A DIVISION OF IKONIX USA

Operation & Service Manual

Model 4320, 4520

Item 99-10319-01
Ver, 2.05
May 18, 2020

CE DECLARATION OF CONFORMITY

Manufacturer:	SCI A Division of Ikonix USA
Address:	28105 N. Keith Drive Lake Forest, IL 60045 USA
Product Name:	4320 Electrical Safety Compliance Analyzer
Model Number:	4320

Conforms to the following Standards:

Safety:	UL 61010-1:2012 CAN/CSA-C22.2 NO. 61010-1-12 EN 61010-1:2010, EN 61010-2-030:2010, EN 61010-031:2002+A1 IEC 61010-1:2010, IEC 61010-2-030:2010, IEC 61010-31:2002+A1
EMC:	EN 61326-1:2006 (EN 55011:1998/A2:2002 Class A, EN 61000-3-2:2006, EN 61000-3-3:1995/ A1:2001/A2:2005 EN 61000-4-2:1995/A2:2000, EN 61000-4-3:2002, EN 61000-4-4:2004, EN 61000-4-5:1995/A1:2000, EN 61000-4-6:2003, EN 61000-4-8:1993/A1:2000, EN 61000-4-11:2004)

Supplementary Information

*The product herewith complies with the requirements of the **Low Voltage Directive 2014/35/EU**, the **EMC Directive 2014/30/EU** and the **RoHS Directive 2011/65/EU** with respect to the following substances: Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent chromium (Cr (VI)), Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE), Deca-BDE included.*

Last two digits of the year the CE mark was first affixed: 05

The technical file and other documentation are on file with Slaughter Company, Inc.

Joseph Guerriero,President
SCI a Division of Ikonix USA
Lake Forest, Illinois USA
May 18, 2020

DECLARATION OF CONFORMITY

Manufacturer:	SCI a Division of Ikonix USA
Address:	28105 N. Keith Drive Lake Forest, IL 60045 USA
Product Name:	4520 Electrical Safety Compliance Analyzer
Model Number:	4520

Conforms to the following Standards:

Safety:	EN 61010-1:2010 EN 61010-2-030:2010, EN 61010-031:2002+A1
EMC:	EN 61326-1:2013 Class A, EN 55011 :2009+A2:2010 Group 1 Class A, EN 61000-3-3:2013, IEC 61000-3-3 :2013, EN 61326-1:2013 (Industrial Locations), EN 61000-4-2:2009, IEC 61000-4-2:2008, EN 61000-4-3:2006+A1:2008+A2:2010 IEC 61000-4-3:2006+A1:2007+A2:2010 EN 61000-4-4:2012, IEC 61000-4-4:2012, EN 61000-4-5:2006, IEC 61000-4-5:2005 EN 61000-4-6:2014, IEC 61000-4-6:2013, EN 61000-4-8:2010, IEC 61000-4-8:2009, EN 61000-4-11:2004, IEC 61000-4-11:2004

Supplementary Information

The product herewith complies with the requirements of the ***Low Voltage Directive 2006/95/EC, EMC Directive 2014/30/EU*** *and the* ***RoHS Directive 2011/65/EU*** *with respect to the following substances: Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent chromium (Cr (VI)), Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE), Deca-BDE included.*

Last two digits of the year the CE mark was first affixed: 12
The technical file and other documentation are on file with Slaughter Company, Inc.

Joseph Guerriero
President
SCI A Division of Ikonix USA
Lake Forest, Illinois USA
July 20, 2017

Warranty Policy

SCI A Division of Ikonix USA, certifies that the tester listed in this manual meets or exceeds published manufacturing specifications. This tester was calibrated using standards that are traceable to the National Institute of Standards and Technology (NIST).

Your new tester is warranted to be free from defects in workmanship and material for a period of (1) year from date of shipment.

SCI recommends that your tester be calibrated on a twelve-month cycle. A return material authorization (RMA) must be obtained from SCI. Please contact our Customer Support Center at 1-847-932-3662 to obtain an RMA number. Damages sustained as a result of improper packaging will not be honored. Transportation costs for the return of the tester for warranty service must be prepaid by the customer. SCI will assume the return freight costs when returning the tester to the customer. The return method will be at the discretion of SCI.

Except as provided herein, SCI makes no warranties to the purchaser of this tester and all other warranties, express or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

Any non-authorized modifications, tampering or physical damage will void your warranty. Elimination of any connections in the earth grounding system or bypassing any safety systems will void this warranty. This warranty does not cover accessories not of SCI manufacture. Parts used must be parts that are recommended by SCI as an acceptable specified part. Use of non-authorized parts in the repair of this tester will void the warranty.

TABLE OF CONTENTS

SAFETY PRECAUTIONS REQUIRED FOR HIGH VOLTAGE TESTING!

GENERAL:

This product and its related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product is a Safety Class I tester (provided with a protective earth terminal).

Before applying power verify that the tester is set to the correct line voltage (115 or 230) and the correct fuse is installed.

INSTRUCTION MANUAL SYMBOL. PLEASE REFER TO THE INSTRUCTION MANUAL FOR SPECIFIC WARNING OR CAUTION INFORMATION TO AVOID PERSONAL INJURY OR DAMAGE TO THE PRODUCT.

INDICATES HAZARDOUS VOLTAGES MAY BE PRESENT.

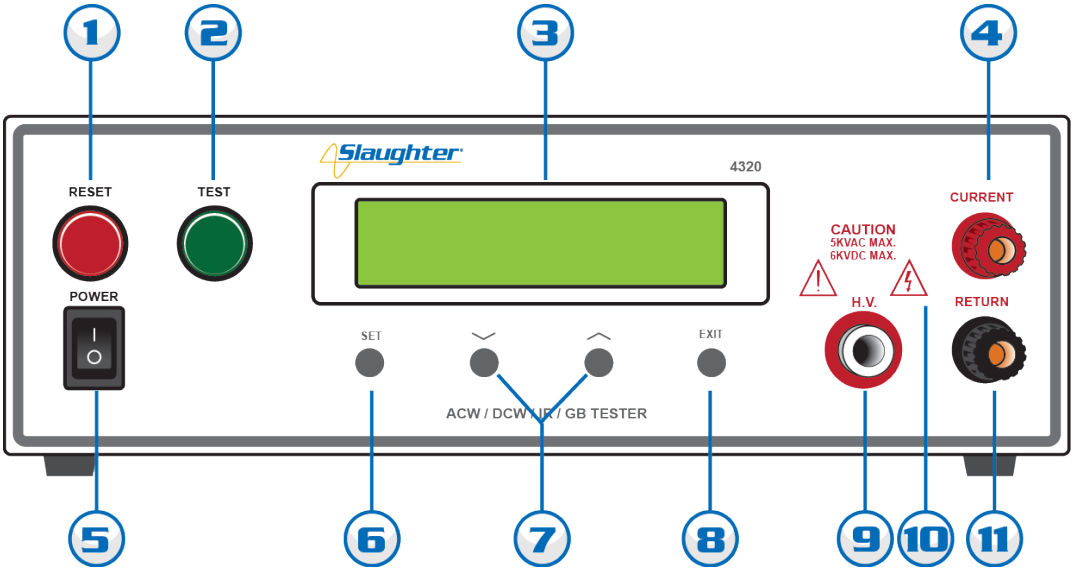
CHASSIS GROUND SYMBOL.

WARNING **CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE BODILY INJURY OR DEATH.**

CAUTION CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD CAUSE DAMAGE TO EQUIPMENT OR PERMANENT LOSS OF DATA.

WARNING **A HIPOT PRODUCES VOLTAGES AND CURRENTS WHICH CAN CAUSE HARMFUL OR FATAL ELECTRIC SHOCK. TO PREVENT ACCIDENTAL INJURY OR DEATH, THESE SAFETY PROCEDURES MUST BE STRICTLY OBSERVED WHEN HANDLING AND USING THE TEST TESTER.**

Front Panel Controls



1. **RESET BUTTON:** This is a momentary contact switch used to reset the tester. If an out-of-range reading is detected during a test, the red failure lamp within the button will light. To reset the system for the next test, press and release this button. This button may also be used to abort a test in progress.

2. **TEST BUTTON:** This is a momentary contact switch used to start a test. Press the green button to turn on the high voltage output when in test mode. The indicator lamp within the button will light when test expires with pass condition.

3. **LCD DISPLAY:** The Liquid Crystal Display is the main readout for the operator and programmer of the test settings and test results**.**

4. **CURRENT OUTPUT JACK:** Use this jack for the connection of the detachable 5-foot (1.52 m) red high current test lead or adapter box. This jack is used when performing a Ground Bond test. Please refer section E. Adapter Box connection for details on connecting the adapter box between the tester and the device under test**.**

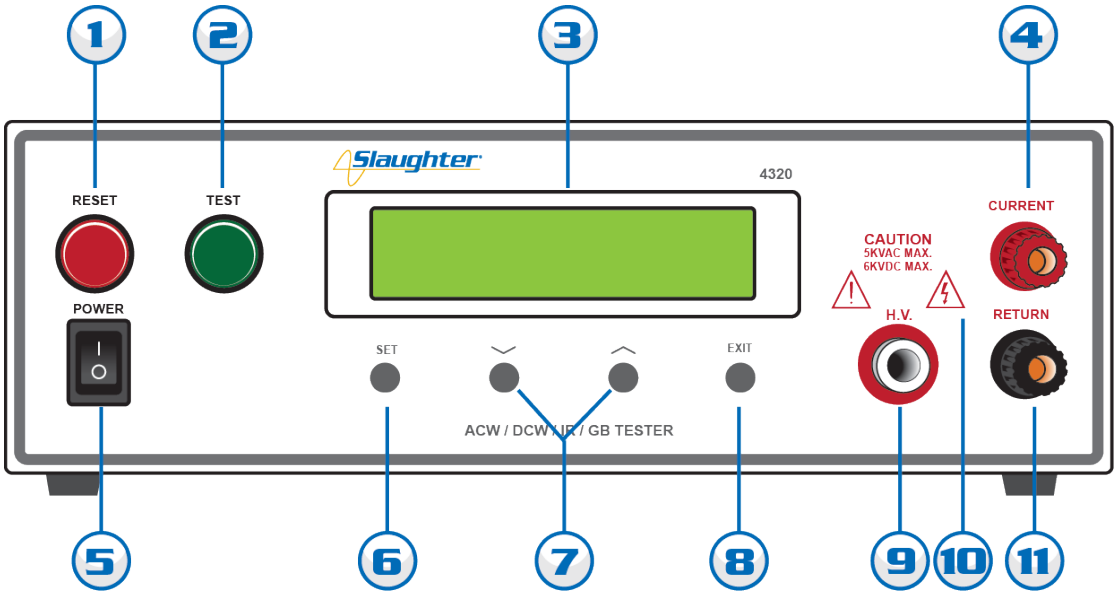
5. **POWER SWITCH:** Rocker-style switch with international ON (|) and OFF (0) markings.

6. **SET KEY:** Use this key to advance forward through the setup menus.

7. **DOWN ARROW (∨):** Use this key to decrement numeric values in the setup mode. This key also used to toggle ON/OFF functions. Also may be used to decrease output voltage during a test in 10-volt increments.

   UP ARROW (∧): Use this key to increment numeric values in the setup mode. This key also used to toggle ON/OFF functions. Also may be used to increase output voltage during a test in 10-volt increments.

Front Panel Controls



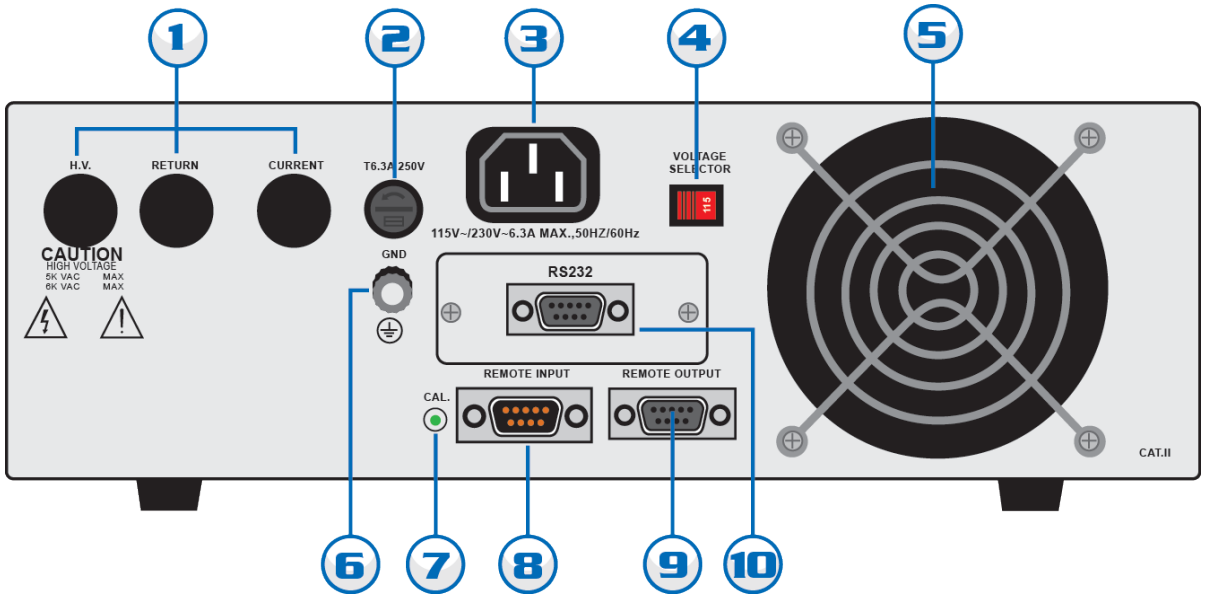
8. **EXIT KEY:** Use this key to enter the test mode screen to initiate a test. Also use this key to enter the System menu parameters and to exit from the System menu.

9. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 6-foot (1.8 m) red high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when this lead is not being used.

10. **HIGH VOLTAGE ARROW (LED INDICATOR):** This indicator flashes to warn the operator that high voltage is present at the high voltage output terminal.

11. **RETURN OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead or three-prong receptacle adapter box. This jack is always used when performing a test. Please refer section E. Adapter Box connection for details on connecting the adapter box between the tester and the device under test.

4320 Rear Panel Controls



1. **POSITION FOR OPTIONAL REMOTE OUTPUT JACKS:** Please refer section Optional Rear Panel Controls for details.

2. **FUSE RECEPTACLE:** To change the fuse unplug the power (mains) cord and turn the fuse cap counter clockwise to remove the fuse.

3. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.

4. **INPUT POWER SWITCH:** Line voltage selection is set by the position of the switch. In the left position, it is set for 115-volt operation, in the right position it is set for 230-volt operation.

5. **THERMAL FAN:** To cool the tester.

6. **CHASSIS GROUND (EARTH) TERMINAL:** This safety terminal should be connected to a good earth ground before operation.

