OPERATING INSTRUCTIONS OBS - T.F.

TYPE 1268-A

AUTOMATIC BATTERY CHARGER

TYPE 1268-P1 BATTERY DRAWER

TYPE 1268-9602 BATTERY

1268-A,-P1,-9602

GENERAL RADIO COMPANY

OPERATING INSTRUCTIONS

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Form 1268-0110-A
July, 1963

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

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SPECIFICATIONS

TYPE 1268-A AUTOMATIC BATTERY CHARGER

Constant-Current Charge: 6 hours at 4 amperes, nominal.

Trickle Charge: 33.8 volts ±2% is maintained at the battery.

Power Required: 105 to 130 (or 210 to 260) volts, 60 cps, 240 watts maximum.

Ambient Temperature Range: 0 to 50 C.

Cabinet: Rack-bench.

Dimensions: Bench model – width 19, height 5 ¼, depth 12 inches (485 by 135 by 305 mm), over-all; rack model – panel 19 by 5 ¼ inches (485 by 135 mm), depth behind panel 11 ½ inches (295 mm).

Net Weight: 29 1/2 pounds (13.5 kg).

TYPE 1268-P1 BATTERY DRAWER AND TYPE 1268-9602 BATTERY

Voltage: 28 volts dc, nominal.

Ampere-Hours: 15 ampere-hours. At 4.3 to 3.2 amperes required by Type 1116-B Emergency Power Supply, batteries will run at least 3 ½ hours.

Cabinet: Relay-rack.

Dimensions: Width 19, height 12 ¼, depth 19 inches (485 by 315 by 485 mm), over-all.

Drawer Net Weight: 25 pounds (11.5 kg).

Battery Net Weight: Approximately 90 pounds (41 kg). Battery shipped direct from supplier.

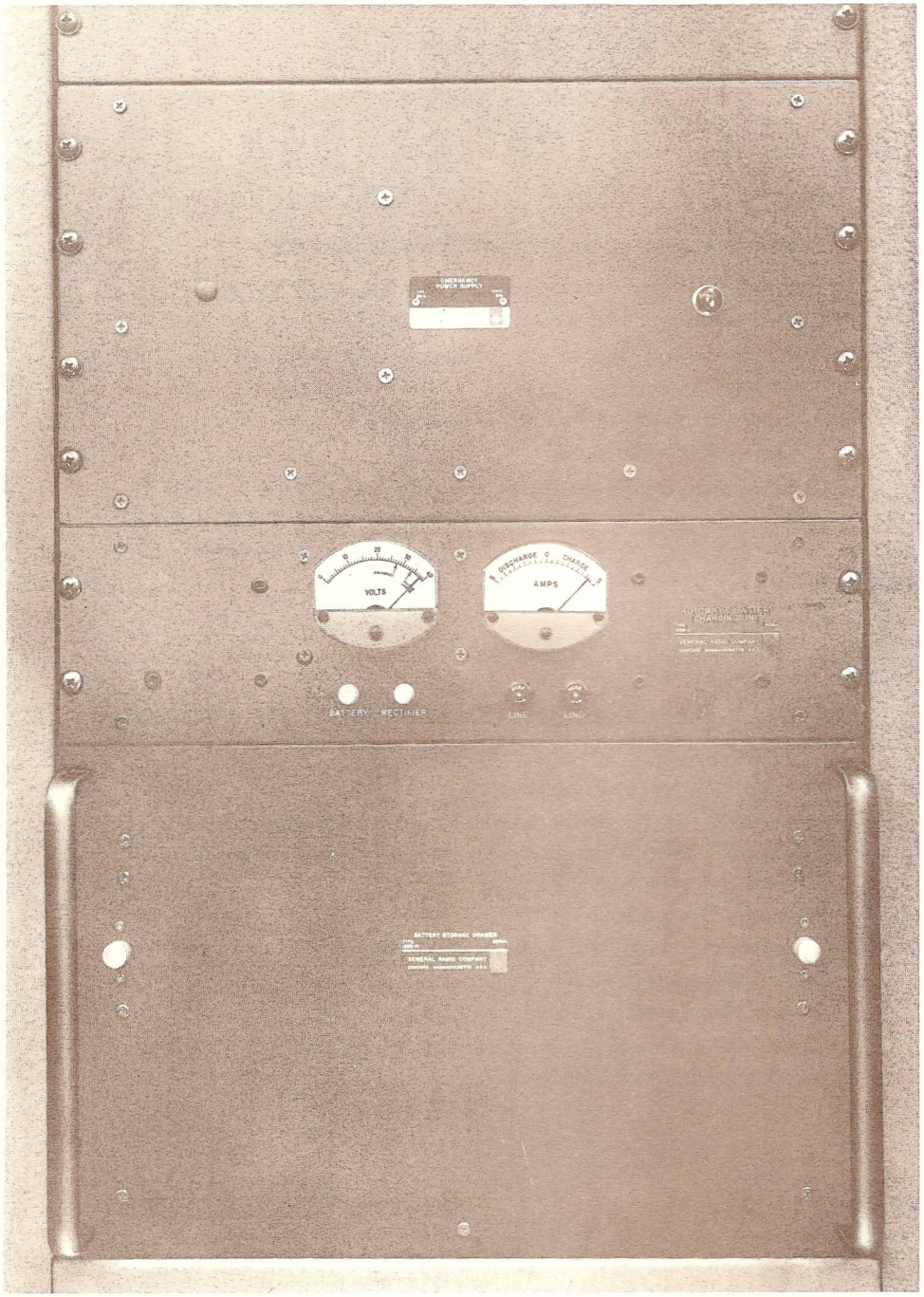


Figure 1. Panel view of the Type 1268-A Automatic Battery Charger and the Type 1268-P1 Battery Drawer, with the Type 1268-9602 Battery.

SECTION **1**

INTRODUCTION

The Type 1268-A Automatic Battery Charger maintains the Type 1268-9602 Battery at optimum charge and will restore this battery from complete discharge to full charge in six hours. The Type 1268-9602 Battery and the Type 1116-B Emergency Power Supply are designed to supply power to a Type 1120 Frequency Standard under emergency conditions. The Type 1268-A can also be used to maintain other nickel-cadmium batteries with electrical characteristics similiar to those of the Type 1268-9602.

