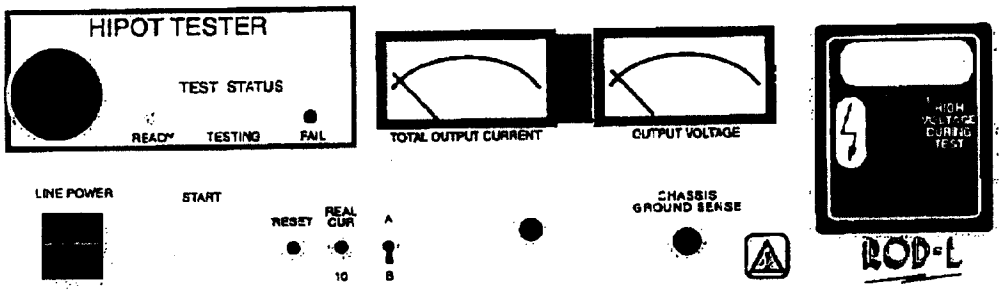
ROD-L

ELECTRONICS, INC.

QUICK START GUIDE



FOR MODELS:

M100AVS5

M100BVS5

M500AVS5

M500BVS5

ROD-L

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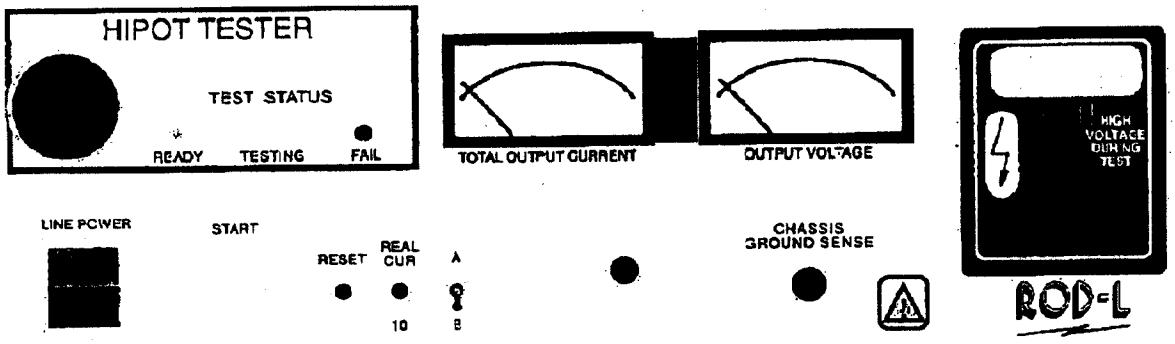
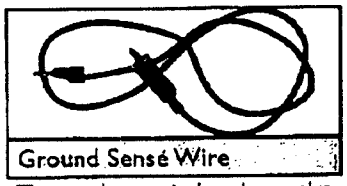
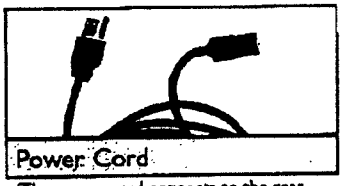


WHAT IS NEEDED FOR SELF TEST AND BASIC DEVICE TESTING



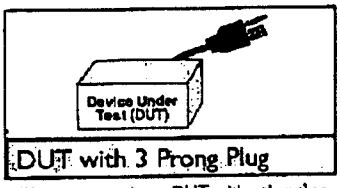
Ground Sense Wire

(The ground sense wire has a banana plug which inserts into the "Chassis Ground Sense post on the front panel of the ROD-L unit and allegator clip to be connected to the DUT)



Power Cord

(The power cord connects to the rear panel of the ROD-L unit and to any grounded three-prong wall socket. Be sure to set the line voltage on rear panel to correct voltage i.e. 110 or 220)



DUT with 3 Prong Plug

(If you are testing a DUT with other than a three prong grounded power cord, see diagram below titled :"SET-UP TESTING 2-WIRE HIPOT")

1. SELF TEST

1.a Make sure the line voltage on rear panel is set to the correct value for the wall outlet (i.e. 110 or 220).

1.b Connect the POWER CORD to the rear of the ROD-L Unit and plug into any three-prong grounded wall outlet.

