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M100DC

Section 1 INTRODUCTION

1-1. Scope of This Manual

This publication provides operation and service instructions for the Rod-L Electronics Inc. Models M100DC, M120DC, and M130DC Hipot Test Instruments. It is divided into six sections.

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

1-2. DC Hipot Tester General Description and Test Features

The Rod-L DC Hipot Test Instruments are essentially the same. The M100DC is the base model, and all the controls for the M120DC are on the front panel. All are rugged, self-contained testers designed for production and/or laboratory use. The DC Hipot Tester's purpose is to provide a means for evaluating the dielectric withstand capabilities of electric and/or electronic devices when subjected to abnormally high input voltages. This is accomplished by monitoring for "breakdown" in the form of arcing/corona or exceeding of the maximum allowable current, determined by the positioning of "Current Trip Potentiometers."

The DC Hipot Testers perform a DC High Voltage leakage and breakdown dielectric withstand test. They test and display DC current and voltage. Specifications are given in Table 1-1.

These models also conduct a low current Ground Continuity Test concurrent with the Hipot Test to ensure that the Device Under Test (DUT) is capable of effectively shunting the "leakage" current produced by the high voltage to earth ground. For operator safety, this CHASSIS GROUND SENSE connection must be made with a low resistance return on the DUT. Without this connection, the tester cannot enter the READY state. Both the Chassis Ground and the power cord Safety Ground of the DUT are monitored and stressed electronically. If either ground fails during the test, the Hipot Tester automatically goes into failure mode; i.e., high voltage is shut down and there is a visual and audible 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

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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.)

Connection of the DUT to the Hipot Tester is made via the front panel High Voltage Receptacle (DUT's that terminate in a three prong cord) or the rear panel High Voltage Connector (all others).

All models incorporate a rapid, automatic electronic shutdown circuit to turn off the high voltage within 2ms (two milliseconds) after a fault. To prevent turn-on surges, the high voltage has an electronically controlled rate-of-rise (adjustable from 50V/sec to 5000V/sec).

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1-3. Product Specifications (Table 1-1)

Table 1-1: DC Hipot Tester Specifications

Test Current	40 microamperes (μ A) to 10 milliamperes (mA) full scale (F.S.)
Test Voltage	User specified up to 5000 VDC
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)
Initial Turn-On Period	Requires 2 seconds normally for safety ground test before starting Hipot test
Safety Ground Continuity	Reject level: 0.1 to 0.5 Ω , (adjustable) \pm 0.01 Ω
Accuracy (Current and Voltage Monitoring)	Better than 1%
Resolution (Output Voltage Control)	2.5V
Resolution (Output Current)	4 Microamperes (μ A)
Input Power	115/230 VAC, 44-66 Hz., 360 watts, max
Ripple	1% at full load, 0.05% at zero current
Regulation	0.05% at full load
Environmental Operating Temperature	0° to 50° C, 32° to 122° F
Exterior Color	Mint grey / Olive grey
Weight	24 lbs (10.9 kg) net, 29 lbs (13.15 kg) shipping
Dimensions	16.75 x 13.25 x 5.5 inches (43 x 34 x 14 cm)

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1-4. 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
- G) Fast electronic shut down of DC High Voltage
- H) Hard RESET after failure required to perform next test
- I) Visually displayed Programming of DC Current Trip Point and High Voltage
- J) Adjustable, linear Ramp Up of DC High Voltage
- K) Complete discharge of Device Under Test (DUT)
- L) High Voltage Output closed to Ground when not in test

1-5. Supplied Equipment

- A) DC Hipot Test Instrument
- 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

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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

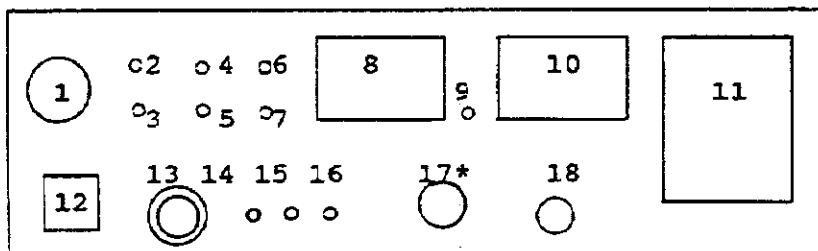
This section contains the recommended procedures for unpacking, inspection, installation, and operation.

