



Operation & Service Manual

Model 294, 295, 296, 297, 298 • E1.09

Model 294 (DC Hipot Tester)
Model 295 (AC Hipot Tester)
Model 296 (AC/DC Hipot Tester)
Model 297 (AC/DC Hipot With IR Tester)
Model 298 (500VA AC Hipot Tester)

Item 99-10813-01

February, 2023



DECLARATION OF CONFORMITY



Manufacturer: SCI An Ikonix Brand

Address: 28105 N. Keith Drive
Lake Forest, IL 60045
USA

Product Name: SCI 290 Series

Model Number: 294, 295, 296, 297

Conforms to the following Standards:

Safety: EN 61010-1:2010+A1:2019
BS EN 61010-2-030:2010
BS EN IEC 61010-2-034:2021+A11:2014
UL 61010-1:2012 R7.19
CAN/CSA-C22.2 NO. 61010-1-12 + GI1 + GI2 (R2017) +A1

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

Supplementary Information:

*The product herewith complies with the requirements of the **Low Voltage Directive 2014/35/EU** and the **EMC Directive 2014/30/EU** and the **RoHS Directive 2015/863/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, Bis(2-ethylhexyl) phthalate, Dibutyl phthalate, Benzyl butyl phthalate, Diisobutyl phthalate included.*

Last two digits of the year the CE mark was first affixed: 16

The technical file and other documentation are on file with Ikonix.

A handwritten signature in black ink, appearing to read 'Adam Braverman'.

Adam Braverman
President
Ikonix
Lake Forest, Illinois USA
December 2022

DECLARATION OF CONFORMITY



Manufacturer: SCI An Ikonix Brand

Address: 28105 N. Keith Drive
Lake Forest, IL 60045
USA

Product Name: SCI 290 Series

Model Number: 298 (500VA)

Conforms to the following Standards:

Safety: UL 61010-1:2012 R7.19, CAN/CSA-C22.2 NO. 61010-1-12+GI1+GI2 (R2017)+A1
BS EN 61010-1:2010+A1:2019, BS EN 61010-2-030: 2010
BS EN IEC 61010-2-034:2021+A11:2014

EMC: EN 61326-1:2013 / BS EN 61326-1:2013 Class A
EN 61000-3-3:2013 / BS EN 61000-3-3:2013/ IEC 61000-3-3:2013
EN 61326-1:2013 / BS EN 61326-1:2013(Industrial Locations)
EN 61000-4-2: 2009 / BS EN 61000-4-2: 2009 / IEC 61000-4-2:2008
EN 61000-4-3: 2006+A1:2008+A2:2010 / BS EN 61000-4-3: 2006+A1:2008+A2:2010
IEC 61000-4-3:2006 +A1:2007+A2:2010
EN 61000-4-4: 2012 / BS EN 61000-4-4: 2012/ IEC 61000-4-4:2012
EN 61000-4-5: 2014 / BS EN 61000-4-5: 2014/ IEC 61000-4-5:2014
EN 61000-4-6: 2014 / BS EN 61000-4-6: 2014/ IEC 61000-4-6:2013
EN 61000-4-8: 2010 / BS EN 61000-4-8: 2010/ IEC 61000-4-8:2009
EN 61000-4-11: 2004 / BS EN 61000-4-11: 2004 / IEC 61000-4-11:2004

Supplementary Information:

*The product herewith complies with the requirements of the **Low Voltage Directive 2014/35/EU** and the **EMC Directive 2014/30/EU** and the **RoHS Directive 2015/863/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, Bis(2-ethylhexyl) phthalate, Dibutyl phthalate, Benzyl butyl phthalate, Diisobutyl phthalate included.*

Last two digits of the year the CE mark was first affixed: 16

The technical file and other documentation are on file with SCI

A handwritten signature in black ink, appearing to read 'Adam Braverman'.

Adam Braverman
President
Ikonix
Lake Forest, Illinois USA
December 2022

Warranty Policy

Ikonix, 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 (5) years from date of shipment. We aim to provide an amazing experience and quality testers that last a long time. If you're not satisfied with your tester, return it within 45 days for a full refund. Calibrate annually with us, or one of our authorized partners, and we'll extend your warranty an additional year for the service life of your tester, and at least five years after discontinuation. If it breaks during that time, we promise to fix it for free (unless abuse or excessive damage is present). When your tester reaches the end of its service life, we'll responsibly recycle it and give you a discount on a replacement. Annual calibration and inspection must be made in each successive year starting one year after the original purchase date in order to remain eligible for extended warranty coverage beyond the standard warranty period (five years).

Ikonix recommends that your tester be calibrated on a twelve-month cycle. A return material authorization (RMA) must be obtained from Ikonix. To obtain an RMA please contact our Customer Support team at 1-847-932-3662 or visit hipot.com. 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. Ikonix will assume the return freight costs when returning the tester to the customer. The return method will be at the discretion of Ikonix.

Except as provided, herein Ikonix makes no warranties to the purchaser of this tester and all other warranties, expressed 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 Ikonix manufacture. Parts used must be parts that are recommended by Ikonix as an acceptable specified part. Use of non-authorized parts in the repair of this tester will void the warranty.

*5 year warranty is valid on any model purchased in 2021 or after.

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Safety Precautions

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 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.

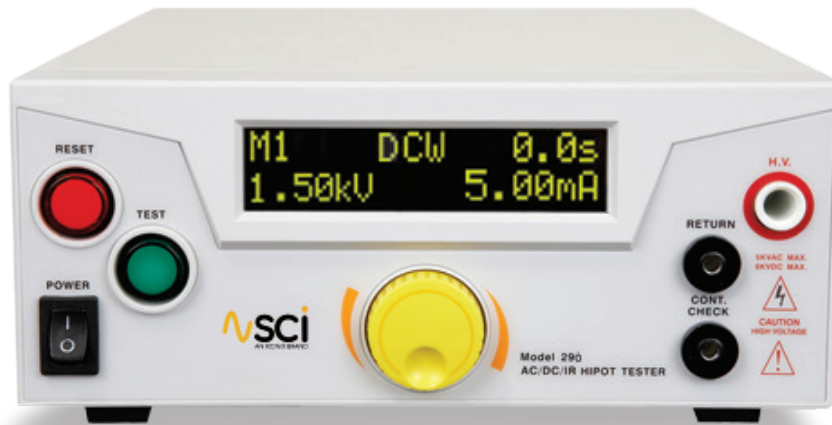
CAUTION

Calls attention to a procedure, practice, or condition that could case damage to equipment or permanent loss of data.

WARNING

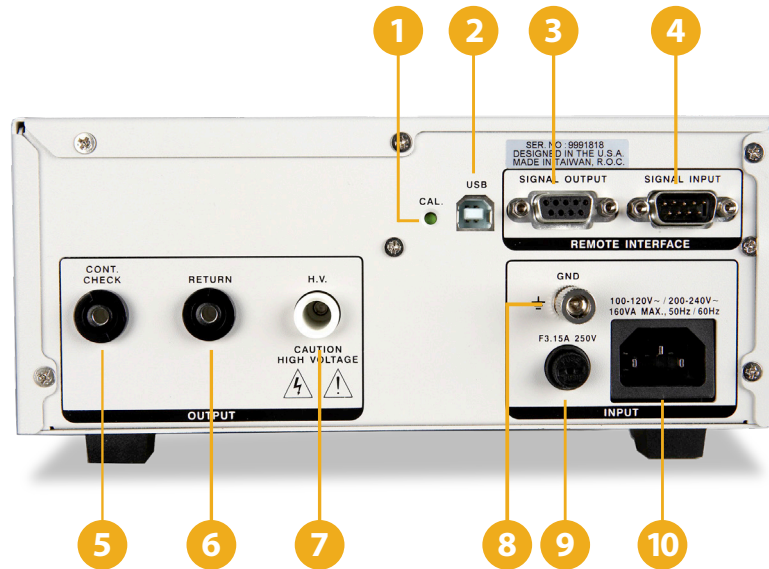
A HIPOT PRODUCES VOLTAGES AND CURRENTS WHICH CAN CAUSE HARMFUL OR FATAL ELECTRIC SHOCK. TO PREVENT ACCIDENTAL INJURY OR DEATH, THESE SAFETY PROCEDURES MUST BE STRICTLY OBSERVED WHEN HANDLING AND USING HTE TESTER.

Front Panel Controls



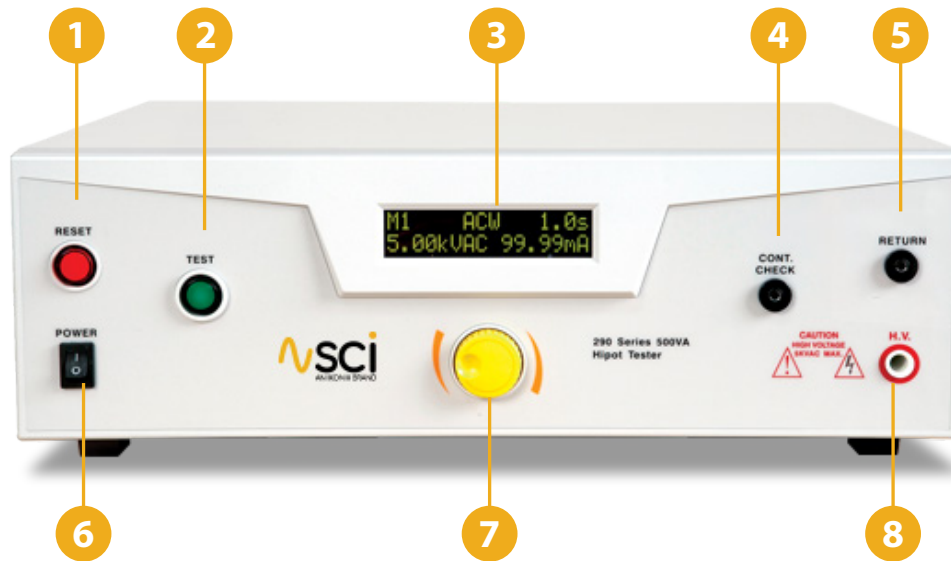
- 1 RESET BUTTON** - This is a momentary contact switch used to reset the tester. If an out-of-range reading is detected during a test, the red failure lamp within the button will light. To reset the system for the next test, press and release this button. This button may also be used to abort a test 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 there is continuity between Cont. Check and Return ports..
- 3 LCD DISPLAY** - The Liquid Crystal Display is the main display for the operator and programmer of the test settings and test results.
- 4 HIGH VOLTAGE OUTPUT JACK** - Use this jack for the connection of the detachable high voltage test lead or the adapter box high voltage connector.
- 5 POWER SWITCH** - Rocker-style switch with international ON (|) and OFF (0) markings.
- 6 ROTARY KNOB** - Use this knob to advance forward/backward through the setup menus and to setup system and test parameters.
- 7 RETURN JACK** - Provides the return connection for the leakage current.
- 8 CONT CHECK** - Provides the connection for checking ground continuity.
- 9 HIGH VOLTAGE LED INDICATOR** - This indicator flashes to warn the operator that high voltage is present at the high voltage output terminal.

Rear Panel Controls

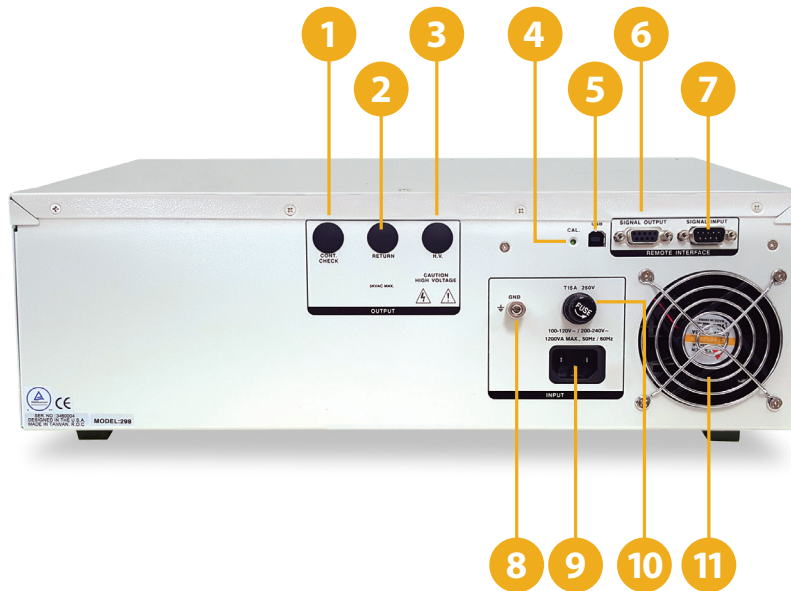


- 1 CALIBRATION ENABLE KEY** - To enter the calibration mode press this key while the tester is being powered ON.
- 2 USB CONNECTOR** - Optional USB port for serial communication. Refer to Option 03 in the Options section.
- 3 SIGNAL OUTPUT** - 9 pin D subminiature female connector for monitoring PASS, FAIL, and PROCESSING output relay signals.
- 4 SIGNAL INPUT** - 9 pin D subminiature male connector for remote control of test, reset, and interlock functions as well as remote memory tests selection.
- 5 OPTIONAL CONTINUITY CHECK PORT** - Provides the connection for checking ground continuity.
- 6 OPTIONAL RETURN PORT** - Provides the return connection for the leakage current.
- 7 OPTIONAL HIGH VOLTAGE OUTPUT PORT** - Use this jack for the connection of the detachable high voltage test lead or the adapter box high voltage connector.
- 8 CHASSIS GROUND EARTH TERMINAL** - This safety ground terminal should be connected to a good earth ground before operation.
- 9 FUSE RECEPTACLE** - To change the fuse unplug the power (mains) cord and turn the fuse cap counter clockwise to remove the fuse.
- 10 INPUT POWER RECEPTACLE** - Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.

Front Panel Controls Model 298



- 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 there is continuity between Cont. Check and Return ports.
- 3 LCD DISPLAY** - The Liquid Crystal Display is the main display for the operator and programmer of the test settings and test results.
- 4 CONT CHECK** - Provides the connection for checking ground continuity.
- 5 RETURN JACK** - Provides the return connection for the leakage current.
- 6 POWER SWITCH** - Rocker-style switch with international ON (|) and OFF (0) markings.
- 7 ROTARY KNOB** - Use this knob to advance forward/backward through the setup menus and to setup system and test parameters.
- 8 HIGH VOLTEAGE OUTPUT JACK** - Use this jack for the connection of the detachable high voltage test lead or the adapter box high voltage connector.



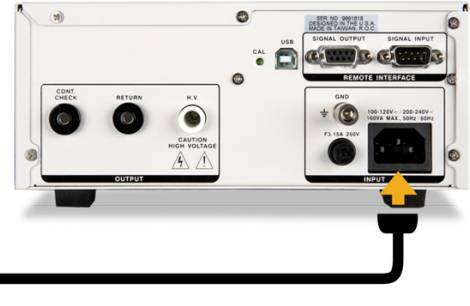
- 1 OPTIONAL CONTINUITY CHECK PORT** - Provides the connection for checking ground continuity.
- 2 OPTIONAL RETURN PORT** - Provides the return connection for the leakage current.
- 3 OPTIONAL HIGH VOLTAGE OUTPUT PORT** - Use this jack for the connection of the detachable high voltage test lead or the adapter box high voltage connector.
- 4 CALIBRATION ENABLE KEY** - Use this jack for the connection of the detachable high voltage test lead or the adapter box high voltage connector.
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- 10 FUSE RECEPTACLE** - To change the fuse unplug the power (mains) cord and turn the fuse cap counter clockwise to remove the fuse.
- 11 THERMAL FAN** - To cool the tester.