1.c Turn on the Line Power on the front panel of the ROD-L Unit.

1.d Insert banana end of GROUND SENSE WIRE into the Chassis Ground Sense post on the front panel of ROD-L unit.

1.e Connect allegator clip of ground sense wire to the metal portion of the ROD-L unit handle. Green Ready light will light.

1.f Press "Start."

After you press start, the "Testing" light will light for a brief period of time and then shut off. This completes the self test.

Disconnecting the Ground Sense Wire from the Chassis Ground Sense post or the metal part of handle will cause the test to fail. The red fail light will light, the audible alarm will sound and the unit will shut down. If this happens, press the Reset button to turn off the alarm.

2. BASIC DEVICE TEST

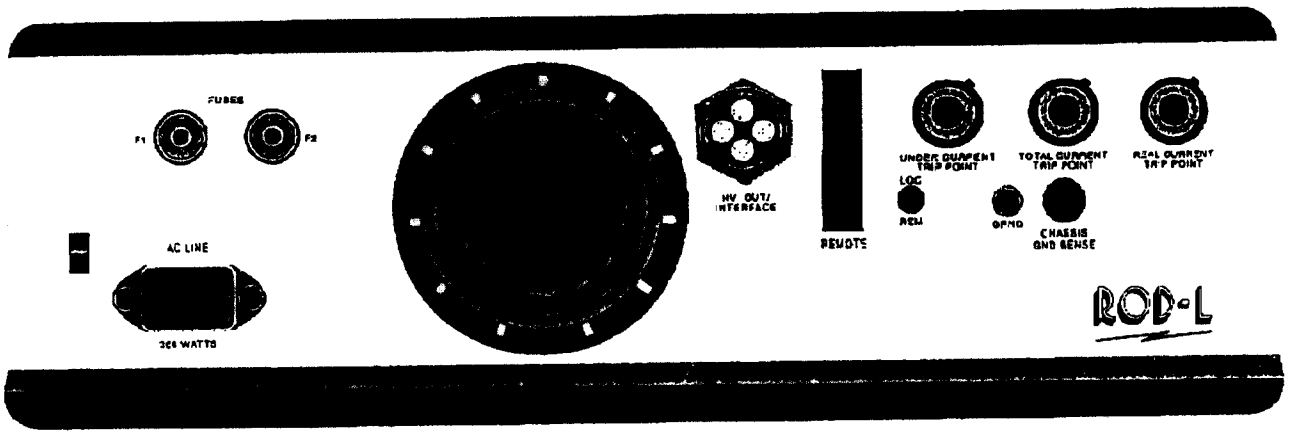
Make sure your test parameters are set correctly on the rear panel. If you are unsure or need to set any test parameters, see instructions on the next page or refer to the manual.

2.a Plug the three-prong plug of the DUT into the front panel receptacle of the ROD-L tester

2.b Connect the allegator clip of the Ground Sense Wire to the DUT. Green Ready light should light.

2.c Press "Start." Testing light will light for a brief period of time and then return to ready mode if test passes.

2.d If failure light and audible alarm turn on, disconnect the DUT and press the Reset button on tester to cancel alarm.



1. Large Variac Knob:

The Variac scale is marked from 0 to 100, and can be interpreted as "percentage of full-scale capability of the unit" (e.g. 50 on the Variac would correspond to 2500 volts on a 5KV maximum unit, but only 1400 volts on a 2.8 kV maximum unit.

2. Total Current Potentiometer:

This is a 10-turn pot, where the extreme clockwise position (10.00 on the vernier dial) corresponds to the maximum current output capability of the unit. A setting of 5.00 on the potentiometer of a 40 mA unit would correspond to a total current trip point of 20 mA, however, for a 25 mA unit a setting of 5.00 on the potentiometer would correspond to a trip point of 12.5 mA.

3. Real Current Potentiometer:

This is also a 10-turn pot which adjusts in exactly the same manner as the total current potentiometer.

4. Under Current Potentiometer:

This is also a 10-turn potentiometer which adjusts in the same manner as the other potentiometers. This potentiometer, when set in any position above 0, requires a minimum amount of current to be drawn (corresponding to the setting of the dial) from the D.U.T. A setting of 5.00 would require at least 20 mA of current to be drawn on a 40 mA unit, but only 12.5 mA on a 25 mA unit.