As soon as line power is restored after a power failure, a constant-current charge of about 4 amperes is applied to the battery. After six hours of this charge, a timer changes the operating mode to constant voltage. This "float" voltage, or trickle charge, automatically maintains the battery at optimum charge regardless of the current required.

SECTION **2**

PRINCIPLES OF OPERATION

2.1 GENERAL.

Variable dc output is obtained from phase-controlled silicon controlled rectifiers (SCR's) in a full-wave bridge rectifier. A unijunction-transistor (UJT) trigger generator provides phase control. The repetition rate of the UJT is controlled by a dc differential amplifier.

The differential amplifier compares either a voltage proportional to the charging current (for constant-current operation) or the battery voltage (for "float"-voltage condition) against a Zener-diode reference voltage.

2.2 SILICON-CONTROLLED-RECTIFIER AND TRIGGER CIRCUITS.

The output from the full-wave rectifier (about 160 volts peak) is clipped by a 20-volt Zener diode (see Figure 2). The clipped waveform synchronizes the unijunction trigger generator at 120 cps. The waveforms at the UJT and SCR's are shown in Figure 3. The left-hand waveforms are for a small resistor R (in Figure 2) and the right-hand waveforms for a large R.

The clipped sine wave (Figure 3a) is applied to base 2 of the unijunction transistor and through an

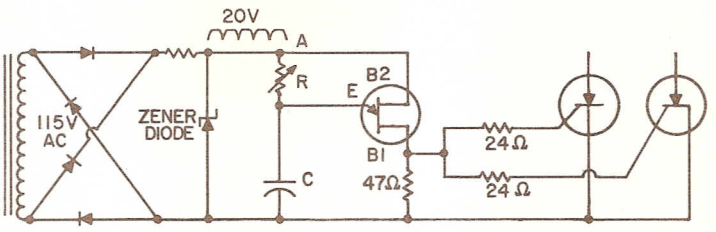


Figure 2. Simplified phase-control circuit of the Type 1268-A Automatic Battery Charger.

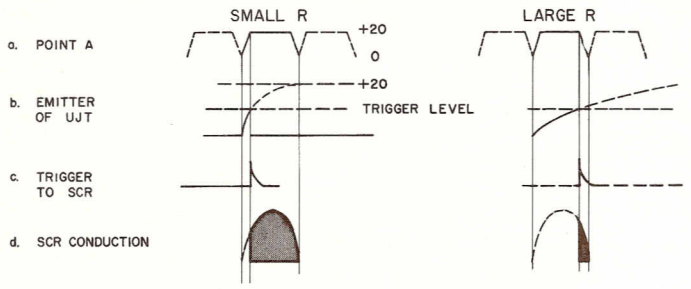


Figure 3. Waveforms at the UJT and SCR's of the phase-control circuit.

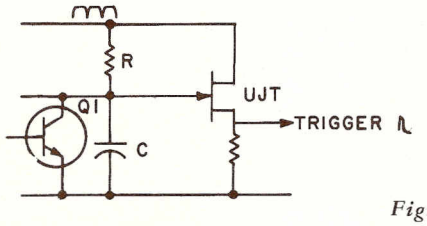


Figure 4. An electronic phase-control circuit.

RC network to its emitter. As soon as voltage occurs at point A (in Figure 2) the voltage at the emitter E of the UJT starts to rise as capacitor C is charged through R. When the voltage at the capacitor reaches about 50% of the voltage at point A, the UJT fires. A trigger pulse is applied to the silicon controlled rectifiers and whichever SCR has forward voltage across it turns on for the remainder of the half cycle. C is now discharged and the operation repeats with the beginning of the next half cycle. When the value of R is changed, the time required for the capacitor C to charge to the firing point is changed.*

The same effect is achieved with a transistor as shown in Figure 4. If Q1 is off, all the current through R flows into C. If Q1 is on, some of the charging current will be taken by Q1 and more time elapses before C is charged.

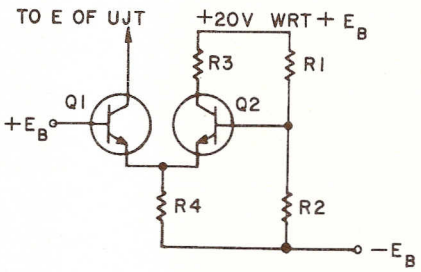
2.3 DIFFERENTIAL AMPLIFIER (COMPARATOR).

Figure 5 shows the basic configuration of the differential amplifier in the constant-voltage operating mode ("float" voltage to the battery). For balanced condition the base of Q2 must be at a voltage close to $+E_B$. The ratio of R1 and R2 determines the battery voltage required for this condition. If the battery voltage drops, the base of Q2 moves positive and Q2 draws more current. This results in a decrease in current through Q1 and the conduction angle of the SCR's increases to increase the battery voltage.

Figure 6 is a simplified schematic diagram for constant-current charging. R2 of Figure 5 is replaced by a photoconductor, R2A. This photoconductor is illuminated by a lamp in the battery lead. When the charging current is increased, the brillance of the lamp is increased and reduces R2A. This reduces the current through Q2, increases the current through Q1, which reduces the rectifier output.

A timer changes operation of the charger from constant-current mode to constant-voltage mode. In the complete schematic diagram, Figure 8, the timer is shown in the current mode.

Figure 5. Elementary schematic diagram of the differential amplifier (comparator) of the Type 1268-A in the constant-voltage mode.



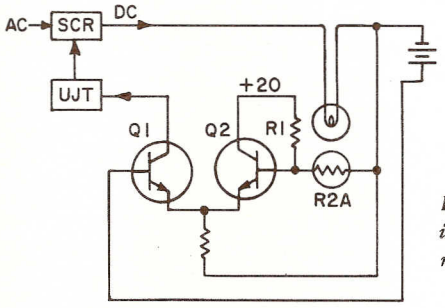


Figure 6. Comparator in the constant-current mode.

When the Type 1268-A Automatic Battery Charger is used with the Type 1116-B Emergency Power Supply, the Type 1268-4000 Plug-In Unit is required for overvoltage protection. During the constant-current charge the voltage of the battery may be greater than 40 volts. The Type 1268-4000 automatically switches a resistor in series with the battery lead to protect the Type 1116-B inverter until the voltage drops sufficiently.