Setup Instructions

Power-Up Sequence:

1. Check to be sure the correct input line cord is used.
2. Connect the power input plug into its socket on the rear panel of the tester.
The SCI 290 series of testers has an automatic input voltage range selection.
3. Connect the male end of the plug to the grounded AC outlet.

Grounded
Power
Source



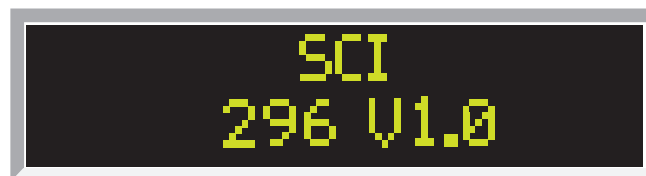
WARNING

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

4. Connect the Interlock Disable key to the Signal Input connector on the back panel of the tester. This is required in order to run a test.



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.

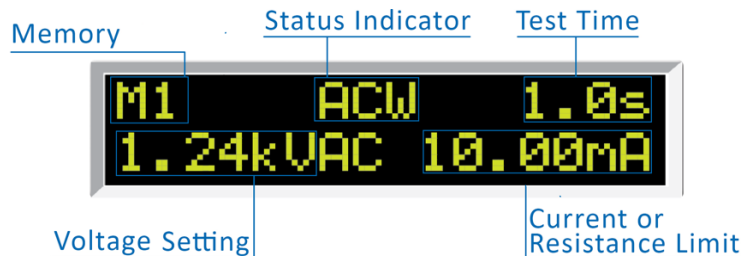
Getting to Know Your Tester

1. Working with Memories

The SCI 290 series of testers are equipped with 5 memory programs numbered 1 through 5. Each memory can be connected sequentially to the next consecutive memory. Only one test type can be selected for each memory location. However, all 5 memory locations can be programmed and the parameters will be saved in each memory. The tests loaded in each memory location can be executed one at a time or as a sequence.

2. Perform Test Screen

The Perform Test Screen displays the following parameters:



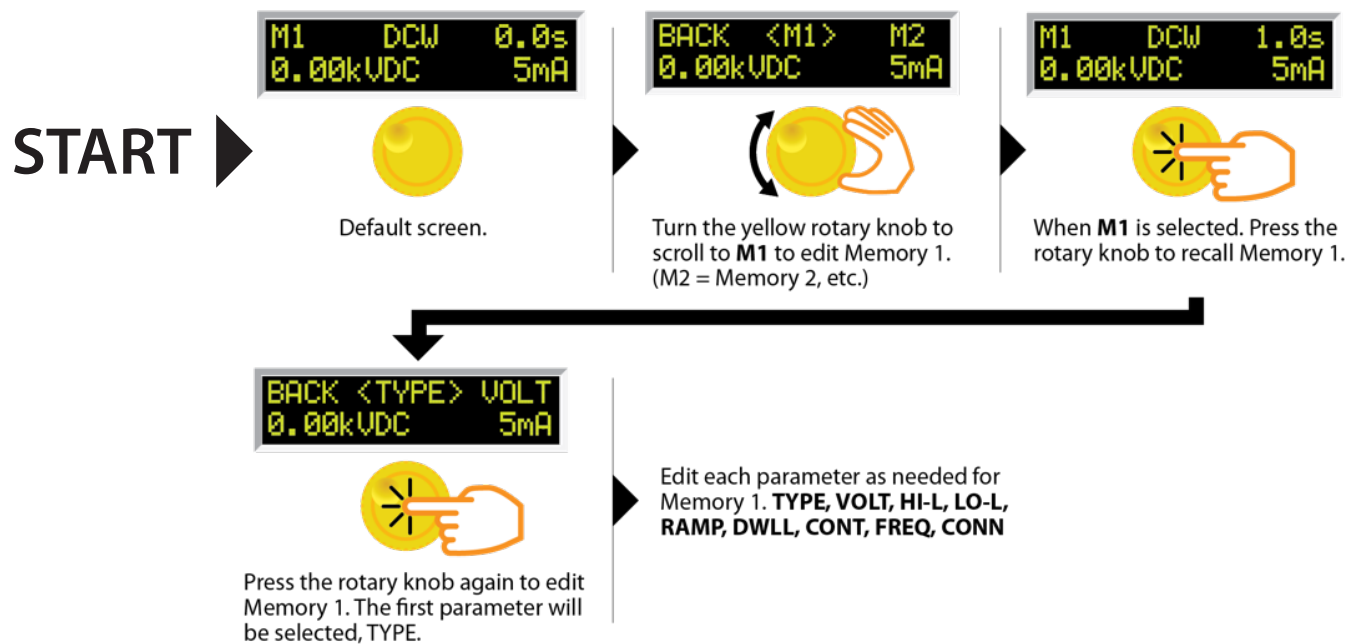
Follow the setup procedures to set the desired parameters. The display will show the either the Hipot test settings or the Insulation Resistance test settings:

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

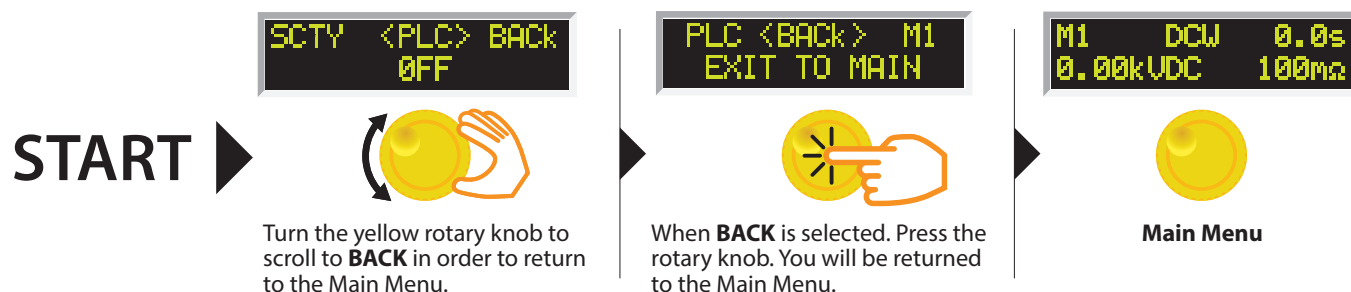
*The underscore character may be displayed after the memory number, i.e. M1_. This indicates that another configured test will execute after the displayed setup has completed.

3. Selecting Memory

PROGRAM A MEMORY

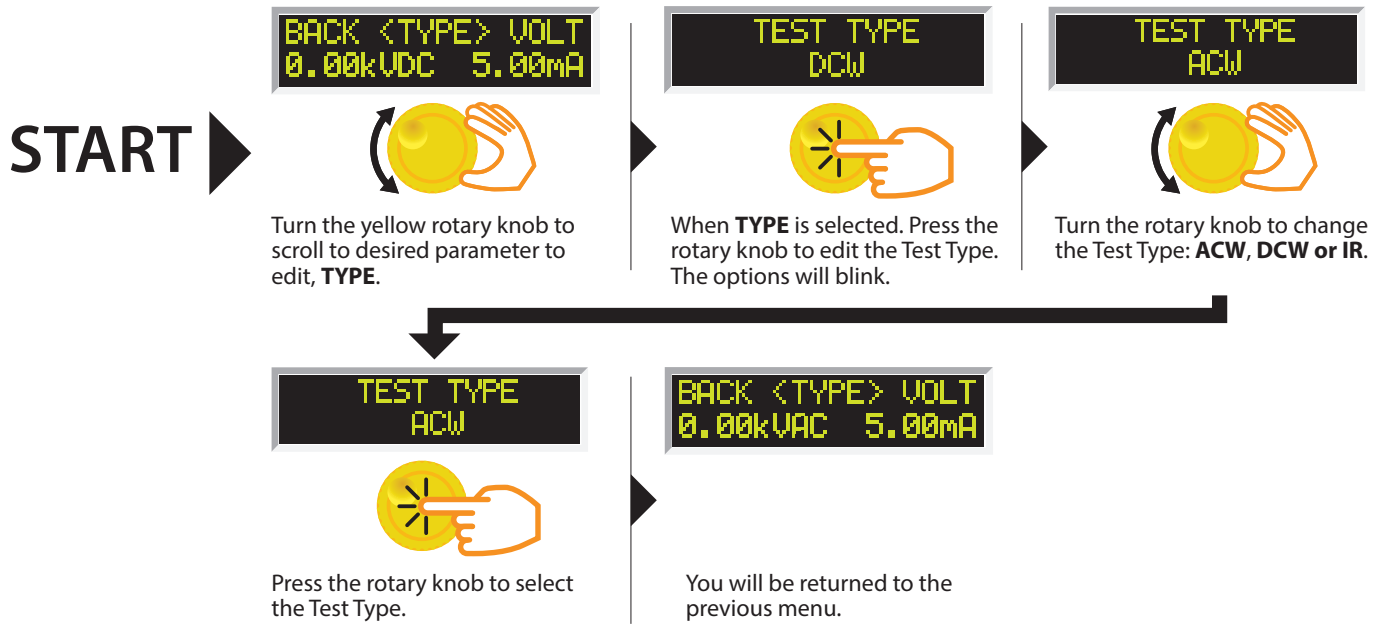


GO BACK TO THE MAIN MENU

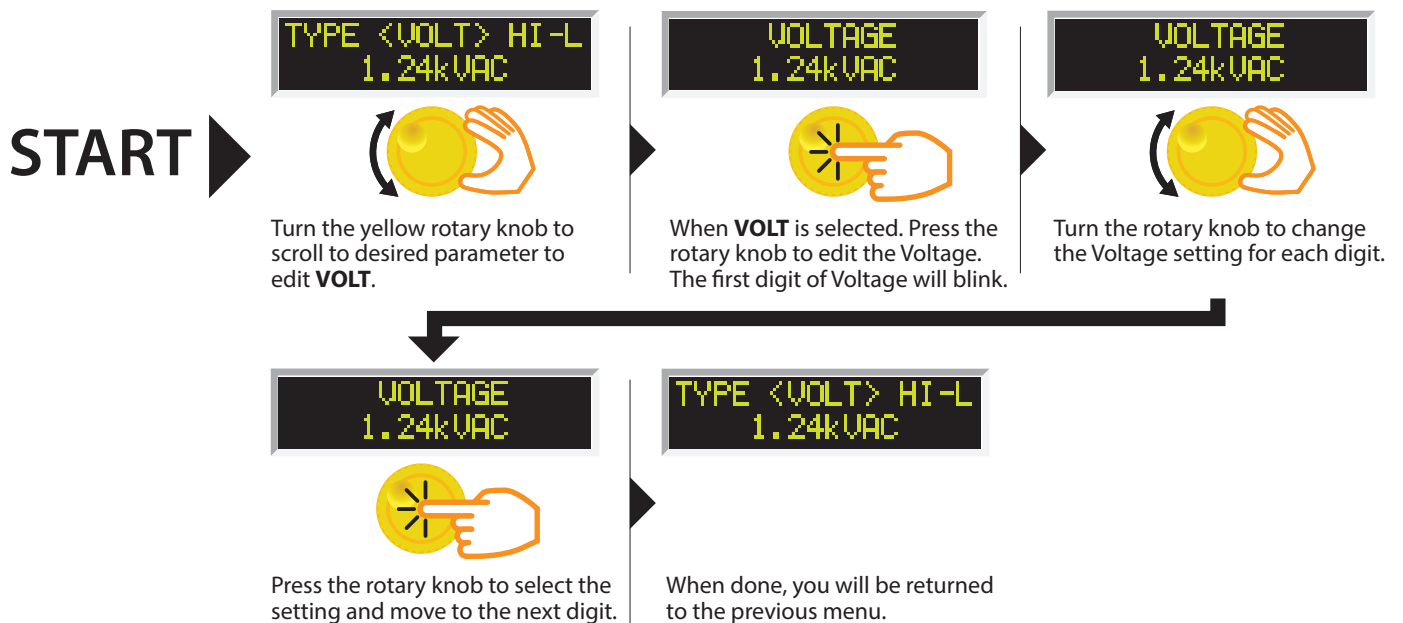


4. Setting an AC Hipot Test

PROGRAM A MEMORY: TYPE AC



PROGRAM A MEMORY: CHANGE VOLTAGE



PROGRAM A MEMORY: CHANGE HI-LIMIT

START ►

VOLT <HI-L> LO-L
0mA



Turn the yellow rotary knob to scroll to desired parameter to edit **HI-L**.

HI-LIMIT
0mA



When **HI-L** is selected. Press the rotary knob to edit the HI-Limit. The first digit of HI-Limit will blink.

HI-LIMIT
5mA



Turn the rotary knob to change the HI-Limit setting for each digit.

HI-LIMIT
5mA



Press the rotary knob to select the setting and move to the next digit.

VOLT <HI-L> LO-L
5mA

When done, you will be returned to the previous menu.

PROGRAM A MEMORY: CHANGE LO-LIMIT

START ►

HI-L <LO-L> RAMP
0mA



Turn the yellow rotary knob to scroll to desired parameter to edit **LO-L**.

LO-LIMIT
0mA



When **LO-L** is selected. Press the rotary knob to edit the LO-Limit. The first digit of LO-Limit will blink.

LO-LIMIT
0mA



Turn the rotary knob to change the LO-Limit setting for each digit.

LO-LIMIT
0mA

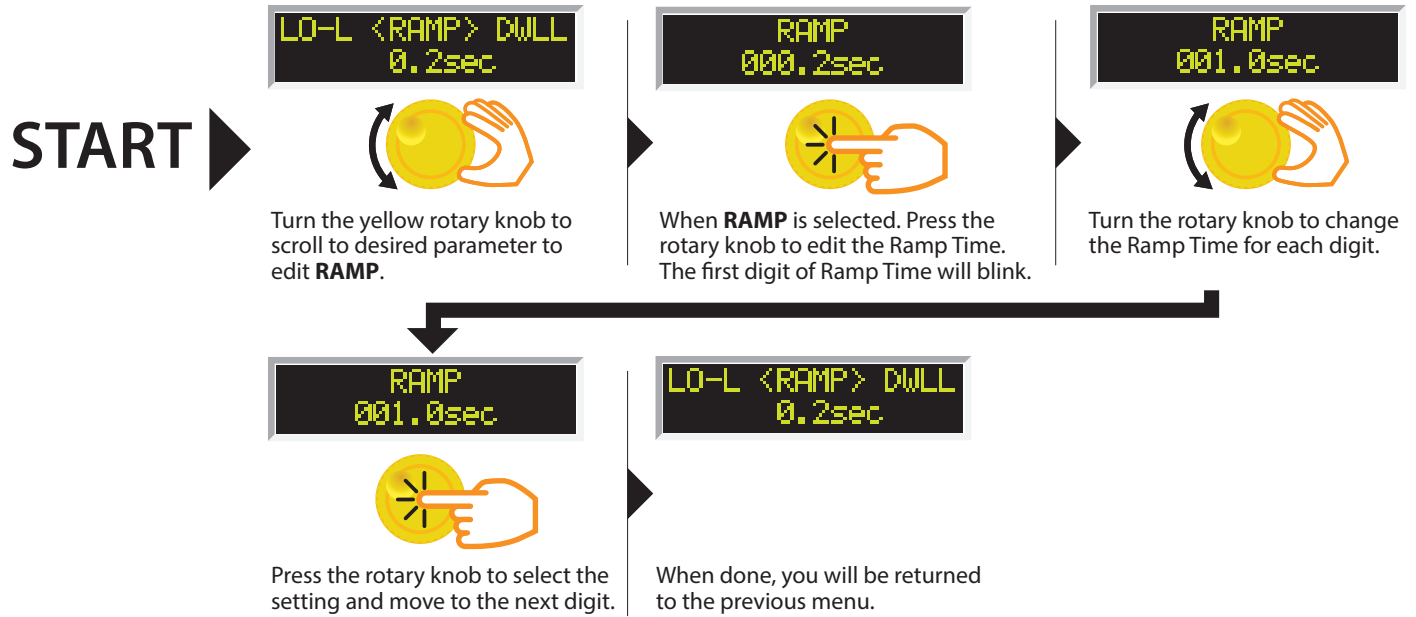


Press the rotary knob to select the setting and move to the next digit.