General Safety Guidelines for ROD-L Units

[Note: The following information applies to all ROD-L units and is also contained in the user's manuals]

All ROD-L Electronics units are designed to assure maximum safety for the operators of the units. There are no extraordinary precautions necessary during their operation and setup, however, due to the fact that high voltage and high current are in use, there are some strongly recommended guidelines listed below:

There are a number of safety features built into ROD-L units that should never be removed or overridden. These are; 1) the chassis ground sense circuit, 2) The internal components of the front panel high voltage receptacle, 3) The recessed start button, 4) The alarm light and alarm tone, 5) The internal shut-down circuitry of the units, 6) The reset switch.

The units should only be connected to three-wire grounded outlets. The safety of the outlets should be periodically checked to insure safety.

Before initial operation, verify that the line input voltage selector switch (for 115 volts vs. 230 volts) is in the correct position.

Due to the fact that high voltage is also present at the rear panel voltage connector during operation of the unit, the connector when not used should be covered or the unit should be positioned in such a way that the metal contacts within it cannot be accidentally touched.

Before changing fuses in the units, the power switch should be turned-off and the power cord disconnected.

Do not touch the device-under-test or its power cord while a test is in progress.

Following the above precautions should eliminate hazard to the operator of the ROD-L unit, but it should be noted that the same common sense advice that would apply to the use of any electrical product should always be used when operating ROD-L units.

M100/500 Series

Section 1
INTRODUCTION

1-1. General

This publication provides operating and servicing instructions for the **Rod-L Electronics, Inc.** AC Hipot Tester Models M100AVS5, M100BVS5, M500AVS5, M500BVS5, and also earlier versions of these like the M100A and M100AV. It is divided into six sections.

Section 1 - Introduction (capabilities and specifications)
Section 2 - Installation and Operation
Section 3 - Theory of Operation
Section 4 - Maintenance and Service
Section 5 - Options
Section 6 - Parts Lists, Schematics and Diagrams

The **Rod-L** AC Hipot Testers are completely self-contained, rugged, **high** voltage potentional test instruments designed for laboratory and production testing environments. They also have safety ground continuity test capability for performance of dielectric withstand tests in accordance with applicable UL, CSA, IEC, FCC, BABT, and other standards. The AV in the designation refers to units that test and display total current, while the BV units test and display total current as well as the resistive part of the AC current. For further information, see Section 3.

The **Rod-L Electronics** AC Hipot Testers perform an AC high voltage leakage and breakdown dielectric withstand test. Test limits for high voltage, time, voltage ramp rate (rate of rise,) total current, (and for the resistive part of the AC current using BVs) are preset by the user. AC current and voltage are displayed on front panel meters. Specifications are given in Table 1-1, page 8.

The Device Under Test (DUT) plugs into the front panel test connector. For operator safety, a Chassis Ground Cable must be connected to a secure low resistance point on the chassis of the DUT. Without this connection, the Hipot Tester will not enter the READY state, and therefore won't begin a TEST. Both the Chassis Ground and the power cord safety Ground of the DUT are monitored and tested electronically. If either ground fails during a test, the Hipot Tester automatically goes into failure mode; i.e., the high voltage is shut down and there is a continuous audible and visual alarm.

NOTE: *The CHASSIS GROUND SENSE circuit is intended to act as a safety ground and ground continuity test for devices employing a chassis ground plane. For testing of two-wire devices or three-wire devices that are exempted by the pertinent regulatory agency from performing a chassis ground continuity test, the CHASSIS GROUND SENSE connection can be made to either Pin 2 of the rear panel high voltage connector or to any appropriate hipot chassis point (e.g., handle, screw, etc.)*

1-2. **Safety Features**

A) "Chassis Ground Sense" - Safety ground required to begin a test

B) Loss of safety ground terminates test cycle

C) Front panel receptacle accepts 3-pronged power cord from DUT providing maximum safety and significantly reduces time required to perform the test

D) Recessed START button

E) Visual alarm at failure

F) Audible alarm at failure (continuous tone)