2.4 METERING.

Both voltage and current of the battery are metered. The voltmeter, M501, is calibrated at 33.8 volts (the nominal float voltage) with R517. The ammeter, M502, reads ±5 amperes for charge or discharge of the battery.

* For a complete description of unijunction-transistor phase control for silicon controlled rectifiers, refer to the General Electric Controlled Rectifier Manual, 1st edition, page 55.

SECTION **3**

INSTALLATION

3.1 MOUNTING OF THE BATTERY CHARGER.

The Automatic Battery Charger is available equipped for either bench or relay-rack mounting. For bench mounting (Type 1268-AM), aluminum end frames are supplied to fit the ends of the cabinet. Each end frame is attached to the instrument with two panel screws and four No. 10-32 round-head screws with notched washers.

For rack mounting (Type 1268-AR), special rack-mounting brackets are supplied to attach the cabinet and instrument to the relay rack (see Figure 7). These brackets permit either cabinet or instrument to be withdrawn independently of the other.

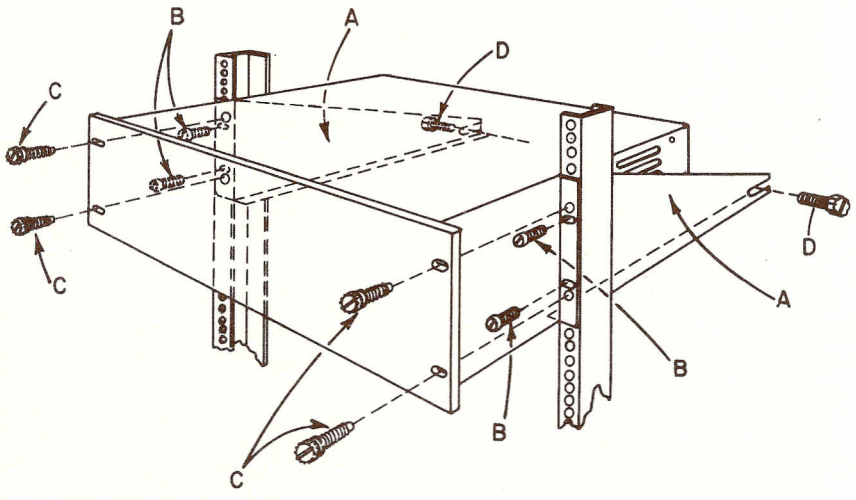


Figure 7. Installation of the Type 1268-AR.

To install the instrument in a relay rack:

a. Attach each mounting bracket (A) to the rack with two No. 12-24 round-head screws (B). Use the inside holes on the brackets.

b. Slide the instrument onto the brackets as far as it will go.

c. Insert the four panel screws with attached washers (C) through the panel and the bracket and thread them into the rack.

d. Toward the rear of each bracket, put a thumb screw (D) through the slot in the bracket and into the hole in the side of the cabinet.

e. On the rear of the cabinet, remove the two round-head screws that hold the cabinet to the instrument.

To remove the instrument from the rack, remove only the four panel screws with washers (C) and draw the instrument forward out of the rack. To remove the cabinet and leave the instrument mounted in the rack, remove only the two thumb screws (D) at the rear of the brackets and pull the cabinet back off the instrument from the rear of the rack.

3.2 INSTALLATION OF BATTERY AND STORAGE DRAWER.

To install the Type 1268-P1 Storage Drawer and 1268-9602 Battery in a relay rack, proceed as follows:

a. On each side of the relay rack, drill four holes on a horizontal line 5 5/64 inches down from the 9th hole from the bottom of the rack at 1, 5, 10, and 15 inches back from the front angle bracket (see Figure 11).

b. Attach the side brackets (A)to the relay rack with 10-32 screws (B), spacers (C and D), No. 10 lockwashers (E), and 10-32 nuts (F). See Figure 12.

c. Adjust the two side brackets so that they are equidistant from the bottom of the rack and level. Tighten the hardware.

d. Place the drawer slides (G) on the top surface of the side brackets. Attach with 6-32 screws (H), No. 6 lockwashers (J), and 6-32 nuts (K). See Figure 12. Do not tighten hardware.

e. Withdraw both drawer slides and assemble the drawer (L) between them with 6-32 screws (M), No. 6 lockwashers (N), and 6-32 nuts (O). See Figure 12.

f. Adjust the drawer assembly so that the bottom edges of the drawer are equidistant from and parallel to the edges of the drawer slides. Tighten the hardware that holds the drawer to the slides.

g. With the drawer slides withdrawn, push the stationary parts of the slides against the inside surface of the front of the relay rack. Slide the drawer assembly in so that the front of the drawer is flush with the other panels in the rack. Tighten the hardware that holds the drawer slides to the side brackets (refer to step d).

h. Solder the terminal-and-lead assembly, 1268-0200, to the positive terminal of the terminal mounting device, PL101. See Figure 13.

j. Solder the terminal-and-lead assembly, 1268-0201, to the negative terminal of PL101. See Figure 13.

k. Place the Type 1268-9602 Battery in the drawer.

l. Place the battery strap around the battery and fasten to the front panel with 10-32, 5/16 screws. Tighten the hardware.

m. Make the following connections (see Figure 13):
with lead 1268-0200 from PL101, connect to BT101A, POS.
with lead 1268-0201 from PL101, connect to BT104F, NEG.

n. Secure the entire assembly to the relay rack with fasteners. See Figure 13.

o. Connect the Type 1268-9602 Battery to the terminal strip in the rear of the Type 1268-A Battery Charger. Be sure that the polarity is correct.

3.3 CONNECTION OF CHARGER TO AC POWER LINE.

When the Type 1268-A Automatic Battery Charger is used with a Type 1116-B Emergency Power Supply, connect the Battery Charger to the power outlet (marked 1268-A) on the rear skirt of the Type 1116-B with the power cord provided. To connect the Battery Charger to an early model of the Type 1116-B which does not have this power outlet, contact the General Radio Service Department for information to modify the Type 1116-B. A Type 1268-4000 Plug-In Unit must also be connected (see Figure 10). When you are not using the Type 1116-B, the Battery Charger may be connected to the power line directly. In either case, check that the source of power is as indicated by the legend at the input socket at the rear of the Battery Charger.

