

Megger[®]

User Manual

STVI

Smart Touch View Interface

SPI225

Smart Primary Injection Test System

Revision History

Revision	ECN #	Date
1	32660	11/26/2014
2	32893	9/27/2015
3	32994	2/19/2016
4	33376	6/26/2017

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







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SAFETY PRECAUTIONS

WARNING:

VOLTAGES GENERATED BY THIS INSTRUMENT CAN BE HAZARDOUS

This instrument has been designed for operator safety; however, no design can completely protect against incorrect use. Electrical circuits are dangerous and can be lethal when lack of caution and poor safety practices are used. There are several standard safety precautions that should be taken by the operator. Where applicable, IEC safety markings have been placed on the instrument to notify the operator to refer to the user manual for instructions on correct use or safety related topics. Refer to the following table of symbols and definitions.

Symbol	Description
	Direct Current
	Alternating Current
	Both direct and alternating current
	Earth (ground) Terminal. There is a common chassis ground terminal located on the front panel (see Front panel under Description of Controls).
	Protective Conductor Terminal
	Frame or Chassis Terminal
	On (Supply)
	Off (Supply)
	Caution, risk of electric shock
	Caution (refer to accompanying documents)

 **WARNING:** Under no circumstances should the operator or technician attempt to open or service any Megger instrument while connected to a power source. Lethal voltages are present and may cause serious injury or death!

SAFETY PRECAUTIONS (Continued)

The following are specific safety related items associated with the test system.

Read and understand all safety precautions and operation instructions before attempting to use this unit.

The purpose of this equipment is limited to use as described in this instruction manual. Should a situation arise that is not covered in the general or specific safety precaution please contact Megger regional representative or Megger, Dallas, Texas.

Safety is the responsibility of the user. Misuse of this equipment can be extremely dangerous.

Always start with the power OFF, before connecting the power cord. Make sure outputs are off before attempting to make test connections.

Never connect the test set to energized equipment.

Always use properly insulated test leads. The optional test leads are rated for the continuous output ratings of the test system, and should be properly used and cared for. DO NOT use cracked or broken test leads.

Always turn the test system off before disconnecting the power cord.

DO NOT attempt to use the unit without a safety ground connected.

DO NOT attempt to use the unit if the power cord ground prong is broken or missing.

DO NOT use the test set in an explosive or flammable atmosphere.

DO NOT use the test set in a wet environment.

The instrument must only be used by suitably trained and competent persons.

Observe all safety warnings marked on the equipment.

Safety related or other important topics, like the statement below, will be notated with the adjoined symbol. Read the topic carefully as it may relate either to the safe operation of the test system or the safety of the operator.

The



Model SPI is not designed for use on energized circuits. For the safety of the operator and protection of the instrument, do not connect it to circuits that are energized. This includes circuits that could become energized during the course of a test procedure utilizing this instrument.

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1.0 STVI Introduction

The **STVI** is a user friendly interface to control the **Megger SPI** test equipment. This manual contains the information that you will need in order to set up and use your STVI with the SPI Device. How the unit operates, some of the different types of testing you can do, and how to save and view your test results with the Smart Touch View Interface software is described. It also covers running the STVI software using the PowerDB software on your PC.

1.1 Smart Touch View Interface



Figure 1 - Smart Touch View Interface

1. **TFT LCD Color Display** – this 8.5 inch touch panel display provides high resolution, and features Wide Viewing Angle Technology with high luminance for reading in direct sunlight.
2. **Control Knob** – this knob will adjust values once the box location of the value to be changed is selected.



Figure 2 - STVI Rear-View

3. **Built-in Foldout Stand** – the STVI may be operated as a handheld controller, or foldout the built-in stand and use a desktop controller.
4. **STVI Ethernet Port** – this Ethernet port is a 10/100BaseTX PoE (Power over Ethernet) port, and is the SPI connection port.

5. **USB Interface** – the USB port is used to update the firmware in the SPI as well as update the software in the STVI using a USB memory stick. It may also be used to download test results from the STVI for download into another PC with Power DB software for storage or printing. For control of the SPI, an Ethernet cable is provided. The STVI gets its power over the Ethernet cable. Even though the STVI has a built-in virtual keyboard, the user can use a USB keyboard with the STVI, as well as a mouse (including Logitech wireless mouse). The keyboard and/or mouse are not provided with the accessories.

1.2 Terminology

The acronyms, terms, and definitions used throughout this manual are described below:

1.2.1 Glossary of Terms for Circuit Breaker Testing

The STVI display screens prompt the user to select, or set, various values. The values vary depending on the protective device under test. Many of the terms used are similar in nature and mean virtually the same thing regardless of the type of breaker. For example, the term Time Dial is commonly used to define the time dial setting on the device under test. Unfortunately, some of the terms described here may apply to different types of devices under test in different ways, and thus may not cover every possible device made. However, it is hoped that this glossary will help the user to understand every setting value on every device under test.