G) Fast electronic shut down of AC High Voltage

H) Hard RESET after failure required to perform next test

I) Adjustable, linear Ramp Up of High Voltage

1-3. **Supplied Equipment**

A) Hipot Test Instrument
Rod-L Model M100AVS5, M100BVS5, M500AVS5, or M500BVS5

B) Power Cord, three pronged, 6 ft

C) Chassis Ground Sense cable, 3 ft

D) Kit for HV connector mate

E) Operation/Service Manual

F) Extra fuse set for the alternate AC supply voltage

1-4. **Product Specifications (Table 1-1)**

Table 1-1: Specifications

Test Voltage
User specified up to 5000 VAC

Test Current
5 milliamperes (mA) to 333 mA full scale (F.S.)

NOTE: *Voltage and current range combinations are user specified. See the Dielectric Withstand Datasheet.*

Voltage Rate of Rise
50 V/second to 5000 V/second (adjustable)

High Voltage Test Time
1 second to 90 seconds (adjustable)

High Voltage Shutdown
Within 2 milliseconds after a fault or end of test is detected (electronic shut down circuits)

Safety Ground Continuity
Reject level: 0.5Ω standard, ±10%
0.1Ω on request

Accuracy (Current and Voltage Monitoring)
Better than 1%

Resolution (Output Current and Voltage Scales)
±3% of F.S.

Initial Turn-On Period
Requires 3 seconds normally before starting Hipot test

Input Power
115/230 VAC, 44-66 Hz;
360 watts, max on M100s, 30 watts typical
115 VAC only, 500 watts, max on M500s

Environmental Operating Temperature
0° to 50° C, 32° to 122° F

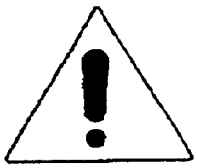
Exterior Color
Mint grey / Olive grey

Weight
35 lbs (15.9 kg) net, 38 lbs (17.2 kg) shipping

Dimensions
16.75 x 13.25 x 5.5 inches (43 x 34 x 14 cm)

Section 2

INSTALLATION AND OPERATION



The exclamation point within a triangle is intended to tell the user that important operating and servicing instructions are in the papers that are provided with the equipment.

WARNING

Verify that the voltage selector switch is positioned and the correct power supply cord is selected to match the voltage source.

WARNING

This product is shipped with a high voltage mating plug and cap installed on the rear panel HV OUT/INTERFACE connector. To reduce the risk of shock, this plug and cap must be used whenever the high voltage interface cable is not installed.

In addition, the high voltage interface cable must only be used when both ends are terminated at their respective equipment connectors. To reduce the risk of electric shock, the equipment must not be operated with one end not terminated.

2-1. General Information

This section contains the recommended procedures for unpacking, inspection, installation, and operation.

2-2. Unpacking and Inspection

Retain the shipping carton and the padding material. **Rod-L Electronics** may assess a charge for a new shipping container if an instrument is not received in the original container.

A shipping carton that appears damaged should be inspected and unpacked with the carrier's agent present. Inspect the instrument for damage. If the instrument is found to be damaged upon receipt, notify the carrier and **Rod-L Electronics** immediately.

M 100's

2-3. Installation

The **Rod-L** AC Hipot Testers are suitable for either bench or rack mounting. To rack mount the instrument, use Option 15A. The instructions for rack mounting are on page 50.

2-4. Power Requirements

The **Rod-L Electronics, Inc.** Hipot Testers require a power source of either 115 or 230 volts AC, 44 to 66 Hz, single-phase. Prior to applying power to the instrument, ensure the AC line voltage selector switch on the Rear Panel is in the appropriate position. When using the **Rod-L** Hipot with other **Rod-L** Testers, the Ground Sense Circuit often works better when the **Rod-L** Testers are connected to a line input with the same ground circuit.

NOTE: *The M500 models cannot be operated using 230 volts input.*

2-5. Operating Controls

The front panel and rear panel controls and indicators are shown and briefly described in Figures 2-1 and 2-2.