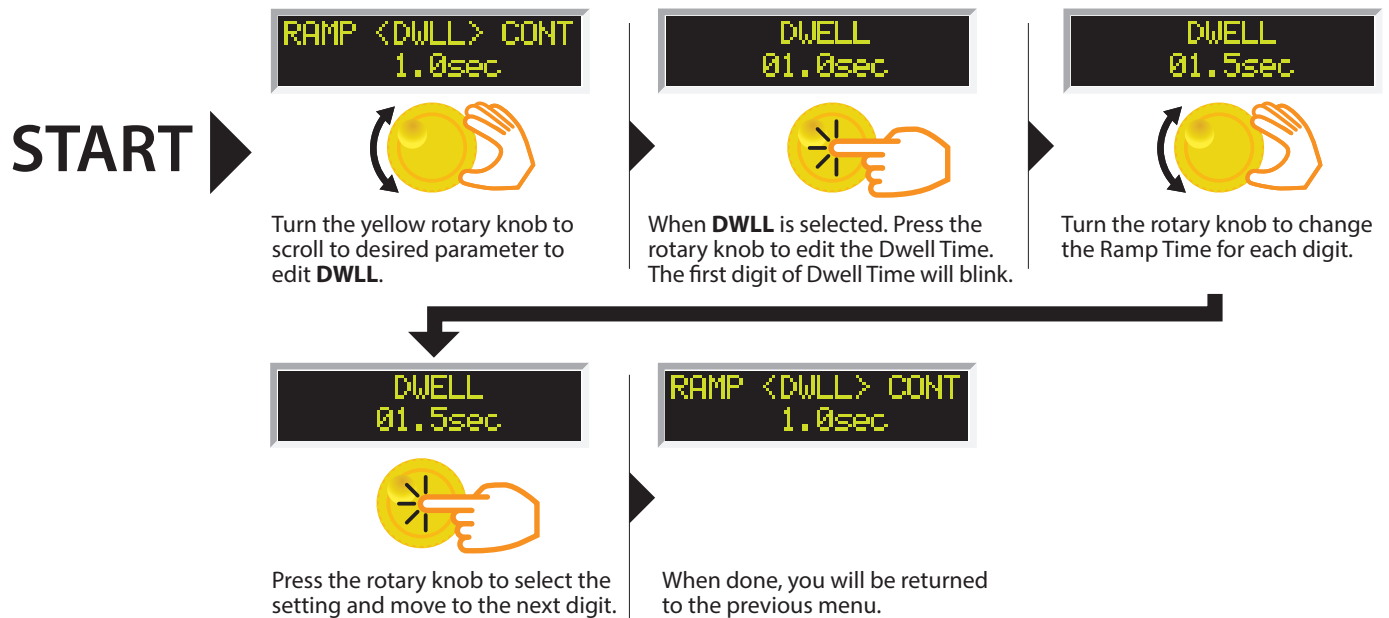
HI-L <LO-L> RAMP
0mA

When done, you will be returned to the previous menu.