Connect the Type 1268-A to a source of power as indicated by the legend at the input socket at the rear of the instrument, using the power cord provided. While instruments are normally supplied for 115-volt operation, the power transformer can be reconnected for 230-volt service (see schematic diagram, Figure 8). When changing connections, be sure to replace line fuses with those of current rating for the new input voltage (refer to Parts List). Appropriate measures should be taken so that the legend indicates the new input voltage. On instruments changed from 230 to 115 volts, this simply means removal of the 230-volt nameplate; a 115-volt legend is marked beneath. For instruments changed to 230 volts, a nameplate (Type 5590-1667) may be ordered from General Radio.

NOTE

A motor-driven timer is used in this instrument. Operation at 50 cps will not damage the instrument but will increase constant-current charging time to about 7 1/4 hours. This may reduce battery life.

3.4 CONNECTION OF BATTERY LOAD (Type 1116-B).

Connect the Type 1116-B Emergency Power Supply to the terminal strip in the rear of the Type 1268-A Automatic Battery Charger.

SECTION **4**

OPERATING PROCEDURE

4.1 OPERATING CONDITIONS.

During the constant-current charging the battery voltage will rise to over 40 volts. The current will be about 4.3 to 4.5 amperes at 30 volts and drop to slightly below 4 amperes toward the end of the charge.

At the end of the charge, the operating mode is switched to "float" voltage of "trickle charge" and the voltage will slowly drop to 33.8 volts. Under trickle-charge conditions, the current will usually be less than 0.1 ampere (slight vibration of the ammeter pointer). High trickle-charge current indicates a defective or worn out battery. High ambient temperatures can also cause high trickle charge.

SECTION **5**

SERVICE AND MAINTENANCE

5.1 WARRANTY.

We warrant that each new instrument sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel, will be repaired, or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

5.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instruction, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

5.3 VOLTAGE AND RESISTANCE MEASUREMENTS.

The following tables list test voltages at transistor pins as an aid in trouble-shooting. DC voltages for Q501, Q502, and Q503 are referred to the positive battery lead. They were measured with a 115-volt, 60-cycle input and a 4.2-ampere constant-current charge. Voltages for Q550 are referred to the negative battery lead. They were measured with the ac line disconnected, and R550 set so that the relay pulls in above a battery voltage of 34 volts.

TABLES OF VOLTAGE MEASUREMENT.

TRANSISTOR (TYPE)	PIN	DC VOLTS
Q501 (TR37)	E	-0.63
	B	0
	C	+2.9
Q502 (TR37)	E	-0.63
	B	0
	C	+4.4
Q503 (TR26)	E	+8.0
	B1	+0.4
	B2	+18.0

TRANSISTOR (TYPE)	PIN	BATTERY VOLTAGE 25.0	33.8	37.0
Q550 (TR33)	E	+9.6	+12.1	+12.4
	B	+9.6	+12.8	+13.2
	C	+25.0	+31.0	+12.7

PARTS LIST

REF NO.	DESCRIPTION	PART NO.
R501	RESISTOR, Power 3.3kΩ ± 5% 5w	6660-2335
R502	RESISTOR, Composition 24Ω ± 5% 1/2w	6100-0245
R503	RESISTOR, Composition 24Ω ± 5% 1/2w	6100-0245
R504	RESISTOR, Composition 390Ω ± 5% 1/2w	6100-1395
R505	RESISTOR, Composition 47Ω ± 5% 1/2w	6100-0475
R506	RESISTOR, Composition 2.7kΩ ± 5% 1/2w	6100-2275
R507	RESISTOR, Composition 2kΩ ± 5% 1/2w	6100-2205
R508	RESISTOR, Composition 2.2kΩ ± 5% 1/2w	6100-2225
R509	RESISTOR, Composition 3.9kΩ ± 5% 1/2w	6100-2395
R510	RESISTOR, Precision 6.2kΩ ± 1%	6690-6289
R511	RESISTOR, Composition 5.6kΩ ± 5% 1/2w	6100-2565
R512	POTENTIOMETER, Wire-Wound 5kΩ ±10%	6057-2509
R513	RESISTOR, Precision 3kΩ ± 1%	6690-6257
R514	RESISTOR, Composition ± 5% 1/2w	
R515		1268-0410
R516	RESISTOR, Film 150kΩ ± 1% 1/8w	6190-9600
R517	POTENTIOMETER, Wire-Wound 5kΩ ±10%	6057-2509
R518	POTENTIOMETER, Wire-Wound 5Ω ±10%	6050-0400
R519	RESISTOR, Power 0.7Ω ±10% 10w	6670-8709
R520	RESISTOR, Power 0.7Ω ±10% 10w	6670-8709
R521	RESISTOR, Composition 10kΩ ± 5% 1/2w	6100-3105
R522	RESISTOR, Composition 15Ω ± 5% 1/2w	6100-0155
C501	CAPACITOR, Electrolytic 50μf +100-10% 50dcwv	4450-2200
C502	CAPACITOR, Plastic 0.1μf ±10% 100v	4860-8250
C503A C503B	CAPACITOR, Electrolytic 1000μf 1000μf 3dcwv	4450-2450
C504	CAPACITOR, Electrolytic 100μf +100-10% 50dcwv	4450-1000
C505	CAPACITOR, Ceramic 0.0033μf ±20% 500dcwv	4406-2339
C506	CAPACITOR, Ceramic 0.0033μf ±20% 500dcwv	4406-2339
CR501	DIODE, Type 1N3253	6081-1001

