filter (auxiliary regulator and signal lamps)
A2 - Power switching and control
A3 - Plus 15 volt output series regulator
A4 - Minus 15 volt output series regulator
A5 - OV/UV Relay and OV "crowbar"
A6 - Output

The internal connection diagrams are shown in Figures 2 and 2A; the component location diagram is shown in Figure 3.

Parts 1 through 6 are the same as parts 21 through 26, except for the indicating lights on the front panel. The former use two LED lights, while the latter use two GE ET-16 lights.

SUBASSEMBLY DESCRIPTION

A1 - Input Filter

The input filter includes components that provide both differential and common mode rejection of the converter switching noise. This subassembly also provides a stabilized source of control circuit operating voltage (16 volts) through Q1, for startup. This source is disconnected through normally closed contacts on the OV/UV relay, K1, when the converter is operating between the overvoltage (17 volts) and the undervoltage (13 volts) limits. The part locations are shown in Figure 4.

A2 - Power Switching and Control

The power switches, Q9 and Q10, are simultaneously driven on and off through driver transformer T1 to apply the filtered input voltage to the primary of T2. The switching frequency, approximately 15 KHz, is generated by U2, and is adjusted to a 33 microsecond 1/2 period by R56. C19, R57 and R56 form the frequency determining network. The output transformer (T2) winding voltage is sensed using isolated winding 3-4, which also provides operating power to the control circuit when the converter is operating within normal limits. U1 compares this voltage to a reference provided by D4 through R35, and produces a trigger pulse to the gate of SCR Q5 to terminate the "on" period of Q9 and Q10. Control of this "on" period governs the amount of energy supplied through the T2 output windings, 5-6 and 7-8, and the output rectifiers, D26 and D27, to the output integrating filter capacitors, C31 and C36. C30-C39 and L5-L8 provide both differential and common-mode noise rejection for each output. The connections to the output circuit breakers are made within these filter circuits.

The switching regulator action is adjusted by R35 to maintain a minimum worst case (input voltage and full output load) voltage at the inputs to A3 (plus 15 volts) and A4 (minus 15 volts) of 17.5 volts for the 1.5 ampere models, and 18.1 volts for the 3.0 ampere models. The part locations are shown on Figure 5.

A3/A4 - Plus 15/Minus 15 Volt Series Regulators

These identical subassemblies use the monolithic integrated circuit LM338 (U3, U4) series regulator to achieve the precise final output voltage regulation. U3 and U4 are directly mounted to their respective heat sinks. This connects the U3 heat sink to the plus 15 volt output, and the U4 heat sink to the plus or minus 15 volt output common or return. The heat sinks are electrically isolated from the chassis by TEFLON stand-off bushings.

The output voltages are adjustable over a narrow range (plus or minus 0.25 volt) by the twenty-turn pots, R102 (plus 15 volts) and R105 (minus 15 volts). Adjustments made which increase the output level (either polarity) to 15.25 volts should be accompanied with an adjustment of R35 to increase the input voltage to the series regulators by the same amount, e.g., 17.6 volts + 0.25 volts = 17.85 volts at at 1.5 ampere load; and 18.1 volts + 0.25 volt = 18.35 volts at a 3.0 ampere load. These regulator input source voltages may be measured for the plus 15 volt regulator from output common to TP1 (a pin located between J3 and R102) and for the minus 15 volt regulator from minus 15 volts OUT to TP2 (located between J4 and R105). The part locations are shown on Figure 6.

A5 - OV/UV Relay and OV Crowbar

This subassembly measures each output voltage and energizes the OV/UV relay (K1) when both outputs are between plus or minus 13 ±0.5 volts and plus or minus 17 ±0.5 volts. Each limit is independently adjustable should trimming be necessary.

- R77 adjusts the plus 17 volt limit
- R84 adjusts the minus 17 volt limit
- R85 adjusts the plus 13 volt limit
- R90 adjusts the minus 13 volt limit

When K1 is de-energized, the red lamp on the front panel is activated, and the form C contacts wired to PA4, PA5 and PA6 are switched for remote alarm activation.

In addition, circuitry to sense if either output exceeds 18.5 plus or minus one volt to trigger the crowbar, SCR-Q19, is incorporated on A5. SCR Q19 is located on subassembly A6. Once triggered on, Q19 clamps both outputs to less than one volt, and causes both poles of the output circuit breaker to trip open. The part locations are shown on Figure 7.

A6 - Output

This subassembly interconnects all ten output connectors, and includes the final output filter capacitors, test jack connections, crowbar SCR-Q19, and output-to-common diode clamps for reactive load current control. The part locations are shown on Figure 8.

OVERCURRENT PROTECTION

A double pole magnetic circuit breaker is connected in the converter ahead of the plus or minus 15 volt output series regulators with one pole in each circuit. Each pole has a two ampere rating for 1.5 ampere units, or a three ampere rating for the 3.0 ampere units. The two poles are mechanically connected so that both outputs will be removed if either side trips. When the breaker trips (or is manually operated), the OV/UV relay is de-energized due to the loss of output voltages. The power switch, or the switch on the equipment test panel, should be used to turn DC power off and on. The circuit breaker may activate both logic voltage polarities unevenly, and cause undesired outputs.

The following tests may be made to insure that the power converter is operating correctly.

Test Equipment

- Voltmeter: Capable of 10 millivolt resolution, e.g., 3-1/2 digit Digital Voltmeter.
- Ammeter: Capable of reading one to five amperes
- Variable load resistor: Two - 3 ohms to 15 ohms, 75 watt minimum, or fixed load resistors: three - 10 ohm, 50 watt minimum

- Power resistor: 75 to 100 ohm, 10 watt minimum, if external voltage sources are used to test OV/UV/crowbar.
- Connectors: to mate to converter output connectors
- Variable voltage power source appropriate for converter being tested, or a suitable tapped battery.

Test Procedures

1. Make sure that the power source or battery is compatible with the converter to be tested. Set at the nominal voltage for the unit under test.
2. Connect positive (+) power lead to PA2, negative (-) lead to PA3 (one of these lines should be appropriately fused if a current-limited power source is not used), and station ground, if available, to PA1. A connection to PA1 is not required for these tests.
3. Close the input power switch, S1. The green and red lamps should come on.
4. Close the overcurrent circuit breaker. The red lamp should go out, the OV/UV relay contacts on PA4, PA5 and PA6 should transfer, and plus or minus 15 volts should appear on all power supply connectors and the test jacks on the front panel. The voltages should be plus or minus 15 ±0.1 volt. It is important to measure the voltages on the test jacks, or an output connector that is not being loaded, to avoid contact drops due to load current.
5. Minor corrections (plus 0.25 volt maximum) may be made to either output voltage by adjusting pots R102 for plus 15 volts and R105 for minus 15 volts.
6. Load regulation may be checked by connecting either the variable loads with ammeters to the outputs, or connecting one 10 ohm resistor to each output for the 1.5 ampere converters, or two 10 ohm resistors for the 3.0 ampere converters. The output voltages should remain within plus or minus 15 ±0.1 volts when fully loaded.
7. Line regulation may be checked with the converter at full (or half) load by adjusting the input voltage over the specified range. The output voltages should remain in the range of plus or minus 15 ±0.1 volts.
8. The operation of the overcurrent breaker may be tested by increasing the load current to 150 percent of rated current and observing circuit breaker operation within ten seconds. Each 10 ohm resistor (if used) will draw 1.5 amperes. Therefore, for overcurrent test, use two for the 1.5 ampere unit and three (on separate output connectors or in parallel) for the 3.0 ampere unit.
9. Testing the overvoltage, undervoltage and crowbar trip points for these converters is a more complex procedure if external sources of adjustable, current-limited voltages (plus 13 to plus 20 volts DC) are not available. If two sources, positive and negative, are available, they may be connected to the appropriate output terminal or test jack through a current limiting 75-100 ohm (10 watt

minimum) resistor (or set current-limited sources for 100 to 250 milliamperes). Open the overcurrent circuit breaker before connecting external voltage sources. Set one source at 15 volts, vary the other from below 13 volts DC to over 17 volts DC, while measuring the voltage on an unloaded output connector. The relay should close-in (red lamp goes out) at 13 ±0.5 volts, and reopen (red lamp on) at 17 ±0.5 volts. Repeat the process for the other output voltage polarity. The crowbar trip point of 18.5 ±1 volts may be verified by continuing to increase either voltage to the point where the SCR is triggered and shorts out both external sources. These external sources must be current-limited as described to avoid damaging the crowbar when it operates. Remove the external voltages to reset the crowbar.