2-2. Unpacking and Inspection

A shipping carton that appears damaged should be inspected and unpacked with the carrier's agent present. Inspect the instrument for damage (scratches, dents, broken knobs or meters, etc.)

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Figure 2-1: M100DC Front Panel Controls



- | | |
|----------------------|--|
| 1. Alarm | emits audible signal on failure |
| 2. V-SET lamp | on when V-SET switch is in set position
off when V-SET switch is in run position |
| 3. READY lamp | on when ready to begin Hipot Test |
| 4. I-SET lamp | on when I-SET switch is in set position
off when I-SET switch is in run position |
| 5. TESTING lamp | on during DC Hipot Test |
| 6. AC lamp | on when AC/DC switch is in AC position |
| 7. FAIL lamp | on if DC Hipot Test fails |
| 8. Current meter | indicates current in DC mA (μ A with Option 09);
inactive during AC Hipot Test;
indicates fail point when in I-SET mode |
| 9. HV ON lamp | flashes when 40VDC or more is present;
inactive during AC Hipot Test |
| 10. Voltage meter | indicates volts in DC kV; inactive for AC test;
indicates max DC kilovolts when in V-SET mode |
| 11. HV Output Block | for input to DUT where DC or AC HV is applied |
| 12. LinePower switch | turns on and indicates line power input |
| 13. START switch | initiates DC (or AC) Hipot Test if READY |
| 14. RESET button | resets Hipot |
| 15. DC/AC switch | chooses DC Hipot or the input from AC Hipot |
| 16. A/B switch | chooses A or B Ramp Rate and Test Time |
| 17.* Select switch | (*Optional) chooses different parameter sets |
| 18. Chassis Ground | for DUT chassis ground connection |
| | Sense jack |

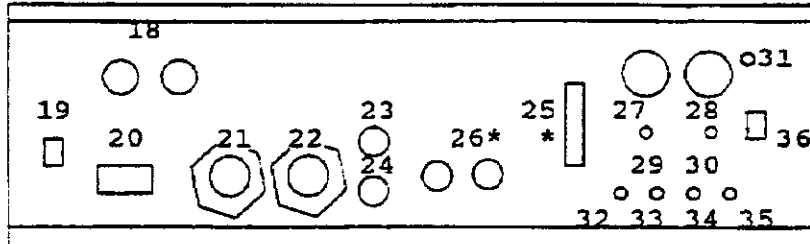
If the instrument is found to be damaged upon receipt, notify the carrier and Rod-L Electronics immediately. Retain the shipping carton and the padding material for the carrier's inspection, and for return shipment.

2-3. Installation

The Rod-L DC Hipot Test Instruments are suitable for either bench or rack mounting. To rack mount the instrument, use Option 15A. The instructions for rack mounting are on page 39.

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Figure 2-2: M100DC Rear Panel Controls



18. AC Fuses F1/F2 3A @ 115VAC, 1.5A @ 230VAC
 19. Voltage Selector Switch chooses 115VAC or 230VAC input; be sure to install correct fuses
 20. AC line power in receptacle
 21. HV In connector for AC Hipot Interface
 22. HV Out connector for Ground Tester Interface
 23. AC Hipot Chassis Gnd Sense jack connects Gnd of DC Hipot to Gnd of AC Hipot to enable AC Hipot Test to start
 24. Chassis Ground Sense jack for DUT chassis ground connection
 - 25.* Remote connector (*Optional) for Remote Interface
 - 26.* Hands-Off con.s (*Optional) for Hands-off palm switches
 27. V-SET pot for voltage programming
 28. I-SET pot for current trip programming
 29. V-SET switch in "set" position allows voltage programming pot to be adjusted and viewed on the voltage meter
 30. I-SET switch in "set" position allows current "trip" fail point programming pot to be adjusted and viewed on the current meter
 31. Ground jack for connecting tester's chassis' together
 32. "A" Test Time Adjustment potentiometer
 33. "B" Test Time Adjustment potentiometer
 34. "A" Voltage Rise (Ramp Rate) Adjustment potentiometer
 35. "B" Voltage Rise (Ramp Rate) Adjustment potentiometer
 36. Burn Switch enables DC Hipot to perform destructive test
- Note that on the M120DC, all controls are on the Front Panel.