1.2.2.1 Pickup (Tap / Sensitivity Rating)

A numerical value associated with a tap or sensitivity rating setting on the device under test. It is used to define a setting value, pick up value, or minimum operating point, of the device under test.

1.2.2.2 Time Delay

It is a numerical value of time, normally associated with the minimum operating time of the device under test. Low Voltage Power Circuit Breakers are available with three types of tripping characteristics: Long-Time, Short-Time, and Instantaneous.

1.2.2.2.1 Long-Time Delay

The long time delay characteristic is normally associated with direct acting low voltage power circuit breakers providing overload protection with typical time delays of approximately 10 - 60 seconds at 300% of pickup.

1.2.2.2.2 Short-Time Delay

The short time delay characteristic is normally associated with direct acting low voltage power circuit breakers providing protection for short circuit or fault conditions. It is used whenever a small delay is necessary for coordination or selectivity with other protective devices. Typical delays of this type characteristic are approximately 6-30 cycles.

1.2.2.3 Instantaneous

A numerical value associated with a tap setting of the instantaneous element of the device under test. It is used to define a pick up value, or minimum operating point, of the instantaneous element of the device under test. The instantaneous trip characteristic is used for short circuit or fault protection and has no intentional time delay.

1.2.2.4 **Test Multiple**

A numerical value normally associated with timing tests. Multiples are normally expressed in terms of whole numbers like 2, 3, 4, etc., times the Pickup or Tap value of the device under test. Fractions of test multiples may also be entered and the appropriate test values and theoretical trip times will be calculated automatically.

1.2.2.5 **Frame Size**

The frame rating is the maximum continuous current rating in amperes of all parts except the overcurrent device. All current-carrying parts, contacts, and pivot points are designed to carry current up to the frame size rating without exceeding heating limits.

1.2.2.6 **Continuous Current Rating**

The continuous current rating is a current value equal to or less than the frame rating. This value of current is printed or stamped on the overcurrent device. It is possible to have a 600-ampere frame rating, with a continuous current rating of only 100 amperes (due to the size of the overcurrent trip device).

1.2.2.7 **Expected Trip Time**

A numerical value representing the expected operating time of the device under test.

1.2.2.8 **Interrupting Rating**

A numerical value associated with the highest current at rated voltage that the device can interrupt without external damage.

1.3 **Power Over Ethernet Input Power**

The STVI gets Power Over Ethernet (PoE) of 48 Volts DC at 0.5 A from the SPI STVI port.

2.0 **SETUP**

2.1 **Unpack System**

Unpack the unit and check for evidence of any shipping damage. If there is any visual damage, immediately notify the freight carrier to make a damage claim, and notify Megger of the damage.

2.1.1 **Initial Start Up**

1. With the Ethernet cable supplied with the unit, connect the STVI Ethernet Port on the SPI unit to the Ethernet port on the top of the Smart Touch View Interface (STVI).
2. Before connecting power to the unit, make sure the SPI POWER ON/OFF Switch is in the OFF position (0). Plug the unit line cord into an appropriate power source and turn the POWER ON/OFF Switch to ON (1). As the SPI unit goes through its power up sequence, in about a minute the STVI power up screen will appear, then the manual start up screen will appear.

2.2 **Communication Ports**

There are two types of communication ports on the STVI, one Ethernet, and two USB ports. On the SPI unit there is a USB port and three Ethernet ports.

2.2.1 Ethernet Port

There is one Ethernet port on the STVI for connecting to the SPI unit. Connect the STVI to the SPI unit using the port labeled STVI (as shown in Figure 3).

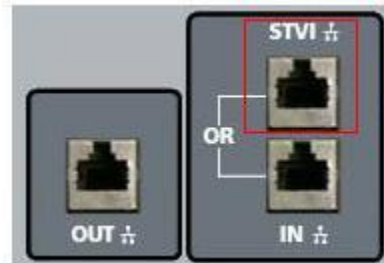


Figure 3 - STVI port on the SPI

2.2.2 USB 2.0 Interface

There are two USB 2.0 Interface ports on the STVI unit (see Figure 2). These ports are used for upgrading firmware in the unit, or upgrading the STVI software using a USB Memory Stick. They may also be used in conjunction with a USB mouse for ease of manual control, even a USB wireless mouse may be used with the STVI.

The Ethernet Port labeled “IN” is a 10/100BaseTX port, and is the primary PC connection port. This port supports MDI/MDI-X auto crossover configuration, which means both standard and “crossover” Ethernet cables may be used. Note that only one of the Ethernet ports may be used at a time (the intended use is for control by the STVI or the PC).