If only one external voltage source is available to perform this test sequence then, with the cover off the converter, either the P5 (plus 15 volts) or P6 (minus 15 volts) plugs may be disconnected from the output board, and the external sources connected to an output terminal of the polarity that was disconnected. The test sequence is performed as above, and alternated for the other polarity. Make sure to securely seat the reconnected P5 or P6 when testing is completed. The circuit breaker will operate when the crowbar voltage is tested.

If external variable, current-limited voltage sources are not available, the following procedure may be used. **Make sure to follow carefully the final readjustment procedure after testing, before putting the converter into service.**

Remove the short circuit from the plus 15 volt output and TP1. Connect the short circuit from the output common to TP2 (a pin on A4 similar to TP1 on A3), and repeat the test sequence for the minus 15 volt output. If the lower voltage (plus or minus 13 volts) cannot be reached satisfactorily, increase the load currents on both outputs to two amperes at the low voltage (plus or minus 13 volts). Remove the short circuit to TP2.

Perform the following final readjustment procedure:

Measure the voltage from output common to TP1 (on A3). Adjust R35 until this voltage is approximately 19 volts. Measure, and adjust if necessary, the plus or minus 15 volt outputs to plus or minus 15.0 volts DC. Set the output currents to the maximum rated currents, 1.50 amperes for the 1.5 ampere unit, and 3.0 amperes for the 3.0 ampere unit. measure the source voltages for both A3 and A4 (A3: measure from output common to TP1; A4: measure from minus 15 volts output to TP2). Adjust R35 until the lowest of either voltage is 17.6 volts for the 1.5 ampere unit, or 18.1 volts for the 3.0 ampere unit. It is important that this final adjustment is made at the maximum load conditions for each type of unit to insure adequate regulator source voltages. If a higher load is used, it will cause a larger than normal power dissipation.

EXTERNAL BATTERY CLAMP

NOTE: The battery clamp is not included in the Type SSA power supply and may not be supplied on all equipments using the Type SSA power supply.

Description

The battery clamp provides protection against transient voltages which may appear on the station battery leads at the relay or cabinet external connections terminal block. A typical battery clamp internal connecton diagram is shown in Figure 9, and outline and mounting dimensions are shown in Figure 11.

The function of the battery clamp is two-fold. The first is to absorb transients which may appear between the battery leads. This is accomplished without allowing a significant voltage change between either lead and the relay surge ground.

The second function is to prevent an incoming surge voltage from causing either the positive or negative battery lead to be driven more than a limited potential difference from the relay ground. The positive battery supply lead cannot assume a positive potential greater than battery voltage, nor a negative potential of more than one volt relative to relay surge ground; and the negative battery supply lead cannot assume a negative potential greater than battery voltage, nor a positive potential of more than one volt relative to relay surge ground.

Normal Operating Conditions

In most stations, under normal operating conditions, the battery voltage is divided by ground indicating lamps, or by other high impedance devices, so that each battery lead is one-half of the battery voltage relative to the relay surge ground. The battery clamp, which is connected to the supply circuits, as shown in Figure 10A, rests with capacitors charged to one-half of battery voltage. The two diodes have this voltage impressed across them in the reverse, or blocking direction.

Solenoids As Surge Voltage Sources

The voltage induced in a solenoid operating coil when the current through the coil is interrupted is determined only by the rate at which the coil current is forced to decay. If the interrupting contact parts rapidly enough, and if the insulation surrounding the contact is weak, this induced voltage may be sufficient to establish an arc to ground. The voltage drop across the arc will be relatively low and constant. If the battery clamp is not used, the remaining impedance in the arc current path is the battery ground lamp. Figure 10B illustrates these conditions.

The collapsing magnetic field of the coil tends to maintain the original magnitude of current flowing in the coil turns, and this current must be driven through the high impedance of the ground lamp. Consequently, a high voltage appears across the lamp. The result is a large voltage swing on the battery leads with respect to ground. The polarity of this voltage causes the lead to which the coil is directly connected to assume a potential with respect to ground which is opposite from normal.

Battery Clamp Operation

If the conditions described in the above paragraph on "Solenoids as Surge Voltage Sources," and shown in Figure 10B exist, the negative battery lead might be driven as much as 1.5 KV, positive with respect to ground (or the positive lead driven negative, with respect to ground). Placing a low impedance, such as the forward impedance of a rectifier, between the lead and ground in parallel with the ground lamp, will limit the voltage swing of that lead. This is shown in Figure 10C.

With this connection, the solenoid current has a low impedance path through which to flow to dissipate the energy in its magnetic field. The induced voltage is kept low, and the battery lead is held within one volt of ground potential, one volt being the approximate voltage drop across the rectifier. Since one battery lead is clamped at ground, the maximum value that the other lead can assume is either plus or minus battery voltage, depending upon which lead is grounded. If a rectifier is placed between each lead and ground, both leads will be clamped at ground potential.

<u>Low Energy Transients Between Battery Leads</u>

It was assumed in the previous paragraphs that the battery leads were held by the battery at a constant potential difference. Because these leads have self-inductance, a current flowing in them results in stored energy that must be dissipated when the current is interrupted. Since the inductance is small, the total stored energy is low, but the self-inductance voltage when the current is rapidly interrupted may be very high. However, this energy can be absorbed by the battery clamp capacitor with only a small change in the voltage between the leads. The stored energy is thereby transferred to the capacitors, and ultimately dissipated in the load circuit without a significant voltage change between the relay surge ground and either of the battery leads at the location of the ground lamps.

CONSTRUCTION

All power supply components are mounted in a metal enclosure two rack units in height. Both the cover and the bottom of the power supply are perforated steel, which allows for ventilation of the heat sinks.

External connections to the power supply are made at the back of the unit. Sockets for interconnecting the power supply output with the static relay logic units are marked "PS." Arrangement of these sockets is shown on the SSA component location drawing, Figure 3. All inputs, and all other outputs, are made on the 12-point PA terminal strip, using screw-type connections.

The test points are brought out to the front panel, providing access to the two output voltages and reference.

<u>CAUTION</u>

THE LOGIC SYSTEM SIDE OF THE TYPE SSA DC POWER SUPPLY USED WITH MOD III STATIC RELAY EQUIPMENT IS ISOLATED FROM GROUND. IT IS A DESIGN CHARACTERISTIC OF MOST ELECTRONIC INSTRUMENTS THAT ONE OF THE SIGNAL INPUT TERMINALS IS CONNECTED TO THE INSTRUMENT CHASSIS. IF THE INSTRUMENT USED TO TEST THE RELAY EQUIPMENT IS ISOLATED FROM GROUND, ITS CHASSIS MAY HAVE AN ELECTRICAL POTENTIAL WITH RESPECT TO GROUND. THE USE OF A TEST INSTRUMENT WITH A GROUNDED CHASSIS WILL NOT AFFECT THE TESTING OF THE EQUIPMENT. HOWEVER, A SECOND GROUND CONNECTION TO THE EQUIPMENT, SUCH AS A TEST LEAD

INADVERTENTLY DROPPING AGAINST THE RELAY CASE, MAY CAUSE DAMAGE TO THE LOGIC CIRCUITRY. NO EXTERNAL TEST EQUIPMENT SHOULD BE LEFT CONNECTED TO THE STATIC RELAYS WHEN THEY ARE IN PROTECTIVE SERVICE, SINCE TEST EQUIPMENT GROUNDING REDUCES THE EFFECTIVENESS OF THE ISOLATION PROVIDED.