2-4. Power Requirements

The Rod-L DC 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.

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2-5. Operating Controls

The front panel and rear panel controls and indicators for the M100DC are shown and briefly described in Figures 2-1 and 2-2. They would all be on the Front Panel of the Model M120DC.

2-6. Storage

It is strongly recommended that the DC Hipot Tester 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 DC Hipot Tester 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."

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.

2-8. Initial Installation and Power-Up

The DC Hipot Tester is shipped configured for 115 VAC operation. Appropriate fuses (1.5 ampere) are also provided for 230 VAC operation. Before applying 230 VAC power to the instrument, perform the following:

CAUTION

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

2-9. Factory Settings

The DC Hipot Tester is shipped with the following factory-selected settings (unless otherwise requested in writing by the customer):

Table 2-1: Factory Settings

TEST MODE SWITCH	"A"	"B"
Voltage	1500 VDC	1500 VDC
Maximum Current	5 mA	5 mA
Test (Dwell) Time	15 sec	2 sec
Ramp Rate	200 V/sec	1000 V/sec
Input Line Voltage Select	115 VAC	

2-10. Operational Check

This is an operator oriented procedure which allows operational check of the Rod-L DC 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) Validate that fuses F1 and F2 are the proper values.
- C) Verify Input Line Voltage Select Switch position.
- D) Connect AC Power Cord to AC receptacle on the rear panel.
- E) Connect the AC Power Cord to a 115 VAC $\pm 10\%$ power source.
- F) Ensure that the V-SET and I-SET switches are in the "RUN" position. Place the AC/DC switch in the DC position.
- G) Verify Remote/Local Switch is in Local position.
- H) Connect low current Ground Sense Cable to the CHASSIS GROUND SENSE terminal on the front panel. Then clip the other end of the cable to the Hipot Tester chassis (the handle is a convenient point). When Option 09 Low Current is present, the alligator clip end has to be connected to HV Return instead.
- I) Set LINE POWER switch to ON. The power ON lamp should illuminate.
- J) The green READY lamp should illuminate.

NOTE: If the power ON lamp remains off, check for proper AC line voltage. If the power ON lamp 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 HV ON lamp will begin flashing. While the HV ON lamp is flashing, quickly disconnect the CHASSIS GROUND SENSE cable. The FAIL lamp should light and the alarm sound, indicating a Safety Ground failure.

WARNING

DC high voltage is present at the front panel HV receptacle block and the rear panel cylindrical connector when the HV ON lamp flashes.

- 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.
- N) Push START. The HV ON lamp will begin flashing and the OUTPUT VOLTAGE meter will indicate the controlled rise to the preset voltage. The HV ON light will remain flashing 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.

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

Option 20 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. Set Current Fail Point

When the I-SET switch is in the "set" position, adjust the I dial on the rear panel until the desired setting is indicated on the current meter [CW (clockwise) to increase.]

2-13. Preset Test Voltage

With the V-SET switch in the "set" position, adjust the V dial to the desired setting (CW to increase).

Be sure to return the SET switches to the RUN position.

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2-14. Preset Test Time/Rise Time

With the A/B switch in the A position, the A Test Time Pot can be adjusted (CW to increase). A TEST must be in progress to adjust for desired Ramp Rate (rate of rise to full voltage). Remember, increasing the time will decrease the Ramp Rate.

The "A" test time pot is used to adjust for desired dwell time at full voltage. These adjustments may require starting the TEST several times.

The "B" times are adjusted with the A/B switch in the B position.