REF NO.	DESCRIPTION	PART NO.
CR502	DIODE, Type 1N3253	6081-1001
CR503	DIODE, Type 1N3253	6081-1001
CR504	DIODE, Type 1N3253	6081-1001
CR505	DIODE, Type 1.5M20Z10	6083-1024
CR506	DIODE, Type 1N645	6082-1016
CR507	DIODE, Type 1N968B	6083-1018
CR508	DIODE, Type 1N645	6082-1016
CR509	DIODE, Type 1N118A	6082-1006
CR510	DIODE, Type 1N645	6082-1016
CR511	DIODE, Type 1N645	6082-1016
CR512	DIODE, Type 1N3661	6081-1007
CR513	DIODE, Type 1N3661	6081-1007
CR514	DIODE, Type 1N3661	6081-1007
F501	FUSE, 115v, 3.2a	5330-2300
	230v, 1.6a	5330-1700
F502	FUSE, 115v, 3.2a	5330-2300
	230v, 1.6a	5330-1700
F503	FUSE, 5a	1268-0430
F504	FUSE, 5a	1268-0430
L501	INDUCTOR	0365-4005
M501	METER	5730-1368
M502	METER	5730-1367
MO501	MOTOR	1268-0440
PL501	PLUG	4240-0600
Q501	TRANSISTOR, Type 2N910	8210-1037
Q502	TRANSISTOR, Type 2N910	8210-1037
Q503	TRANSISTOR, Type 2N1671B	8210-1026
Q504	TRANSISTOR, Type 2N1772A	8210-1038
Q505	TRANSISTOR, Type 2N1772A	8210-1038
T501	TRANSFORMER	0685-4003

NOTE: When ordering replacement parts, please specify the instrument type number as well as the part numbers of the items required.

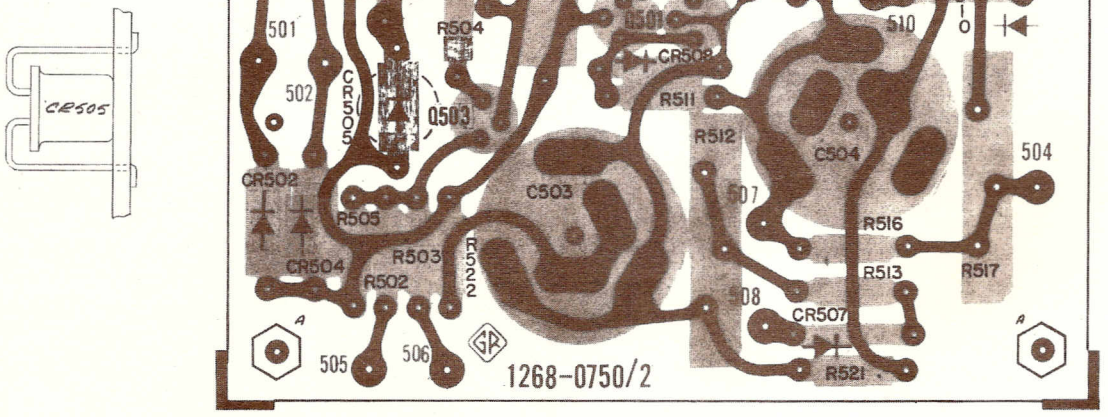


Figure 9. Etched-board layout for the Type 1268-A.