RECEIVING, HANDLING AND STORAGE

The Type SSA power supply will normally be supplied as part of a static relay equipment, mounted in a rack or cabinet with other static relays and test equipment. Immediately upon receipt of a static relay equipment, it should be unpacked and examined for any damage sustained in transit. If damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Sales Office.

Reasonable care should be exercised in unpacking the equipment. If the equipment is not to be installed immediately, it should be stored indoors in a location that is free from moisture, dust, metallic chips, and severe atmospheric contaminants.

Just prior to final installation the shipping support bolt should be removed from each side of all relay units, to facilitate possible future unit removal for maintenance. These shipping support bolts are approximately eight inches back from the relay front panel. STATIC RELAY EQUIPMENT, WHEN SUPPLIED IN SWING RACK CABINETS, SHOULD BE SECURELY ANCHORED TO THE FLOOR OR TO THE SHIPPING PALLET TO PREVENT THE EQUIPMENT FROM TIPPING OVER WHEN THE SWING RACK IS OPENED.

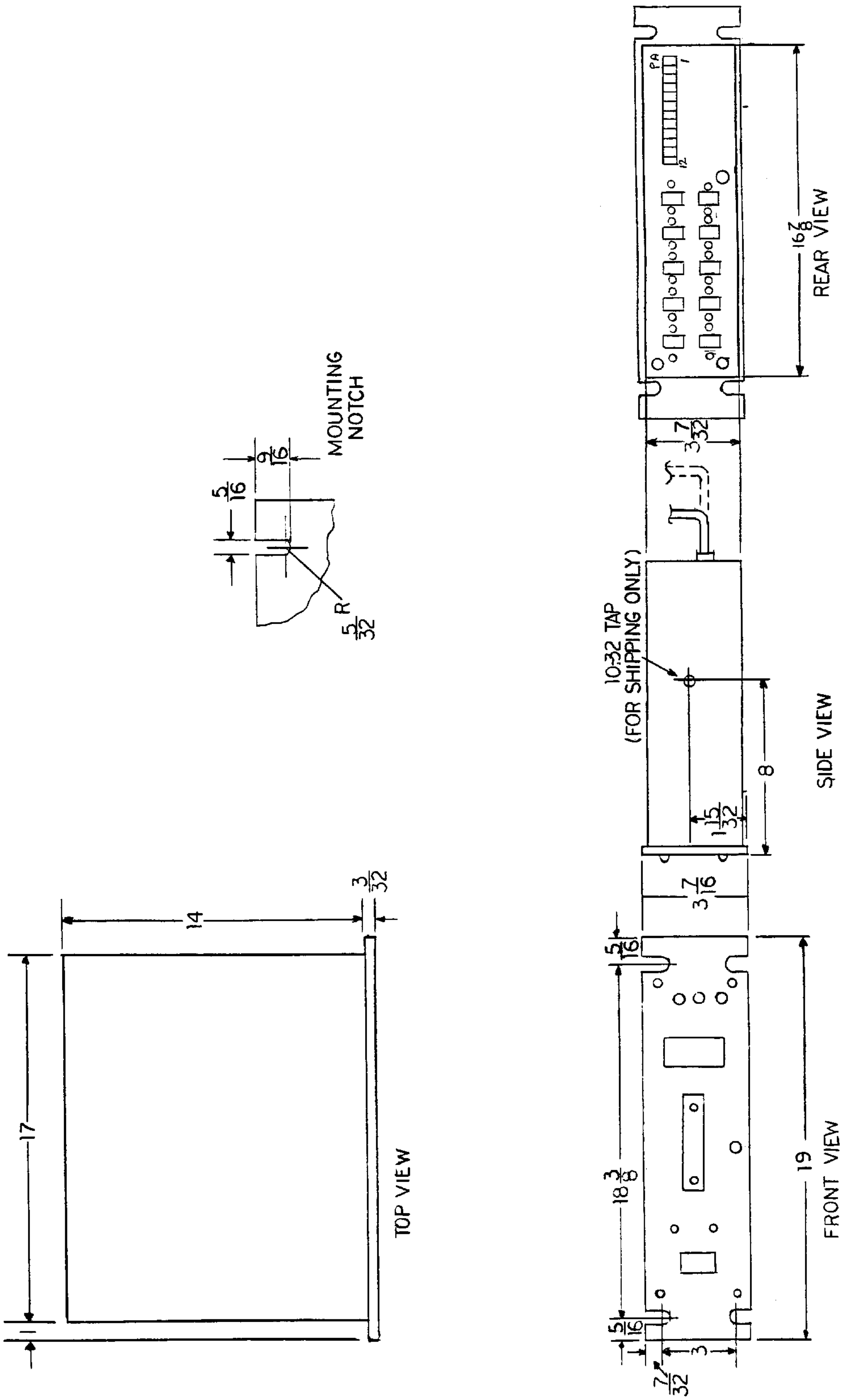
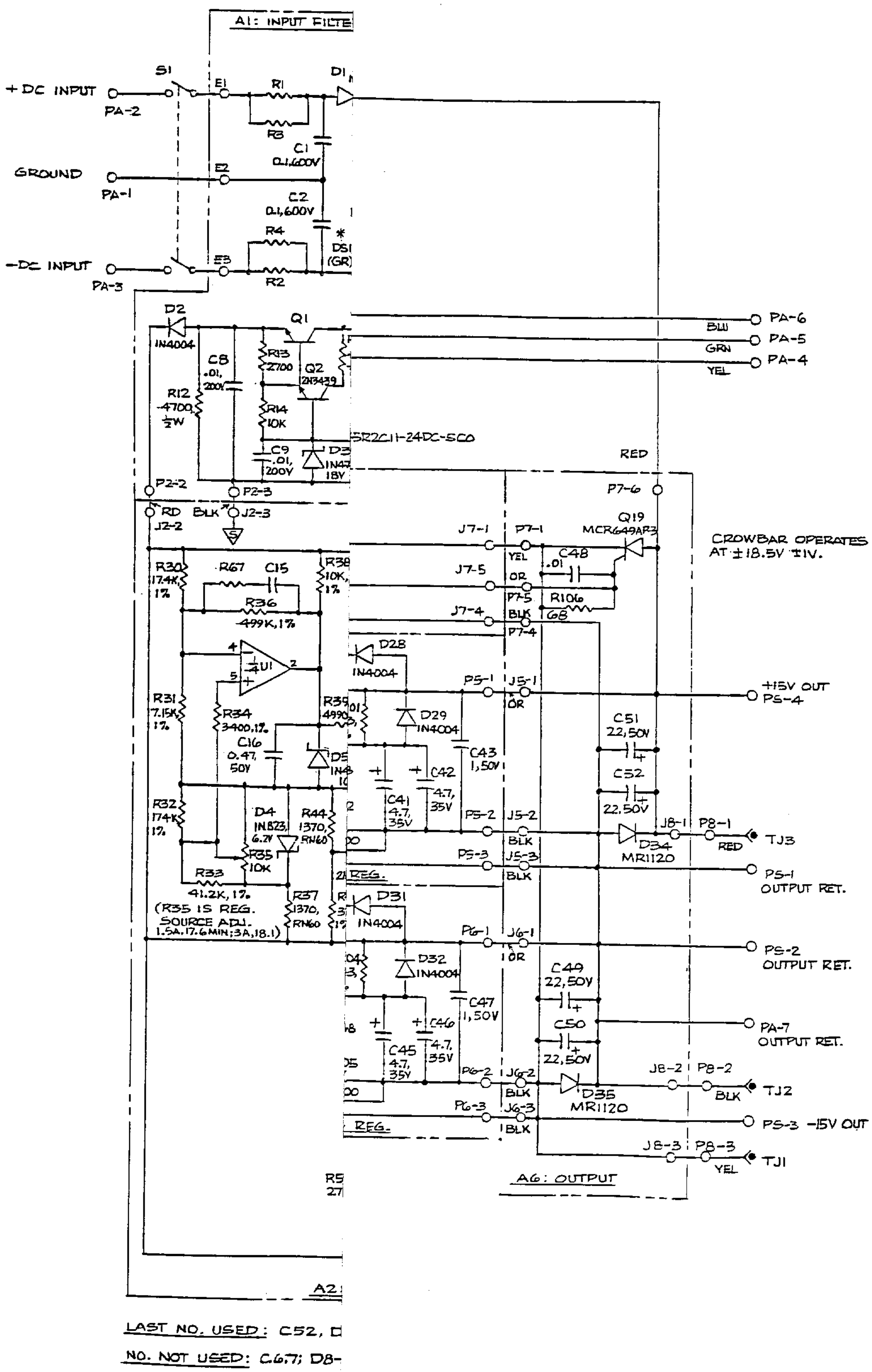