2-15. Automatic Test Procedure

Connect the Device Under Test (DUT) to the Hipot Tester output voltage receptacle. Then connect the Chassis Ground Cable between the DC Hipot Tester and an electrical ground of the DUT. If the READY light goes on a solid ground connection is sensed and the testing may proceed; if the READY light does not go on, the ground needs checking.

When the READY light comes on, the DUT is ready to be hipot tested with the START signal coming from the REMOTE or the START Switch.

NOTE: If the DC Hipot Tester is operated at maximum voltage and maximum current simultaneously, then the operation duty cycle must not exceed 25%—where duty cycle shall be defined as:

$$\frac{\text{operation time}}{\text{operation time} + \text{rest time}} \times 100\%$$

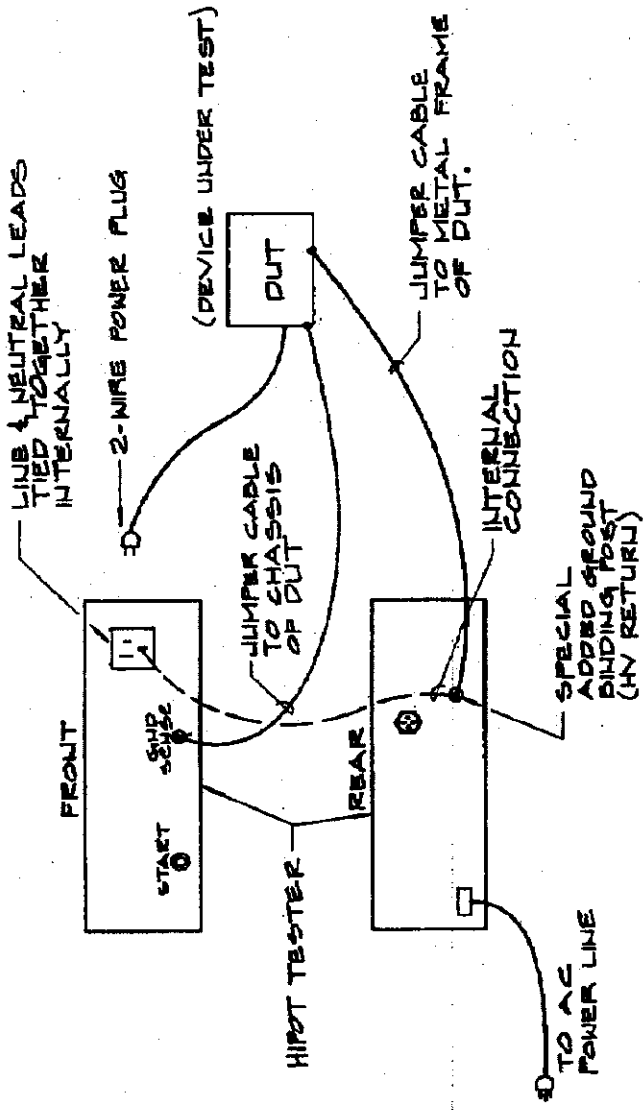
2-16. Using the DC Hipot Tester with a Rod-L AC Hipot

See the drawings at the rear of this manual, #s 01076-01, 01077-01, and 01076-01. One of these drawings should enable setting up of the DC Hipot Tester with a Ground Continuity Tester and/or AC Hipot Tester.

Ensure the Testers are connected to the same AC Line Power source.

The Ground Tester/Hipot Tester Interface Cable is connected from the AC Hipot Tester to the connector on the Rear Panel of the DC Hipot Tester labeled "AC Hipot," which is the input HV connector. This ties the high voltage, Start, and Reset signals from the AC Hipot Tester, so that the DUT need be connected only into the Front Panel Receptacle of the DC Hipot Tester. Then, when the AC/DC switch is switched to AC, and the Start button on the DC Hipot Tester is pressed, the AC Hipot begins a test, and the high voltage is connected to the Front Panel Receptacle of the DC Hipot Tester.

REV.	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	4-7-86	
B	BINDING POST TIED TO HV BLOCK GND. GND SENSE TO DUT CHASSIS.		<i>slat</i> ZEMARK



REV. NO. DATE REV.