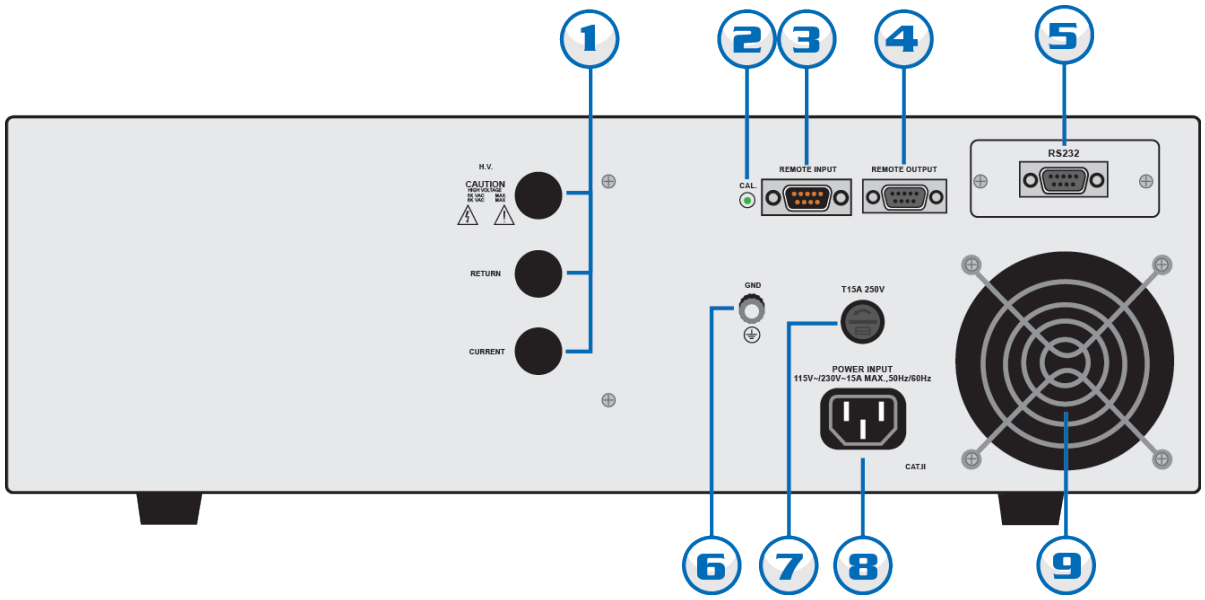
7. **CALIBRATION ENABLE KEY:** To enter the calibration mode press this key while the tester is being powered ON.

8. **REMOTE INPUT:** 9 pin D subminiature male connector for remote control of test, reset, and interlock functions as well as remote memory tests selection.

9. **REMOTE OUTPUT:** 9 pin D subminiature female connector for monitoring PASS, FAIL, and PROCESSING output relay signals.

10. **BUS INTERFACE:** Optional connector for interconnection to RS-232 bus interface.

4520 Rear Panel Controls



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9. **THERMAL FAN:** To cool the tester.

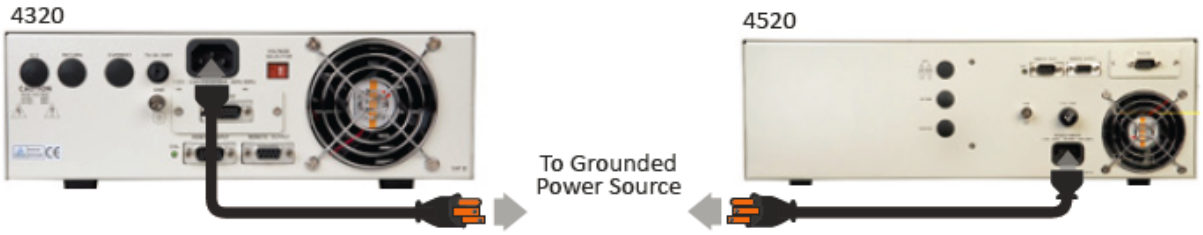
Setup Instructions for Model 4320/4520

Power-Up Sequence:

1. Check to be sure the correct input line voltage has been selected on the rear panel, either 115 volts AC or 230 volts AC. NOTE: The 4520 has an automatic input range selection.

2. Connect the power input plug into its socket on the rear panel of the tester.

3. Connect the male end of the plug to the outlet receptacle.



WARNING **PLEASE BE SURE THAT THE SAFETY GROUND ON THE POWER LINE CORD IS NOT DEFEATED AND THAT YOU ARE CONNECTING TO A GROUNDED POWER SOURCE. ALSO, CONNECT THE REAR PANEL CHASSIS GROUND FOR ADDITIONAL SAFETY.**

4. Connect the Interlock Disable key to the Remote Input connector on the back panel of the tester. *This is required in order to run a test.* For more information on the interlock, see section 5.3: Remote Interlock.

5. Turn on the POWER switch located on the lower left hand side of the front panel. Upon powering the tester up, a POWER ON SELF TEST (POST) will automatically be performed. This test will check for the condition of the ram chips, PCB's and other critical components. In addition the display will show the following message, with the actual model number and software version number.

6. The tester will recall the last memory program that was active and the display will show the parameters that were programmed into that memory. The tester is now ready for operation.

Getting to Know Your Tester:

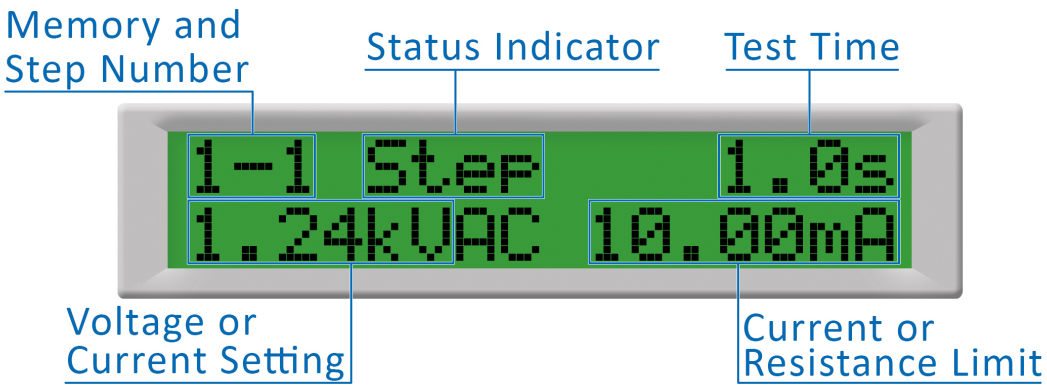
1. Working with Memories

The model 4320/4520 is equipped with 6 memory programs numbered 1 through 6. Each memory location contains 6 separate steps that can be connected sequentially to the next consecutive step. Each step contains 4 separate locations, one for each function. Only one function can be selected for each step, but the other three function parameters remain stored in the memory. The following memory map illustrates the separate location for each function.

Memory 1-6	Step 1	Step 2	Step 3…Step 5	Step 6
	AC	AC	AC	AC
	DC	DC	DC	DC
	IR	IR	IR	IR
	GND	GND	GND	GND

2. Perform Test Screen

The Perform Test Screen displays 6 parameters:

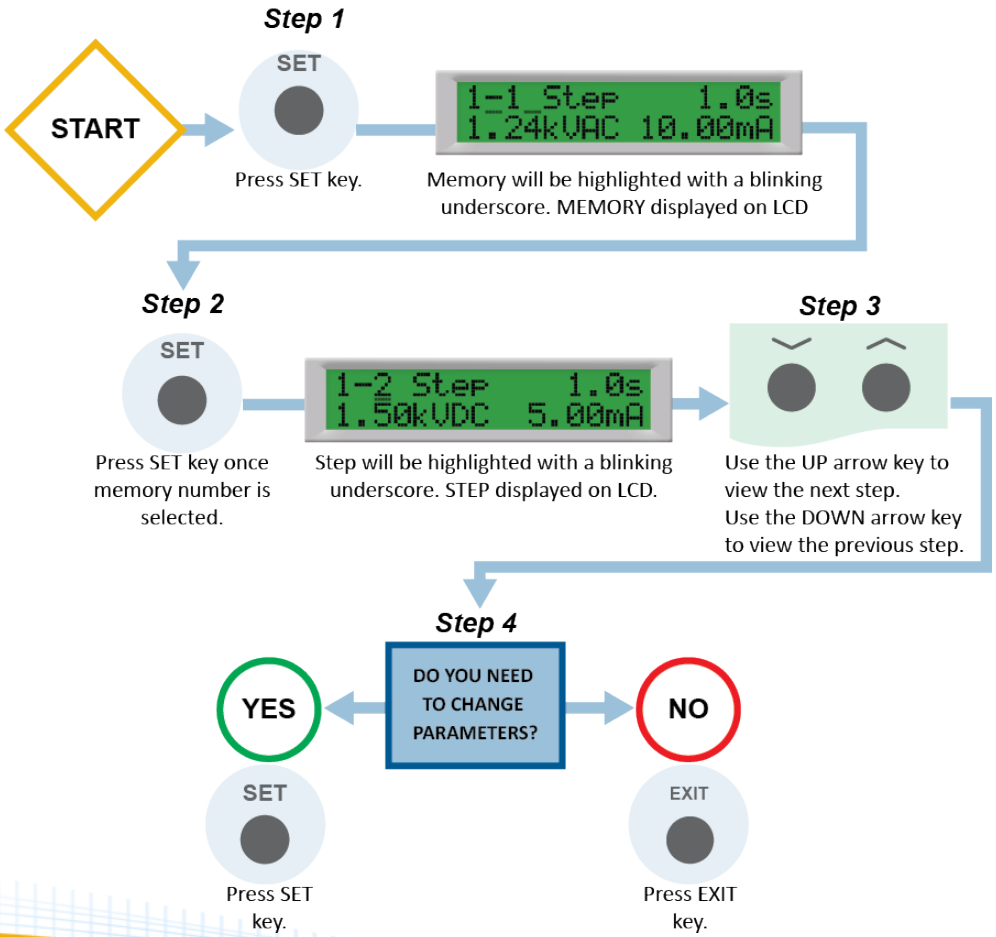


Follow the setup procedures to set the desired parameters. The display will show the either the Hipot test settings, the Insulation Resistance test settings or Ground Bond test settings depending on what has been selected:

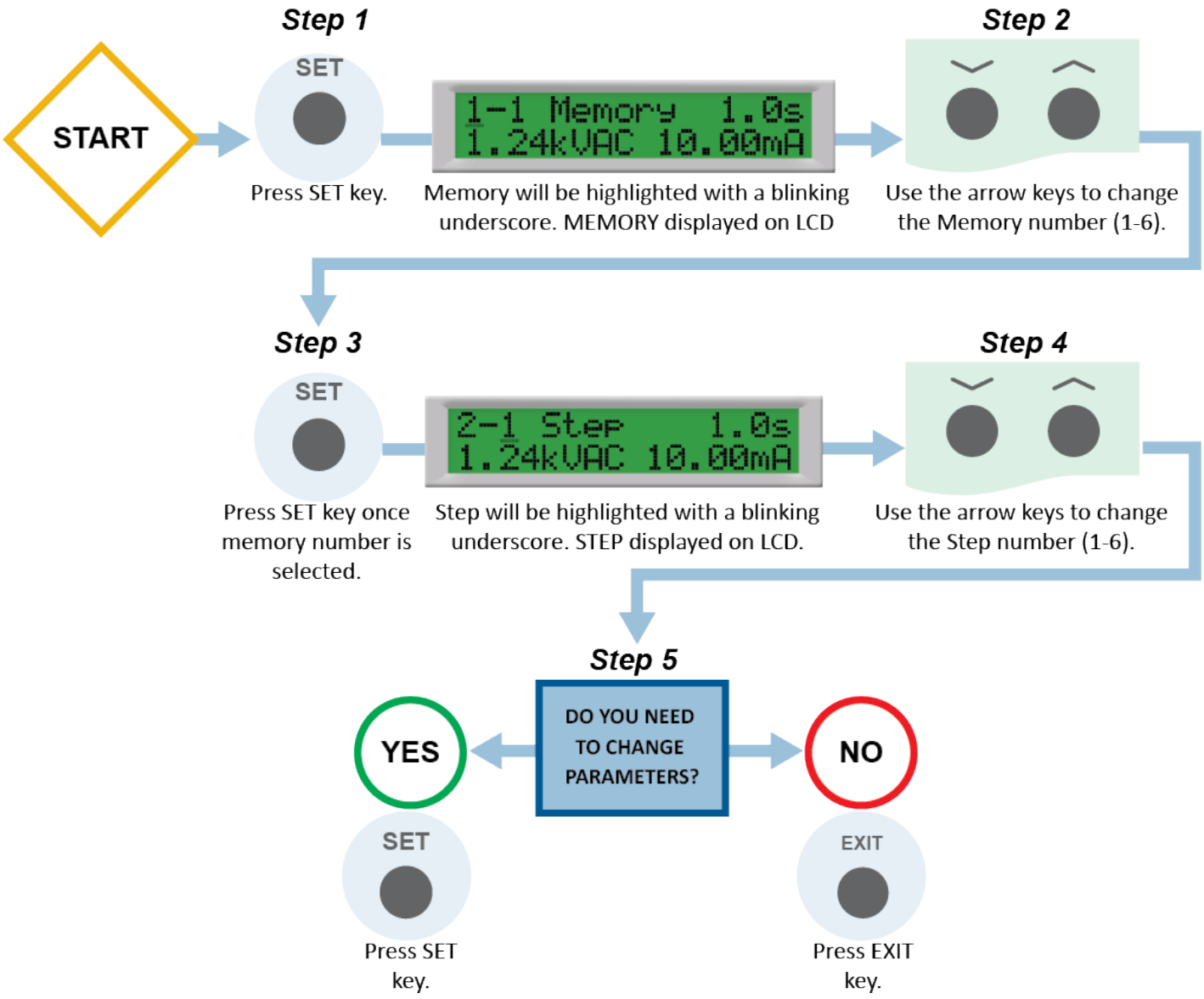
Display*	Description
	AC Hipot test display
	DC Hipot test display
	Insulation Resistance test display
	Ground Bond test display

* *The underscore character may be displayed after the step number, i.e. X – X_. This indicates that another configured test will execute after the displayed setup has completed.*