Figure 1 (0138B7693-0) Outline and Mounting Dimensions
for the Type SSA Power Supply



61-1, Sh. 1) Internal Connections Diagram
r the Type SSA Power Supply

P1 48 VDC, 1.5A	P4 48 VDC, 3A	P2 125 VDC, 1.5A	P5 125 VDC, 3A	P3 250 VDC, 1.5A	P6 250 VDC, 3A
470µF, 100V	470µF, 100V	170µF, 250V	170µF, 250V	170µF, 250V	170µF, 250V
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	170µF, 250V	170µF, 250V
NOT USED.	470µF, 100V	NOT USED	170µF, 250V	NOT USED.	170µF, 250V
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	NOT USED.	170µF, 250V
2200pF, 100V	2200pF, 100V	2200pF, 100V	2200pF, 100V	2200pF, 100V	2200pF, 100V
2 AMP	3 AMP	2 AMP	3 AMP	2 AMP	3 AMP
A115B	A115B	A115C	A115C	A115M	A115M
A115B	A115B	A115C	A115C	A115M	A115M
A115B	A115B	A115C	A115C	A115M	A115M
A115B	A115B	A115C	A115C	A115M	A115M
2N5038	2N5038	2N6250	2N6250	2N6675	2N6675
2N5038	2N5038	2N6250	2N6250	2N6675	2N6675
2N5038	2N5038	2N6250	2N6250	2N6675	2N6675
0.3Ω, 3W	0.3Ω, 3W	0.3Ω, 3W	0.3Ω, 3W	1.5Ω, 3W	1.5Ω, 3W
0.3Ω, 3W	0.3Ω, 3W	0.3Ω, 3W	0.3Ω, 3W	1.5Ω, 3W	1.5Ω, 3W
0.3Ω, 3W	0.3Ω, 3W	NOT USED.	NOT USED.	NOT USED.	NOT USED.
0.3Ω, 3W	0.3Ω, 3W	NOT USED.	NOT USED.	NOT USED.	NOT USED.
3900Ω, 2W	3900Ω, 2W	3900Ω, 2W	3900Ω, 2W	9100Ω, 2W	9100Ω, 2W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	3900Ω, 2W	3900Ω, 2W	9100Ω, 2W	9100Ω, 2W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	3900Ω, 2W	3900Ω, 2W	9100Ω, 2W	9100Ω, 2W
3900Ω, 2W	3900Ω, 2W	3900Ω, 2W	3900Ω, 2W	9100Ω, 2W	9100Ω, 2W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	3900Ω, 2W	3900Ω, 2W	9100Ω, 2W	9100Ω, 2W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	3900Ω, 2W	3900Ω, 2W	9100Ω, 2W	9100Ω, 2W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	1000Ω, 5W	1000Ω, 5W	1000Ω, 5W	1000Ω, 5W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	1000Ω, 5W	1000Ω, 5W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	680Ω, 3W	680Ω, 3W
10KΩ, 1/2W	10KΩ, 1/2W	27KΩ, 2W	27KΩ, 2W	27KΩ, 2W	27KΩ, 2W
REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	REPLACE WITH JUMPER.	56KΩ, 2W	56KΩ, 2W
180Ω, 2W	180Ω, 2W	250Ω, 3W	250Ω, 3W	250Ω, 3W	250Ω, 3W
NOT USED.	NOT USED.	NOT USED.	NOT USED.	56KΩ, 2W	56KΩ, 2W
NOT USED.	NOT USED.	NOT USED.	NOT USED.	56KΩ, 2W	56KΩ, 2W
NOT USED.	NOT USED.	NOT USED.	NOT USED.	NOT USED.	56KΩ, 2W
NOT USED.	NOT USED.	NOT USED.	NOT USED.	NOT USED.	56KΩ, 2W
5.6Ω, 3W	2.2Ω, 3W	15Ω, 3W	8.2Ω, 3W	27Ω, 3W	15Ω, 3W
5.6Ω, 3W	2.2Ω, 3W	15Ω, 3W	8.2Ω, 3W	27Ω, 3W	15Ω, 3W
1000Ω, 1/4W	1000Ω, 1/4W	1000Ω, 1/4W	1000Ω, 1/4W	1000Ω, 1/4W	1000Ω, 1/4W
31A0660	31A0661	31A0662	31A0663	31A0664	31A0665

SH. 1 THIS DWG.