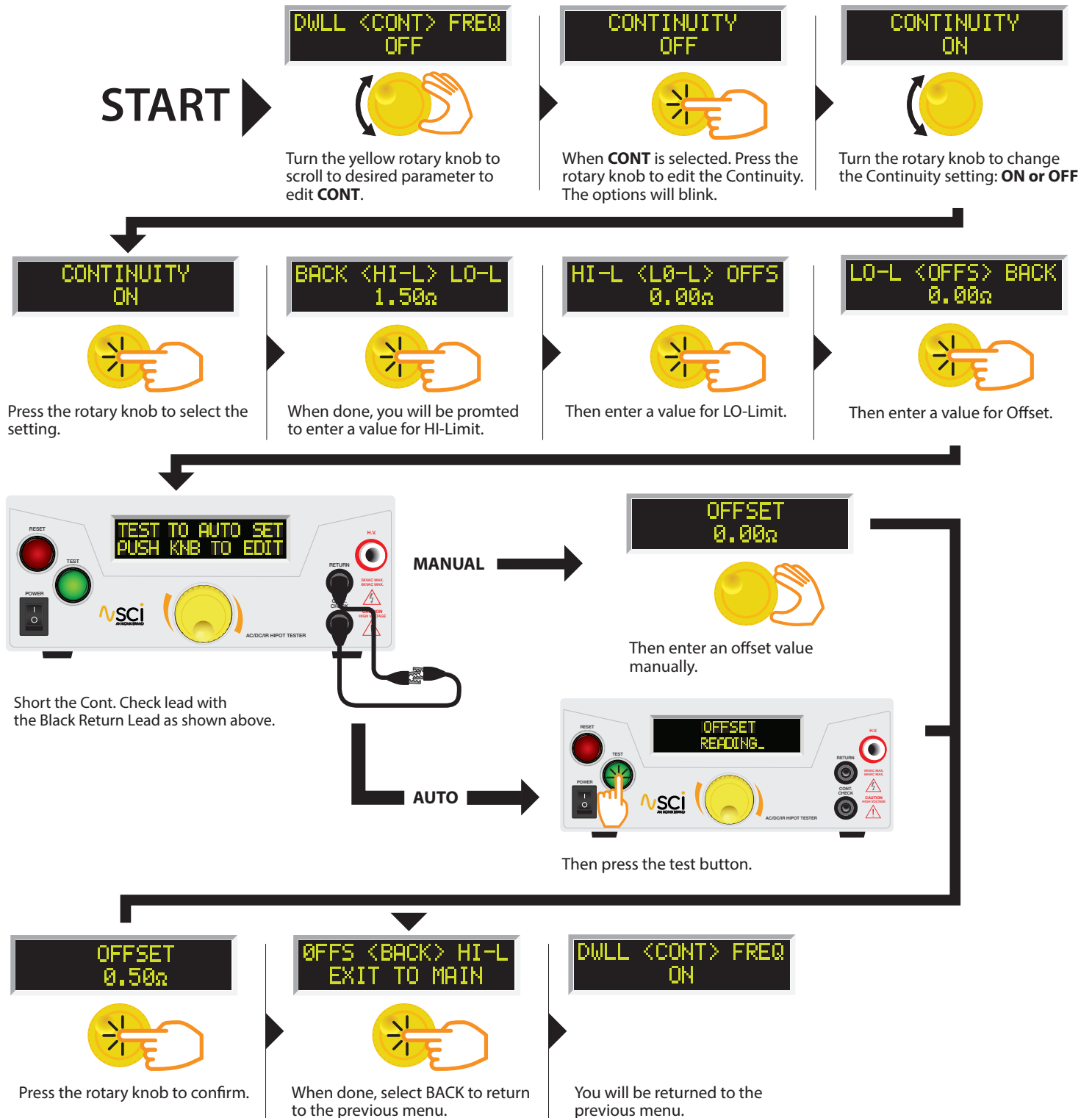
PROGRAM A MEMORY: CHANGE RAMP



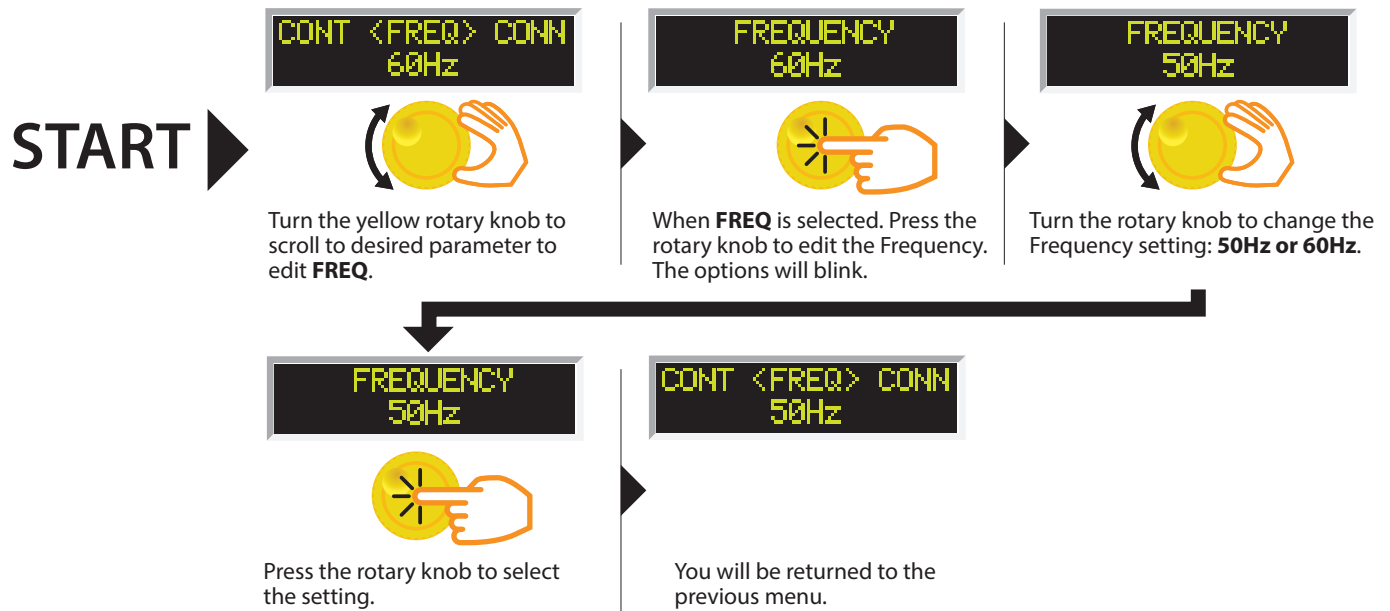
PROGRAM A MEMORY: CHANGE DWELL



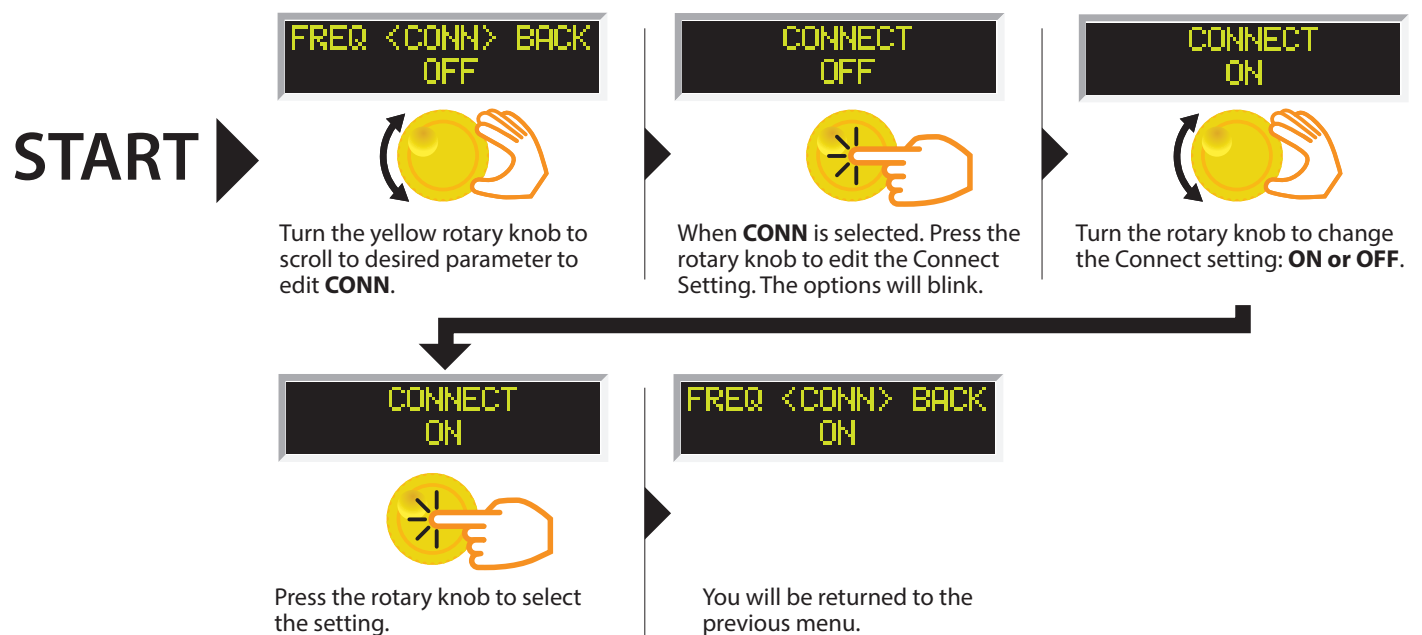
PROGRAM A MEMORY: CHANGE CONTINUITY



PROGRAM A MEMORY: CHANGE FREQUENCY



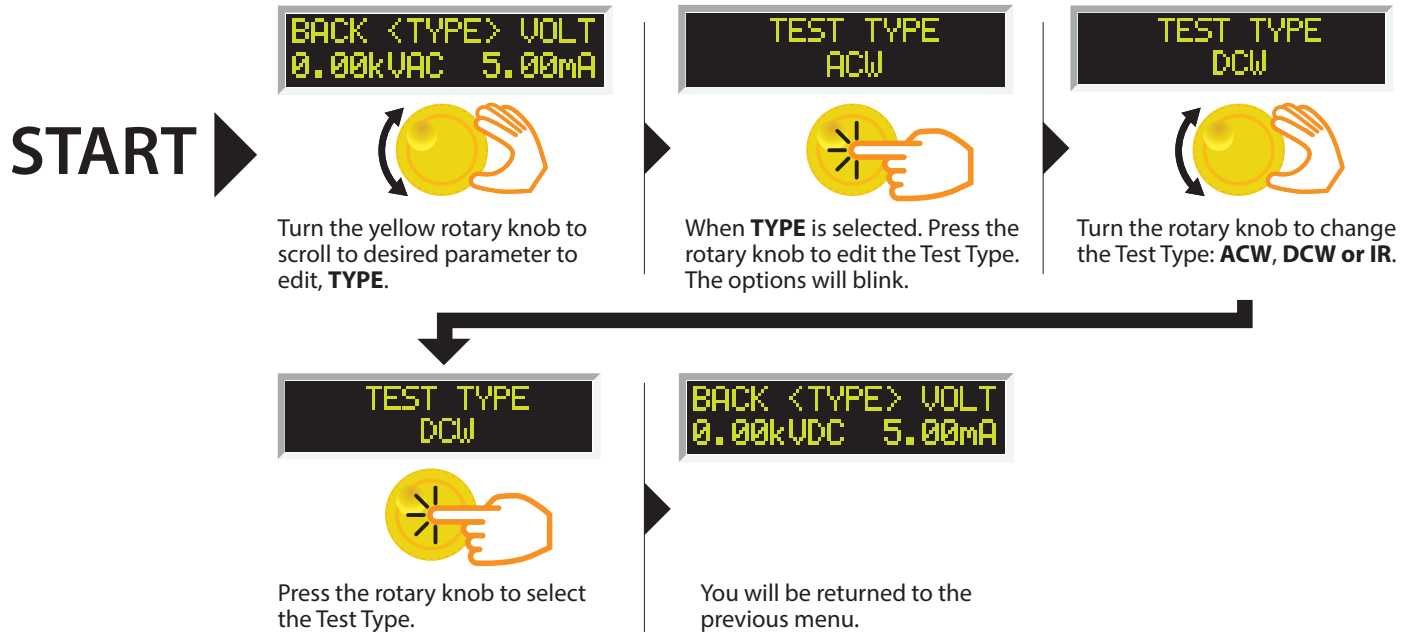
PROGRAM A MEMORY: CHANGE CONNECT



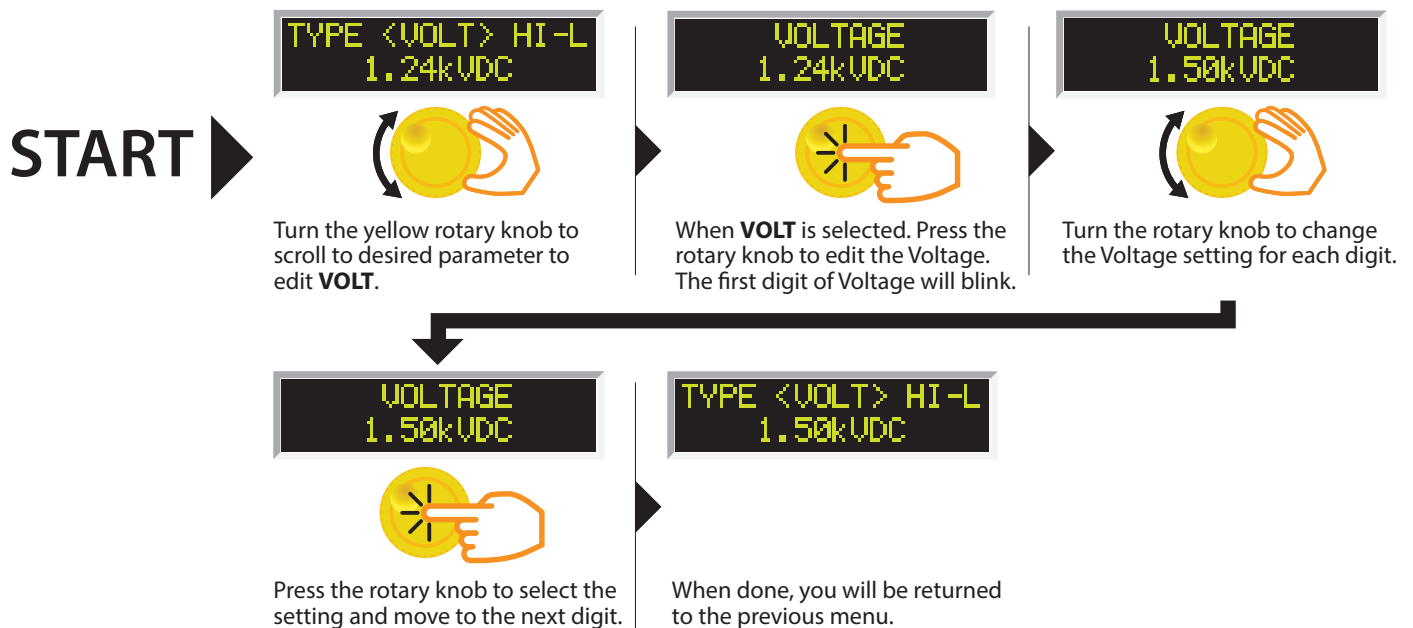
5. Setting a DC Hipot Test

The DC Hipot test can be programmed into any of the 5 memory locations in a similar manner as the AC Hipot test. From the main menu, select the memory location that you desire to program with the DC Hipot test.