REV.	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	4-7-86	
B	BINDING POST TIED TO HV BLOCK GND. GND SENSE TO DUT CHASSIS.		<i>slat</i> ZEMARK

CONTRACT NO.	DATE	DATE
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DESIGNER	CONCHECK	REVISED

SIZE	FIG. NO.	DWG. NO.	REV.
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SCALE			SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED	CONTRACT NO.
ALL DIMENSIONS ARE IN INCHES	
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DECIMALS SHALL BE TO 2 PLACES	
NEUTRAL	
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DESIGNED BY	
CHECKED BY	
APPROVED BY	

DO NOT SCALE DRAWING
APPLICATION

FIG. NO. IN REV

REV	DESCRIPTION	DATE	APPROVED
A	Initial release	29 Ac 86	C Holley
B	Redrawn, corrected use	July 94	EDS
C	Added Ground	6 Fe 95	EDS
D	Added note 3 & moved 3a	11 My 95	EDS

SYSTEM OBJECTIVE
To perform a Ground Continuity, then a DC Hipot test automatically through one high voltage receptacle and with one press of the start switch.

SYSTEM CHECK

Use the 4-pin-IV-connector interface cable (P/N 00333-04) to connect the "interface" connector at the rear of the Ground Continuity Tester to the "Gnd Tester" connector at the rear of the M100DC.

Connect together the "Chassis Ground Sense" (black banana jack) at rear of each unit using a jumper cable with a standard banana plug at each end.

Connect "Ground" (the metal banana jack) at rear of the ground continuity tester to "Ground" (the metal banana jack) at the rear of the Hipot Tester.

Connect the High Current ground cable (P/N 00436-04) giant banana plug at one end, battery clip at the other) to the "Chassis Ground Sense" at the front of the ground continuity tester and to its metal chassis frame.

The function select switch of the ground continuity tester should be in the "GND/HIPOT" position.

Plug both units into a common-ground AC outlet. Turn power of the Ground Continuity Tester on first, then power on the Hipot Tester. Both ready lights should then come on. If the M100DC ready light is not on, press the reset button.

Press the ground continuity tester's start button. The test begins, and after the ground continuity test is completed, the Hipot Tester will start automatically.

Now the system is ready for use.

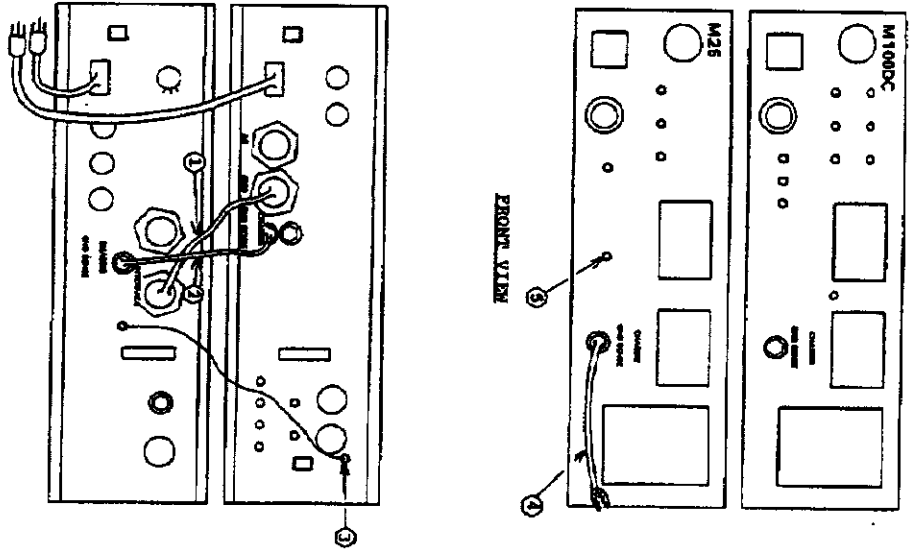
SYSTEM USE

Assuming units are calibrated to the desired trip points, remove ground cable connection to the Ground Continuity Tester and connect it to the metal chassis frame of the Doyloc Under Test (DUT).