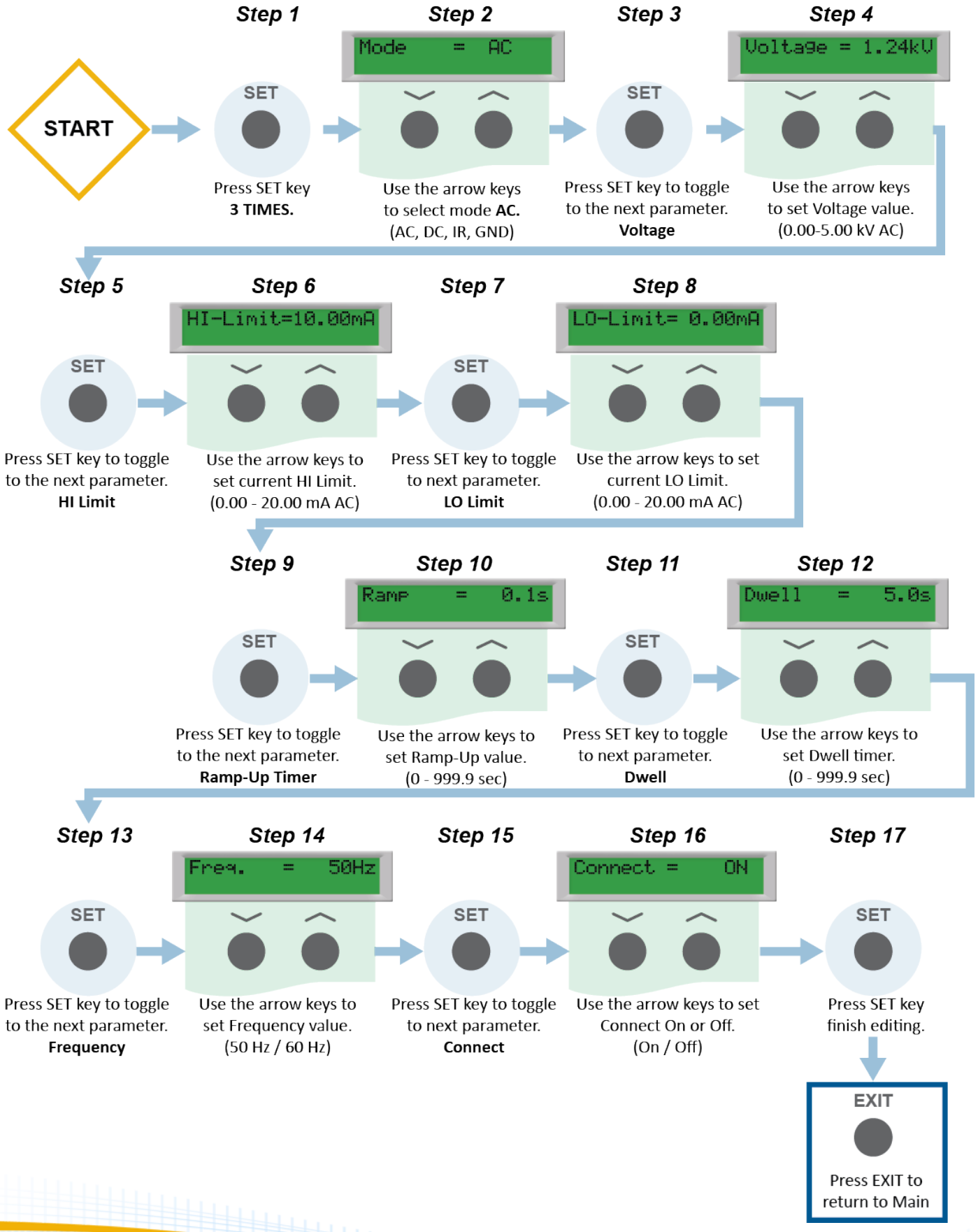
To view the next test setup:



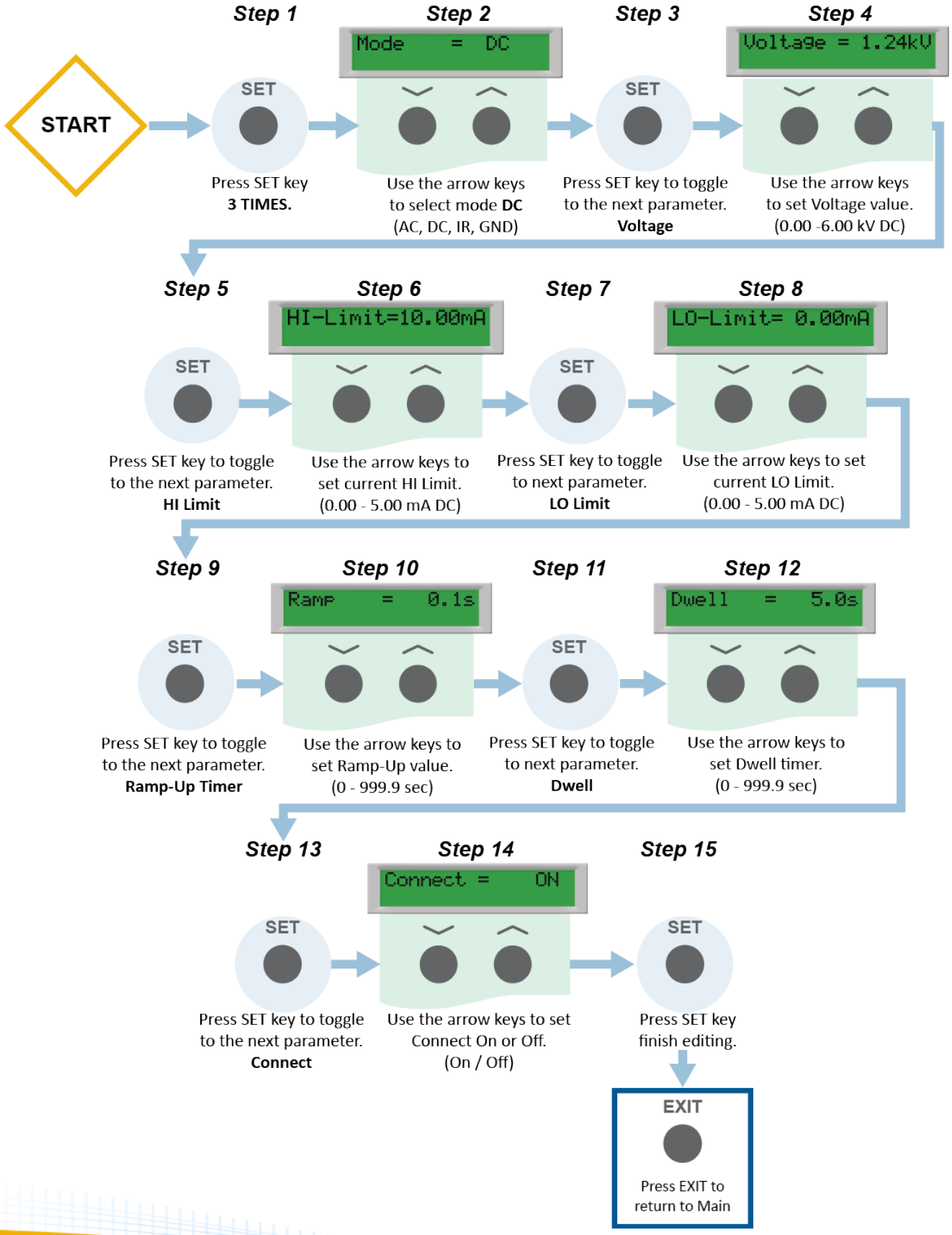
3. Selecting Memory and Step Locations



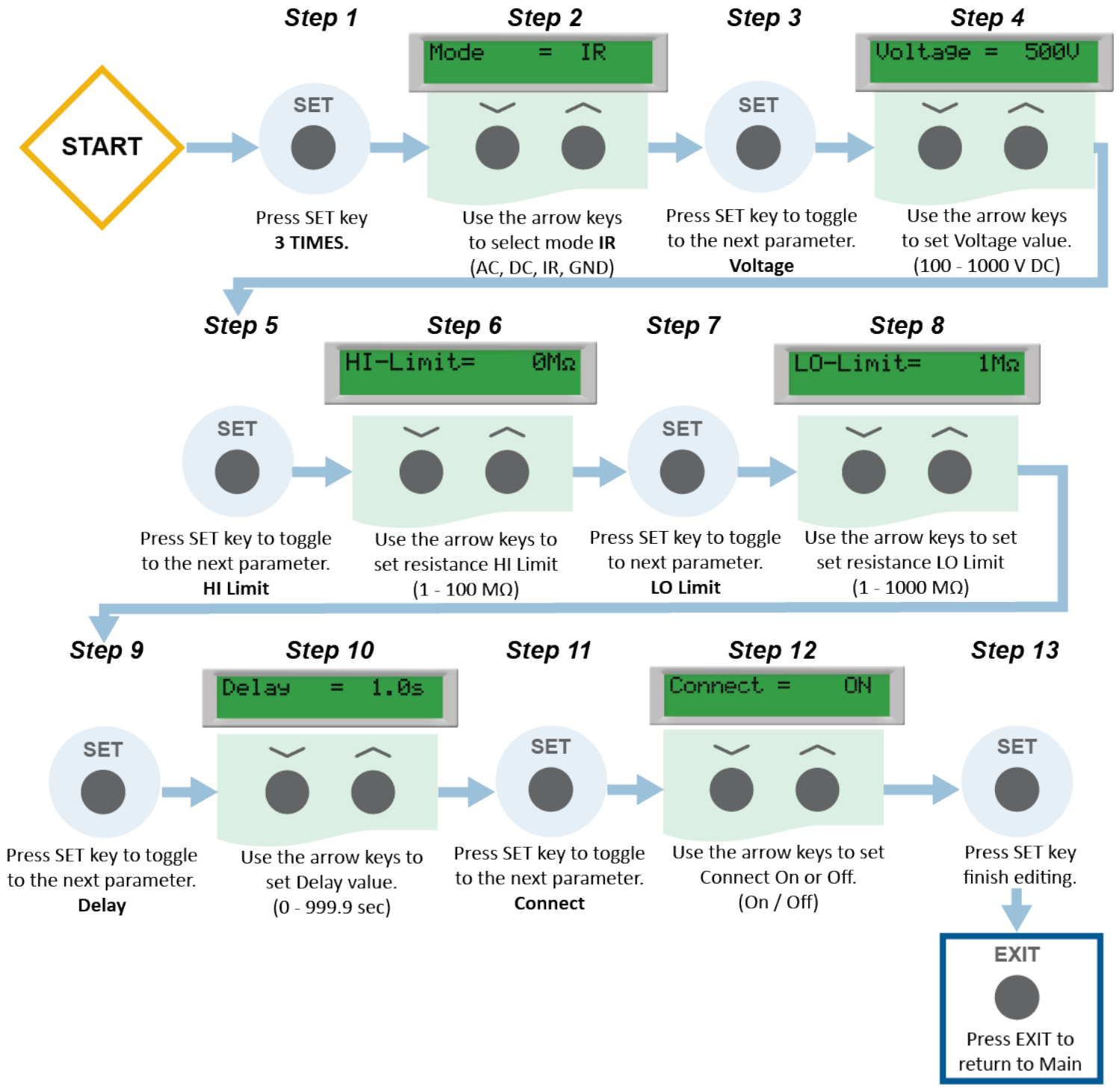
4. Setting an AC Hipot Test



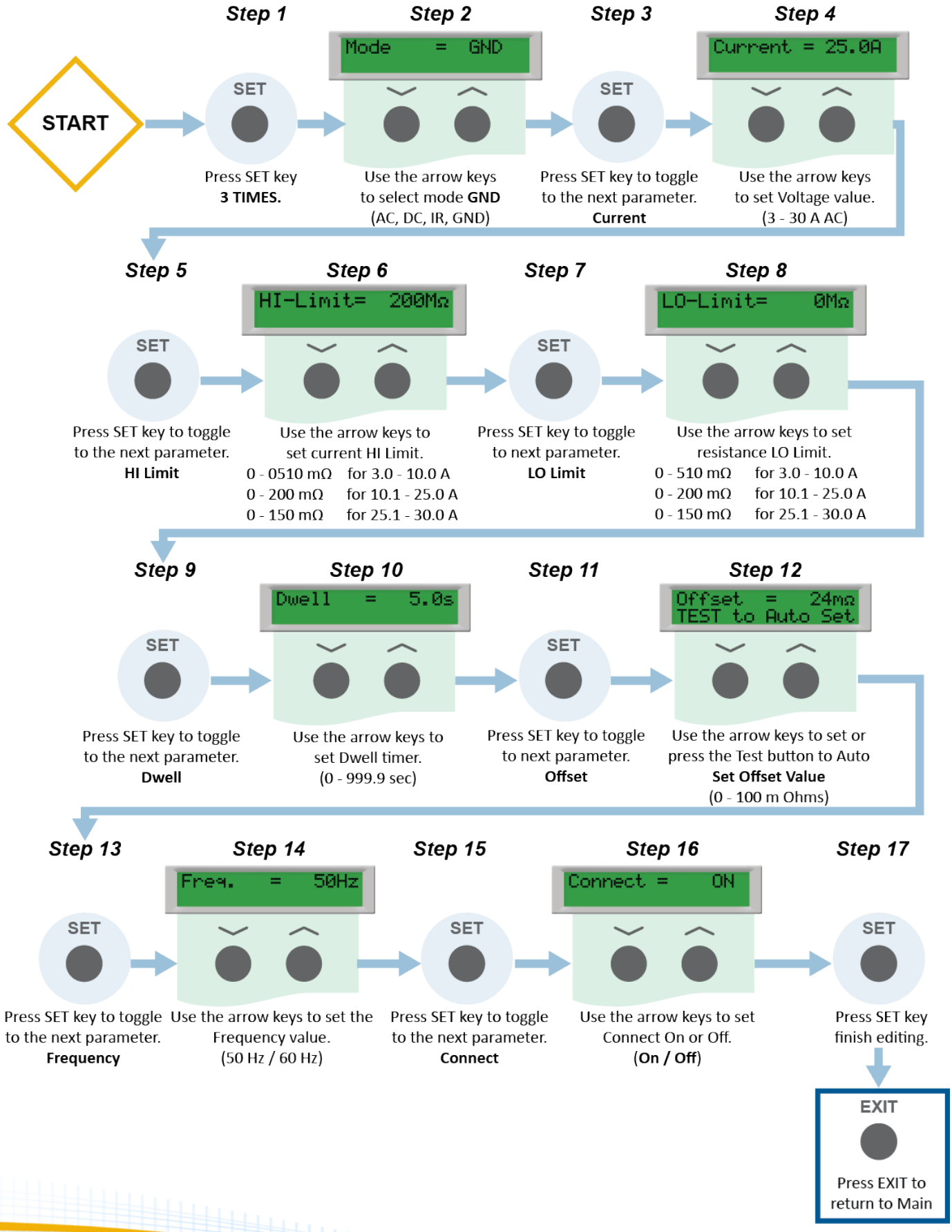
5. Setting a DC Hipot Test



6. Setting an IR Test



7. Setting a GND Bond Test



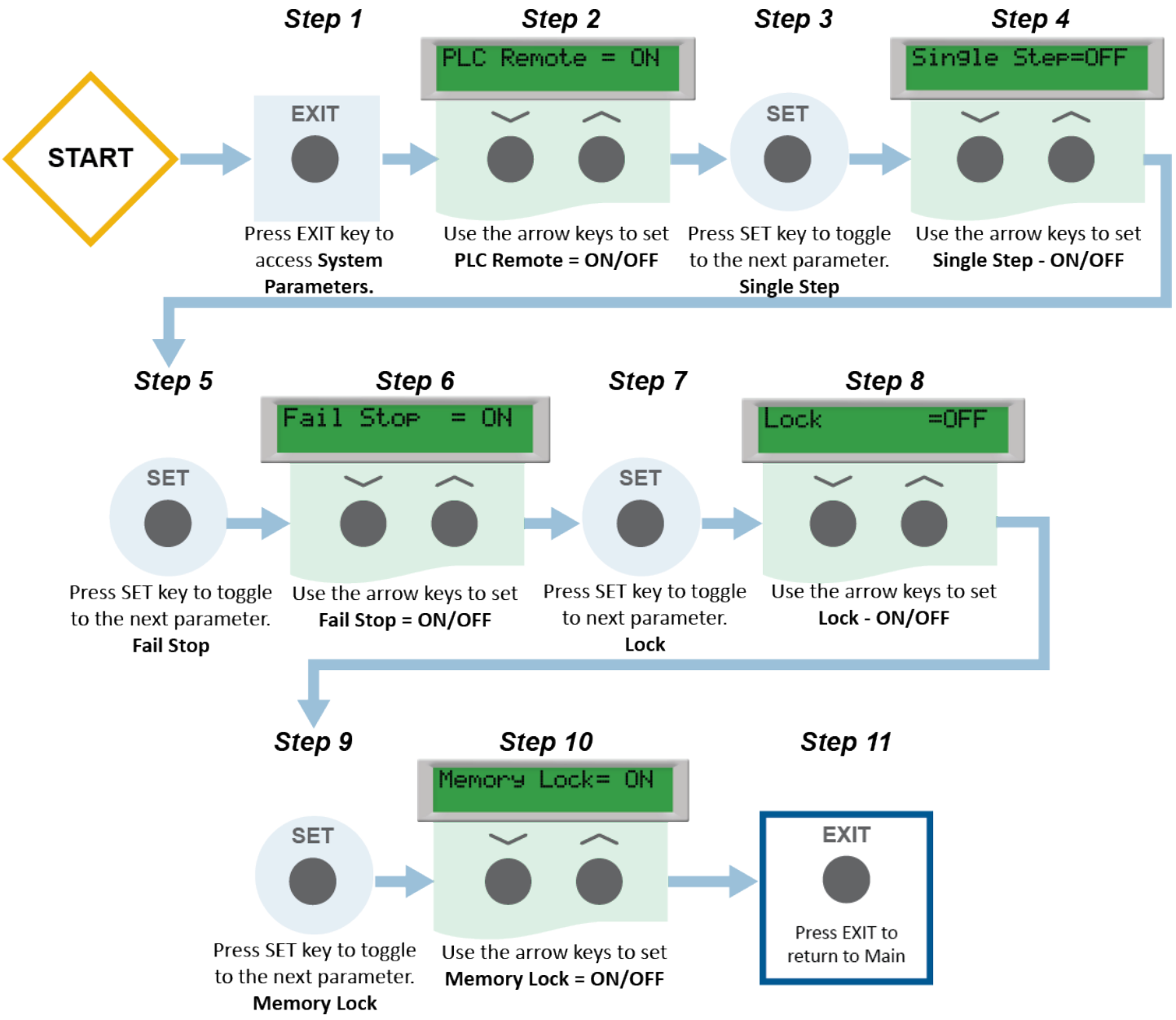
System Parameter Descriptions

System Parameter	Setting	Description
PLC Remote	ON/OFF	Allows the user to initiate a test through the REMOTE INPUT on the rear panel of the tester. If PLC Remote = ON the front panel TEST button is disabled and a test may only be started through the rear panel I/O. If PLC Remote = OFF, the test must be initiated via the front panel TEST button.
Single Step	ON/OFF	Temporarily overrides the automatic connection feature. If Single Step = ON the tester will pause after each step is completed, even if step Connect function is set to ON. To continue the test sequence, press the TEST button to execute the next connected step. Each time the TEST button is pressed the next connected step will execute. If you press the RESET button before completing all connected steps, it will return the tester to the original starting step. If a step fails and you wish to continue to the next step, do not press the RESET button but press the TEST button.
Fail Stop	ON/OFF	If Fail Stop = ON, a sequence of tests will stop if a failure occurs. If Fail Stop = OFF, the sequence of tests will continue to the end of the sequence regardless of whether or not a failure has occurred. If a failure has occurred, the red RESET button will light and alarm will sound indicating failure during the sequence. Pressing the RESET button will silence the alarm and reset the tester.
Key Lock	4000 Series Security Feature	
Lock	ON/OFF	There are two different lockout selections. The first selection is Key Lock. Within this selection, you can lockout all front panel control functions except TEST, RESET and memory selections.
Memory Lock	ON/OFF	Memory Lock and is used in conjunction with the Key Lock. Lock must be ON for Memory Lock to function.

Use the following chart to set the Key Lock and Memory Lock for your application.

KEY LOCK	MEMORY LOCK	ACCESSIBLE KEYS
OFF	OFF	All
OFF	ON	All
ON	OFF	TEST, RESET, and SET/Up-Down arrows for memory selection
ON	ON	TEST and RESET

Setting System Parameters

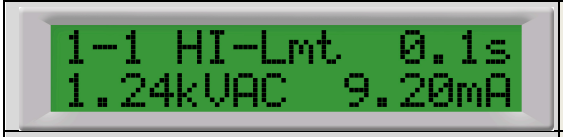
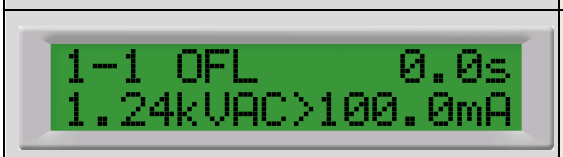
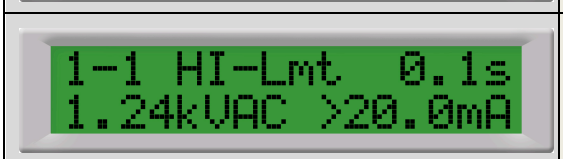
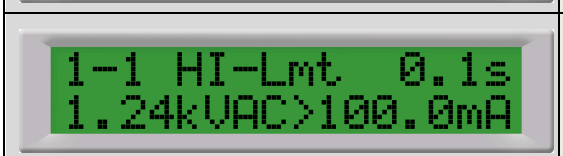


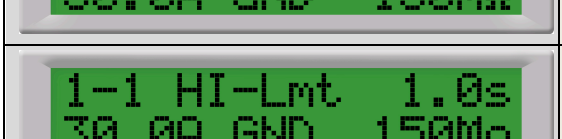
Using the Display

Test Mode Displays

Test Mode Display	Test Type	Description
	AC/DC Hipot	Displayed when the test voltage is ramping up from 0.0 VAC/VDC to full test voltage.
	AC/DC Hipot, Ground Bond	Displayed when the test voltage or test current has reached full potential. Dwell is the amount of time the potential or current is held at the set value.
	AC/DC Hipot, IR, Ground Bond	Displayed when a test sequence has passed. The green TEST button will illuminate and a short audible beep tone will be activated.
	AC/DC Hipot, IR, Ground Bond	Displayed if the operator elects to stop a test in process. This can be accomplished by pressing the RESET button during the test.
	IR	Displayed while the test is in process. If the IR value exceeds the set limits, the test will fail after the DELAY time has expired.

Failure Mode Displays

Failure Mode Display**	Test Type	Description
	AC Hipot	Displayed if the leakage current exceeds the high limit setting, but does not exceed the metering range.
	AC Hipot	Displayed if the leakage current does not exceed the low limit setting.
	AC Hipot	Displayed if there is a short circuit in the DUT during the test.
	AC Hipot	**4320 only**. Displayed if a flash over occurs in the DUT during the test, which results in an OFL condition due to the current exceeds the maximum metering range.
	AC Hipot	**4520 only**. Displayed if a flash over occurs in the DUT during the test, which results in an OFL condition due to the current exceeds the maximum metering range.
	AC Hipot	**4320 only**. Displayed if the leakage current exceeds the metering range and neither a short circuit nor flash over occurred.
	AC Hipot	**4520 only**. Displayed if the leakage current exceeds the metering range and neither a short circuit nor flash over occurred.
	DC Hipot	Displayed if the leakage current exceeds the high limit setting, but does not exceed the metering range.
	DC Hipot	Displayed if the leakage current does not exceed the low limit setting.
	DC Hipot	Displayed if there is a short circuit in the DUT during the test.
	DC Hipot	**4320 Only**. Displayed if a flash over occurs in the DUT during the test, which results in an OFL condition due to the current exceeds the maximum metering range.
	DC Hipot	**4520 Only**. Displayed if a flash over occurs in the DUT during the test, which results in an OFL condition due to the current exceeds the maximum metering range.

	DC Hipot	**4320 only**. Displayed if the leakage current exceeds the metering range and neither a short circuit nor flash over occurred.
	DC Hipot	**4520 only**. Displayed if the leakage current exceeds the metering range and neither a short circuit nor flash over occurred.
	IR	Displayed if the insulation resistance exceeds the high limit setting, but does not exceed the metering range.
	IR	Displayed if the insulation resistance exceeds the high limit setting, and exceeds the metering range.
	IR	Displayed if the leakage current does not exceed the low limit setting and is within the metering range
	IR	Displayed if the leakage current does not exceed the low limit setting and is not within the metering range.
	GND	Displayed if the resistance exceeds the metering range. For current range 3.0 – 10.0A
	GND	Displayed if the resistance exceeds the metering range. For current range 10.1 – 25.0A
	GND	Displayed if the resistance exceeds the metering range. For current range 25.1A – 30.0A
	GND	Displayed if the resistance exceeds the high limit trip setting, but do not exceed the metering range.
	GND	Displayed if the resistance does not exceed the low limit setting.
*** For all failures, the red RESET button will illuminate and an alarm will be activated. To stop the alarm, please press the RESET button once. The alarm will stop and the display will retain the failure information. The tester is now ready for the next test. If the RESET button is pressed again, the failure information will be cleared and the display will indicate the setting data of the executed test.*		

Error Messages

Display	Description
	This message appears on the display, if the tester's output reading does not match the setting. When the tester has an output problem and the TEST button is pressed, the Output Error screen will appear. The RESET button is not active in this situation. Only the EXIT key will allow you to return to the test mode. When the EXIT key is pressed the tester will continue with its normal failure indication process. The failure light and Alarm can be cleared by pressing the RESET button. If Output Error occurs please call the Slaughter Company Customer Support Center at 1-800-504-0055 for assistance.
	All of the buttons and keys are not active in this situation. This type of failure permanently locks the tester in the Fatal Error mode and required that the tester be serviced by a Slaughter Company authorized service center. Contact the Slaughter Company Customer Support Center at 1-800-504-0055 to receive further instruction. **FATAL ERROR 9002** will appear on the display, if the tester's System data or the Model/Option data are corrupted and do not match the setting. **FATAL ERROR 9003** will appear on the display, if the tester's Calibration data is corrupted.

Reviewing Test Results for Multistep Sequences

After the test is performed, the test results will be indicated on the front panel display.

Pass: If the DUT passes the test, you will hear a short audible beep and the display will indicate the test result.

Fail: If a failure occurs, you will hear a long audible alarm and the red flashing indicator will light up. To stop the alarm, press the RESET button.

The test results from the memories that are executed can be reviewing by pressing the Up (∧) or Down (∨) arrow keys. Successive key presses will continue advancing to the next result. The results of the last step in the process will be followed by the first step when scrolling through the results. Results can be reviewed at any time before the next test is executed. All results are cleared at the start of the next test cycle.

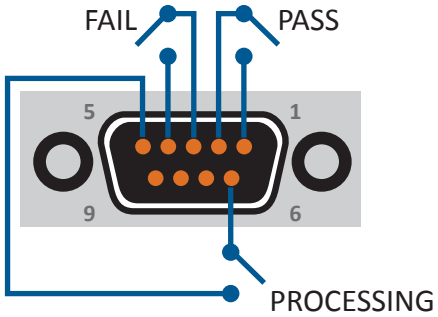
Using the Remote I/O:

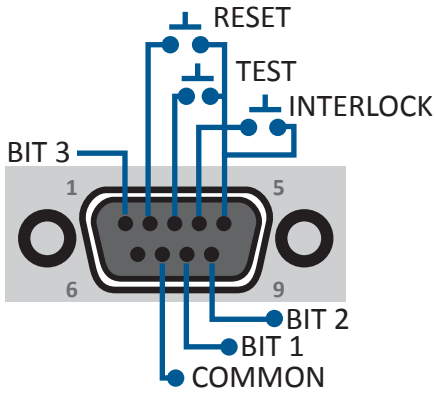
Two 9-pin “D” type connectors are mounted on the rear panel that provides REMOTE-INPUT-OUTPUT control and information.

- These connectors mate with standard 9 pin D-sub-miniature connector provided by the user.
- The output mates to a male (plug) connector while the input mates to a female (receptacle) connector.
- For best performance, a shielded cable should be used. To avoid ground loops the shield should not be grounded at both ends of the cable.

Suggested AMP part numbers for interconnecting to the Remote I/O	
Part Number	**Description**
205204-4	PLUG SHELL WITH GROUND INDENTS
205203-3	RECEPTACLE SHELL
745254-7	CRIMP SNAP-IN PIN CONTACT (for plug)
745253-7	CRIMP SNAP-IN SOCKET CONTACT (for receptacle)
745171-1	SHIELDED CABLE CLAMP (for either plug or receptacle)
747784-3	JACKSCREW SET (2)

REMOTE I/O Pinouts:





Signals on Remote I/O

<table>
<tr><th colspan="3">REMOTE INPUT/OUTPUT</th></tr>
<tr><td colspan="3">Remote Output</td></tr>
<tr><td>Output Signal</td><td>Pins</td><td>Description</td></tr>
<tr><td>PASS</td><td>1 and 2</td><td>The relay contact closes after detecting that the device under test passed all tests. The connection is opened when the next test is initiated or the reset function is activated.</td></tr>
<tr><td>FAIL</td><td>3 and 4</td><td>The relay contact closes after detecting that the device under test failed any test. The connection is opened when the next test is initiated or the reset function activated.</td></tr>
<tr><td>PROCESSING</td><td>5 and 6</td><td>The relay contact closes while the tester is performing a test. The connection is opened at the end of the test.</td></tr>
<tr><td colspan="3">These are normally open free contacts and will not provide any voltage or current. The ratings of the contacts are 1 AAC/250 VAC (0.5 ADC). When a terminal becomes active, the relay closes thereby allowing the external voltage to operate an external device.</td></tr>
<tr><td colspan="3">Remote Input</td></tr>
<tr><td>Output Signal</td><td>Pins</td><td>Description</td></tr>
<tr><td>TEST</td><td>3 and 5</td><td>A normally open momentary switch can be wired across pins 3 and 5 to allow remote operation of the TEST function.</td></tr>
<tr><td>RESET</td><td>2 and 5</td><td>A normally open momentary switch can be wired across pins 2 and 5 to allow remote operation of the RESET function. For safety, the front panel RESET button remains active even when a remote reset switch is connected so that high voltage can be shut down from either location.</td></tr>
<tr><td>INTERLOCK</td><td>4 and 5</td><td>Remote Interlock utilizes a set of closed contacts to enable the tester’s output. The output of the tester will be disabled under the following conditions:
If the Interlock contacts are open and the TEST button is pushed
If the interlock contacts are opened during a test (test will automatically abort)
A pop-up message will be displayed on the screen:
 
The tester can still be used without the external interlock device as long as the Interlock Connector (P/N # 99-10040-01 provided with unit) is plugged into the Remote Interface, Signal Input port. If there is nothing connected to the Remote Interface, Signal Input port to provide a connection to the interlock, the tester will not perform tests.</td></tr>
<tr><td colspan="3">When the PLC Remote mode is ON, the tester will respond to simple switch or relay contacts closures. When the PLC Remote function is ON the TEST button on the front panel will be disabled.</td></tr>
</table>

Remote Memory Bit Selection			
Memory #	**BIT 3**	**BIT 2**	**BIT 1**
01	**0**	**0**	**1**
02	**0**	**1**	**0**
03	**0**	**1**	**1**
04	**1**	**0**	**0**
05	**1**	**0**	**1**
06	**1**	**1**	**0**

Where: **1** = Momentary Contact closure between BIT and COMMON
0 = NO Contact closure between BIT and COMMON

- The memory select bits need to be set simultaneously and remain set for a minimum of **20ms** to guarantee that the correct memory will be selected.
- The memory select bits may be set in sequential manner, provided that the time delay between each bit is **less than 4ms**.
- When the desired bit pattern has been established it needs to remain set for a minimum of **20ms** to guarantee that the correct memory will be selected.