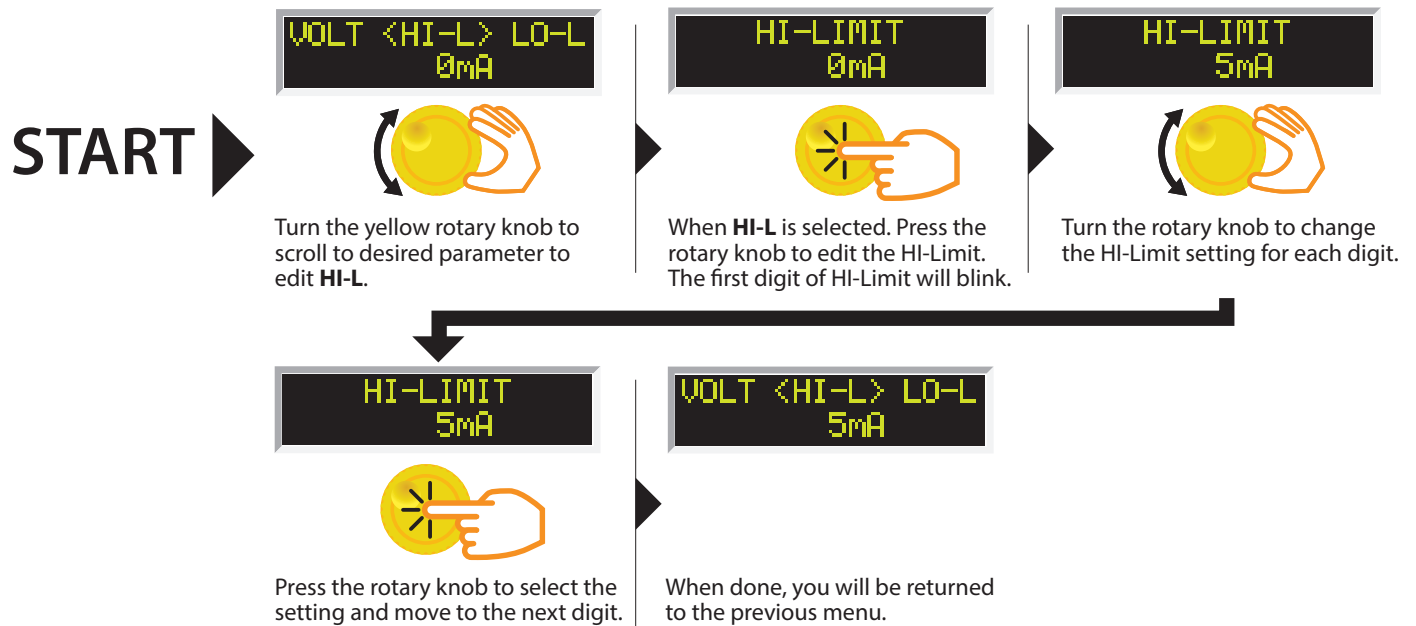
PROGRAM A MEMORY: TYPE DC



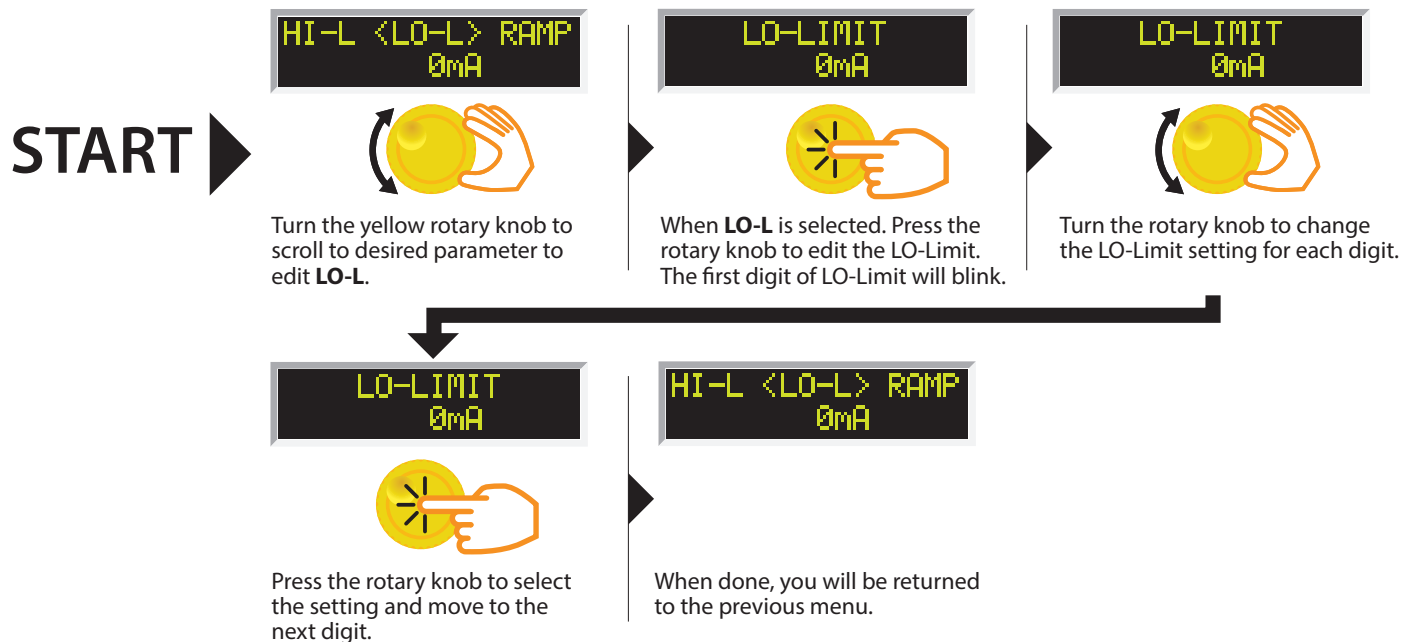
PROGRAM A MEMORY: CHANGE VOLTAGE - DC



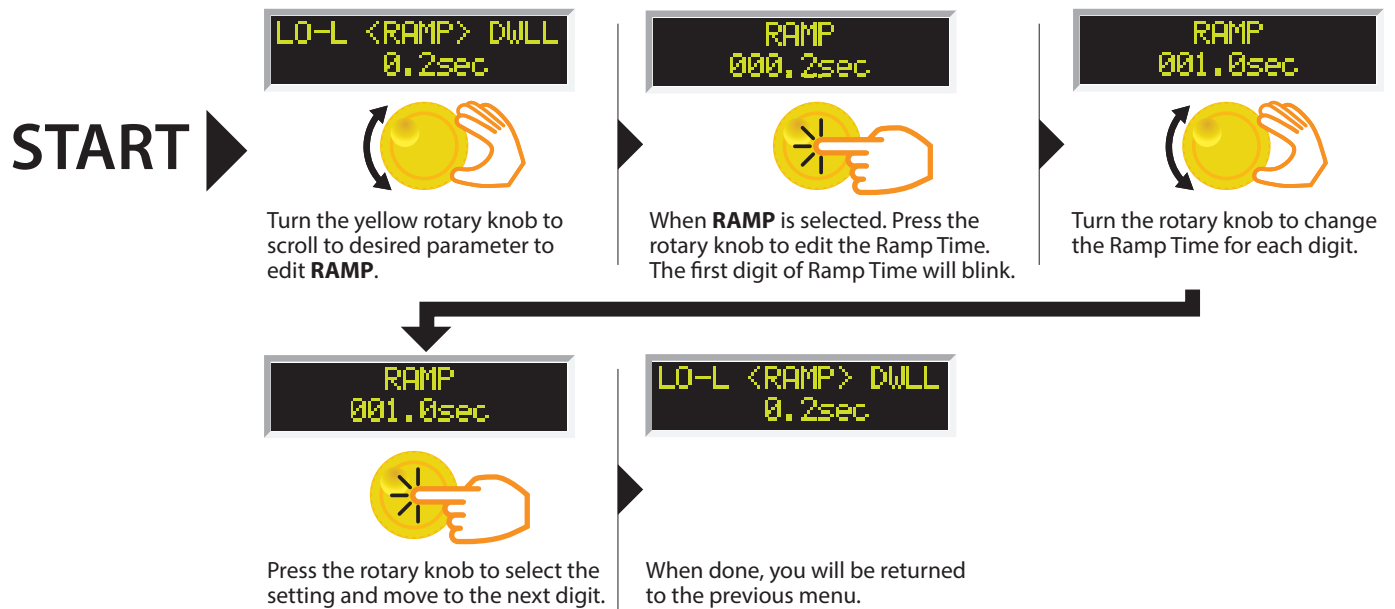
PROGRAM A MEMORY: CHANGE HI-LIMIT



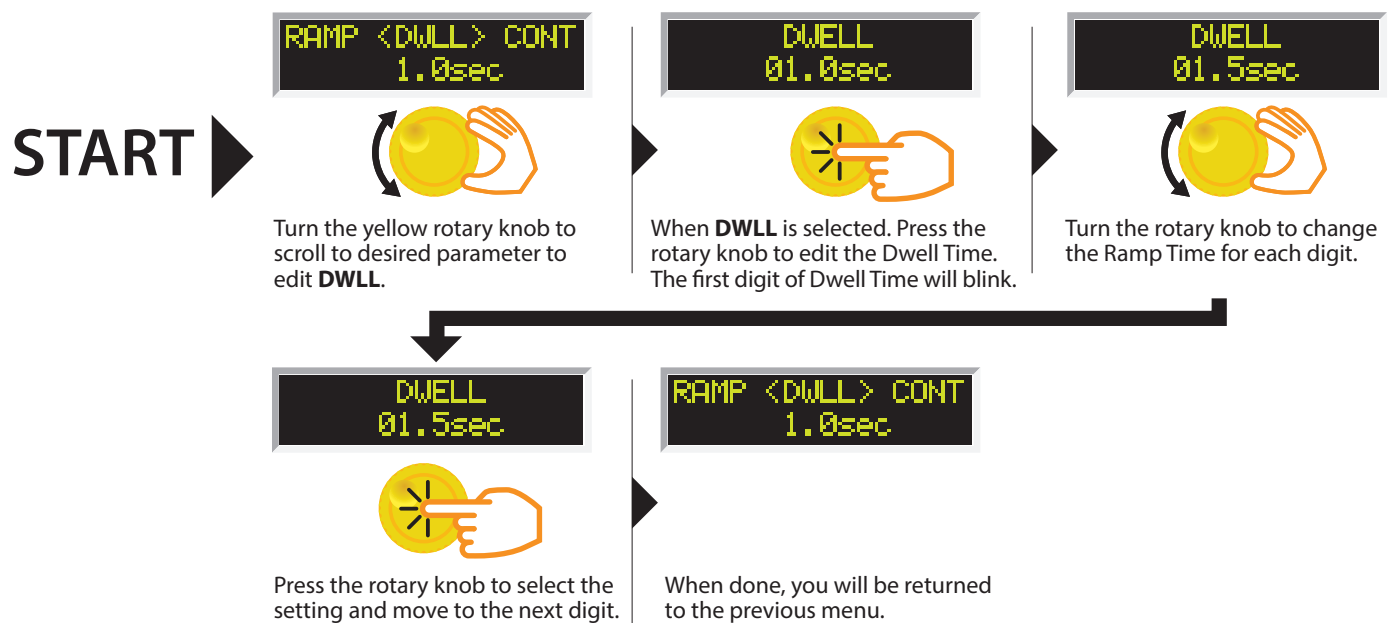
PROGRAM A MEMORY: CHANGE LO-LIMIT



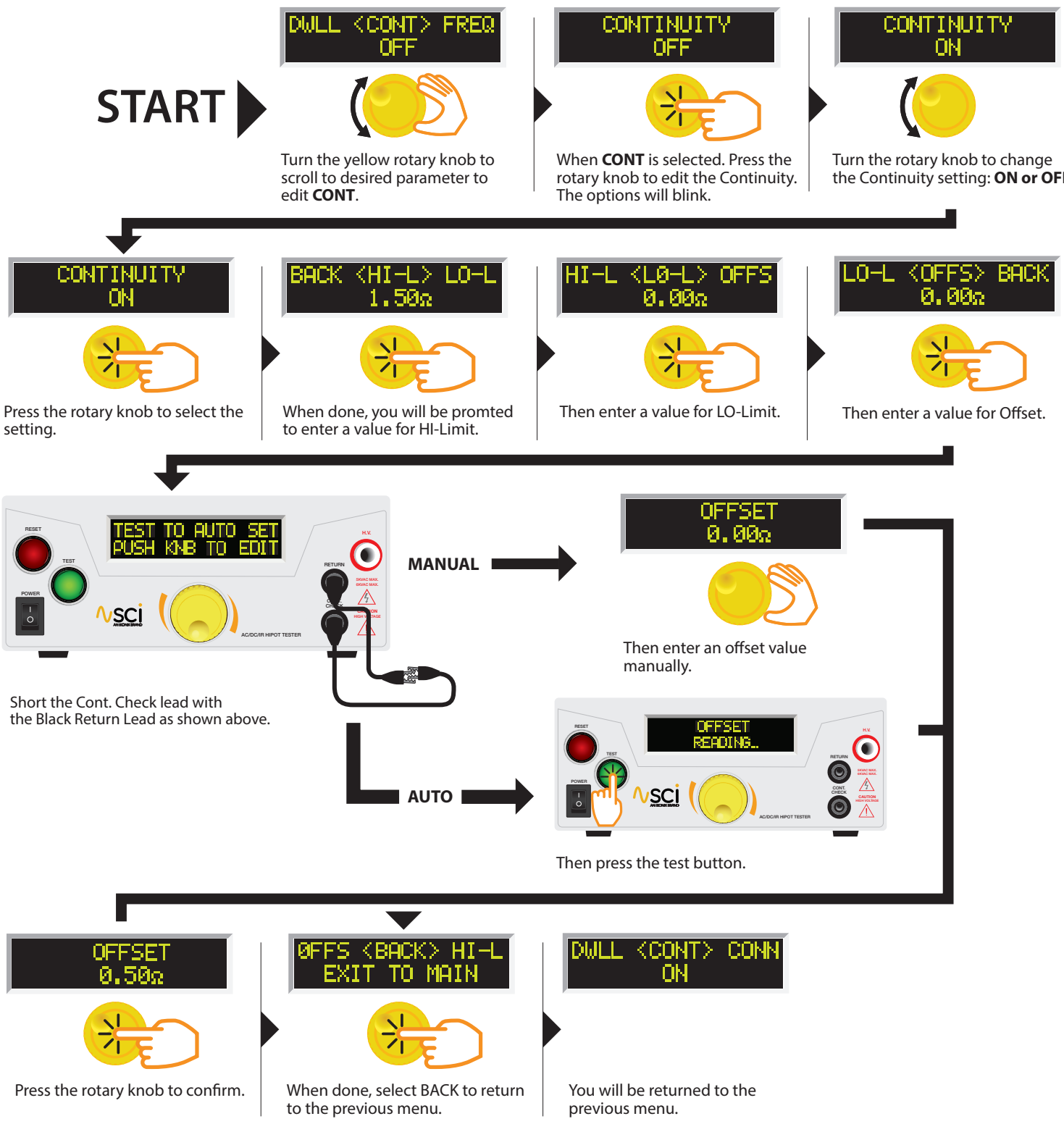
PROGRAM A MEMORY: CHANGE RAMP



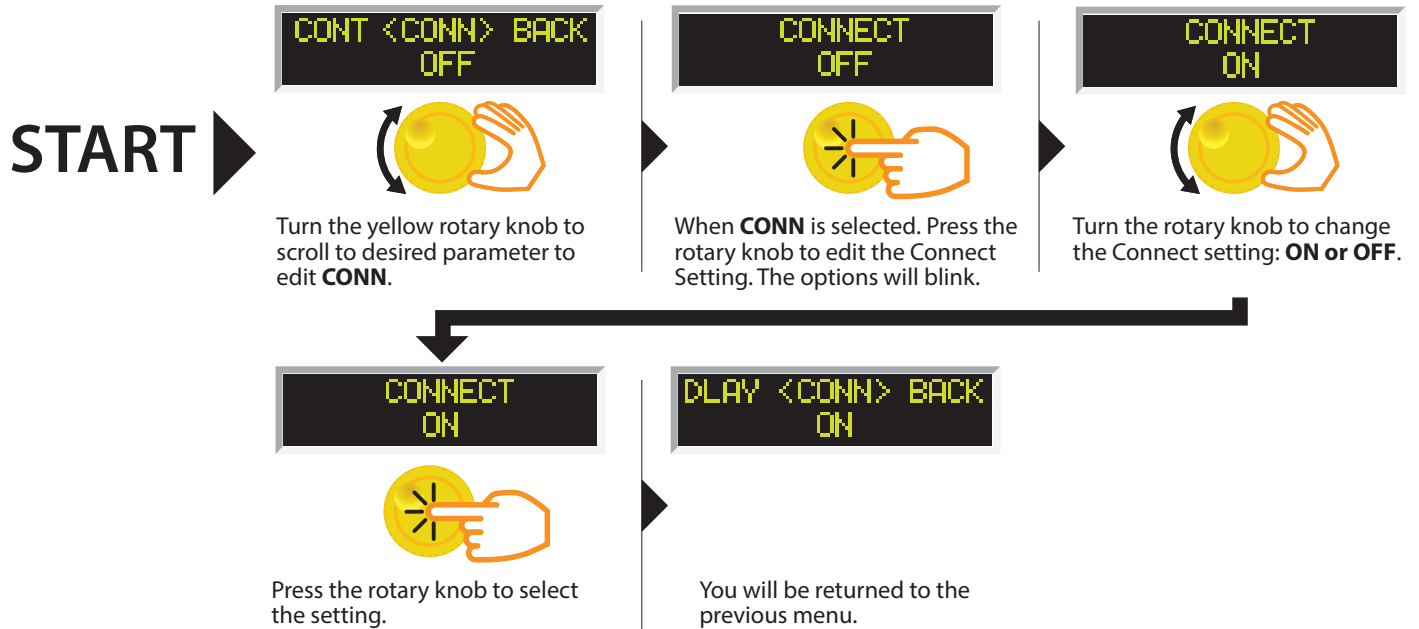
PROGRAM A MEMORY: CHANGE DWELL



PROGRAM A MEMORY: CHANGE CONTINUITY



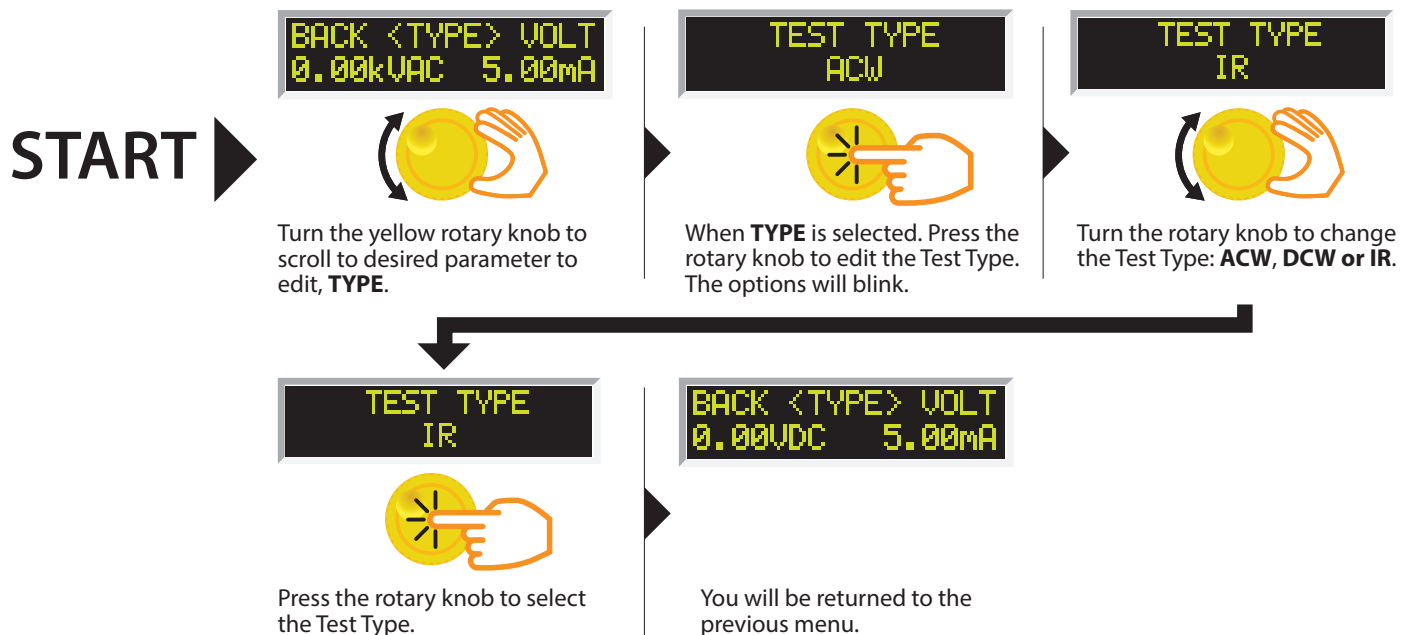
PROGRAM A MEMORY: CHANGE CONNECT



6. Setting an IR Test

The IR test can be programmed into any of the 5 memory locations in a similar manner as the AC or DC Hipot test. From the main menu select the memory location that you desire to program with the IR test.

PROGRAM A MEMORY: TYPE IR



PROGRAM A MEMORY: CHANGE VOLTAGE - IR

START ►

TYPE <VOLT> HI-L
500VDC



Turn the yellow rotary knob to scroll to desired parameter to edit **VOLT**.

VOLTAGE
500VDC



When **VOLT** is selected. Press the rotary knob to edit the Voltage. The first digit of Voltage will blink.

VOLTAGE
1000VDC



Turn the rotary knob to change the Voltage setting for each digit.

VOLTAGE
1000VDC



Press the knob to select the setting and move to the next digit.

TYPE <VOLT> HI-L
1000VDC

When done, you will be returned to the previous menu.

PROGRAM A MEMORY: CHANGE HI-LIMIT - IR

START ►

VOLT <HI-L> LO-L
0Mz



Turn the yellow rotary knob to scroll to desired parameter to edit **HI-L**.

HI-LIMIT
0Mz



When **HI-L** is selected. Press the rotary knob to edit the HI-Limit. The first digit of HI-Limit will blink.

HI-LIMIT
1Mz



Turn the rotary knob to change the HI-Limit setting for each digit.

HI-LIMIT
1Mz

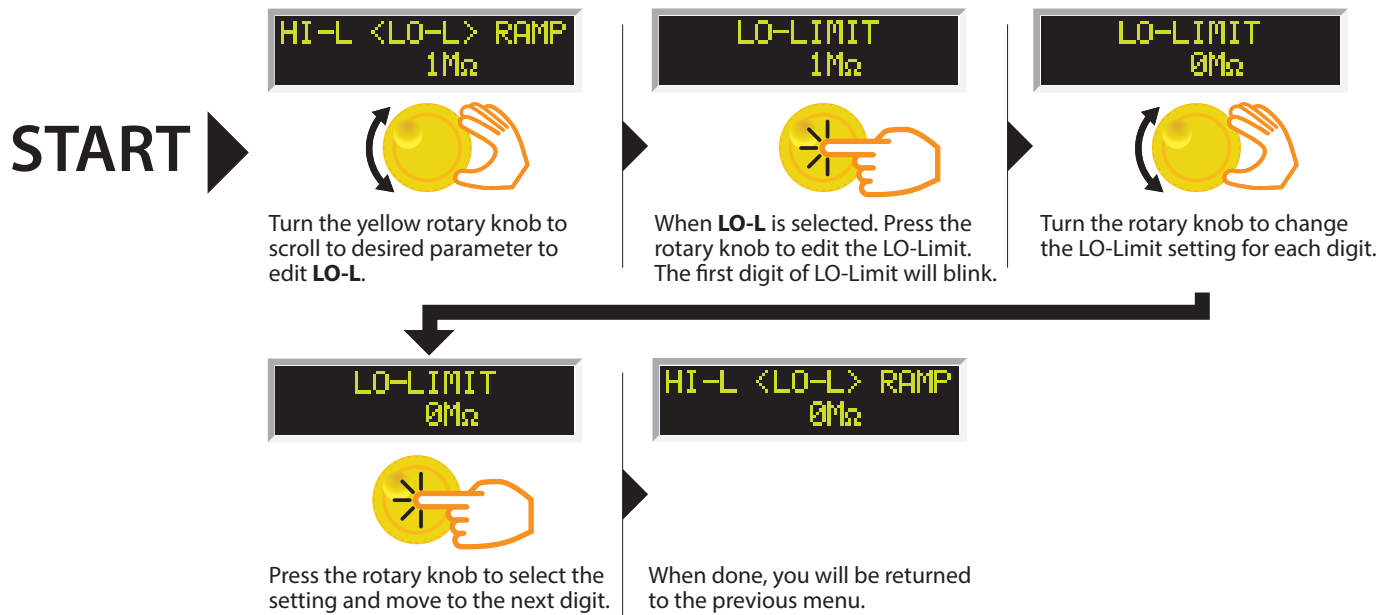


Press the rotary knob to select the setting and move to the next digit.

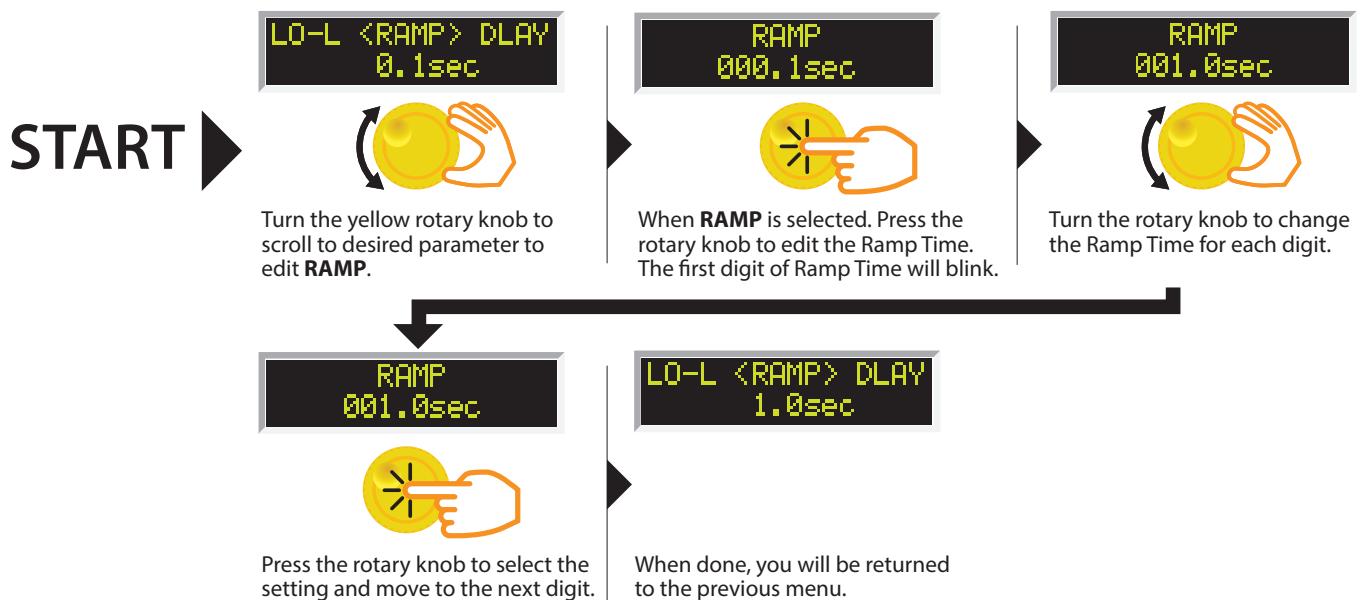
VOLT <HI-L> LO-L
1Mz

When done, you will be returned to the previous menu.