Figure 2A (0145D9061-1, Sh. 2) List of Parts for Various Power Supply Models

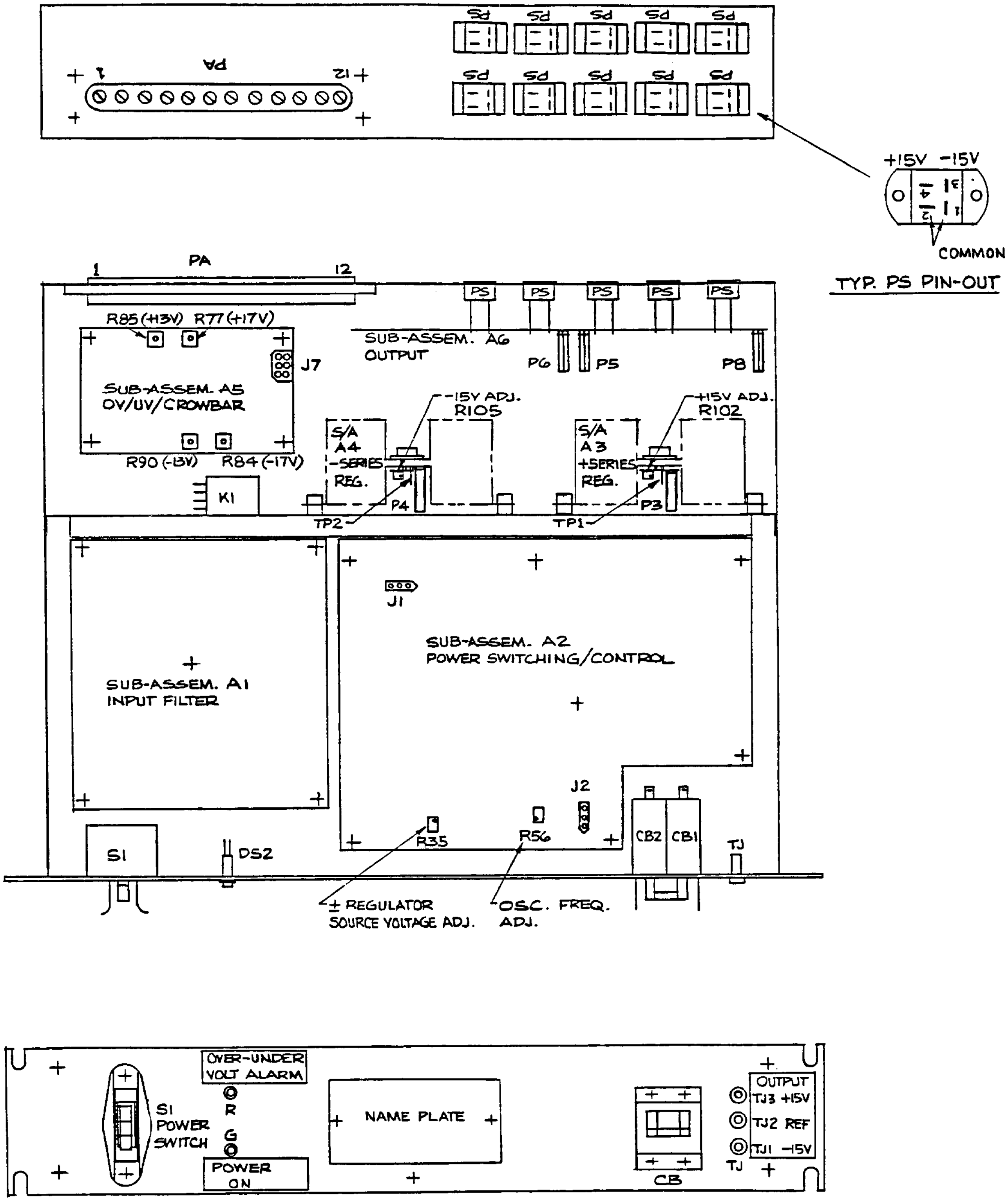


Figure 3 (0179C6370-0) Component Location Diagram
for the Type SSA Power Supply

TABLE-1

FIND NOS.	48V IN (P1 or P4)	125V IN (P2 or P5)	250V IN (P3 or P6)
R3, R4	✓	NOT USED.	NOT USED.
R6, R7	REPLACE WITH W1.	✓	✓
R10, R11	REPLACE WITH W2.	✓	✓
R16	REPLACE WITH W4.	✓	✓
R17, R18		REPLACE WITH W5.	✓
R20	REPLACE WITH W3.	REPLACE WITH W3.	✓
R19	½ WATT	2 WATT	2 WATT
R21	2 WATT	3 WATT	3 WATT