2-6. Storage

It is strongly recommended that the Hipot be packed as if for reshipment. Environmental conditions during storage and reshipment should be as follows:

A) Maximum temperature: 167°F (75°C)

B) Minimum temperature: -40°F (-40°C)

2-7. Repackaging for Shipment

If possible, use the original shipping container and packing materials. Otherwise:

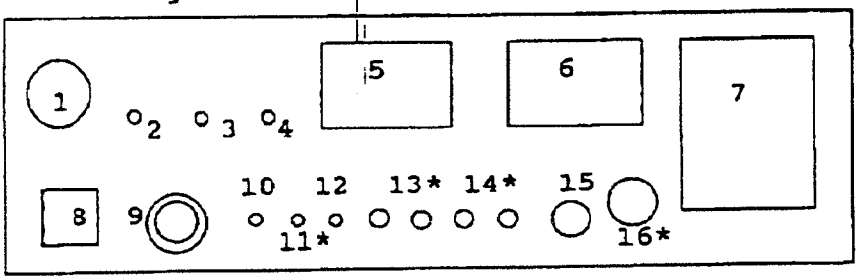
A) Wrap the Hipot in heavy paper or plastic before placing it in the shipping container.

B) Use plenty of packing material around the instrument, and protect the front panel with cardboard or plastic bubble packing. Protect the instrument with two inch rubberized foam pads placed along all surfaces of the instrument, or with a layer of excelsior about 6 inches thick packed firmly against all surfaces of the instrument.

C) Use a strong, well-sealed shipping container (350 lb/sq in. bursting test.)

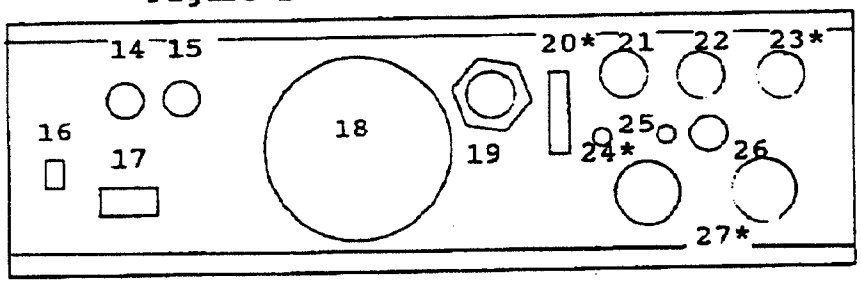
D) Mark the container "FRAGILE - DELICATE INSTRUMENT."

Figure 2-1: Front Panel Controls



1.	Alarm	emits audible signal on failure
2.	READY lamp	on when ready to begin Hipot Test
3.	TESTING lamp	on during Hipot Test
4.	FAIL lamp	on if Hipot Test fails
5.	Current meter	indicates current in AC mA
6.	Voltage meter	indicates volts in AC kV
7.	HV Output Block receptacle	for input to Device Under Test (DUT) where AC HV is applied
8.	LinePower switch	turns on and indicates line power input
9.	START switch	initiates AC Hipot Test if READY
10.	RESET button	resets Hipot
11.*	REAL switch	(*BV only) while pressed, displays Real Current
12.	A/B switch	chooses A or B Ramp Rate and Test Time
13.*	Rise Time pots	(*Optional) A & B Rise Time adjustment pots
14.*	Test Time pots	(*Optional) A & B Test Time adjustment pots
15.	Chassis Ground Sense jack	for DUT chassis ground connection
16.*	Current Trip switch	(*Optional) 6 selectable current fail points

Figure 2-2: Rear Panel Controls



14.	AC Fuse 1	.5A 250V norm blo for 115VAC, .5A 250V norm blo for 230VAC
15.	AC Fuse 2	2A (for M100, 5A for M500) 250V norm blo fuse for 115VAC, 1A (for M100, 2.5A for M500) 250V norm blo fuse for 230VAC
16.	Voltage Selector Switch	chooses 115VAC or 230VAC input; be sure to install correct fuses
17.	AC line power in	receptacle
18.	Variac	adjusts high voltage output during test
19.	HV Out connector	for Hipot Interface
20.*	Remote connector	(*Optional) for Remote Interface
21.	Under I pot	adjusts Under Current Trip (Fail) Point
22.	Total I pot	adjusts Total Current Trip (Fail) Point
23.*	Real I pot	(*BV only) adjusts Real Current Fail Point
24.*	LOC/REM switch	(*Optional) chooses Remote or normal operation
25.	Ground Sense jack	for DUT chassis ground connection
26.	Ground jack	for connecting tester's chassis' together
27.*	Hands-Off con.s	(*Optional) for Hands-off palm switches