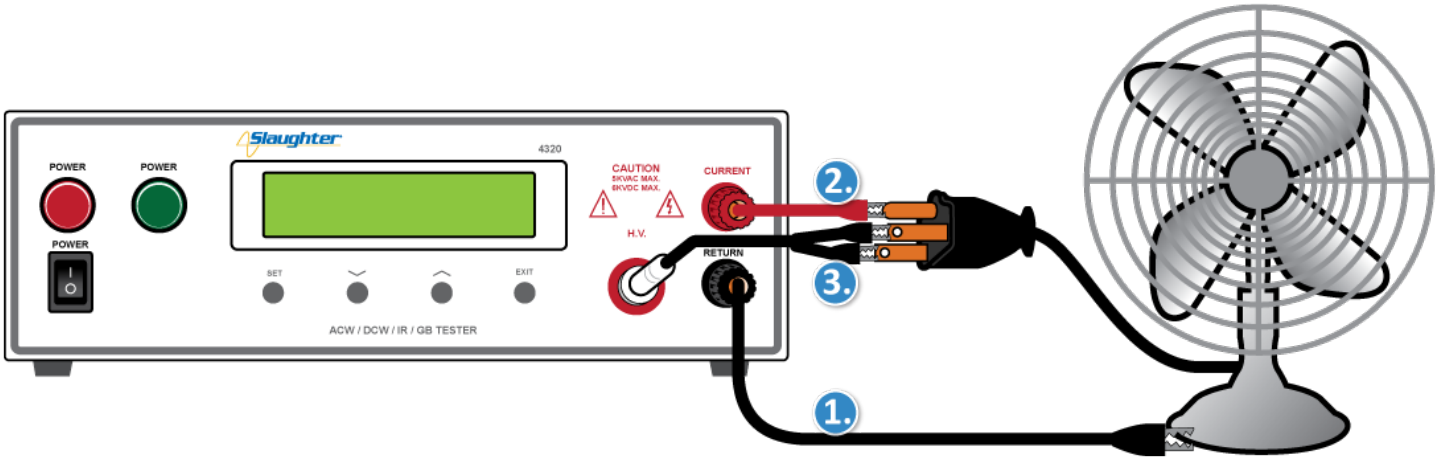
WARNING **ACTIVATING TEST PROGRAM FUNCTIONS THROUGH THE REMOTE CONNECTOR SELECTS THE MEMORY AND STARTS THE TEST THAT IS PRE-PROGRAMMED INTO THAT MEMORY.**

CAUTION **Do not connect voltage or current to the signal inputs. Applying voltage to the signal input could result in damage to the control circuitry.**

Using the Tester Accessories:

WARNING **NEVER CONNECT THE ADAPTER BOX OR TEST LEADS TO THE TESTER WHILE THE HIGH VOLTAGE OUTPUTS ARE ENERGIZED.**

Using the Test Leads



1. Connect the black return lead (99-10008-01) to the front panel return output terminal and connect the other end of the lead to the dead metal on the chassis of the DUT.

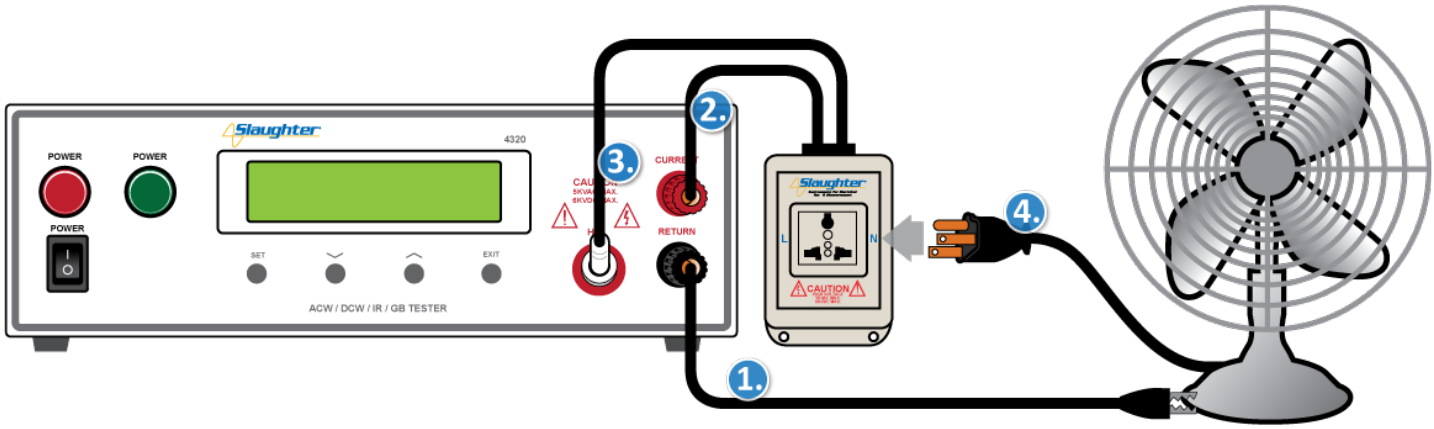
2. If you are performing a Ground Bond test, connect one end of the high current lead (99-10009-01) to the front panel current output terminal and the other end to the ground pin of the DUT line cord.

3. If you are using the high voltage lead (102-055-913, w/ red clip) or probe, connect it to the front panel high voltage terminal and connect the other end of the cable to both the hot and neutral pins of the line cord.

Using the Adapter Box

The adapter box is an **optional accessory** and is not provided as standard equipment with the model 4320/4520. If you would like to acquire an adapter box for use with your tester, please contact The Slaughter Company using the contact information provided in the Safety section of this manual.

The following diagram shows how to connect the adapter box to the 4320/4520 and to the device under test.



The rear output connections may also be used for connecting the adapter box.

1. Connect the black return lead (99-10008-01) to the front panel return output terminal and connect the other end of the lead to the dead metal on the chassis of the DUT.

2. Connect the high current lead (99-10009-01) from the adapter box to the front panel current output terminal.

3. Connect the high voltage lead (102-055-913) from the adapter box to the front panel high voltage terminal.

4. Plug your DUT into the adapter box.

This adapter box allows for connection to an item that is terminated in a three-prong line cord. If testing a product which is terminated in a three-prong plug, you are also required to perform a Ground Bond test on the ground conductor of the DUT to the chassis or dead metal of the product. The high current is wired to the ground pin of the receptacle box and from there the test is performed on the ground conductor of the DUT to the chassis or dead metal of the product. With the model 4320/4520, you can perform the Hipot and Ground Bond tests sequentially.

Appendix A - Installation and Test Operator Information

Installation

1. Unpacking and Inspection

Your tester was shipped in a custom foam insulated container that complies with ASTM D4169-92a Assurance Level II Distribution Cycle 13 Performance Test Sequence.

If the shipping carton is damaged, inspect the contents for visible damage such as dents, scratches, or broken meters. If the tester is damaged, notify the carrier and the Slaughter Company customer support department immediately. Please save the shipping carton and packing material for the carrier's inspection. Our customer support department will assist you in the repair or replacement of your tester. Please do not return your product without first notifying us and receiving an RMA (return materials authorization) number.

2. Safe Lifting and Carrying Instructions

Proper methods of lifting and carrying can help to protect against injury. Follow the recommendations below to ensure that testers are handled in a safe manner.

- **Determine if the tester can be lifted by one individual or requires additional support.**
- **Make sure that your balance is centered and your feet are properly spaced, shoulder width apart behind the tester.**
- **Bend at the knees and make sure your back is straight.**
- **Grip the tester with your fingers and palms and do not lift unless your back is straight.**
- **Lift up with your legs, not your back.**
- **Keep the tester close to your body while carrying.**
- **Lower the tester by bending your knees. Keep you back straight.**

3. Contents of the Carton

Inside the carton will be the following:

DESCRIPTION	SLA PART NUMBER
4000 Series Tester	4000 Hipot, Ground Bond, IR Tester
High Voltage Probe	102-050-913
High Voltage Cable	102-055-913
High Current Return Lead	99-10008-01
High Current Output Lead	99-10009-01
Fuse	99-10106-01, 6.3 Amp, slow blow, 250VAC
Interlock Connector	99-10040-01
Line Cord*	125-013-001 Standard

*The Line Cord listed is American. Other combinations of the Line Cord are available upon request.

WARNING **ONLY ACCESSORIES WHICH MEET THE MANUFACTURER'S SPECIFICATION SHALL BE USED.**

4. Preparation for Use

Power Requirements and Line Voltage Selection

CAUTION **This tester requires a power source of either 115 volts AC ± 10%, 47-63 Hz single phase or 230 volts AC ±10%, 47-63 Hz single phase. Please check the rear panel to be sure the proper switch setting is selected for your line voltage requirements before turning your tester on (model 4320 only). In addition, please be sure the correct fuse is selected and installed while the tester is in the off position.**

Do not switch the line voltage selector switch located on the rear panel while the tester is on or operating (model 4320 only). This may cause internal damage and represents a safety risk to the operator.

NOTE

For operation at 115 Volts AC and 230 Volts AC use a 6.3 A slow blow fuse (model 4320).

For operation at 115 Volts AC and 230 Volts AC use a 15 A slow blow fuse (model 4520).

5. Power Cable

WARNING **BEFORE CONNECTING POWER TO THIS TESTER, THE PROTECTIVE GROUND (EARTH) TERMINALS OF THIS TESTER MUST BE CONNECTED TO THE PROTECTIVE CONDUCTOR OF THE LINE (MAINS) POWER CORD. THE MAIN PLUG SHALL ONLY BE INSERTED IN A SOCKET OUTLET (RECEPTACLE) PROVIDED WITH A PROTECTIVE GROUND (EARTH) CONTACT. THIS PROTECTIVE GROUND (EARTH) MUST NOT BE DEFEATED BY THE USE OF AN EXTENSION CORD (POWER CABLE) WITHOUT A PROTECTIVE CONDUCTOR (GROUNDING).**

This tester is shipped with a three-wire power cable. When this cable is connected to an appropriate AC power source, this cable connects the chassis to earth ground. The type of power cable shipped with each tester depends on the country of destination.

Operating Environment

This equipment is intended for indoor use only. The equipment has been evaluated according to Installation Category II and Pollution Degree 2 as specified in IEC 664.

This tester may be operated within the following environmental conditions:

Temperature……41° - 104° F (5° - 40° C)

Relative humidity …….0 - 80%

Altitude ……6,560 feet (2,000 meters)

WARNING **DO NOT BLOCK ANY VENTILATION OPENINGS TO PREVENT OVER HEATING OF THE EQUIPMENT. KEEP THE VENTILATION SLITS UNCOVERED DURING OPERATION. FAILURE TO DO SO COULD CAUSE THE TESTER TO OVERHEAT AND MAY DAMAGE INTERNAL COMPONENTS.**

If the tester is used in a matter not specified by the manufacturer, the protection provided by the tester may be impaired.

Storage and Shipment

Environment

This tester may be stored or shipped in environments with the following limits:

Temperature.....-40° - 167° F (-40° - 75°C)

Altitude..... 50,000 feet (15,240 meters)

The tester should also be protected against temperature extremes which may cause condensation within the tester.

Packaging

Contact our customer support department (1-847-932-3662) for an RMA (return materials authorization) number. Please enclose the tester with all options, accessories, and test leads. Indicate the nature of the problem or type of service needed. Also, please mark the container "FRAGILE" to insure proper handling. Please refer to the RMA number for all correspondence.

Packaging Instructions:

1. **Be sure to REMOVE ALL ACCESSORIES and the INTERLOCK DISABLE from the tester.**
2. **Wrap the tester in a bubble pack or similar foam. Enclose the same information as above.**
3. **Use a strong double-wall container that is made for shipping instrumentation. 350 lb. test material is adequate.**
4. **Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 inch) thick around all sides of the tester. Protect the control panel with cardboard.**
5. **Seal the container securely.**
6. **Mark the container "FRAGILE" to insure proper handling.**
7. **Please ship models 4320/4520 via Federal Express or UPS air.**
8. **Please refer in all correspondence to your RMA number.**

Test Operator and Safety Considerations

1. Qualifications

This tester generates voltages and currents which can cause **harmful or fatal electric shock** and must only be operated by a skilled worker trained in its use.

The operator should understand the electrical fundamentals of voltage, current, and resistance.

2. Safety Procedures

Operators should be thoroughly trained to follow these and all other applicable safety rules and procedures before they begin a test. Defeating any safety system should be treated as a serious offense and should result in severe penalties, such as removal from the Hipot testing job. Allowing unauthorized personnel in the area during a test should also be dealt with as a serious offense.

3. Dress

Operators should not wear jewelry which could accidentally complete a circuit.

4. Medical Restrictions

This tester should not be operated by personnel with heart ailments or devices such as pacemakers.

5. Test Procedures

WARNING **NEVER PERFORM A HIPOT TEST ON ENERGIZED CIRCUITRY OR EQUIPMENT!**

If the tester has an external safety-ground connection, be sure that this is connected. Then connect the return lead **first** for any test regardless of whether the device under test is a sample of insulating material tested with electrodes, a component tested with the high voltage test lead, or a cord-connected device with a two or three-prong plug.

Plug in the high voltage test lead only when it is being used. Handle its clip only by the insulator---**never touch the clip directly.** Be certain that the operator has control over any remote test switches connected to the Hipot. Double-check the return and high voltage connections to be certain that they are proper and secure.

WARNING **NEVER TOUCH THE ITEM UNDER TEST OR ANYTHING CONNECTED TO IT WHILE HIGH VOLTAGE IS PRESENT DURING THE HIPOT TEST**

When testing with DC, always discharge the capacitance of the item under test and anything the high voltage may have contacted--such as test fixtures--before handling it or disconnecting the test leads.

Hot stick probes can be used to discharge any capacitance in the item under test as a further safety precaution. A hot stick is a non-conducting rod about two feet long with a metal probe at the end which is connected to a wire. To discharge the device under test, two hot sticks are required. First connect both probe wires to a good earth ground. Then touch one probe tip to the same place the return lead was connected. While holding the first probe in place, touch the second probe tip to the same place where the high voltage lead was connected.