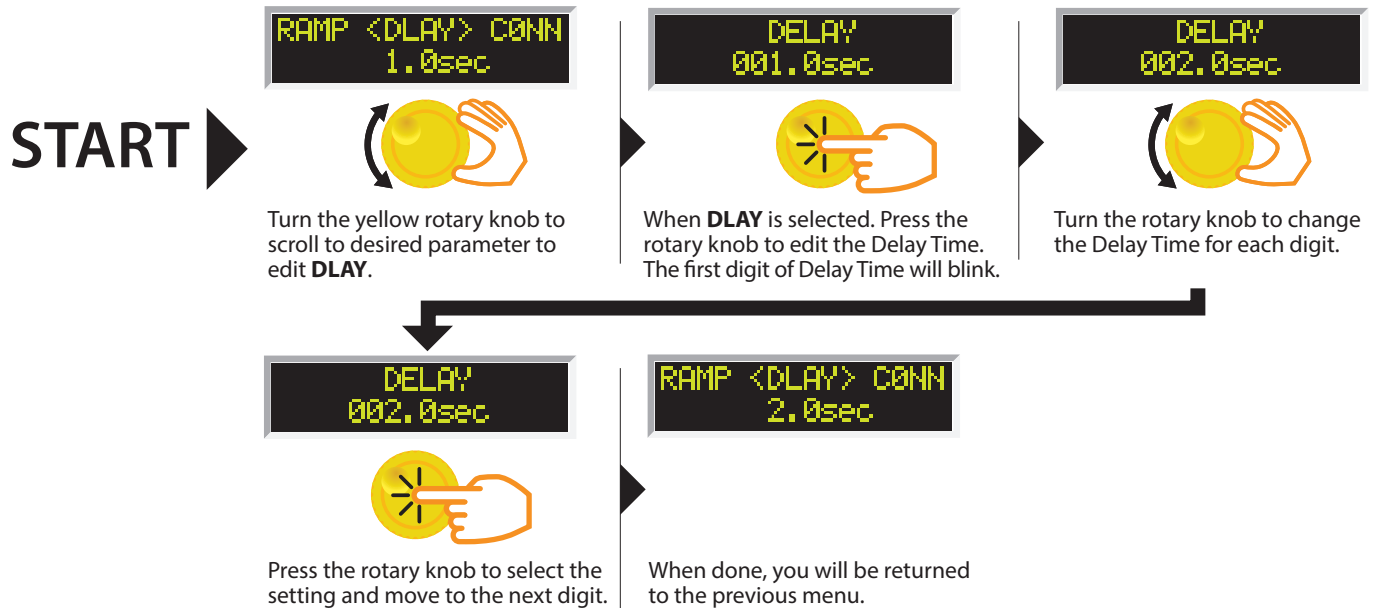
PROGRAM A MEMORY: CHANGE LO-LIMIT - IR



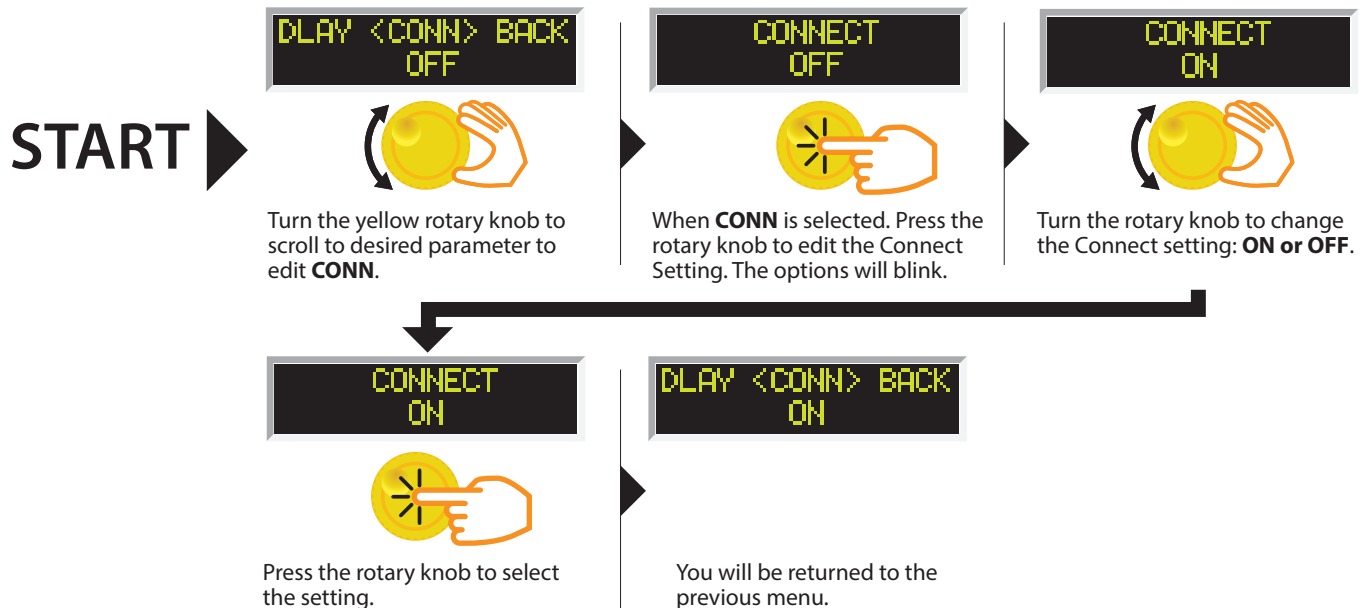
PROGRAM A MEMORY: CHANGE RAMP - IR



PROGRAM A MEMORY: CHANGE DELAY - IR



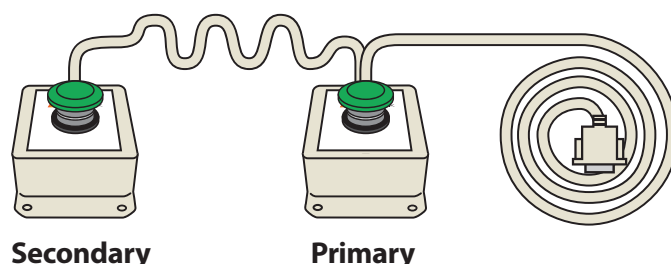
PROGRAM A MEMORY: CHANGE CONNECT



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.
DUAL TEST	ON/OFF	Allows the user to initiate a test through use of Dual Test Switch connected to the Signal Input port of the tester. This functionality requires PLC Remote parameter to be set to ON. If DUAL Test = ON, the front panel TEST button is disabled and a test may only be started by pressing dual test switches within 0.5 seconds of one another. If DUAL Test = OFF, the regular PLC remote operation applies. ¹
SCTY (security) ²	OFF	With SCTY set to OFF, all test and system parameters can be edited.
	RUN	With SCTY set to RUN, the user will not be able to recall any of the memory locations or edit any of the test and system parameters. With this setting if the user attempts to edit any test or system parameter the following message will be displayed, "Security is RUN, can't be edited."
	MEM	With SCTY set to MEM, the user will be able to recall any of the 5 available memory locations. The user will not be able to edit any test or system parameters.

¹For testers with firmware versions 1.01 and below - if running a sequence of connected tests and all tests pass, the Dual Remote Palm switches will send a RESET signal to the tester at the end of the sequence. If a test in the sequence fails, the Dual Palm Remote switches will not send a RESET signal to the tester. In this case a reset can be performed by either using the front panel RESET button or by pressing the primary switch of the Dual Palm Remote switches. The primary switch of the Dual Remote Palm switches is directly connected to the Signal Input of the tester. If no RESET signal is received by the tester, next press of the Dual Palm Remote switch would advance and run the next step in the memory.



Dual Palm Remote Switches (Sold Separately)

²Anytime the Security setting is changed the user will be asked to enter a PIN number. This PIN will be required again if the Security parameter needs to be set to a different setting. Refer to the Edit Security flow chart for instructions on setting the pin.

Setting System Parameters

EDIT SECURITY SETTINGS

START ►

M1 DCW 0.0s
0.00kVDC 100mA



Default screen.

M5 <SCTY> PLC
OFF



Turn the yellow rotary knob to scroll to **SCTY** to edit Security settings.

M5 <SCTY> PLC
OFF



When **SCTY** is selected. Press the rotary knob to enter the Security settings. The options will blink.

SECURITY
RUN



Turn rotary knob to change the Security settings: **OFF, RUN or MEM.**

SECURITY
MEM



Press the rotary knob to select the Security setting option.

PIN NUMBER
000



Enter a PIN number for the Security setting. Turn rotary knob to enter the PIN.

PIN NUMBER
123



Press the rotary knob to save the PIN. This PIN will be required when the Security setting is edited.

M5 <SCTY> PLC
MEM



You will be returned to the previous menu.

EDIT PLC REMOTE SETTINGS

START ►

M1 DCW 0.0s
0.00kVDC 100mA



Home screen.

SCTY <PLC> BACK
OFF



Turn the yellow rotary knob to scroll to **PLC** to edit the PLC settings.

SCTY <PLC> BACK
OFF



When **PLC** is selected. Press the rotary knob to enter the PLC settings. The options will blink.

PLC REMOTE
ON



Turn rotary knob to change the PLC settings: **ON** or **OFF**.

PLC REMOTE
ON



Press the rotary knob to select the PLC setting.

SCTY <PLC> BACK
ON



You will be returned to the previous menu.

PROGRAM A MEMORY: CHANGE DUAL

START ►

PLC <DUAL> BACK
OFF



Turn the yellow rotary knob to scroll to desired parameter to edit **DUAL**.

DUAL TEST
OFF



When **DUAL** is selected. Press the rotary knob to edit the Connect Setting. The options will blink.

DUAL TEST
ON



Turn the rotary knob to change the Dual setting: **ON** or **OFF**.

DUAL TEST
ON



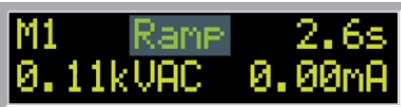




Press the rotary knob to select the setting.

PLC <DUAL> BACK
ON

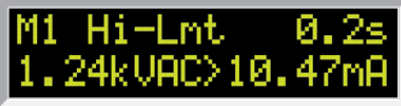
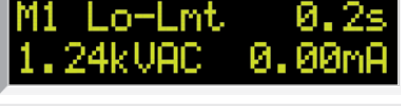
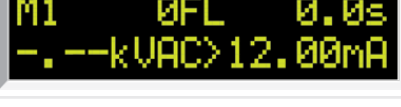



You will be returned to the previous menu.



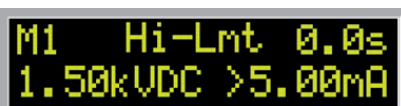
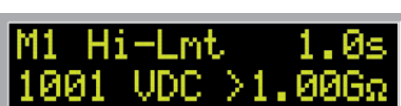
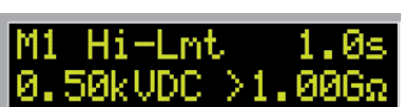
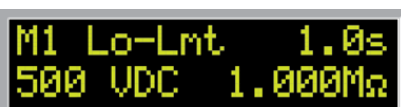
Using the Display

Test Mode Displays

Test Mode Display	Test Type	Description
	AC/DC Hipot & IR	Displayed when the test voltage is ramping up from 0.0 VAC/VDC to full test voltage.
	AC/DC Hipot	Displayed when the test voltage has reached full potential. Dwell is the amount of time the potential is held at the set value.
	AC/DC Hipot & IR	Displayed when a test sequence has passed.
	AC/DC Hipot & IR	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.

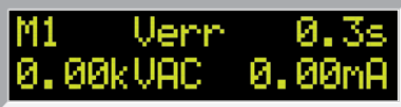
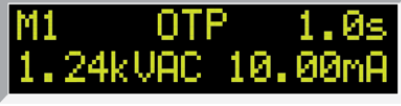
Failure Mode Displays

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 in the DUT during the first 300 mS of test.
	AC Hipot	Displayed if leakage current exceeds the metering range during a test.
	AC/DC Hipot	Displayed if the Continuity test within the hipot test fails.
	DC Hipot	Displayed if the leakage current exceeds the high limit setting, but does not exceed the metering range.

Failure Mode Display*	Test Type	Description
	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	Displayed if the leakage current exceeds the metering range and either a short or flashover has occurred during the test.
	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.

*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
	<p>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 failure light will illuminate and an alarm will be heard.</p> <p>Pressing the RESET key will allow you to return to the test mode. The failure light and alarm can be cleared by pressing the RESET button. If Output Error occurs please call the SCI Customer Support Center at 1-800-504-0055 for assistance.</p>
	<p>All of the buttons and keys are not active in this situation. This type of failure permanently locks the tester in Fatal Error mode and then requires the tester to be serviced by an SCI authorized service center. Contact the SCI Customer Support Center at 1-800-504-0055 to receive further instruction.</p> <p>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.</p> <p>FATAL ERROR 9003 will appear on the display, if the tester's Calibration data is corrupted.</p>
	<p>This message appears on the screen if the tester detects an over-temperature condition on the power amplifier. The fail light will illuminate and the alarm will be heard. The Reset key can be used to clear this failure condition.</p>

Reviewing Test Results for Multi-step 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 turning the rotary knob left or right. Successive rotation of the knob 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

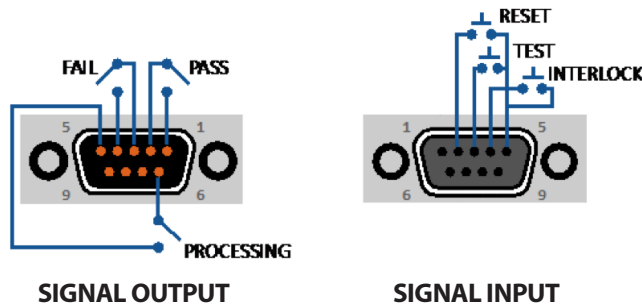
Two 9-pin "D" type connectors are mounted on the rear panel that provides REMOTE-INPUT-OUTPUT control and information.

- 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

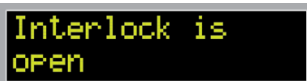
REMOTE INPUT/OUTPUT

Remote Output

Output Signal	Pins	Description
PASS	1 and 2	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.
FAIL	3 and 4	The relay contact closes after detecting the device under test failed any test. The connection is opened when the next test is initiated or the reset function activated.
PROCESSING	5 and 6	The relay contact closes while the tester is performing a test. The connection is opened at the end of the test.

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.

Remote Input

Output Signal	Pins	Description
TEST	3 and 5	A normally open momentary switch can be wired across pins 3 and 5 to allow remote operation of the TEST function.
REST	2 and 5	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.
INTERLOCK	4 and 5	<p>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:</p> <ul style="list-style-type: none">• 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). <p>A pop-up message will be displayed on the screen:</p>  <p>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.</p>

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.