Plug the DUT into the high voltage receptacle of the ground continuity tester.

Press the ground continuity tester's start button to begin the test.

For individual machine difficulties, see the appropriate manual.



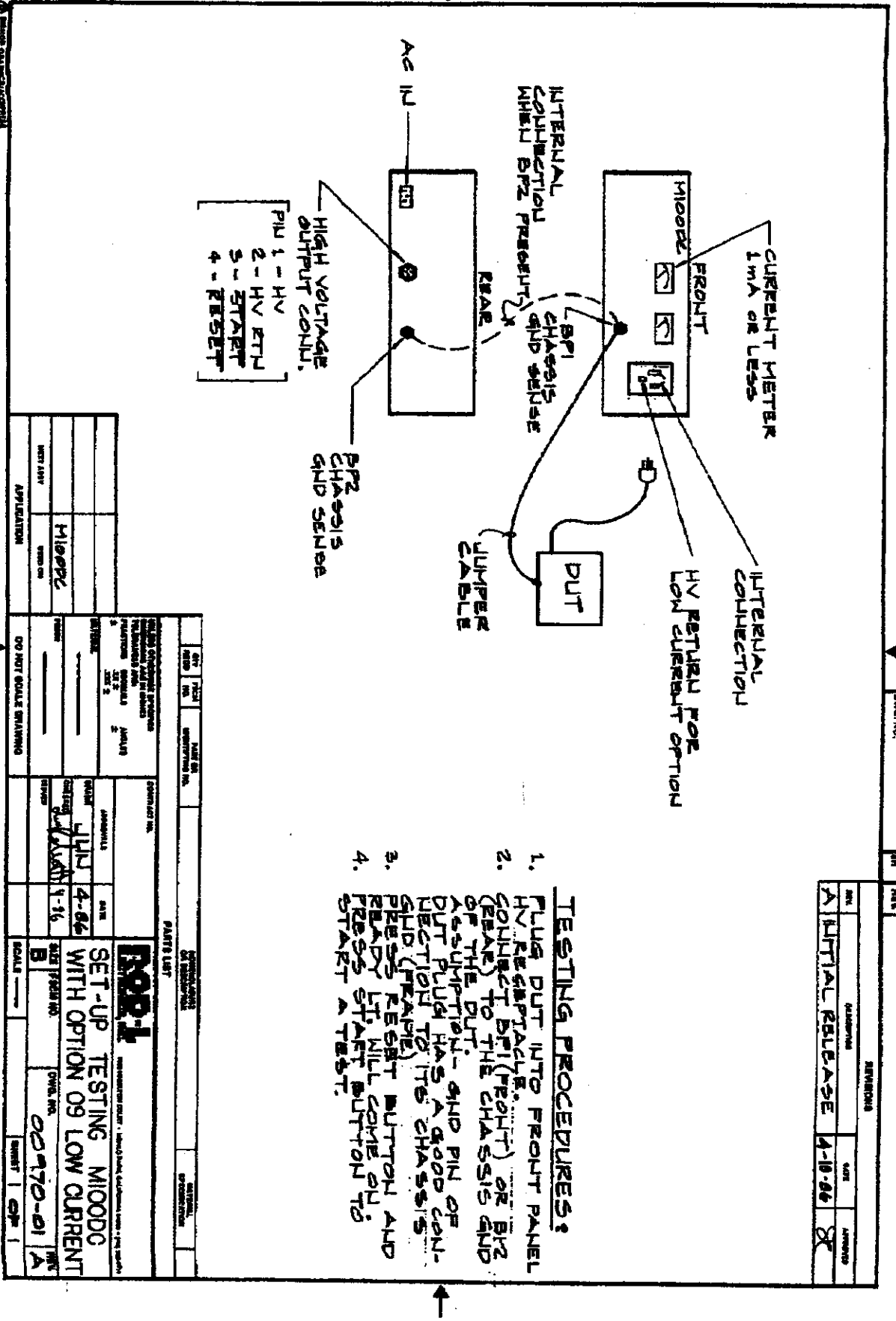
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POP-1
DIAGRAM - SYSTEM HOOKUP
GT - DC INTERFACE