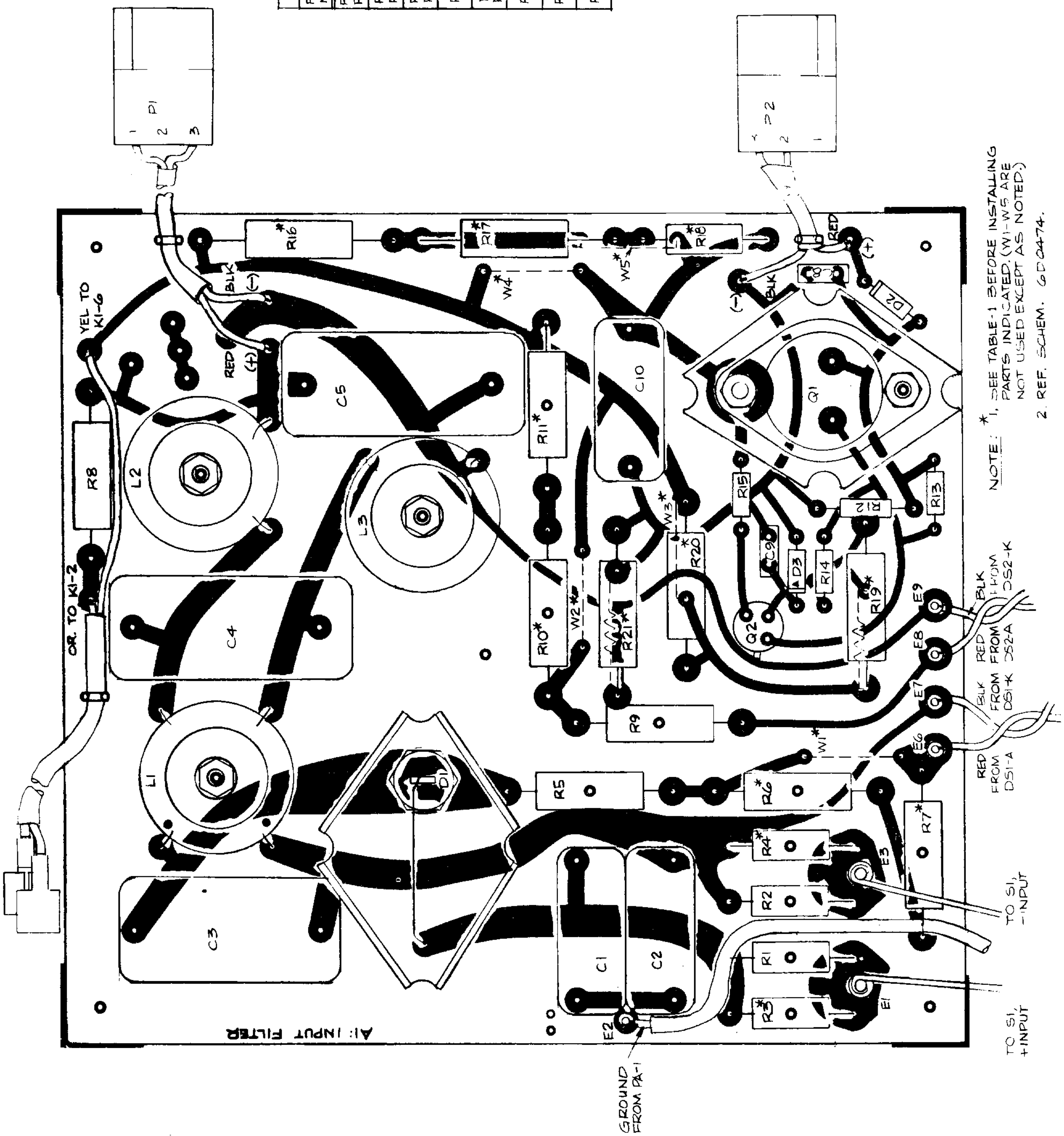


Figure 4 - A1 Board Parts Location

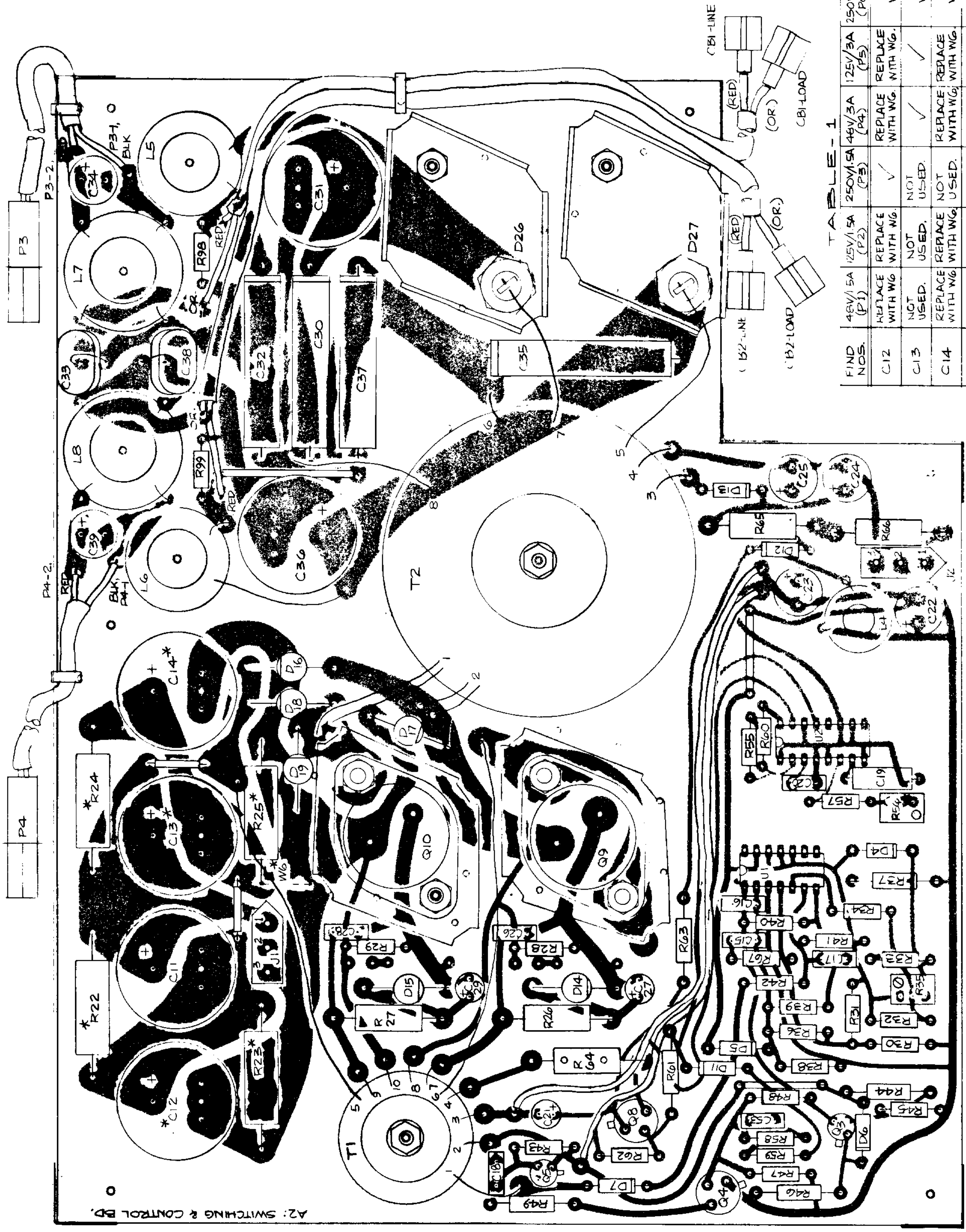


TABLE - 1

FIND NOS.	48V/1.5A (P1)	125V/1.5A (P2)	250V/1.5A (P3)	48V/3A (P4)	125V/3A (P5)	250V/3A (P6)
C12	REPLACE WITH W6	REPLACE WITH W6.	✓	REPLACE WITH W6.	REPLACE WITH W6.	✓
C13	NOT USED.	NOT USED.	NOT USED.	✓	✓	✓
C14	REPLACE WITH W6.	REPLACE WITH W6.	NOT USED.	REPLACE WITH W6.	REPLACE WITH W6.	✓
R22	NOT USED.	NOT USED.	✓	NOT USED.	NOT USED.	✓
R23	NOT USED.	NOT USED.	✓	NOT USED.	NOT USED.	✓
R24	NOT USED.	NOT USED.	NOT USED.	NOT USED.	NOT USED.	✓
R25	NOT USED.	NOT USED.	NOT USED.	NOT USED.	NOT USED	✓

* THESE PARTS TO BE INSTALLED PER TABLE-1.
(W6 IS NOT USED EXCEPT AS NOTED)