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

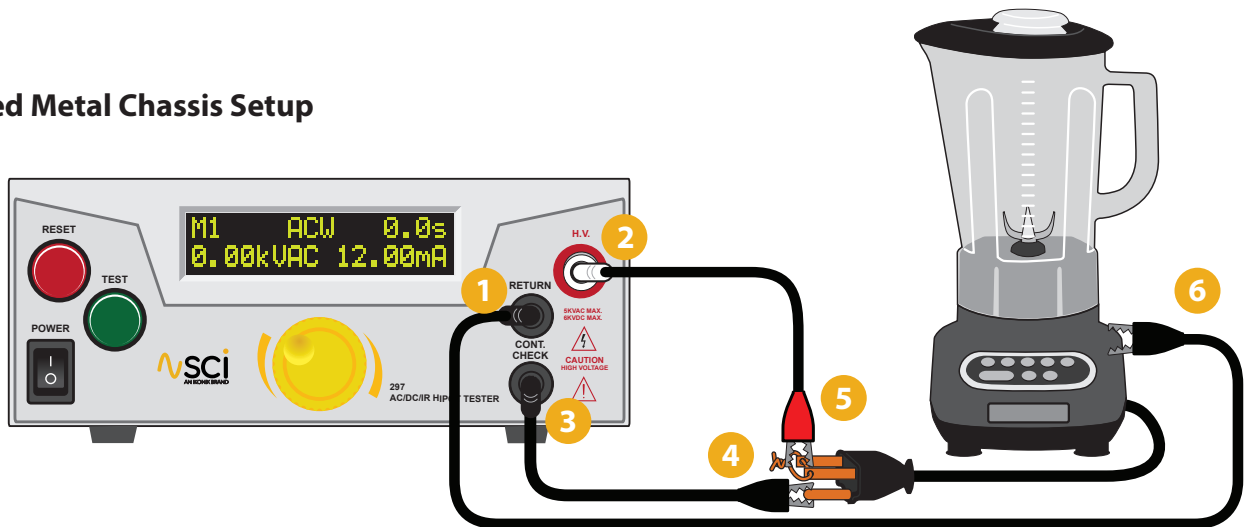
WARNING

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

Using the Test Leads

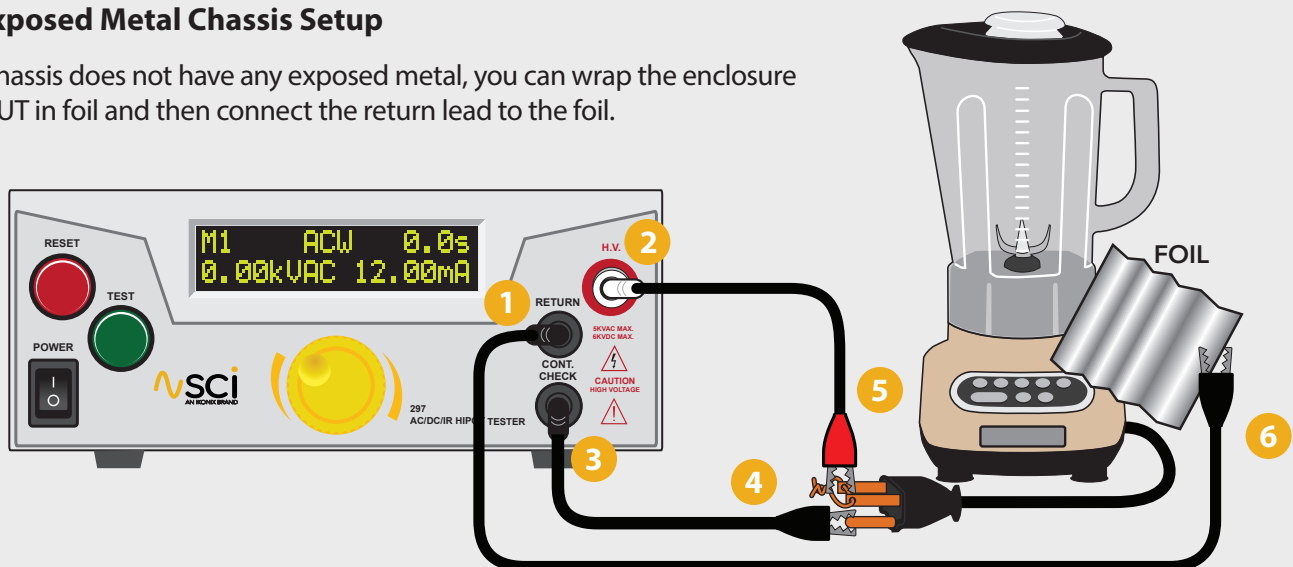
- 1 Plug the black ground return lead (P/N 02100A-13) into the Return terminal located on the front panel of the tester.
- 2 Plug the high voltage lead (P/N 04040A-08) into the H.V. terminal on the front panel of the tester.
- 3 Plug the continuity lead to the CONT. CHECK terminal on the front panel of the tester.
- 4 Connect the clip end continuity lead to the ground pin of the DUT.
- 5 Connect the clip end of the high voltage lead to the current carrying conductors of the DUT's circuitry.
- 6 Connect the clip end of ground return lead to the exposed or dead metal chassis of the DUT.

Exposed Metal Chassis Setup



Non-Exposed Metal Chassis Setup

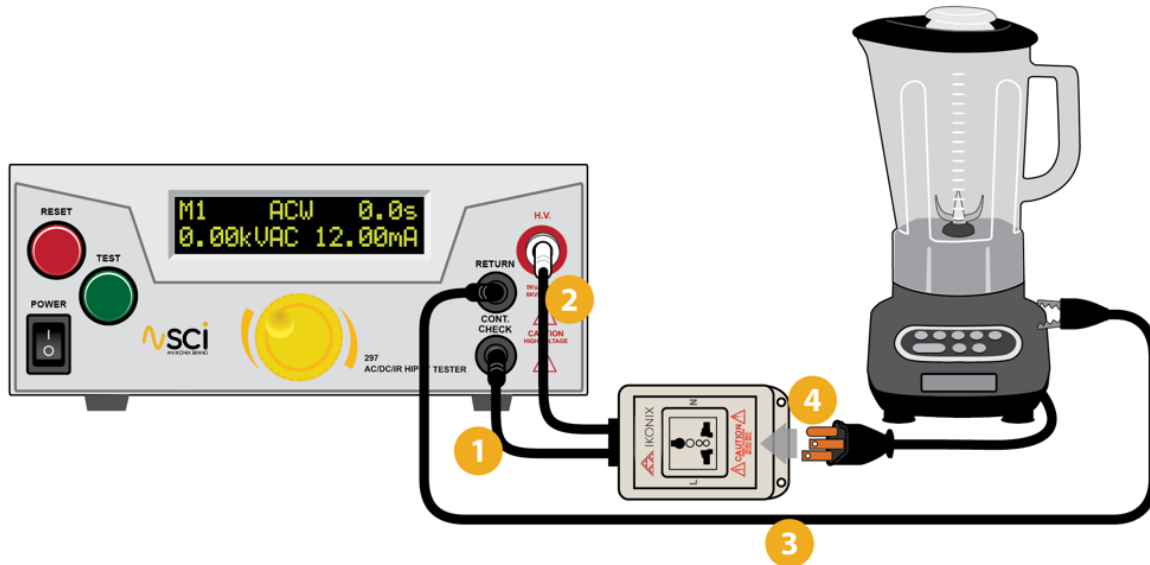
If your chassis does not have any exposed metal, you can wrap the enclosure of the DUT in foil and then connect the return lead to the foil.



Using the Adaptor Box

The adapter box is an **optional accessory** and is not provided as standard equipment with the 290 Series. If you would like to acquire an adapter box for use with your tester, please contact SCI using the contact information provided in the Safety section of this manual.

The following diagram shows how to connect the adapter box to the 290 and to the device under test.



- 1 Connect the black lead from the adapter box to the front panel CONT. CHECK terminal.
- 2 Connect the high voltage lead from the adapter box to the front panel high voltage terminal.
- 3 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.
- 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.

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 SCL 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 your back straight.

3. Contents of the Carton

Inside the carton will be the following:

DESCRIPTION	SLA PART NUMBER
290 Series Tester	290 Series Hipot and IR Tester
High Voltage Lead	04040A-08
Cable Assembly Return Lead (2 Qty)	02100A-13
Fuse (2 Qty)	Fuse 3.15A 250V Fast-Blow 20mm
Interlock Connector	38075
USB Cable*	39066
USB Flash Drive (Product Manual)	99-10726-01
Line Cord**	33189
High Voltage Probe***	102-050-913
Fuse 15A 250V Slow-Blow 30mm***	99-10020-01
Line Cord for 298***	38071

* Only included if USB option is ordered

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

***Only applicable for Model 298

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 $\pm 10\%$, 47-63 Hz single phase or 230 volts AC $\pm 10\%$, 47-63 Hz single phase. In addition, please be sure the correct fuse is selected and installed while the tester is in the off position.

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 humidity20 - 80%
Altitude6,560 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 via Federal Express or UPS air.
8. Please refer in all correspondence to your RMA number.

Test Operator 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 that 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 mm² (for rated current up to 10 A) or 3G 1.0mm² (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 manner not specified by SCl 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 - 290 Series Tester Specifications

Unless otherwise stated, accuracies are relative to a laboratory standard measurement.

Why use the term “Counts”?

SCI 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.

INPUT		
Voltage	100 - 120 / 220 - 240V Auto Range, ± 10% variation	
Frequency	50 / 60 Hz ± 5%	
Fuse	3.15 A / 250V AC Fast Blow 15A/250V AC Slow-Blow (Model 298)	
HIPOT TEST MODE		
Output Rating	5 kV @ 12 mA AC (Models 295, 296 & 297) 6 kV @ 5 mA DC (Models 294, 296 & 297) 5 kVAC @ 99.9 mA (Model 298)	
Voltage Setting	Range:	0.00 – 5.00 kV AC 0.00 – 6.00 kV DC
	Resolution:	0.01 kV
	Accuracy:	± (1.5% of setting + 5 V)
Voltage Display	Range:	0.00 – 5.00 kV AC 0.00 – 6.00 kV DC
	Resolution:	0.01 kV
	Accuracy:	± (1.5% of reading + 10 V) < 500 V ± (1.5% of reading) ≥ 500 V
Current Display	Range:	0.10 – 12.00 mA AC 0.02 – 5.00 mA DC
	Resolution:	0.01 mA
	Accuracy:	± (2% of reading + 2 counts)
	Model 298	
	Range:	0.10 – 100 mA AC
	Resolution:	0.01 mA
	Accuracy:	± 2% of setting + 6 counts
HI-Limit	Range:	0.10 – 12.00 mA AC
	Resolution:	0.01 mA
	Accuracy:	± (2% of setting + 2 counts)
	Range:	0.02 – 5.00 mA DC
	Resolution:	0.01 mA
	Accuracy:	± (2% of setting + 2 counts)
	Model 298	
	Range:	0.10 – 100 mA AC (Model 298)
	Resolution:	0.01 mA
	Accuracy:	± 2% of setting + 6 counts

LO-Limit	Range:	0.00 – 12.00 mA AC
	Resolution:	0.01 mA
	Accuracy:	± (2% of setting + 2 counts)
	Range:	0.00 – 5.00 mA DC
	Resolution:	0.01 mA
	Accuracy:	± (2% of setting + 2 counts)
Model 298	Range:	0.00 – 100 mA AC (Model 298)
	Resolution:	0.01 mA
	Accuracy:	± 2% of setting + 6 counts
Failure Detector	Audible and Visual	
DC Output Ripple	< 5 % at 6 kV / 5 mA Resistive Load	
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	0.015 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 – 60.0 sec (0 = Continuous)
	Resolution:	0.1 sec
	Accuracy:	± (0.1% + 0.05 sec)
Ramp Timer	Range:	0.2 – 180.0 sec
	Resolution:	0.1 sec
	Accuracy:	± (0.1% + 0.05 sec)
GROUND CONTINUITY CHECK		
Output Current	Range:	0.1 A, Fixed
	Accuracy:	± 0.01 A
HI and LO Limit	Range:	0.00 – 1.50Ω
	Resolution:	0.01Ω
	Accuracy:	± (2% of setting + 2 counts)
Offset	Range:	0.00 – 0.50Ω
	Resolution:	0.01Ω
	Accuracy:	± (2% of setting + 2 counts)
INSULATION RESISTANCE TEST MODE (Model 297 Only)		
Output Voltage	Range:	100 – 1000 V DC
	Resolution:	10 V
	Accuracy:	± (1.5% of setting + 3 V)
Voltage Display	Range:	100 – 1000 V
	Resolution:	10 V
	Accuracy:	± (1.5% of reading + 5 V)

Resistance Display	Range:	1 - 1000 MΩ (4 Digit, Auto Ranging)		
	Resolution:		100- 499 VDC	500 – 1000 VDC
		MΩ	MΩ	MΩ
		0.001	1.000 – 1.999	1.000 – 9.999
		0.01	2.00 - 19.99	10.00 - 99.99
		0.1	20.0 – 1000	100.0 – 1000
	Accuracy:	± (3% of reading + 2 counts) at test voltage > 500V ± (7% of reading + 2 counts) at test voltage ≤ 500V		
HI and LO-Limit	Range:	0, 1 – 1000 MΩ		
	Resolution:	0 = OFF		
	Accuracy:	Same as Resistance Display Accuracy		
Ramp Timer	Range:	0.1sec or 2.0sec		
	Resolution:	0.1 sec		
	Accuracy:	± (0.1% + 0.05 sec)		
Delay Timer	Range:	0, 0.5 – 999.9 sec (0 = Continuous)		
	Resolution:	0.1 sec		
	Accuracy:	± (0.1% + 0.05 sec)		
GENERAL SPECIFICATIONS				
Safety Agency Listing	CE, cTUVus, RoHS2			
PLC Remote Control	Input:	Test, Reset, Interlock		
	Output:	Pass, Fail, Test-in-Process		
Memory	5 memories All memories are linkable			
Security	Run Only Mode (RUN) - To avoid unauthorized access to test parameters and memory locations.			
	Memory Mode (MEM)- Allows access to memory locations but restricts any changes in test parameters.			
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) 8.5 x 3.5 x 11.9 inches (215 x 88.1 x 300 mm) 16.93 x 5.20 x 11.84 inches (430 x 132 x 300 mm) - Model 298			
	Weight: 12 lbs (5.46 Kg) 46 lbs (25.4 Kg) - Model 298			
Environmental	Operating Temperature :	32° - 104°F (0° - 40°C)		
	Relative Humidity:	20 to 80%		
Calibration	Calibrated using standards with accuracies traceable to the 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.			

Appendix C - 290 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

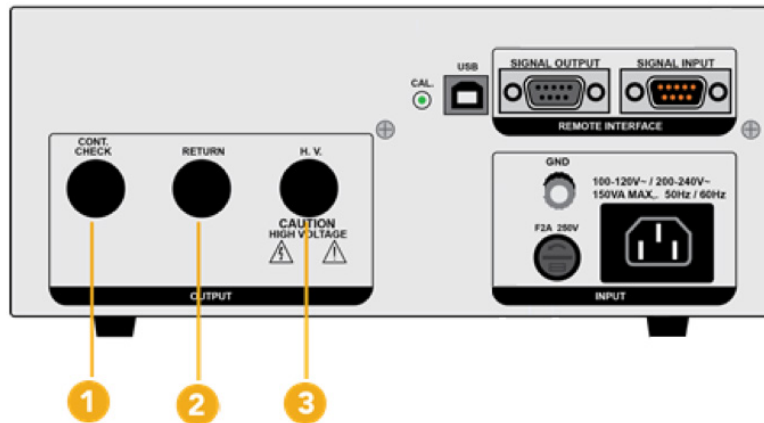
290 Options

Option List

Code	Description
01	Rear Output Kit
03	USB Port
04	10 Memory Option
06	3mA AC/DC Current Limit (excludes Model 298)
07	Pulse Mode (Model 295 only)
08	Push to Test Mode (Model 295 only)

Option 01- Rear Output Kit

This option provides three output connections on the rear panel of the tester. These are the same as the front panel HV, RETURN and CONT. CHECK connections.