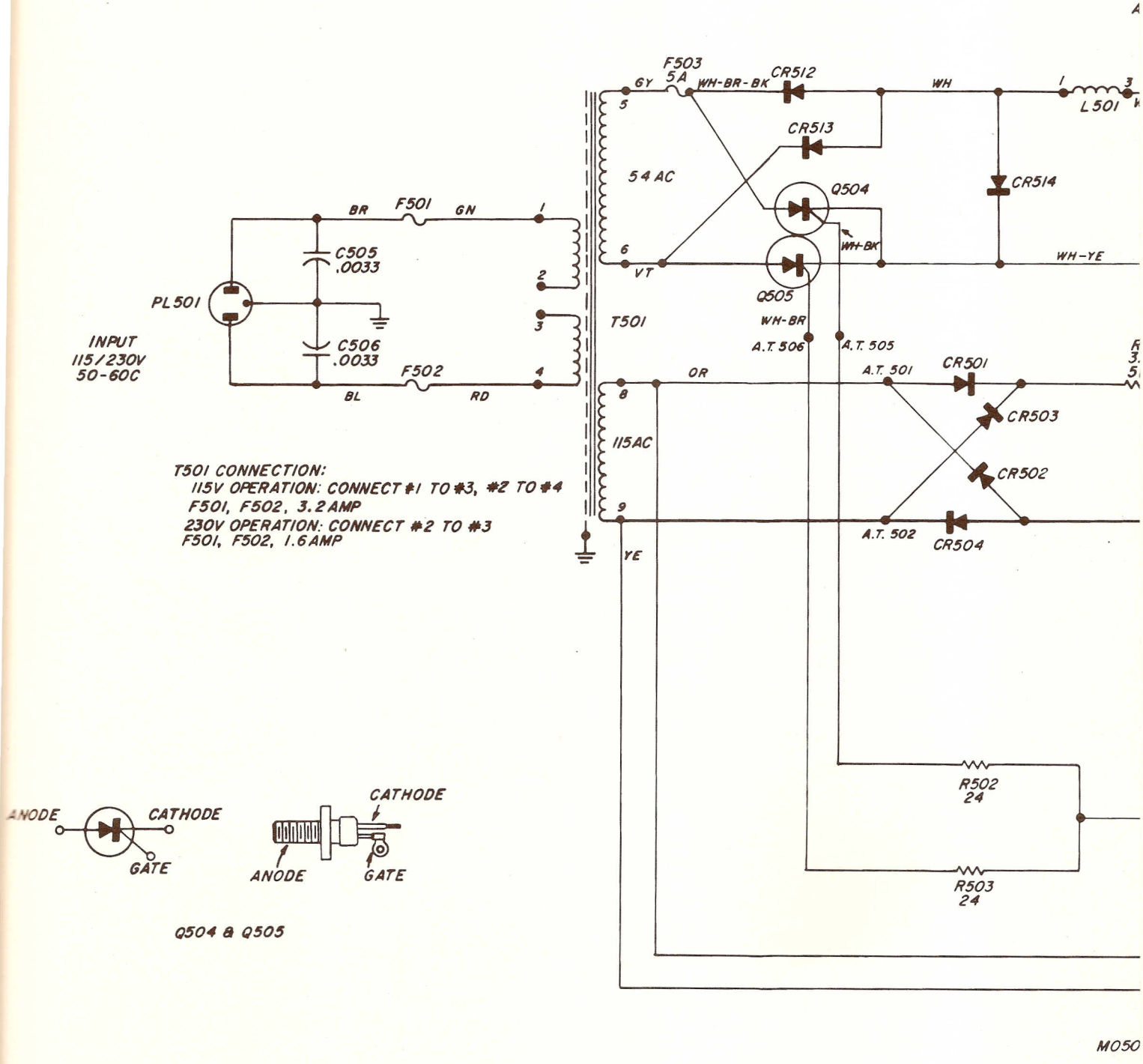
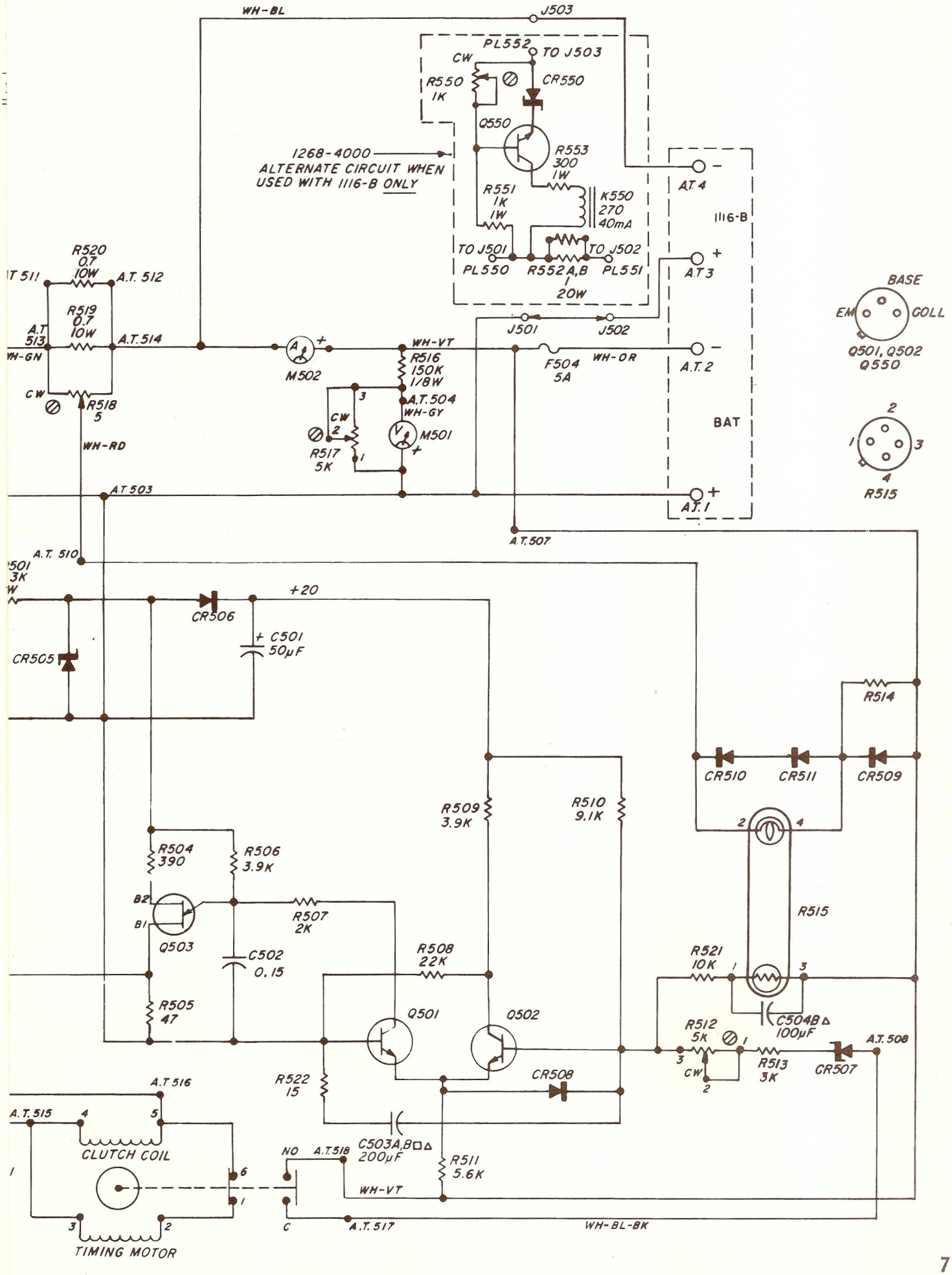


Figure 8. Schematic diagram of the Type 1268-A Automatic Battery Charger.


WH-BL
J503
PL552
TO J503
CW
R550
1K
CR550
Q550
R553
300
1W
R551
1K
1W
K550
270
40mA
1268-4000
ALTERNATE CIRCUIT WHEN
USED WITH 1116-B ONLY
TO J501
TO J502
PL550
R552A,B
20W
PL551
A.T. 4
A.T. 3
A.T. 2
A.T. 1
1116-B
BAT
J501
J502
R520
0.7
10W
A.T. 511
A.T. 512
R519
0.7
10W
A.T. 513
A.T. 514
WH-GN
CW
R518
5
WH-RD
M502
WH-VT
R516
150K
1/8W
A.T. 504
WH-GY
CW
R517
5K
M501
F504
5A
WH-OR
BASE
EM
COLL
Q501, Q502
Q550
R515
A.T. 503
A.T. 507
A.T. 510
CR506
+20
+ C501
50μF
CR505
R514
CR510
CR511
CR509
R509
3.9K
R510
9.1K
R504
390
R506
3.9K
B2
B1
Q503
R507
2K
C502
0.15
R508
22K
R505
47
Q501
Q502
R521
10K
C504B△
100μF
R512
5K
CW
R513
3K
CR507
A.T. 508
A.T. 516
A.T. 515
CLUTCH COIL
R522
15
CR508
C503A,B□△
200μF
R511
5.6K
NO
A.T. 518
WH-VT
TIMING MOTOR
C
A.T. 517
WH-BL-BK