6. Test Station

Location

Select an area away from the main stream of activity which employees do not walk through in performing their normal duties. If this is not practical because of production line flow, then the area should be roped off and marked for **HIGH VOLTAGE TESTING**. No employees other than the test operators should be allowed inside. If benches are placed back-to-back, be especially careful about the use of the bench opposite the test station. Signs should be posted: **"DANGER - HIGH VOLTAGE TEST IN PROGRESS - UNAUTHORIZED PERSONNEL KEEP AWAY."**

Power

Voltage-Hipot Test Equipment must be connected to a good ground. Be certain that the power wiring to the test bench is properly polarized and that the proper low resistance bonding to ground is in place.

Power to the test station should be arranged so that it can be shut off by one prominently marked switch located at the entrance to the test area. In the event of an emergency, anyone can cut off the power before entering the test area to offer assistance.

WARNING **THE MAINS PLUG IS USED AS THE DISCONNECTING DEVICE AND SHALL REMAIN READILY OPERABLE. THE SOCKET-OUTLET SHALL BE INSTALLED NEAR THE EQUIPMENT AND SHALL BE EASILY ACCESSIBLE.**

CAUTION **Do not replace the power supply cord with an improperly rated cord. For North American: A UL listed and CSA labeled power cord must be used with the tester in the United States and Canada. The power cord must include a NEMA5-15 style male plug, SVT or SJT cord sets, and be rated for at least 125VAC, 10A, number 16 gauge (or 125VAC, 15A, number 14 gauge) wire or larger, and the length of the cord does not exceed 2 m must be used. For European: A certified power supply cord not lighter than light PVC sheathed flexible cord according to IEC 60227, designation H03 VV-F or H03 VVH2-F (for equipment mass not exceeding 3 kg), or H05 VV-F or H05 VVH2-F2 (for equipment mass exceeding 3 kg), and be rated for at least 3G 0.75 mm^2 (for rated current up to 10 A) or 3G 1.0mm^2 (for rated current over 10 A up to 16 A) wire or larger, and the length of the cord does not exceed 2 m must be used.**

Work Area

Perform the tests on a non-conducting table or workbench, if possible.

There should not be any metal in the work area between the operator and the location where products being tested will be positioned.

Position the tester so the operator does not have to reach over the product under test to activate or adjust the tester. If the product or component being tested is small, it may be possible to construct guards or an enclosure, made of a non-conducting material such as clear acrylic, such that the item being tested is within the guards or enclosure during the test, and fit them with switches so that the tester will not operate unless the guards are in place or the enclosure closed. The outlet which is used to provide power to the tester should be easily accessible.

Keep the area clean and uncluttered. All test equipment and test leads not absolutely necessary for the test should be removed from the test bench and put away. It should be clear to both the operator and to any observers which product is being tested, and which ones are waiting to be tested or have already been tested. If the tester is used in a matter not specified by Slaughter Company, Inc. the protection provided by the tester may be impaired.

Do not perform Hipot tests in a combustible atmosphere or in any area where combustible materials are present.

KEY SAFETY POINTS TO REMEMBER:

- **Keep unqualified and unauthorized personnel away from the test area.**
- **Arrange the test station in a safe and orderly manner.**
- **Never touch the product or connections during a test.**
- **In case of any problem, turn off the high voltage first.**
- **Properly discharge any item tested with DC before touching connections.**

Appendix B - 4000 Series Tester Specifications

Model 4320 Functional Specifications

Unless otherwise stated, accuracy's are relative to a laboratory standard measurement.

INPUT	
Voltage	115 / 230V selectable, ± 10 % variation
Frequency	50 / 60 Hz ± 5%
Fuse	6.3 A slow blow 250V AC
HIPOT TEST MODE	
Output Rating	5 kV @ 20 mA AC 6 kV @ 5 mA DC
Voltage Setting	Range: 0.00 – 5.00 kV AC 0.00 – 6.00 kV DC Resolution: 0.01 kV Accuracy: ± (2 % of setting + 5 V)
Voltage Display	Range: 0.00 – 5.00 kV AC 0.00 – 6.00 kV DC Resolution: 0.01 kV Accuracy: ± (2 % of reading + 10 V)
Current Display	Range: 0.00 – 20.00 mA AC 0.00 – 5.00 mA DC Resolution: 0.01 mA Accuracy: ± (2 % of reading + 0.02 mA)
HI and LO-Limit	Range: 0.00 – 20.00 mA AC Resolution: 0.01 mA Accuracy: ± (2 % of setting + 0.02 mA) Range: 0.00 – 5.00 mA DC Resolution: 0.01 mA Accuracy: ± (2 % of setting + 0.02 mA)
Failure Detector	Audible and Visual
DC Output Ripple	≤ 5% Ripple RMS at 6 KV DC @ 5 mA, resistive load
Discharge Time	≤ 200 ms
Maximum Capacitive Load in DC Mode	1 uF < 1 kV 0.08 uF < 4 kV 0.75 uF < 2 kV 0.04 uF < 5 kV 0.5 uF < 3 kV 0.01 uF < 6 kV
AC Output Waveform	Sine Wave, Crest Factor = 1.3 – 1.5
AC Output Frequency	Range: 60 or 50 Hz, User Selectable Accuracy: ± 0.1 %
Output Regulation	± (1 % of setting + 5 V) from no load to full load
Dwell Timer	Range: 0, 0.2 – 999.9 sec (0 = Continuous) Resolution: 0.1 sec Accuracy: ± (0.1 % + 0.05 sec)

Ramp Timer	Range:	0.1 – 999.9 sec
	Resolution:	0.1 sec
	Accuracy:	± (0.1 % + 0.05 sec)
INSULATION RESISTANCE TEST MODE		
Output Voltage	Range:	100 – 1000 V DC
	Resolution:	1 V
	Accuracy:	± (2 % of reading + 5 V)
Voltage Display	Range:	0 – 1000 V
	Resolution:	1 V
	Accuracy:	± (2 % of reading + 2 counts)
Resistance Display	Range:	1 - 1000 MΩ (4 Digit, Auto Ranging)
	Resolution:	500VDC / 1000VDC MΩ / MΩ / MΩ 0.01 / 1.00 - 40.00 / 1.00 - 80.00 0.1 / 35.0 - 999.9 / 75.0 - 999.9
	Accuracy:	± (3% of reading + 2 counts) at test voltage > 500V ± (7% of reading + 2 counts) at test voltage ≤ 500V
HI and LO-Limit	Range:	1 – 1000 MΩ
	HI-Limit:	0 = OFF
	Accuracy:	Same as Resistance Display Accuracy.
Delay Timer	Range:	0, 0.5 – 999.9 sec (0 = Continuous)
	Resolution:	0.1 sec
	Accuracy:	± (0.1 % + 0.05 sec)
GROUND BOND TEST MODE		
Output Voltage	Range:	6 V AC, Fixed
Output Frequency	Range:	60 or 50 Hz, User Selectable
	Accuracy:	± 0.1 %
Output Current	Range:	3.0 – 30.0 A AC
	Resolution:	0.1 A
	Accuracy:	± (2 % of setting + 0.02 A)
Current Display	Range:	0.0 – 30.0 A AC
	Resolution:	0.1 A
	Accuracy:	± (3 % of reading + 0.1 A)
HI and LO-Limit	Range:	0 – 510 mΩ for 3.0 - 10.0 A 0 – 200 mΩ for 10.1 - 25.0 A 0 – 150 mΩ for 25.1 - 30.0 A
	Resolution:	1 mΩ
	Accuracy:	± (2 % of setting + 2 mΩ)
Dwell Timer	Range:	0, 0.5 – 999.9 sec (0 = Continuous)
	Resolution:	0.1 sec
	Accuracy:	± (0.1 % + 0.05 sec)

Milliohm Offset	Range: 0 – 100 mΩ Resolution: 1 mΩ Accuracy: ± (2 % of setting + 2 mΩ)
GENERAL SPECIFICATIONS	
Safety Agency Listing	CE, cTUVus, RoHS2
PLC Remote Control	Input: Test, Reset, Interlock, Recall Memory 1 - 6 Output: Pass, Fail, Test-in-Process
Memory	6 memories, 6 steps per memory All steps are linkable Single step mode
Security	Key Lock capability to avoid unauthorized access to all test parameters. Memory Lock capability to avoid unauthorized access to memory locations.
Line Cord	Detachable 6 ft (1.8 m) power cable terminated in a three-prong grounding plug.
Terminations	6 ft (1.8 m) high voltage and return leads (2) with clips. An optional remote receptacle box may be purchased for testing items terminated with a line cord. International receptacles are also available.
Mechanical	Tilt up front feet. Dimensions: (WxHxD) 11x 3.5 x 17 inches (280 x 89 x 430 mm) Weight: 33 lbs (15 Kg)
Environmental	Operating Temperature : 32° - 104°F (0° - 40°C) Relative Humidity: 0 to 80%
Calibration	Traceable to National Institute of Standards and Technology (NIST). Calibration controlled by software. Adjustments are made through front panel keypad in a restricted access calibration mode. Calibration information stored in non-volatile memory.

Why use the term “Counts”?

Slaughter publishes some specifications using COUNTS which allows us to provide a better indication of the tester’s capabilities across measurement ranges. A COUNT refers to the lowest resolution of the display for a given measurement range. For example, if the resolution for voltage is 1V then 2 counts = 2V.

Model 4520 Functional Specifications

Unless otherwise stated, accuracy's are relative to a laboratory standard measurement.

INPUT	
Voltage	115 / 230V Auto Range, ± 15 % variation
Frequency	50 / 60 Hz ± 5%
Fuse	15 A slow blow 250V AC
HIPOT TEST MODE	
Output Rating	5 kV @ 100 mA AC 6 kV @ 10 mA DC
Voltage Setting	Range: 0.00 – 5.00 kV AC 0.00 – 6.00 kV DC Resolution: 0.01 kV Accuracy: ± (2 % of setting + 5 V)
Voltage Display	Range: 0.00 – 5.00 kV AC 0.00 – 6.00 kV DC Resolution: 0.01 kV Accuracy: ± (2 % of reading + 10 V)
Current Display	Range: 0.00 – 99.99 mA AC 0.00 – 10.00 mA DC Resolution: 0.01 mA Accuracy: ± (2 % of reading + 6 counts)
HI and LO-Limit	Range: 0.00 – 99.99 mA AC Resolution: 0.01 mA Accuracy: ± (2 % of setting + 6 counts) Range: 0.00 – 10.00 mA DC Resolution: 0.01 mA Accuracy: ± (2 % of setting + 6 counts)
Failure Detector	Audible and Visual
Discharge Time	≤ 200 ms
Maximum Capacitive Load in DC Mode	1 uF < 1 kV 0.08 uF < 4 kV 0.75 uF < 2 kV 0.04 uF < 5 kV 0.5 uF < 3 kV 0.01 uF < 6 kV
AC Output Waveform	Sine Wave, Crest Factor = 1.3 – 1.5
AC Output Frequency	Range: 60 or 50 Hz, User Selectable Accuracy: ± 0.1 %
Output Regulation	± (1 % of setting + 5 V) from no load to full load
Dwell Timer	Range: 0, 0.2 – 999.9 sec (0 = Continuous) Resolution: 0.1 sec Accuracy: ± (0.1 % + 0.05 sec)

Ramp Timer	Range:	0.1 – 999.9 sec	
	Resolution:	0.1 sec	
	Accuracy:	± (0.1 % + 0.05 sec)	
INSULATION RESISTANCE TEST MODE			
Output Voltage	Range:	100 – 1000 V DC	
	Resolution:	1 V	
	Accuracy:	± (2 % of reading + 2 counts)	
Voltage Display	Range:	0 – 1000 V	
	Resolution:	1 V	
	Accuracy:	± (2 % of reading + 2 counts)	
Resistance Display	Range:	1 - 1000 MΩ (4 Digit, Auto Ranging)	
	Resolution:	500VDC	1000VDC
		MΩ	MΩ	MΩ
		0.01	1.00 - 40.00	1.00 - 80.00
		0.1	35.0 - 999.9	75.0 - 999.9
	Accuracy:	± (3% of reading + 2 counts) at test voltage > 500V ± (7% of reading + 2 counts) at test voltage ≤ 500V	
HI and LO-Limit	Range:	1 – 1000 MΩ	
	HI-Limit:	0 = OFF	
	Accuracy:	Same as Resistance Display Accuracy.	
Delay Timer	Range:	0, 0.5 – 999.9 sec (0 = Continuous)	
	Resolution:	0.1 sec	
	Accuracy:	± (0.1 % + 0.05 sec)	
GROUND BOND TEST MODE			
Output Voltage	Range:	6 V AC, Fixed	
Output Frequency	Range:	60 or 50 Hz, User Selectable	
	Accuracy:	± 0.1 %	
Output Current	Range:	3.0 – 30.0 A AC	
	Resolution:	0.1 A	
	Accuracy:	± (2 % of setting + 0.02 A)	
Current Display	Range:	0.0 – 30.0 A AC	
	Resolution:	0.1 A	
	Accuracy:	± (3 % of reading + 0.1 A)	
HI and LO-Limit	Range:	0 – 510 mΩ for 3.0 - 10.0 A 0 – 200 mΩ for 10.1 - 25.0 A 0 – 150 mΩ for 25.1 - 30.0 A	
	Resolution:	1 mΩ	
	Accuracy:	± (2 % of setting + 2 mΩ)	
Dwell Timer	Range:	0, 0.5 – 999.9 sec (0 = Continuous)	
	Resolution:	0.1 sec	

	Accuracy: ± (0.1 % + 0.05 sec)
Milliohm Offset	Range: 0 – 100 mΩ Resolution: 1 mΩ Accuracy: ± (2 % of setting + 2 mΩ)
GENERAL SPECIFICATIONS	
Safety Agency Listing	CE, cTUVus, RoHS2
PLC Remote Control	Input: Test, Reset, Interlock, Recall Memory 1 - 6 Output: Pass, Fail, Test-in-Process
Memory	6 memories, 6 steps per memory All steps are linkable Single step mode
Security	Key Lock capability to avoid unauthorized access to all test parameters. Memory Lock capability to avoid unauthorized access to memory locations.
Line Cord	Detachable 6 ft (1.8 m) power cable terminated in a three-prong grounding plug.
Terminations	6 ft (1.8 m) high voltage and return leads (2) with clips. An optional remote receptacle box may be purchased for testing items terminated with a line cord. International receptacles are also available.
Mechanical	Tilt up front feet. Dimensions: (WxHxD) 16.9 x 5.2 x 15.7 inches (430 x 133 x 400 mm) Weight: 54 lbs (24.5 Kg)
Environmental	Operating Temperature : 32° - 104°F (0° - 40°C) Relative Humidity: 0 to 80%
Calibration	Traceable to National Institute of Standards and Technology (NIST). Calibration controlled by software. Adjustments are made through front panel keypad in a restricted access calibration mode. Calibration information stored in non-volatile memory.

Why use the term “Counts”?