- 1 Continuity Jack** Provides the connection for checking ground continuity.
- 2 Return Jack** For the connection of the black return test lead or three-prong receptacle adapter box. This jack is always active when performing a test.
- 3 High Voltage Jack** For the connection of the 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 active when performing a test.

Option 03 – USB interface

This option may be added as a serial type communication protocol. This option provides all of the function control of the USB interface. The Type B USB connector labeled “USB” is for connection of the SCI 290 Series Testers to any compatible PC. When selecting USB Interface, the protocol for interfacing and communicating with a PC can be found in Appendix D: Remote Bus Interface: USB of this manual.

Option 04 – 10 Memory Option

This option increases the total number of memory locations on the tester from 5 memories to 10 memories. With this option, the tester will display memories M0 to M9 for a total of 10 memory locations.

Option 06 - 3mA AC/DC Current Limitation (all models)

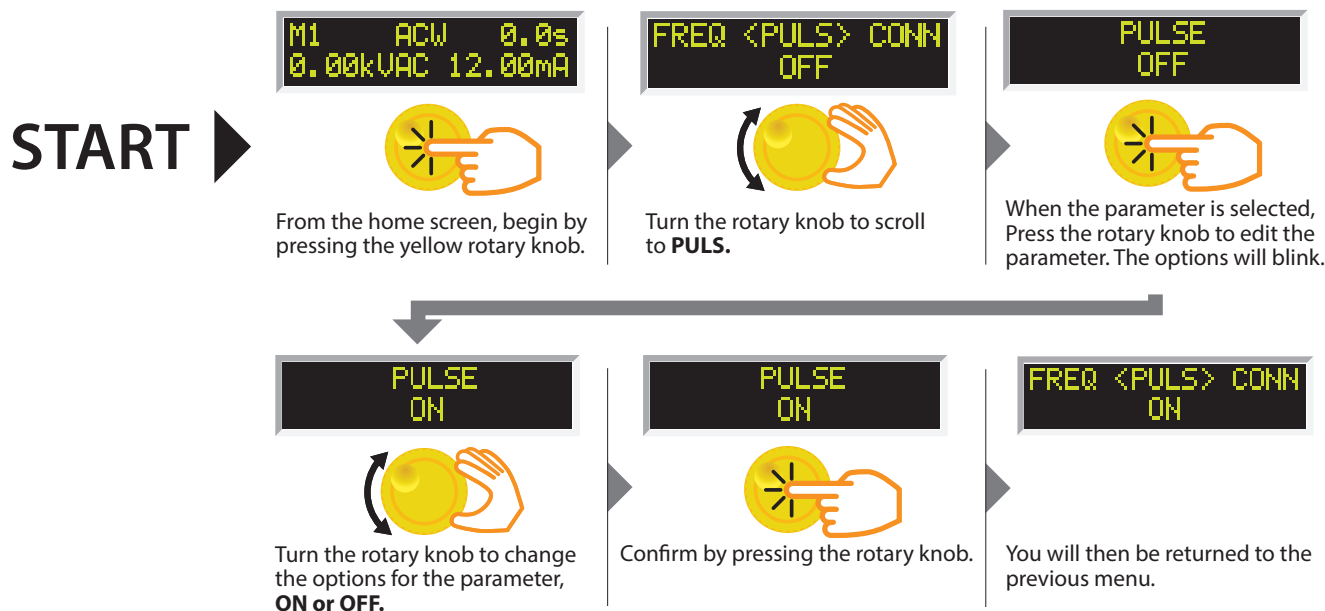
This option limits the maximum current capability of the tester to 3mA AC or DC. The following specifications table is applicable when this option is installed in the tester:

AC WITHSTAND VOLTAGE		
Settings		
Hi-Limit AC current, mA	Range: Resolution: Accuracy:	0.10 - 3.00 0.01 ± (2% of setting + 2 counts)
Lo-Limit AC current, mA	Range: Resolution: Accuracy:	0.00 - 3.00 0.01 ± (2% of setting + 2 counts)
Measurement		
AC Current, mA	Range: Resolution: Accuracy:	0.10 - 3.00 0.01 ± (2% of reading + 2 counts)
Short Circuit Protection	minimum current 3.5 mA RMS at short circuit, Response time < 2ms	
DC WITHSTAND VOLTAGE		
Settings		
Hi-Limit AC current, mA	Range: Resolution: Accuracy:	0.00 - 3.00 0.01 ± (2% of setting + 2 counts)
Lo-Limit AC current, mA	Range: Resolution: Accuracy:	0.00 - 3.00 0.01 ± (2% of setting + 2 counts)
Measurement		
AC Current, mA	Range: Resolution: Accuracy:	0.02 - 3.00 0.01 ± (2% of reading + 2 counts)
Short Circuit Protection	Minimum current 3.5 mA AVG at short circuit, Response time < 2ms	

Option 07 – Pulse Mode (Model 295 only)

This option allows the tester to perform repeated testing upon a failure. The tester will automatically reset after failure for continuous testing. The testing time will not be restarted when automatic reset for continuous testing. With this option installed on the tester an additional test parameter PULS will be available in the menu. To use this option the PULS parameter must be enabled:

PROGRAM A MEMORY: CHANGE PULSE



The following test specifications will apply if the Pulse Mode option is used:

AC WITHSTAND VOLTAGE		
Settings		
Hi-Limit AC current, mA	Range: Resolution: Accuracy:	0.10 - 3.00 0.01 ± (2% of setting + 2 counts)
Lo-Limit AC current, mA	Range: Resolution: Accuracy:	0.00 - 3.00 0.01 ± (2% of setting + 2 counts)
Dwell Time, second	Range: Resolution: Accuracy:	Pulse, 0.2-60.0 Pulse: automatic reset after failure for continuous testing. 0.1 ± (0.1% of setting + 0.05 sec)
Measurement		
AC Current, mA	Range: Resolution: Accuracy:	0.10 - 3.00 0.01 ± (2% of reading + 2 counts)

Option 08 – Push to Test Mode

With this option installed an extra parameter called HOLD appears in the ACW test setup. When HOLD is set to ON, the DWELL parameter in the test setup disappears. This allows the user to press and hold the TEST button to execute the test and run it continuously or for any desired time. Once the TEST button is released the test will abort.

PROGRAM A MEMORY: CHANGE HOLD

START ►

M1 ACW 0.0s
0.00kVAC 12.00mA



From the home screen, begin by pressing the yellow rotary knob.

FREQ <HOLD> CONN
OFF



Turn the rotary knob to scroll to **HOLD**.

HOLD TEST
OFF



When the parameter is selected, press the rotary knob to edit the parameter, the options will blink.

HOLD TEST
ON



Turn the rotary knob to change the options for the parameter, **ON** or **OFF**.

HOLD TEST
ON



Confirm by pressing the rotary knob.

FREQ <HOLD> CONN
ON

You will then be returned to the previous menu.

Appendix D - Remote BUS Interface: USB

This section provides information on the proper use and configuration of bus remote interface. The USB remote interface is optional on all 290 Series models. Please see the OPTIONS section of the manual for details.

USB 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 USB interface card requires you to download a driver in order for the instrument to recognize the USB interface. The driver can be found on the SCI website:

www.hipot.com/products/290.aspx

Click on "USB Driver" to download the driver. This link contains an automatic extract and install program. Follow the instructions of the installation program to initialize the driver install. NOTE: The USB port acts as a USB to RS-232 converter. As a result, the PC will recognize the USB port as a virtual COM port.

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.

When sending command over the USB 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.

USB Interface Command List

The USB 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 290 Series testers. 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
SACO	Set Continuity 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.

SACO - Set the offset for the Continuity 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.

Memory Location Edits and Companion Queries

The following commands are used to create or modify Test Setup at each Memory Locations.

Command	Description	Value
FL <memory location number>	Load Test Located at Memory Location	Memory location number = 1-5
FL?	Query Memory Location	1-5
SAA	Add ACW Test	
SAD	Add DCW Test	
SAI	Add IR Test	
ADD <ACW,p,p,p,p,p,p,p,p,p>	Add all parameters for ACW Test	ACW, Voltage(kV), HI-Limit(mA), LO-Limit(mA), Ramp(s), Dwell(s), Continuity(ON/OFF), Cont. HI-Limit(Ω), Cont. LO-Limit(Ω), Cont. Offset(Ω), Frequency, Connect(ON/OFF)
ADD <DCW,p,p,p,p,p,p,p,p,p>	Add all parameters for DCW Test	DCW, Voltage(kV), HI-Limit(mA), LO-Limit(mA), Ramp(s), Dwell(s), Continuity(ON/OFF), Cont. HI-Limit(Ω), Cont. LO-Limit(Ω), Cont. Offset(Ω), Connect(ON/OFF)
ADD <IR,p,p,p,p,p,p>	Add all parameters for IR Test	IR, Voltage(V), HI-Limit(Ω), LO-Limit(Ω), Ramp(s), Delay(s), Connect (ON/OFF)

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

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.

FL? - Query the memory location of the current selection.

	ACW	DCW	IR
1	Voltage	Voltage	Voltage
2	HI-Limit	HI-Limit	HI-Limit
3	LO-Limit	LO-Limit	LO-Limit
4	Ramp Up	Ramp Up	Ramp Up
5	Dwell	Dwell	Delay
6	Continuity (ON/OFF)	Continuity (ON/OFF)	Connect (ON/OFF)
7	Continuity HI-Limit	Continuity HI-Limit	
8	Continuity LO-Limit	Continuity LO-Limit	
9	Continuity Offset	Continuity Offset	
10	Frequency	Connect (ON/OFF)	
11	Connect (ON/OFF)		

Test Parameter Editing Commands

These commands are used to modify the test parameter within each memory. 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	Values
EV <value> EV?	Edit Voltage	ACW DCW IR	0.00 – 5.00 (kV) 0.00 – 6.00 (kV) 100 – 1000 (V)
EH < value > EH?	Edit HI-Limit	ACW DCW IR	0.10 – 12.00 (mA) 0.02 – 5.00 (mA) 0, 1- 1000 (MΩ) 0 = Off
EL < value > EL?	Edit LO-Limit	ACW DCW IR	0.10 – 12.00 (mA) 0.02 – 5.00 (mA) 0, 1- 1000 (MΩ) 0 = Off
ERU < value > ERU ?	Edit Ramp	ACW DCW IR	0.2 – 180.0 (sec) 0.2 – 180.0 (sec) .1, 2.0 (sec)
EDW < value > EDW?	Edit Dwell	ACW DCW	0.0, 0.2 – 60.0s 0.0, 0.2 – 60.0s 0.0 = Continuous
EDE < value > EDE?	Edit Delay	IR	0.0, 0.5 - 999.9s 0.0 = Continuous
ECT {1 0} ECT?	Edit Continuity	ACW DCW	1=On, 0=Off
ECH < value > ECH?	Edit Continuity HI-Limit	ACW DCW	0.00 – 1.50 (Ω)
ECL < value > ECL?	Edit Continuity LO-Limit	ACW DCW	0.00 – 1.50 (Ω)
ECO < value > ECO?	Edit Continuity Offset	ACW DCW	0.00 – 0.50 (Ω)
EF {1 0} EF?	Edit Frequency	ACW	1=60 Hz, 0=50 Hz
ECC {1 0} ECC?	Edit Connect	ACW DCW IR	1=On, 0=Off

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
SPR {1 0} SPR?	PLC Remote ON/OFF	1=On, 0=Off
SEC < 0 >	Edit Security OFF	0=Off
SEC < value, mmm> SEC?	Edit Security ON, Passcode	1=RUN, 2=MEM, mmm = 000 – 999 (Passcode)

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 <memory location>?	Result Data Query by memory locaiton	1-5
RR?	Read Reset Query	1=Open, 0=Closed
RI?	Read Interlock Query	1=Open, 0=Closed
RDM?	Read Current Max	Maximum current measured during the test including Ramp Up and Dwell Time
LS?	List Step Parameters	Memory, GND, Current(A), HI-Limit(mΩ), LO-Limit(mΩ), Dwell(s), Frequency(Hz), Offset(mΩ), Connect
LS <memory location>?	List Step Parameters by memory location	Memory Location = 1-5

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 memory location, test type, test status, and metering. The syntax for this command response is {memory - step, test type, status, meter 1, meter 2, meter 3}.
{Memory, GND, Status, Current(A), Resistance(mΩ), Time(s)}

RD <step number>? - Read the results for an individual memory location. Each parameter is separated by commas and includes memory location, test type, test status, and metering. The syntax for this command response is {memory - step, test type, status, meter 1, meter 2, meter 3}.
{Memory, GND, Status, Current(A), Resistance(mΩ), Time(s)}

RR? - Read the remote Reset input signal. When the remote reset has to 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 to 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.

RDM? - Read the remote Interlock input signal. When the remote Interlock has to 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;

{Memory, ACW, Status, Voltage(kV), Current(mA), Time(s)}

{Memory, DCW, Status, Voltage(kV), Current(mA), Time(s)}

{Memory, DCW, Status, Voltage(kV), Current(mA), Time(s)}

LS <memory location>? - Lists all the Parameters for the individual step indicated by step number = 1-5.

SFW? - Return the current firmware version of the tester.

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	Reset Tester
*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 ordered 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 290

Part Number	QTY	Reference Designator	Description
Supplied Accessories			
99-10020-01	2		Fuse 3.15A 250V Fast-Blow 20mm
38075	1		Interlock Connector
02100A-13	2		Cable Assembly Return Lead
04040A-08	1		High Voltage Lead
33189	1		Cable Input Cordset USA
38071	1		Cable Input Cordset USA
39066	1		USB Cable
99-10726-01	1		USB Flash Drive (Product Manual)
99-10656-01*	2		Fuse 15A 250V Slow-Blow 30mm
102-050-913*	1		High Voltage Probe
Panel Components			
99-10297-01	1		Fuse Holder 20mm
99-10727-01	1		High Voltage Connector
99-10017-01	2		Return Connector
99-10312-01	1		Power Switch 2P/15A
99-10016-01	1		Earth Connector
99-10735-01	1		Rotary Knob
330-113-001	1	TEST	Test Switch Green Lighted
330-113-002	1	RESET	Reset Switch Red Lighted
99-10763-01	1		Feet Kit w/o Rubber Inserts
175-974-002	2		Rubber Insert for Front Feet
99-10762-01	2		Rubber Insert for Rear Feet
99-10736-01	1		16x2 OLED LCD
175-936-002	1		Case Handle
99-10650-01*	1		Fuse Holder 30mm
99-10850-01*	1		16x2 OLED LCD
PCB Assemblies			
99-10745-01	1	AMGSP7100	Amplifier Board
99-10746-01	1	CNTSG7100	Continuity Board
99-10747-01	1	CONSG7100	Main Control Board
99-10748-01	1	EVRSG7100	Encoder Board
99-10749-01	1	HRYSG7100	High Voltage Relay Board
99-10750-01	1	LEDM001B	LED Assembly
Internal Components			
99-10751-01	1	T2	High Voltage Output Transformer

*Only applicable for Model 298

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 SCI Refer servicing to a SCI. authorized service center.

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Online hipot.com

Service Interval

The tester and its power cord, test leads, and accessories must be returned **at least once a year** to a SCI authorized service center for calibration and inspection of safety related components. SCI 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. SCI will not be responsible for any injuries sustained due to unauthorized equipment modifications or use of parts not specified by SCI. Testers returned to SCI with unsafe modifications will be returned to their original operating condition at your expense.