2-8. Factory Settings

The **Rod-L** AC Hipot Testers are shipped with the following factory-selected settings (unless otherwise requested in writing by the customer):

Table 2-1: Factory Settings

Input Line Voltage Select	115 VAC	
TEST MODE SWITCH	"A"	"B"
Test (Dwell) Time	60 sec	1 sec
Ramp Rate (2.8 or 5kV units)	500 V/sec	1000 V/sec
Ramp Rate (1.5kV units)	300 V/sec	500 V/sec

2-9. Initial Installation and Power-Up

The **Rod-L** AC Hipot Tester is shipped configured for 115 VAC operation. (See Figure 2-2 for correct fuse usage.) Appropriate fuses are provided for 230 VAC operation in the shipping accessories kit. Before applying 230 VAC power to the Hipot, perform the following:

WARNING

This instrument to be used ONLY in **THREE WIRE GROUNDED OUTLETS**. It is recommended that periodic checks of the outlet and the ground wire be made to ensure operator safety.

CAUTION

Changing Fuses: Turn off the Hipot Tester and **DISCONNECT THE POWER CORD**. Then install the proper fuses. Otherwise, damage to the instrument and/or operator could result.

2-10. Operational Check

This is an operator oriented procedure which allows operational check of the **Rod-L** AC Hipot Test Instrument without test equipment. Refer to Section 4 of this manual for a complete calibration procedure.

Place the instrument in a sturdy position, preferably on an insulated surface, with all surrounding metal/conductors grounded. Position the power cord so as to avoid being walked on or pinched by other equipment.

A) Set LINE POWER switch to OFF.

B) Set the TOTAL CURRENT control to the full CW (clockwise) position.

C) Set the REAL CURRENT control to the full CW position (BV models only.)

D) Validate that fuses F1 and F2 are the proper values. (See Figure 2-2 for correct fuse usage.)

E) Verify Input Line Voltage Select Switch position.

F) Connect AC Power Cord to AC receptacle on the rear panel.

G) Connect the AC Power Cord to a 115 VAC ±10% power source.

H) Connect low current Ground Sense Cable to the CHASSIS GROUND SENSE terminal on the front panel. Then attach the aligator clip end of the cable to the Hipot Tester chassis (the handle is a convenient point.)

I) Set LINE POWER switch to ON. The lamp in the switch should illuminate.

J) Press the RESET button. The green READY lamp should illuminate.

NOTE: *If the lamp in the power switch remains off, check for proper AC line voltage. If the lamp in the power switch is ON and the green READY lamp remains off, check the* CHASSIS GROUND SENSE *connections.*

K) With the READY lamp lit, push the START switch. The TESTING lamp will light. Now quickly disconnect the CHASSIS GROUND SENSE cable. The FAIL lamp should light and the alarm sound a continuous tone, indicating a Safety Ground failure.

WARNING

AC high voltage is present at the front panel HV receptacle block and the rear panel cylindrical connector when the TESTING LAMP is lit.

L) Push the RESET switch to extinguish the FAIL lamp and the alarm.

M) Reconnect the CHASSIS GROUND SENSE cable per step "H." The READY lamp should re-illuminate after the RESET button is pressed.

N) Push START. The TESTING lamp will light and the OUTPUT VOLTAGE meter will indicate the controlled rise to the preset voltage. The TESTING light will remain on until the test time has expired or a test failure is detected.

2-11. Fail Indications

Over Current failures are represented with the FAIL lamp and audible alarm coming on continuously until the RESET button is pressed.

Ground Continuity faults are also depicted with the FAIL lamp and audible alarm coming on continuously, and additionally, the READY lamp turns off. The Hipot Tester must be manually RESET.

An Under Current FAIL is indicated with a tone that is about one second long, then the Hipot Tester resets itself.

Option 05 Hands-Off FAIL signal is about two seconds long, and then the Hipot Tester is resets itself automatically.