Figure 5 - A2 Board Parts Location

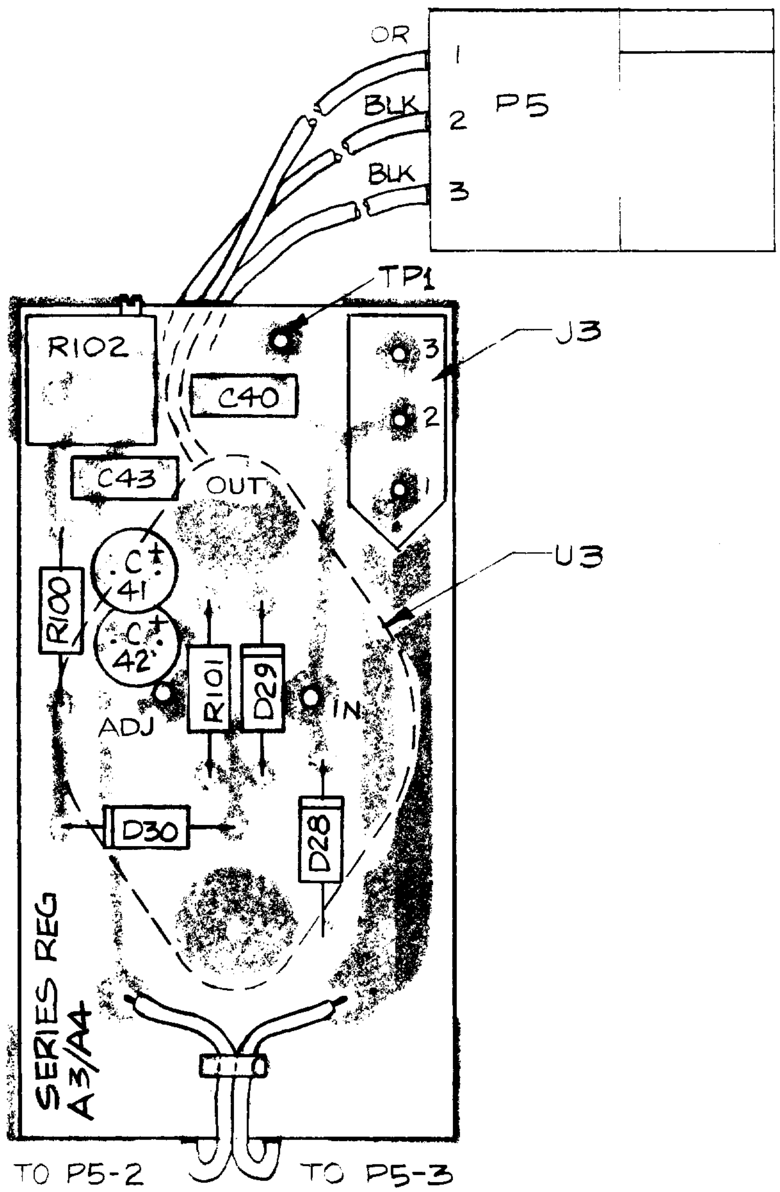


Figure 6 - A3/A4 Boards Parts Location

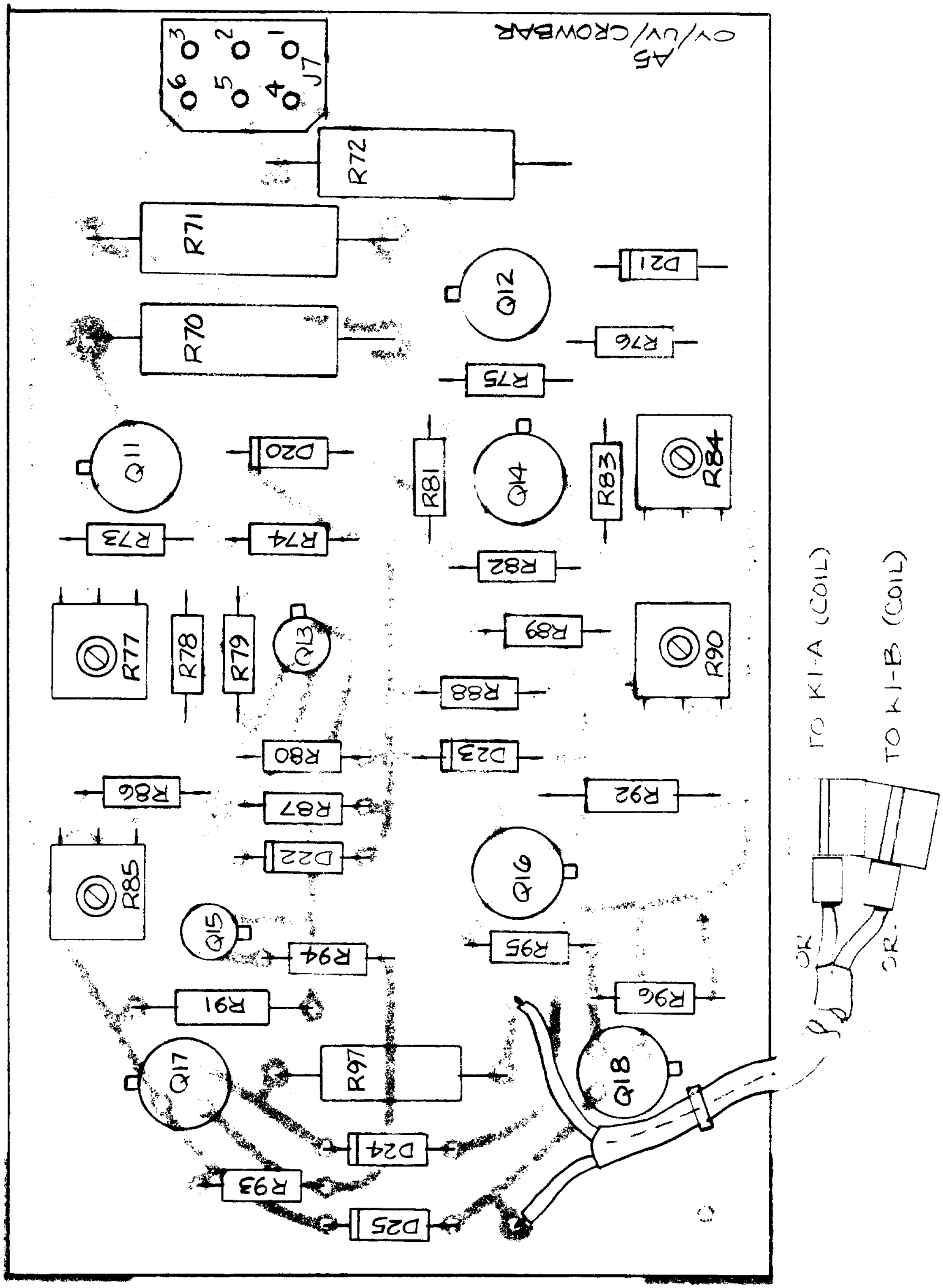


Figure 7 - A5 Board Parts Location

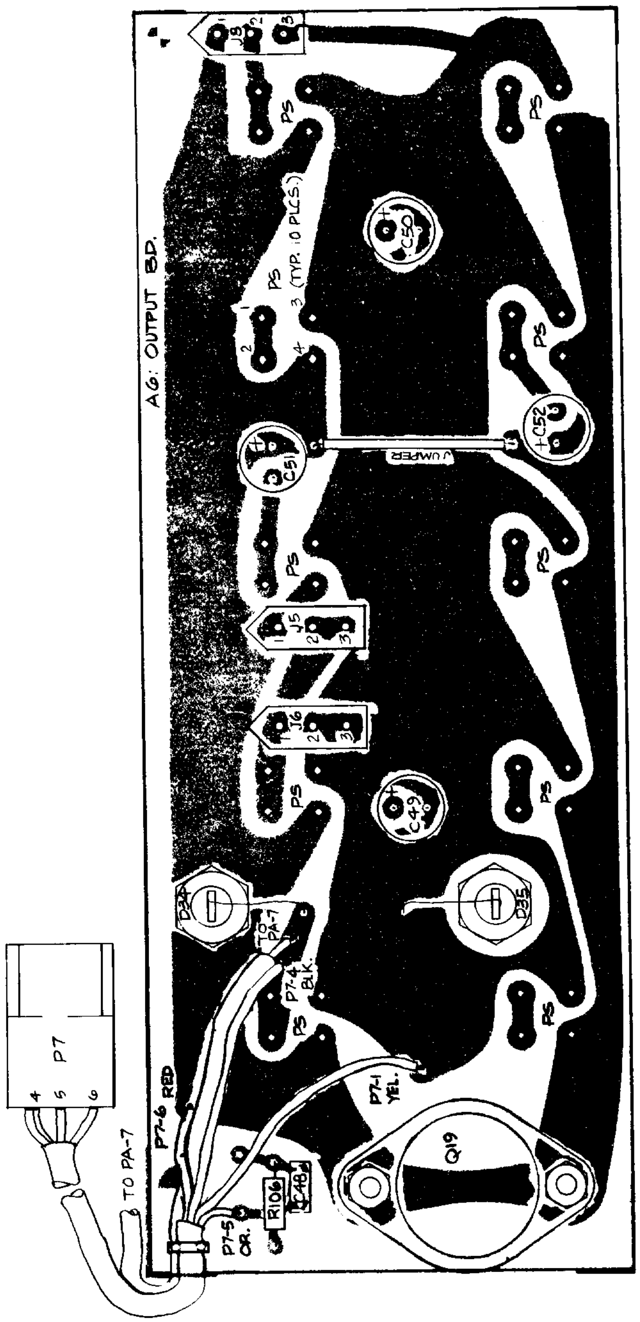
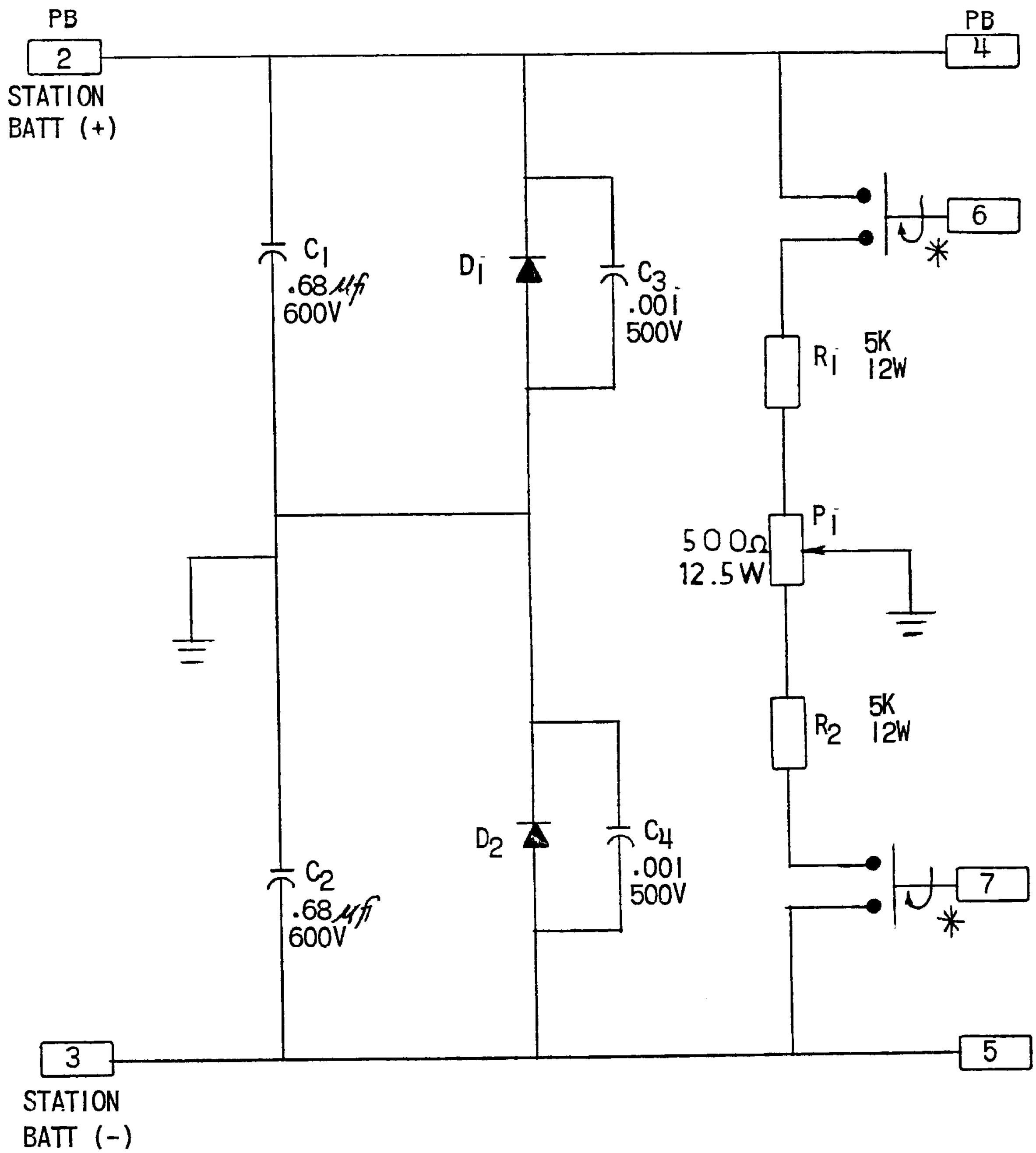