REV	DATE	BY
B	01076-01	D



REV	DESCRIPTION	DATE	APPROVED
1	INITIAL RELEASE	4-10-86	RC

- TESTING PROCEDURES:**
1. PLUG DUT INTO FRONT PANEL HV RECEPTACLE.
 2. CONNECT BIZ (FRONT) OR BIZ (REAR) TO THE CHASSIS GND AND OF THE DUT.
 3. AS AN OPTION - GND PIN OF DUT PLUG HAS A GOOD CONNECTION TO ITS CHASSIS GND (FEASIBLE).
 4. PRESS RESET BUTTON AND READY LIGHT WILL COME ON. PRESS START BUTTON TO START A TEST.

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Section 5 OPTIONS

5-1. Remote Control; Options 01 and 19

The DC Hipot Tester has remote control and data logging capability when one of the Remote Options is used. It would include another PCB, and the signals would come through a DB-25 connector on the rear panel.

Several versions of the Remote Option are available (see schematic 01306-02): first, either Option 01 Digital or Option 19 Analog and Digital; second, with/without Option 09 Low Current; and third, with/without Pass Signal. The A19 Remote Control / Low Current PCB is configured differently for the various combinations available.

The Remote Functions are categorized into two main types for purposes of this manual: Digital and Analog.

5-1.1. Digital Functions

These functions concern the status of the instrument and are available with Option 01. There are three inputs: *START*, *RESET*, and *SELECT A*. There are four outputs: *READY*, *TEST*, *PASS*, and *FAILURE*. These signals are TTL compatible and optically isolated.

START starts a test cycle during the low to high transition if a *READY* status already exists. The *START* input has to remain high for about 15ms minimum.

RESET resets all the operations of the DC Hipot Tester when a high level is held.

READY puts out a low level when a *Chassis Ground* connection is detected at $<0.1\Omega$. This *Chassis Ground* test is performed continuously, and since a bad *Chassis Ground* condition would be latched, driving the *READY* output continuously high, the *RESET* input has to be activated in order to re-evaluate the *Chassis Ground* connection. *RESET* also has to be activated at the beginning of any testing set up (with A51 Hipot Control PCB or above). *READY* status has to be at low level in order to activate the *START* input.

TEST is a low level output when a test is in progress.

PASS is a low level output when a test passes.

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FAILURE is output at low level whenever there is an abortive condition during a test. Conditions that could cause this are *Chassis Ground Failure* or *Overcurrent condition* and/or *breakdown failure*. When *Option 05 Hands Off* is used, a failure would be produced if the *START* input was released during a test. So if a remote option is used with the *Hands Off Option*, the start input must go to low a level and stay there during a test.

AC/DC input selects the DC Hipot Tester operation when a low level is held. Otherwise, the AC Hipot Tester is enabled which is connected to the DC Hipot Tester through the rear panel interface connector. In DC mode, the *START* and *RESET* signals go only to the DC Hipot Tester. In the AC mode, the *START* and *RESET* signals go only to the AC Hipot Tester. It is possible with the A19 Remote Control / Low Current PCB to control both DC and AC Hipot Testers through the DC Hipot Tester.

SELECT A, when held low, selects the A set of parameters, and when high, selects the B set of parameters to be set.

REMOTE (or *REM* on older units) selects the remote analog programming capability when a high level input is held. This allows the High Voltage, Current Trip Point, Ramp Rate, and Test Time (Duration) to be programmed.

5-1.2. Analog Functions

These functions are for the programming of the main parameters of a test, and the data logging of the High Voltage and Leakage Current as are on the DC Hipot Tester front panel meters. These functions are available only with Option 19. The signals are analog, scaled to 10V maximum, and interface a remote controller to special circuitry in the DC Hipot Tester. The digital *REMOTE* input has to be at a high level in order to activate that special circuitry.

EXT VREF is the input that selects—with any voltage from 0 to 10V—the *dwelt time High Voltage* value at the end of the Ramp up. The F.S. (full scale) High Voltage value corresponds to 10V, and the relationship between *EXT VREF* and High Voltage is completely linear.