Option 18 Ohm Sense FAIL emits beeps at about 1 to 2 per second until the reset button is pushed. Also, there are no TESTING nor FAIL lights. This does not denote failure.

When Option 10 Audible Test Tone is installed in a Hipot Tester, the alarm will sound pulses at 3 to 6 beeps per second whenever a TEST is in progress.

2-12. List of User Adjustable Pots

R30 on the A6-S5 PCB	A Rise Time	(see pages 32-34)
R4 on the A6-S5 PCB	B Rise Time	(see pages 32-34)
R37 on the A21 PCB	A Test Time	(see pages 32-34, 38)
R2 on the A21 PCB	B Test Time	(see pages 32-34, 38)
Total Current Trip Point on the Rear Panel		(see page 39)
Under Current Trip Point on the Rear Panel		(see page 41)
Real Current Trip Point on the Rear Panel		(see page 40)

2-13. Automatic Test Procedure

The following procedure assumes the **Rod-L AC Hipot Tester** has been calibrated and adjusted for normal operation. Proceed as follows:

A) Place the Device Under Test (DUT) next to the Hipot Tester.

B) Plug the power cord of the DUT into the high voltage connector of the Hipot Tester.

C) Connect the GROUND SENSE cable between the DUT and CHASSIS GROUND SENSE banana jack of the Hipot Tester. If this ground connection is less than 0.5Ω, (0.1Ω optional,) the READY lamp will light.

D) Press the START button. The TESTING lamp should light. (If the Ohms Sense option is used, refer to Section 5, page 51.)

WARNING

High voltage is applied to the Device Under Test. Do not touch the DUT power cord or chassis while the TESTING lamp is lit. If you do, extreme shock may result.

E) Check that the OUTPUT VOLTAGE meter indicates the test selected voltage. If voltage is high or low, adjust the VARIAC on the rear panel to compensate.

F) Restart the test. Observe the total current indication. (The BV Model has an additional feature: press the PUSH FOR REAL CURRENT ÷ 10 push button to observe the "real" or resistive part of the current.)

G) For a normal test, the TESTING lamp will extinguish at completion of the preset test time. If one of the preset current failure setpoints is exceeded, the ground sense connection is interrupted, or an arcing condition occurs due to dielectric insulation breakdown, the test will automatically abort, giving a failure indication, i.e. the FAIL lamp will light and the audible alarm will sound continuously. The operator must then manually press the RESET push button before a test can be repeated.

H) In the event of a FAIL indication, the operator should investigate carefully to determine which failure occured. For this reason the ammeter should be continuously monitored during the test.

NOTE: *At least five seconds must elapse between TURN-ON and the first hipot test, and three seconds must elapse between successive hipot tests, or random FAIL indications may occur.*