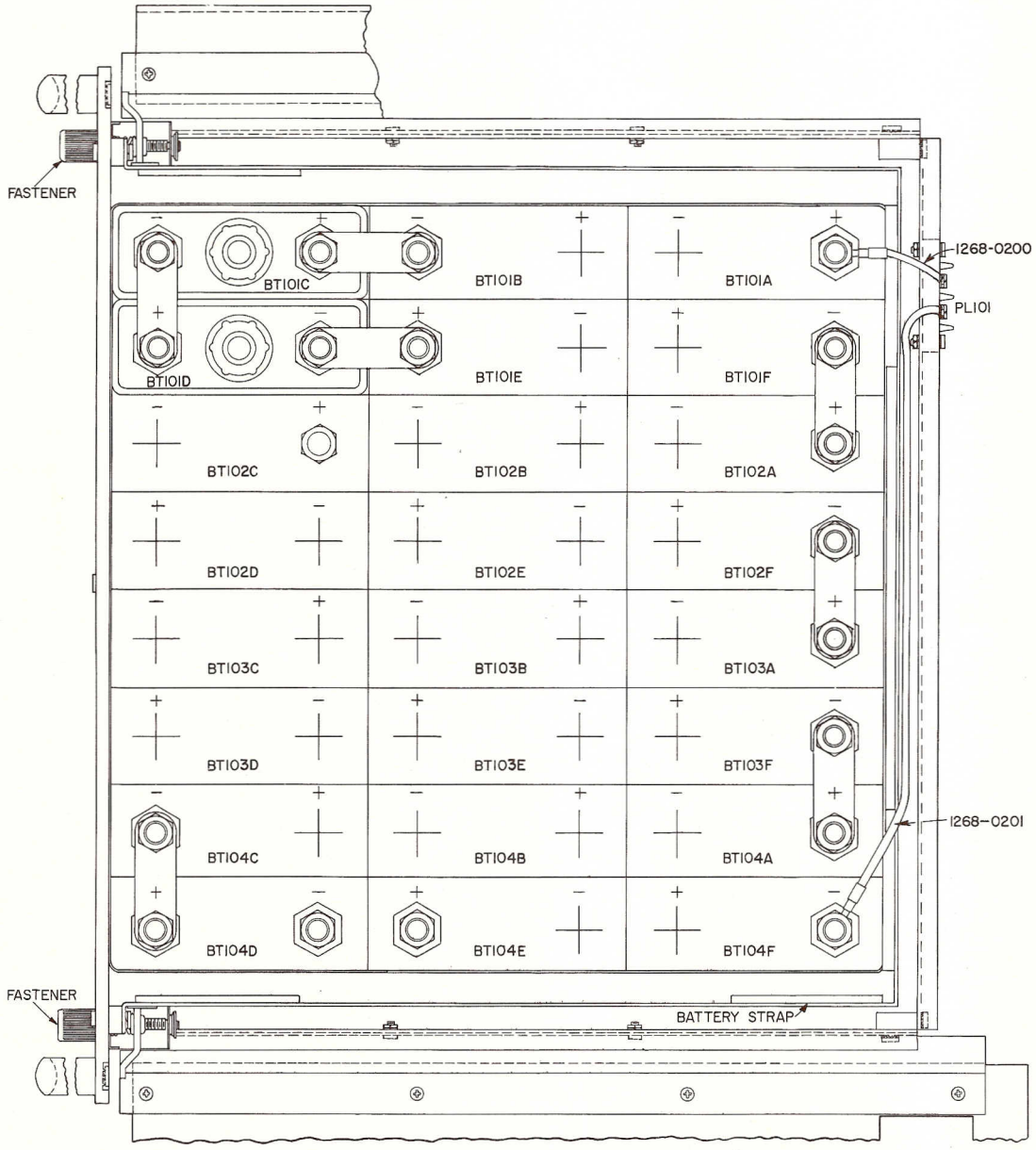


Figure 13 Terminal connections for the Type 1268-9602 Battery.