EXT ITRIP chooses—with any voltage from 0 to 10V—the leakage Current Trip Point value. The F.S. leakage current value corresponds to 10V, and the relationship between *EXT ITRIP* and leakage Current Trip Point is completely linear.

EXT VTEST is the input that selects—with any voltage from 0 to 10V—the Test Time Duration. A 10V input corresponds to about 1sec, and the relationship between *EXT VTEST* and Test Time Duration is inversely proportional. This means that as the *EXT VTEST* voltage decreases, the Test Time duration increases.

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EXT VRISE is the input that chooses—with any voltage from 0 to 10V—the Ramp Rate. The F.S. High Voltage value per second corresponds to 10V, and the relationship between **EXT VRISE** and Ramp up Rate is completely linear.

OUTPUT CURRENT monitors the actual leakage Current output, where 10V represents the F.S. Current value. The relationship between the monitoring and the actual value is completely linear.

OUTPUT VOLTAGE monitors the actual High Voltage output, where 10V represents the F.S. High Voltage value. The relationship between the monitoring and the actual value is completely linear.

5-1.3. Remote Theory

The digital inputs on the A19 Remote Control PCB; **START**, **RESET**, **SELECT A**, **REMOTE**, and **AC/DC**, are connected to U7, the TTL buffer inverter 7416, which drives the optical isolators U4, U5, U6, U3, and U14 respectively to provide the proper signals to the DC Hipot Tester. These inputs are high level active.

The digital outputs **READY**, **TEST**, **PASS**, and **FAILURE** on the A19 are provided by the outputs of the optical isolators U10, U11, and U9 respectively. These outputs are low level active.

The remote controller must provide an external 5V supply and the respective external ground return. The +5V supply would have to provide about 100mA. The fan out of the outputs is about 3 TTL gates.

The analog inputs, **EXT VREF**, **EXT ITRIP**, **EXT VTEST**, and **EXT VRISE** come in to a voltage follower, LM324, at either U1 or U2. The signals are then delivered to the standard circuitry which is activated by the **REMOTE** signal.

The LM324 U2 also provides buffering for the analog outputs **OUTPUT CURRENT** and **OUTPUT VOLTAGE**.

The input impedance for the input signals is 10k Ω , and the output impedance for the output signals is about 75 Ω . The analog signals are not optically isolated, and a separate ground reference lead is provided which is ultimately tied to the chassis of the DC Hipot Tester. No external voltage supply has to be provided for the analog interface.

M10-DC

The DB-25 pin assignment needed for using the Remote Options is shown below:

DB 25 Pin #	Signal Name	Analog/Digital
1	EXTGND (Digital Supply)	
2	VOUT	A
3	IOUT	A
4	GND (Analog Reference)	
5	EXTVREF	A
6	EXTITRIP	A
7	EXT VTEST	A
8	EXT VRISE	A
9	-PASS	D
10		
11		
12		
13		
14		
15	AC/DC	D
16	EXTGND (Digital Supply)	
17	REMOTE	D
18	RESET	D
19	START	D
20	EXT +5V (Digital Supply)	
21	-READY	D
22	-TEST	D
23	-FAILURE	D
24		
25	SELECTA	D

5-2.1. Option 05, Hands Off Operation Description

Option 05 Hands Off Operation is used to force the operator to maintain closure of two palm switches in order to start AND keep the test going. With both hands occupied, the operator cannot touch the DUT (Device Under Test) during a test, hence, their HANDS are OFF the DUT.

The Rod-L DC Hipot Tester uses two five-pin DIN connectors on the rear panel to connect to the palm switches whenever Option 05 is installed. It also means, though, that even if you want to use the regular START button, you must hold the button down for the duration of the test. Otherwise, the Hipot Tester will fail.

This option must be installed at the factory because it uses a special rear panel.

5-2.2. Option 05, Hands Off Operation Theory

The Hands Off signal is from U15 pin 9, a CMOS NAND gate, on the A51 Hipot Control PCB.

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