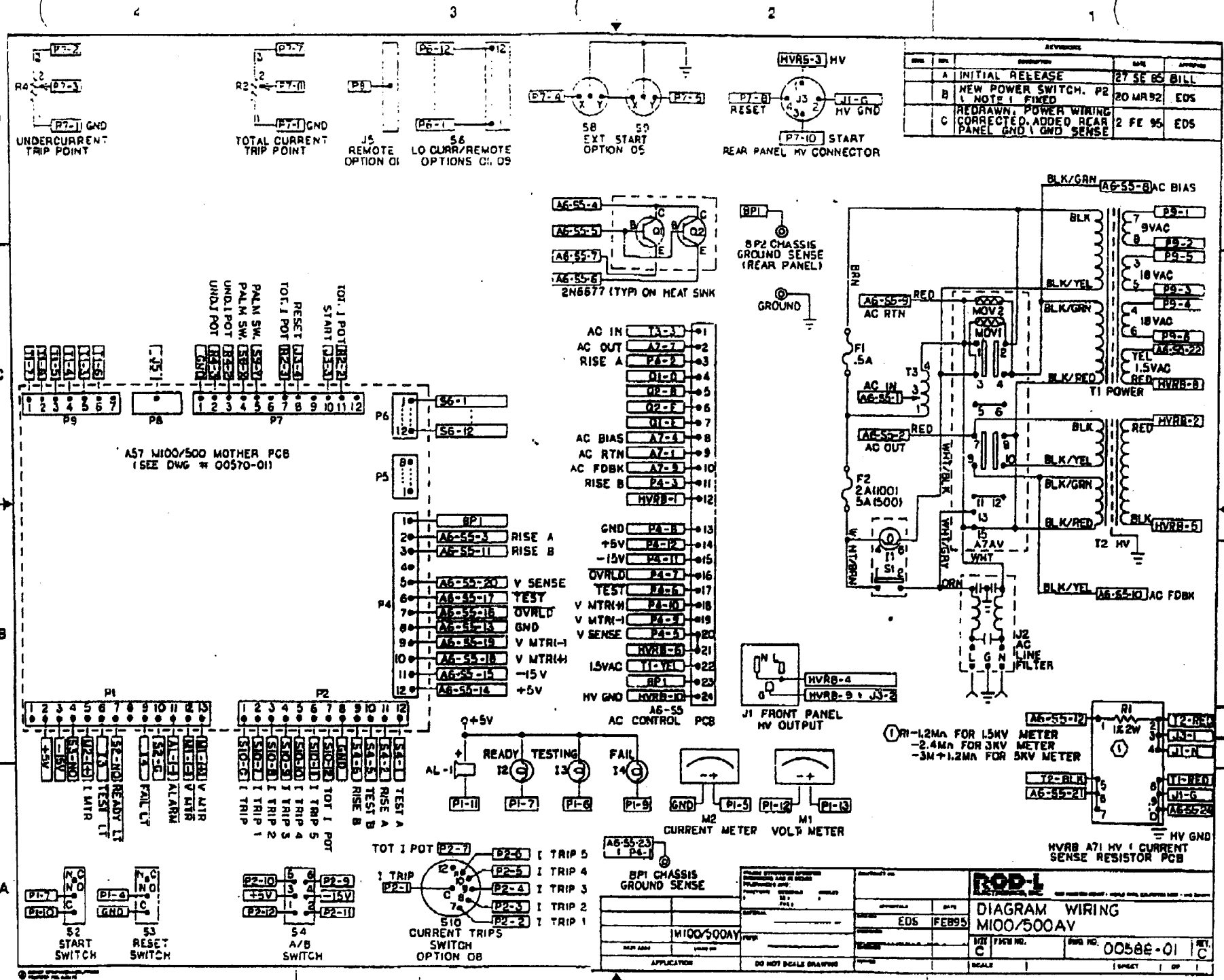

UNDERCURRENT TRIP POINT
TOTAL CURRENT TRIP POINT
J5 REMOTE OPTION 01
S6 LO CURR/REMOTE OPTIONS 01, 09
S8 EXT START OPTION 05
HVRB-3 HV
REAR PANEL HV CONNECTOR
RESET
HV GND
START
REVISIONS
A INITIAL RELEASE 27 SE 85 BILL
B NEW POWER SWITCH. P2 NOTE 1 FIXED 20 MR 92 EDS
C REDRAWN. POWER WIRING CORRECTED. ADDED REAR PANEL GND & GND SENSE 2 FE 95 EDS
2N6677 (TYP) ON HEAT SINK
BPI
8 P2 CHASSIS GROUND SENSE (REAR PANEL)
GROUND
AC BIAS
AC RTN
AC OUT
AC FDBK
T1 POWER
T2 HV
AC IN
A57 M100/500 MOTHER PCB (SEE DWG # 00570-01)
A6-55 AC CONTROL PCB
J1 FRONT PANEL HV OUTPUT
J2 AC LINE FILTER
R1-1.2MΩ FOR 15KV METER
-2.4MΩ FOR 30KV METER
-3MΩ+1.2MΩ FOR 50KV METER
HVRB A71 HV & CURRENT SENSE RESISTOR PCB
HV GND
READY
TESTING
FAIL
M2 CURRENT METER
M1 VOLT METER
S2 START SWITCH
S3 RESET SWITCH
S4 A/B SWITCH
S10 CURRENT TRIPS SWITCH OPTION 08
BPI CHASSIS GROUND SENSE
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DIAGRAM WIRING
M100/500AV
00588-01
EDS FEB95