Slaughter publishes some specifications using COUNTS which allows us to provide a better indication of the tester’s capabilities across measurement ranges. A COUNT refers to the lowest resolution of the display for a given measurement range. For example, if the resolution for voltage is 1V then 2 counts = 2V.

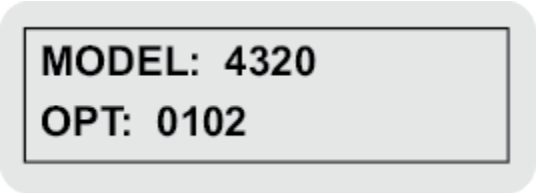
Appendix C - 4320/4520 Options

Introduction

This section contains a list and descriptions of available factory installed options at the time of this printing. The list of options contains an option code number which can be referenced on the model option label on the rear panel of the unit when options are present.

Model Option Label

On the rear panel of the tester, you will find a label that contains the option code.



For example, your options code will appear as follows:

fitted with option 01 OPT: 01

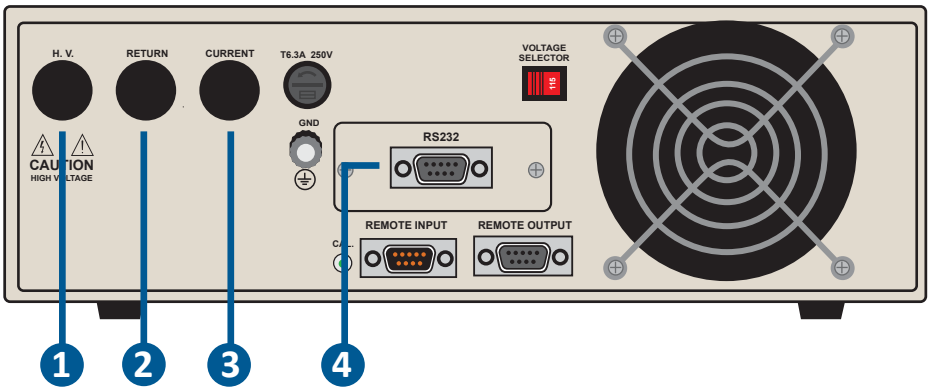
fitted with option 01 and 02 OPT: 0102

4320/4520 Options

Option List

CODE	DESCRIPTION
01	Rear Outputs
02	RS232 Interface

Optional Rear Panel Outputs (4320)



1. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 6-foot (1.8 m) red high voltage test lead or three-prong receptacle adapter box. The jack is recessed for safety when this lead is not being used. This jack is always used when performing the Hipot or Insulation Resistance tests. Please refer section E. Adapter Box connection for details on connecting the adapter box between the tester and the device under test

2. **CURRENT OUTPUT JACK:** This jack uses for the connection of the detachable 5-foot (1.52 m) red high current test lead or adapter box. This jack is always used when performing a Ground Bond test. Please refer section E. Adapter Box connection for details on connecting the adapter box between the tester and the device under test.

3. **RETURN OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead or three-prong receptacle adapter box. This jack is always used when performing a test. Please refer section E. Adapter Box connection for details on connecting the adapter box between the tester and the device under test.

4. **Optional RS-232 Interface**

   This option may be added as a serial type communication protocol. This option provides all of the function control of the RS-232 interface. The 9-pin D-type subminiature connector labeled “RS-232” is for connection of the 4320/4520 to any compatible PC. When selecting RS232, the protocol for interfacing and communicating with a PC can be found on Annex D: Remote Bus Interface: RS232 of this manual.

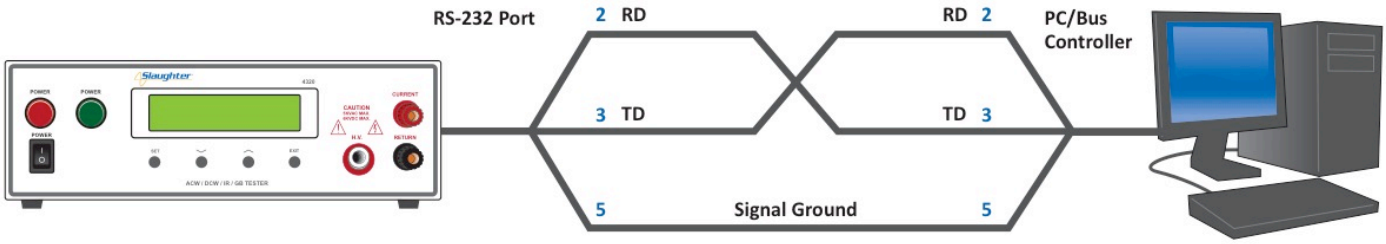
APPENDIX D - Remote BUS Interface: RS-232

This section provides information on the proper use and configuration of bus remote interface. The RS-232 remote interface is optional on all 4320/4520 models. Please see the OPTIONS section of the manual for details.

RS-232 Interface

This interface provides all of the control commands and parameter setting commands. All commands can be found in the command list of this manual.

The RS-232 cabling should be configured as follows for a 9-pin serial port interface:



The COM port should have the following configuration. 9600 baud, 8 data bits, 1 stop bit, no parity. This interface does not support XON/XOFF protocol or any hardware handshaking. The controller should be configured to ignore the handshaking lines DTR (pin 4), DSR (pin 6), CTS (pin 8) and RTS (pin 7). If the port cannot be configured through software to ignore the lines then the handshake lines should be jumpered together in two different sets. Pins 4 and 6 jumpered together and pins 7 and 8 jumpered together at the controller end of the cable.

When sending command over the RS232 bus, the tester will send a response string of 06 hex or 6 decimal, the Acknowledge (ACK) ASCII control code if the transfer was recognized and completed by the tester. If there is an error with the command string that is sent, the tester will respond with 15 hex or 21 decimal, the Not Acknowledge (NAK) ASCII control code. The ACK or NAK response allows for software handshaking, to monitor and control data flow. When requesting data from the tester, it will automatically send the data back to the controller input buffer. The controller input buffer will accumulate data being sent from the tester including the ACK and NAK response strings, until it has been read by the controller.

RS-232 Interface Command List

The RS-232 bus will automatically send any response back to the controller's input buffer. Note that the commands are case sensitive and must be typed in capital letters. Each command string should be terminated by the ASCII control code, New Line <NL>, or OAh.

The following conventions are used to describe the commands syntax for the 4320/4520. Braces ({ }) enclose each parameter for a command string. Triangle brackets (< >) indicate that you must substitute a value for the enclosed parameter. The Pipe (|) is used to separate different parameter options for a command. The command and the parameter data must be separated with a space. All commands that end with a question mark (?) are query commands and require an IEEE-488 read command to retrieve the data from the device's output buffer.

Test Execution Commands

The following commands are used to control actual output voltage and current from the tester. Please observe all safety precautions.

COMMAND	DESCRIPTION
TEST	Execute a Test
RESET	Abort a Test in Process or Reset Failures
SAO	Set Auto Offset

TEST

Starts the test sequence at the selected step loaded into memory (RAM).

RESET

Stop or abort a test. Also used to reset a latched failure condition.

SAO

Set the offset for the Ground bond test. The cables and any test fixture should be connected before executing the command. This command will perform an actual test and all safety precautions should be observed when using this command.

File Editing Commands and Companion Queries

The following commands are used to create or modify Test Setup Files.

COMMAND	DESCRIPTION	VALUE
FL <*file number*> FL?	File Load	*file number* = 1-6
SS <*step number*> SS?	Step Select	*step number* = 1-6
SAA	Step Add ACW test	
SAD	Step Add DCW test	
SAI	Step Add IR test	
SAG	Step Add GND test	

FL <*file number*>
Load a file from non-volatile memory into random access memory RAM.

SS <*step number*>
Selects the active selected step to load into RAM. The step must first be selected before any specific parameters can be edited.

The parameter values should use complete text and not use the coded values that are associated with the individual parameter setting commands. Such as "ON" and "OFF" and any toggle field that use words or phrases like "OPEN", "CLOSE". The LS? companion command will also list all parameters in complete text as they appear on the setting screen.

	ACW	DCW	IR
1	Voltage	Voltage	Voltage
2	Max Limit	Max Limit	Max Limit
3	Min Limit	Min Limit	Min Limit
4	Ramp Up	Ramp Up	Delay
5	Dwell	Dwell	DUT Output (ON/OFF)
6	Frequency	DUT Output (ON/OFF)	Connect (ON/OFF)
7	DUT Output (ON/OFF)	Connect (ON/OFF)	
8	Connect (ON/OFF)		

	GND
1	Current
2	HI-Limit
3	LO-Limit
4	Dwell
5	Offset
6	Frequency
7	Connect (ON/OFF)

Test Parameter Editing Commands

These commands are used to modify the test parameter within each step. These commands require a parameter value to be included with the command. The companion query command will read the parameter. The writing of the parameter requires that the unit not be included with the value, only the numeric value should be included with the command. Also when the query commands are used the response will not include the units characters. Many of the commands will function the same way for multiple test types however the input range may be different and therefore used a different possible set of values.

COMMAND	NAME	TEST TYPES	VALUE
ECC {1|0} ECC?	Edit Step Connect	ALL	1= On, 0=Off
EC < *value* > EC?	Edit Current	GND	3.00 - 30.00A
EDE < *value* > EDE?	Edit Delay	IR	0.0, 0.5 - 999.9s 0.0 = Continuous
EDW < *value* > EDW?	Edit Dwell	ACW DCW GND	0.0, 0.5 – 999.9s 0.0, 0.5 – 999.9s 0.0, 0.5 – 999.9s 0.0 = Continuous
EF {1|0} EF?	Edit Frequency	ACW GND	1=60Hz, 0=50Hz
EH < *value* > EH?	Edit HI-Limit	ACW DCW IR GND	4320: 0.0 – 20,000uA 4520: 0.0 – 99,990uA 4320: 0.0 – 5,000uA 4520: 0.0 – 10,000uA 0 - 1000MΩ 0 - 510mΩ
EL < *value* > EL?	Edit LO-Limit	ACW DCW IR GND	0.0 – 20,000uA 0.0 – 5,000uA 0 - 1000MΩ 0 - 510mΩ
EO < *value* > EO?	Edit Offset	GND	0 - 100mΩ

COMMAND	NAME	TEST TYPES	VALUE
ERU < *value*> ERU?	Edit Ramp-Up	ACW DCW	0.1 - 999.9s
EV <*value*> EV?	Edit Voltage	ACW DCW IR	1 – 5kV 1 – 6kV 100 - 1000V

System Parameter Editing Commands and Companion Queries

These commands are used to modify the system parameters for the tester. These commands require a parameter value to be included with the command.

COMMAND	NAME	VALUE
SDH{1|0} SDH?	DUT HV Setup ON/OFF	1=On, 0=Off
SPR {1|0} SPR?	PLC Remote ON/OFF	1=On, 0=Off
SSI {1|0} SSI?	Single Step ON/OFF	1=On, 0=Off
SF {1|0} SF?	Fail Stop ON/OFF	1=On, 0=Off
SL {1|0} SL?	System Lock	1=On, 0=Off
SML {1|0} SML?	System Memory Lock	1=On, 0=Off

Query Commands

These query commands will retrieve data from the tester. These commands include functions for retrieving test data, test results and remote hardware.

COMMAND	NAME	VALUE
TD?	List Testing Data	Data from test in Process
RD <***step number***>?	Result Data Query	1-3
RR?	Read Reset Query	1=Open, 0=Closed
RI?	Read Interlock Query	1=Open, 0=Closed
LS?	List Step Parameters	
LS <*step number*>?	List Step Parameters by step number	*step number* = 1-6

TD?

Read the active data being displayed on the LCD display while the test is in process. It will also read the last data taken when the test sequence has completed. Each parameter is separated by commas and includes step number, test type, test status, and metering. The syntax for this command response is {memory - step, test type, status, meter 1, meter 2, meter 3}. Each meter will contain both the value and the units.

RD <step number>?

Read the results for an individual step. The step number is the actual step number that has been saved within the file, not the order of which the steps were executed. For example if the test was executed starting from step 3 and ending with step 5 then the first step test results will be found in location 3 not in location 1. Each parameter is separated by commas and includes step number, test type, test status, and metering. The syntax for this command response is {memory - step, test type, status, meter 1, meter 2, meter 3}. Each meter will contain both the value and the units.

RR?

Read the remote Reset input signal. When the remote reset has be activated by closing the contacts the query will return a value of 0 to indicate the tester is being Reset.

RI?

Read the remote Interlock input signal. When the remote Interlock has be activated by opening the contacts the query will return a value of 1 to indicate the tester is in the Interlock state and will not be able to generate output voltage or current.

LS?
Lists all the Parameters for the individual step that is currently selected.
The response will be formatted as follows; **<*step, test, p1, p2, p3…*>** Where <*step*> is the step number, <*test*> is the test type and <*p1,p2*> etc., indicates the parameters of the test.

LS <*step number*>?
Lists all the Parameters for the individual step indicated by *step number* = 1-30.

The response will be formatted as follows; <*step, test, p1, p2, p3…*> Where <*step*> is the step number, <*test*> is the test type and <*p1,p2*> etc., indicates the parameters of the test. IEEE 488.2 Common Commands

These commands are required by the IEEE-488.2 standard with the exception of *PSC, *PSC?. Most of these commands are not available over the RS-232 bus except for the *IDN? command which can be used to retrieve the tester identification information, and the four status reporting commands *ESR?, *ESE, *ESE? and *STB?.

COMMAND	NAME	DESCRIPTION
*IDN?	Identification Query	SLA, Model Number, Serial Number, Firmware Revision
*RST	Reset Command	Resets 4320/4520
*TST?	Self-Test Query	00H=OK 01H=TEST EEPROM ERROR
*CLS	Clear Status Command	Clear Standard Event Status Register Clear Service Request Register
*OPC	Operation Complete Command	When TEST command ok setting ESR BIT0 =1
*OPC?	Operation Complete Query	1 = TEST completed ok 0 = TEST in process
*WAI	Wait-to-Continue Command	
*PSC {1|0}	Power-on Status Clear Command	1 = Power-on clear enable registers 0 = Power-on load previous enable registers
*PSC?	Power-on Status Clear Query	
*ESR?	Standard Event Status Register Query	BIT 0, 01H,(1) Operation Complete BIT 1,02H,(2) Not Used BIT 2,04H,(4) Query Error BIT 3,08H,(8) Device Error BIT 4,10H,(16) Execution Error BIT 5,20H,(32) Command Error BIT 6,40H,(64) Not Used BIT 7,80H,(128) Power On
*ESE <*value*>	Standard Event Status Enable Command	*value* = 0 - 255
*ESE?	Standard Event Status Enable Query	0 - 255
*STB?	Read Status Byte Query	BIT 0, 01H,(1) ALL PASS BIT 1,02H,(2) FAIL BIT 2,04H,(4) ABORT BIT 3,08H,(8) PROCESS

		BIT 4,10H,(16) Message Available BIT 5,20H,(32) Standard Event (ESB) BIT 6,40H,(64) Request Service (MSS) BIT 7,80H,(128) PROMPT
*SRE <*value*>	Service Request Enable Command	*value* = 0 - 255
*SRE?	Service Request Enable Query	0 - 255

***IDN?**
Read the tester identification string. Company =SLA.

***RST**
Reset the tester to original power on configuration. Does not clear Enable register for Standard Summary Status or Standard Event Registers. Does not clear the output queue. Does not clear the power-on-status-clear flag.