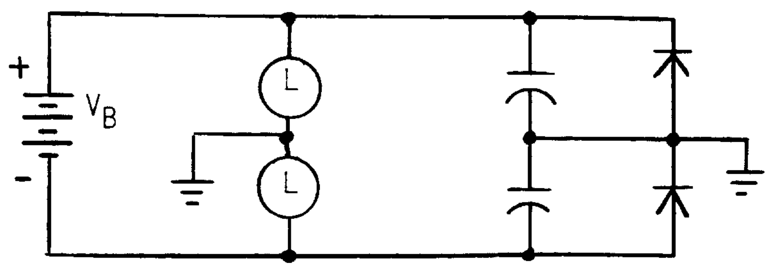
Figure 8 - A6 Board Parts Location



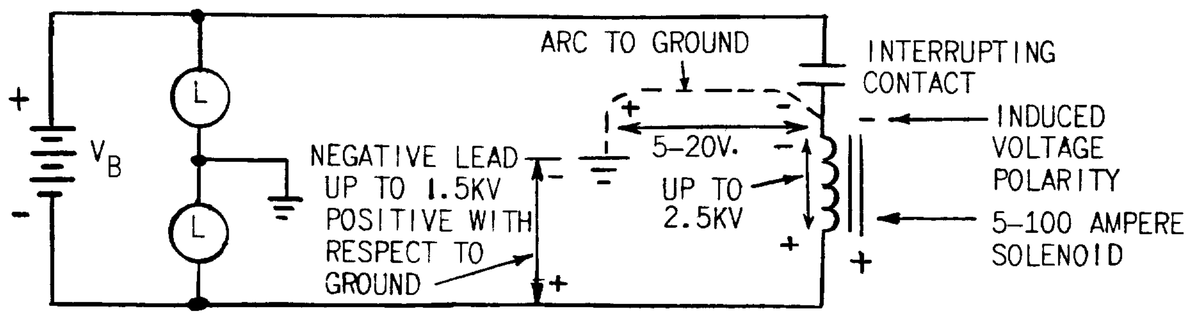
* DISCONNECTS ON THE NUMBER 6 AND 7 POSITION OF TERMINAL BLOCKS ARE FOR OPTIONAL CONNECTION TO RESISTOR DIVIDER

⏚ BUS BAR, RIGHT SIDE, FRONT VIEW, WITH TERMINAL 1 AT TOP

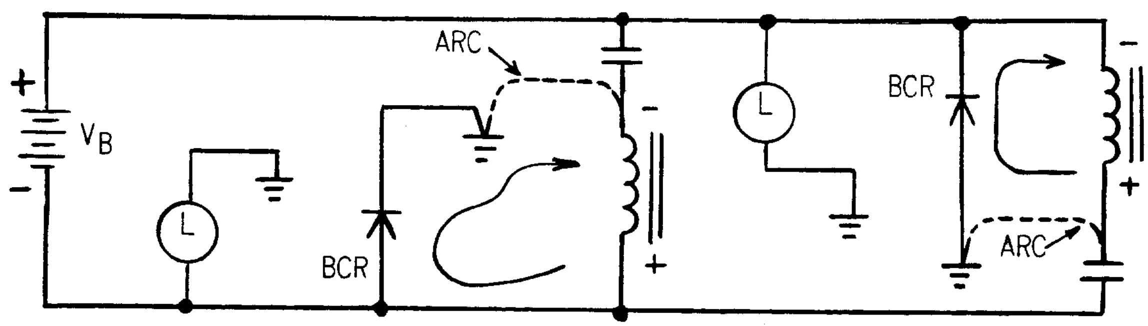
Figure 9 (0227A2136-2) Internal Connections Diagram for a Typical Battery Clamp



(A) NORMAL OPERATING CONDITIONS



(B) ARC-OVER TO GROUND DURING SOLENOID CURRENT INTERRUPTION WITHOUT BATTERY CLAMP RECTIFIERS



(C) CONDITIONS DURING ARC-OVER TO GROUND WITH BATTERY CLAMP RECTIFIERS (BCR) CONNECTED

Figure 10 (0148A4062-1) Battery Clamp Surge Current Condition

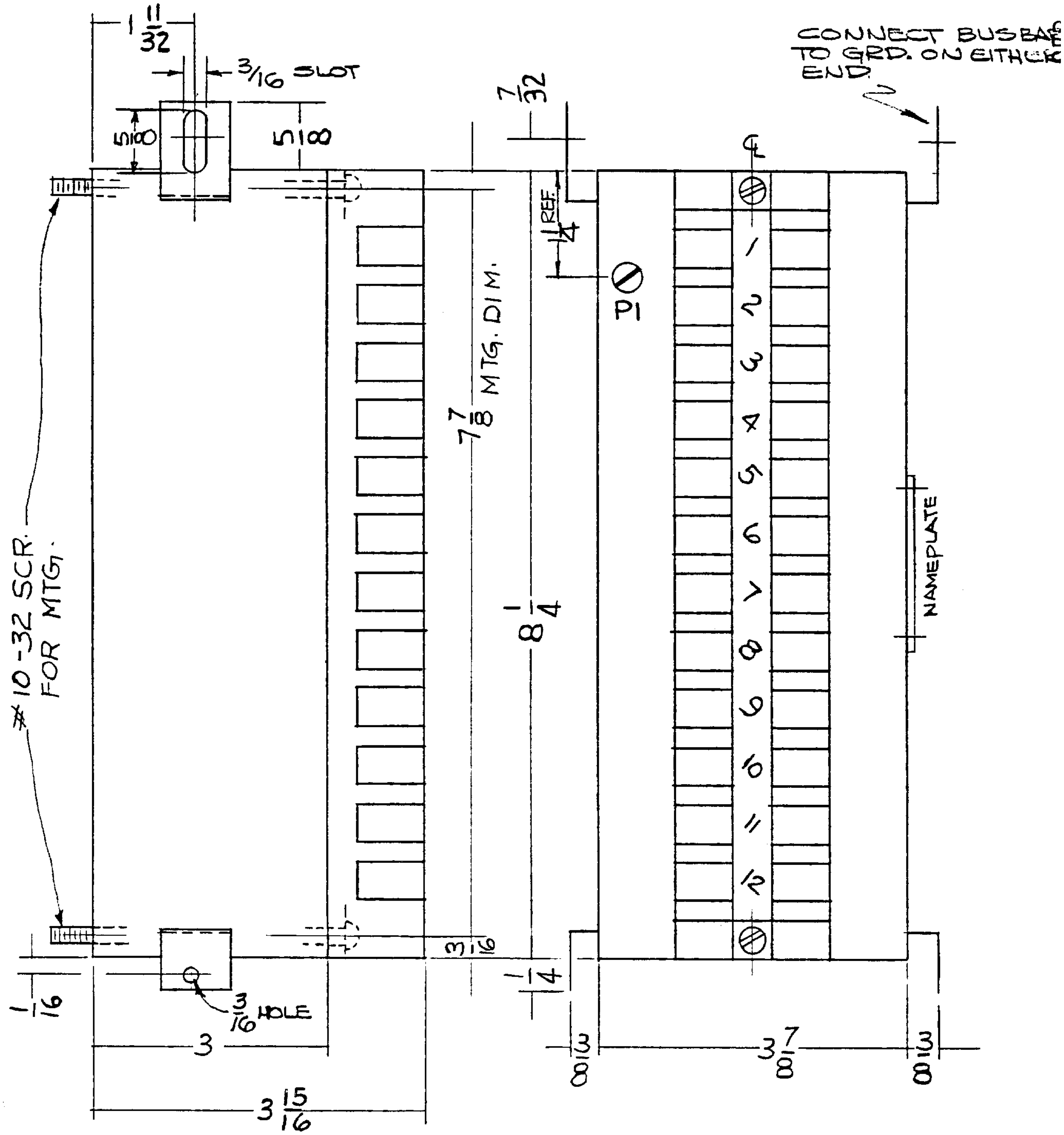


Figure 11 (0227A2137-1) Outline and Mounting Dimensions for the Type SDA50A Battery Clamp

GENERAL ELECTRIC COMPANY
POWER SYSTEMS MANAGEMENT BUSINESS DEPT.
MALVERN, PA 19355

GENERAL ELECTRIC

6/84

PRINTED IN U.S.A.