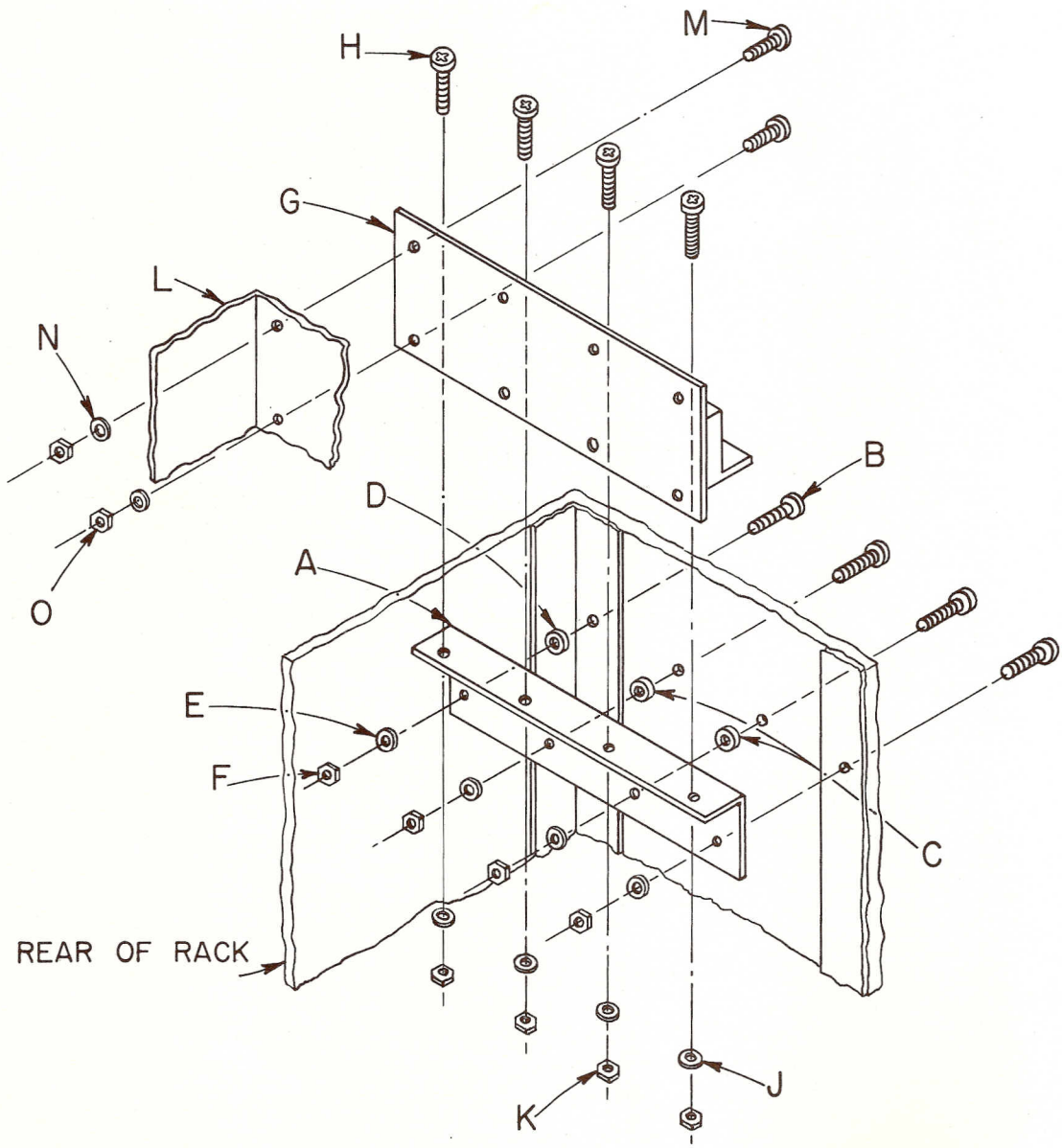


Figure 12. Installation of the Type 1268-P1 Battery Drawer.

Legend

A -side brackets (2)
B -screws, 10-32, ½-inch (8)
C -spacers, 3/16-inch (4)
D -spacers, 1/16-inch (2)
E -lockwashers, No. 10 (8)
F -nuts, 10-32 (8)
G -drawer slides (2)
H -screws, 6-32, 5/8-inch (8)
J -lockwashers, No. 6 (8)
K -nuts, 6-32 (8)
L -drawer (1)
M -screws, 6-32, 5/16-inch (16)
N -lockwashers, No. 6 (16)
O -nuts, 6-32 (16)

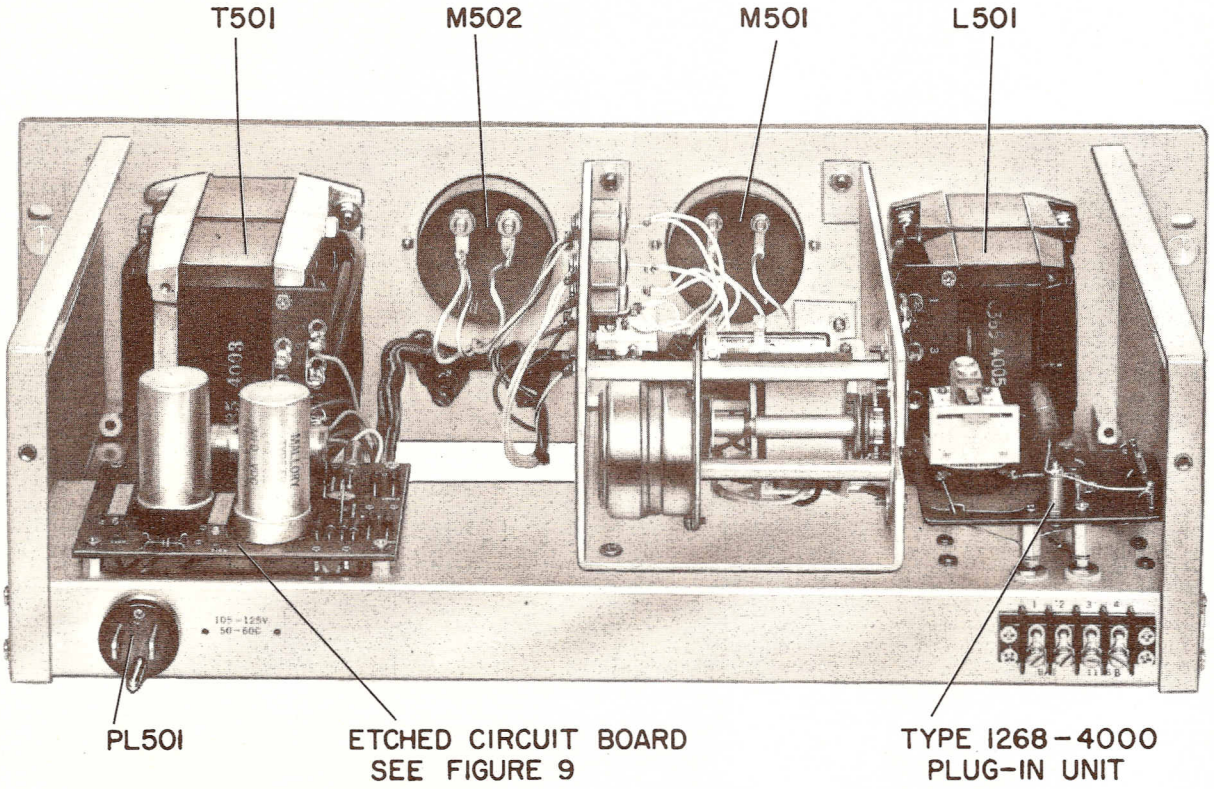
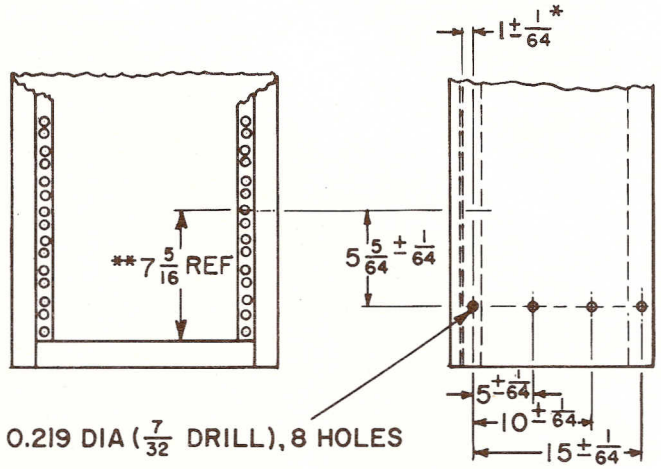


Figure 10. Interior View of Type 1268-A Automatic Battery Charger.



* MEASURE FROM THE INSIDE SURFACE OF THE FRONT ANGLE BRACKET

** THIS DIMENSION IS ALSO THE 9th HOLE FROM THE BOTTOM OF THE CABINET

Figure 11. Location of relay-rack holes for installation of the Type 1268-P1 Battery Drawer.

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