***TST?**
Performs a self test of the tester data memory. Returns 0 if it is successful or 1 if the test fails.

***CLS**
Clears the Status Byte summary register and event registers. Does not clear the Enable registers.

***OPC**
Sets the operation complete bit (bit 0) in the Standard Event register after a command is completed.

***OPC?**
Returns an ASCII "1" after the command is executed.

***WAI**
After the command is executed, it prevents the tester from executing any further query or commands until the no-operation-pending flag is TRUE.

***PSC {1|0}**
Sets the power-on status clear bit. When set to 1 the Standard Event Enable register and Status Byte Enable registers will be cleared when power is turned ON. 0 setting indicates the Enable registers will be loaded with Enable register masks from non-volatile memory at power ON.

***PSC?**
Queries the power-on status clear setting. Returns 0 or 1.

***ESR?**
Queries the Standard Event register. Returns the decimal value of the binary-weighted sum of bits.

***ESE <*value*>**
Standard Event enable register controls which bits will be logically ORed together to generate the Event Summary bit 5 (ESB) within the Status Byte.

***ESE?**
Queries the Standard Event enable register. Returns the decimal value of the binary-weighted sum of bits.

***STB?**
Read the Status Byte. Returns the decimal value of the binary-weighted sum of bits.

***SRE <*value*>**
Service Request enable register controls which bits from the Status Byte should be use to generate a service request when the bit value = 1.

***SRE?**
Queries the Service Request enable register. Returns the decimal value of binary-weighted sum of bits.

Appendix E - Replacement Parts List - Model 4320/4520

Rev: D

PART NUMBER	QTY.	REFERENCE DESIGNATOR	DESCRIPTION
99-10320-01	1	CON4320	Main Control Board 4320
99-10639-01[1]	1	CON4320	Main Control Board 4520
99-10321-01	1	AMP4320	Amplifier Board 4320
99-10637-01[1]	1	AMP3780	Amplifier Board 4520
99-10322-01	1	HV4320A	HV Control Board 4320
99-10638-01[1]	1	HV4320H	HV Control Board 4520
99-10323-01	1	RY4320	HV AC/DC Switch Board 4320
99-10641-01[1]		RY4320	HV AC/DC Switch Board 4520
99-10324-01	1	CKB-06	Keypad Board
99-10572-01	1	RS232-M1	RS232 Interface Board
99-10573-01	1	-	RS232 Cable
99-10325-01[2]	1	PWR3670	Input Voltage Select Board 4320
99-10326-01	1	REM4320	Remote Board
99-10640-01[1]	1	OPT4520	Output Switch Board 4520
99-10016-01	1	-	Earth Connector
99-10018-01	1	-	High Voltage Connector
99-10673-01	1	-	Return Terminal
99-10674-01	1	-	Current Terminal
175-946-013	1	-	Feet Kit w/o Rubber Inserts
175-974-002	4	-	Rubber Insert
99-10106-01[2]	1	-	Fuse 6.3A, 250V, Slow Blow, 5x20mm
99-10656-01[1]	1	-	Fuse 15A, 250V Slow Blow
99-10297-01[2]	1	-	Fuse Holder 20mm
99-10650-01[1]	1	-	Fuse Holder 30mm
99-10355-01	1	-	LCD Display 16 x 2 Characters
99-10312-01[2]	1	-	Power Switch 2P 15A
330-118-001[1]	1	-	Power Switch 2P 250V 10A
330-113-001	1	-	Test Switch, Green
330-113-002	1	-	Reset Switch, Red
99-10333-01[2]	1	T1	Input Transformer
99-10334-01	1	T2	Output High Voltage Transformer
99-10653-01[1]	1	T2	Output 500VA HV Transformer
99-10654-01[1]	1	T3	Ground Bond Transformer
125-013-001	1	-	Input Power Cable 10A/6Ft.

PART NUMBER	QTY.	REFERENCE DESIGNATOR	DESCRIPTION
102-050-913	1	-	High Voltage Probe
102-055-913	1	-	High Voltage Output cable
99-10008-01	1	-	Return cable
99-10009-01	1	-	Current cable
99-10028-01	11	Q…	Power Transistors on AMP4320
99-10029-01	1	RY1	Relay Gunther 3392-1290-246 on RY4320
99-10033-01	1	RY2	Relay Gunther 3390-1290-246 on RY4320
99-10681-01	1	IC2[1]	Microcontroller 8 Bit SM89516B
99-10867-01	1	IC2[2]	Microcontroller 8 Bit W79E632A
99-10681-01	1	IC24	Microcontroller 8 Bit SM8951B
99-10030-01	1	IC50	12 Bit D/A Converter 7541
99-10032-01	1	IC20	8 Bit D/A Converter DAC 0800
99-10671-01	1	Test/Pass	Replacement Bulb
99-10672-01	1	Reset/Fail	Replacement Bulb

[1] 4520 Only

[2] 4320 Only

Appendix F - Service and Maintenance

User Service

To prevent electric shock do not remove the tester cover. There are no user serviceable parts inside. Routine maintenance or cleaning of internal parts is not necessary. Any external cleaning should be done with a clean dry or slightly damp cloth. Avoid the use of cleaning agents or chemicals to prevent any foreign liquid from entering the cabinet through ventilation holes or damaging controls and switches, also some chemicals may damage plastic parts or lettering. Schematics, when provided, are for reference only. Any replacement cables and high voltage components should be acquired directly from Slaughter Company, Inc. Refer servicing to a Slaughter Company, Inc. authorized service center.

SLAUGHTER COMPANY, INC.
28105 N. KEITH DRIVE
LAKE FOREST, IL 60045-4546 U.S.A.

☎PHONE: 1 (847) 932-3662
1 (800) 504-0055
FAX: 1 (847) 932-3665
E-MAIL : support@hipot.com
www.hipot.com

Service Interval

The tester and its power cord, test leads, and accessories must be returned **at least once a year** to a Slaughter Company authorized service center for calibration and inspection of safety related components. Slaughter Company will not be held liable for injuries suffered if the tester is not returned for its annual safety check and maintained properly.

User Modifications

Unauthorized user modifications will void your warranty. Slaughter Company will not be responsible for any injuries sustained due to unauthorized equipment modifications or use of parts not specified by Slaughter Company. Testers returned to Slaughter Company with unsafe modifications will be returned to their original operating condition at your expense.

Appendix G – Calibration Procedure

This tester has been fully calibrated at the factory in accordance to our published specifications. It has been calibrated with standards traceable to NIST. You will find in this manual a copy of the "Certificate of Calibration". It is recommended that you have this tester recalibrated and a safety check done at least once per year. Slaughter recommends you use "Calibration Standards" that are NIST traceable, or traceable to agencies recognized by NIST to keep this tester within published specifications.

End user metrology standards or practices may vary. These metrology standards determine the measurement uncertainty ratio of the calibration standards being used. Calibration adjustments can only be made in the Calibration mode and calibration checks or verification can only be made while operation in Test mode.

Calibration Equipment Required:

The following standard equipment will be needed to properly calibrate your tester.

A Standard AC Voltmeter with 5,000 Volts range

A Standard AC Voltmeter with 6 Volts range

A Standard DC Voltmeter with 6,000 Volts range

A Standard DC Voltmeter with 1,000 Volts range

A Standard AC Ammeter with 30 A range

A Standard AC Milliammeter with 20 mA range

A Standard DC Milliammeter with 5 mA range

A Standard Resistor 100 kΩ/20Watt/1500VAC

A Standard Resistor 1 MΩ/0.25Watt/300VDC

A Standard Resistor 50 MΩ/0.25Watt/1000VDC

1. Calibration Initialization

To enter the calibration mode the tester must be in the OFF position. Using a pen or small screwdriver, press and hold the recessed calibration key on the rear panel, then turn on the input POWER switch. The display will show:

To calibrate AC voltage please follow procedure on next paragraph, to calibrate other parameters use Up (∧) or Down (∨) arrow keys to scroll to the desired calibration point, then follow procedure on relative paragraph below.

When the calibration process is completed successfully and the tester accepts the entered calibration data it will output one short “beep” and advance to the next calibration point, otherwise the tester will output two short “beeps” and will not advance to the next calibration point.

2. To calibrate AC Voltage

Please connect a standard 5000V AC Voltmeter to the HV and RETURN connectors.

Then press the TEST button on the front panel. The tester will provide around 5000VAC on the output connectors and the display will show:

Press the Up (∧) or Down (∨) arrow keys to enter the reading of the standard AC Voltmeter into the tester. Then press SET key to store the voltage setting and to advance to the next calibration point or press the RESET button to return to the calibration menu without changing the calibration setting. Press the EXIT key to exit from the calibration mode and to return to the test mode.

3. To calibrate DC Voltage

Please connect a standard 6000V DC Voltmeter to the HV and RETURN connectors.

Press the Up (∧) or Down (∨) arrow keys until the display shows:

Then press the TEST button on the front panel. The tester will provide around 6000VDC on the output connectors and the display will show:

Press the Up (∧) or Down (∨) arrow keys to enter the reading of the standard DC Voltmeter into the tester. Then press SET key to store the voltage setting and to advance to the next calibration point or press the RESET button to return to the calibration menu without changing the calibration setting. Press the EXIT key to exit from the calibration mode and to return to the test mode.

4. To calibrate IR Voltage

Please connect a standard 1000V DC Voltmeter to the HV and RETURN connectors.

Press the Up (∧) or Down (∨) arrow keys until the display shows:

Then press the TEST button on the front panel. The tester will provide around 1000VDC on the output connectors and the display will show:

Press the Up (∧) or Down (∨) arrow keys to enter the reading of the standard DC Voltmeter into the tester. Then press SET key to store the voltage setting and to advance to the next calibration point or press the RESET button to return to the calibration menu without changing the calibration setting. Press the EXIT key to exit from the calibration mode and to return to the test mode.

5. To calibrate AC Current

Please connect a 100 kΩ resistor in series with the standard 20mA AC Milliammeter and connect these across the HV and RETURN connectors of the tester.

Press the Up (∧) or Down (∨) arrow keys until the display shows:

Then press the TEST button on the front panel. The tester will provide around 1000VAC on the output connectors and the display will show:

Press the Up (∧) or Down (∨) arrow keys to enter the reading of the standard AC Milliammeter into the tester. Then press SET key to store the current setting and to advance to the next calibration point or press the RESET button to return to the calibration menu without changing the calibration setting. Press the EXIT key to exit from the calibration mode and to return to the test mode.

6. To calibrate DC Current

Please connect a 100 kΩ resistor in series with the standard 5mA DC Milliammeter and connect these across the HV and RETURN connectors of the tester.

Press the Up (∧) or Down (∨) arrow keys until the display shows:

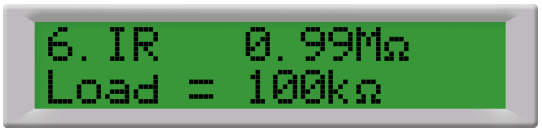
Then press the TEST button on the front panel. The tester will provide around 500VDC on the output connectors and the display will show:

Press the Up (∧) or Down (∨) arrow keys to enter the reading of the standard DC Milliammeter into the tester. Then press SET key to store the current setting and to advance to the next calibration point or press the RESET button to return to the calibration menu without changing the calibration setting. Press the EXIT key to exit from the calibration mode and to return to the test mode.

7. To calibrate Insulation Resistance range

Please connect a 100kΩ standard resistor across the HV and RETURN connectors.

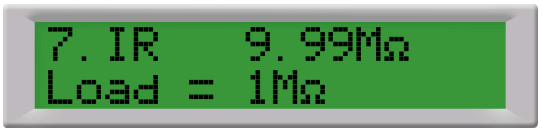
Press the Up (∧) or Down (∨) arrow keys until the display shows:



Then press the TEST button on the front panel. The tester will execute automatic calibration process. The process does not require data entry. The tester will provide around 300VDC on the output connectors and the display will show:

The tester will output one short “beep” and advance to the next calibration point when the automatic process is completed successfully, otherwise the tester will output two short “beeps” and will not advance to the next calibration point.

When previous calibration point was completed successfully display will show:



Please connect a 1MΩ standard resistor across the HV and RETURN connectors.

Then press the TEST button on the front panel. The tester will execute automatic calibration process. The process does not require data entry. The tester will provide around 300VDC on the output connectors and the display will show:

The tester will output one short “beep” and advance to the next calibration point when the automatic process is completed successfully, otherwise the tester will output two short “beeps” and will not advance to the next calibration point.

When previous calibration point was completed successfully display will show:

Please connect a 50MΩ standard resistor across the HV and RETURN connectors.

Then press the TEST button on the front panel. The tester will execute automatic calibration process. The process does not require data entry. The tester will provide around 1000VDC on the output connectors and the display will show:

The tester will output one short “beep” and advance to the next calibration point when the automatic process is completed successfully, otherwise the tester will output two short “beeps” and will not advance to the next calibration point.

When previous calibration point was completed successfully display will show:

The 50MΩ standard resistor should be connected across the HV and RETURN connectors of the tester.

Then press the TEST button on the front panel. The tester will execute automatic calibration process. The process does not require data entry. The tester will provide around 150VDC on the output connectors and the display will show:

The tester will output one short “beep” and advance to the next calibration point when the automatic process is completed successfully, otherwise the tester will output two short “beeps” and will not advance to the next calibration point.

8. To calibrate Ground Bond test voltage

Please connect a standard 6V AC Voltmeter across the CURRENT and RETURN connectors of the tester.

Press the Up (∧) or Down (∨) arrow keys until the display shows:

Then press the TEST button on the front panel. The tester will generate an output of about 6 VAC and the display will show:

Press the Up (∧) or Down (∨) arrow keys to enter the reading of the standard AC Voltmeter into the tester. Then press SET key to store the voltage setting and to advance to the next calibration point or press the RESET button to return to the calibration menu without changing the calibration setting. Press the EXIT key to exit from the calibration mode and to return to the test mode.

9. To calibrate Ground Bond test current

Please connect the standard 30A AC Ammeter across the CURRENT and RETURN connectors of the tester.

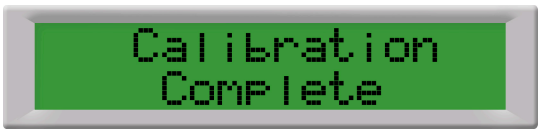
Press the Up (∧) or Down (∨) arrow keys until the display shows:

Then press the TEST button on the front panel. The display will show:

Press the Up (∧) or Down (∨) arrow keys to enter the reading of the standard AC Ammeter into the tester. Then press SET key to store the current setting and to advance to the next calibration point or press the RESET button to return to the calibration menu without changing the calibration setting. Press the EXIT key to exit from the calibration mode and to return to the test mode.

10. Exit Calibration Mode

When all calibration parameters are completed successfully the display will show:



Please press the EXIT key to exit from the calibration mode and to return to the test mode.