2.3 Smart Touch View Interface

The STVI is the manual control and user interface for the unit. All manual entries will be made through the STVI unless the unit is connected to a personal computer. During the power up sequence the test system automatically does a self-test to insure everything is operating properly. Once the system has completed it's self-checks the Introduction Screen will appear as shown in Figure 4. If the software detects a SPI it will be automatically connected and the main SPI Startup Screen (Figure 8) will be displayed.

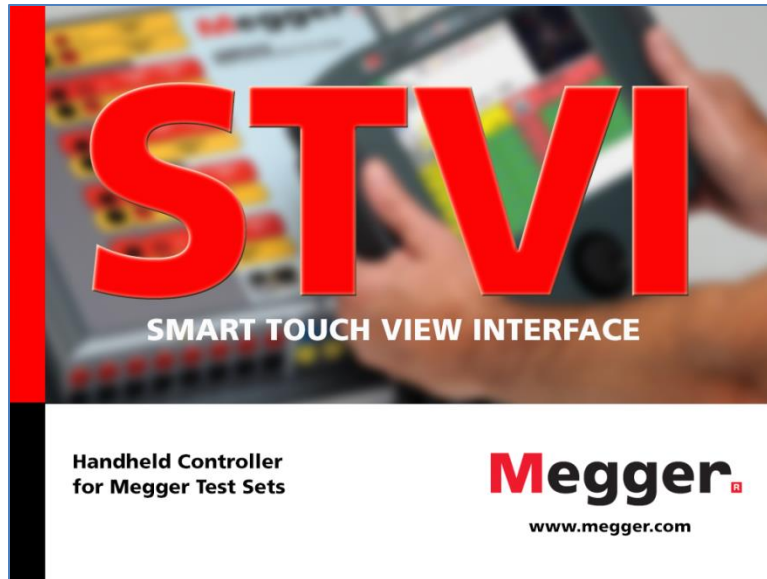


Figure 4 - Introduction Screen

When using the **PC version** of the STVI software, the Instrument Selection Screen will be displayed. Note that the software is used to communicate with numerous instruments. The SPI icon should be located under the heading of Breaker Test Sets. Click on the SPI button in the Instrument Selection Screen to connect to a SPI.

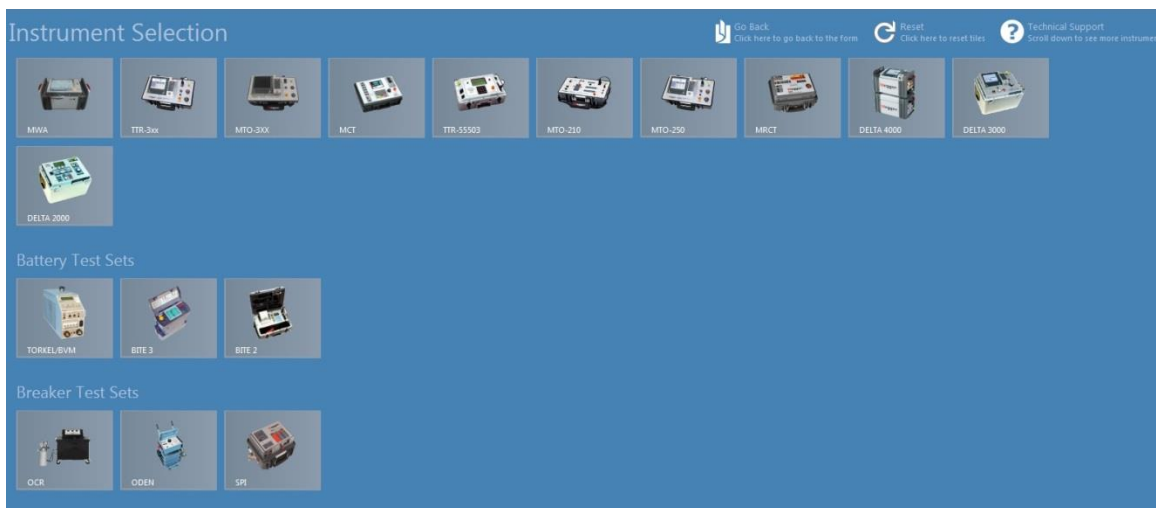


Figure 5 - Instrument Selection Screen

The PC version will then display the Instrument Configuration screen as shown in Figure 6. Click the OK button and the software will attempt to auto detect an instrument and connect. If no instrument is detected due to firewall, VPN settings or an incorrect IP address the user will need to take appropriate corrective action. In this case the firewall can be turned off or you can enter the IP address directly using the Instrument Configuration screen. The user can un-check the Auto Discover Unit box and enter the IP address directly in the field provided. The Auto Config IP address of the SPI unit can be found on the nameplate of the test set.

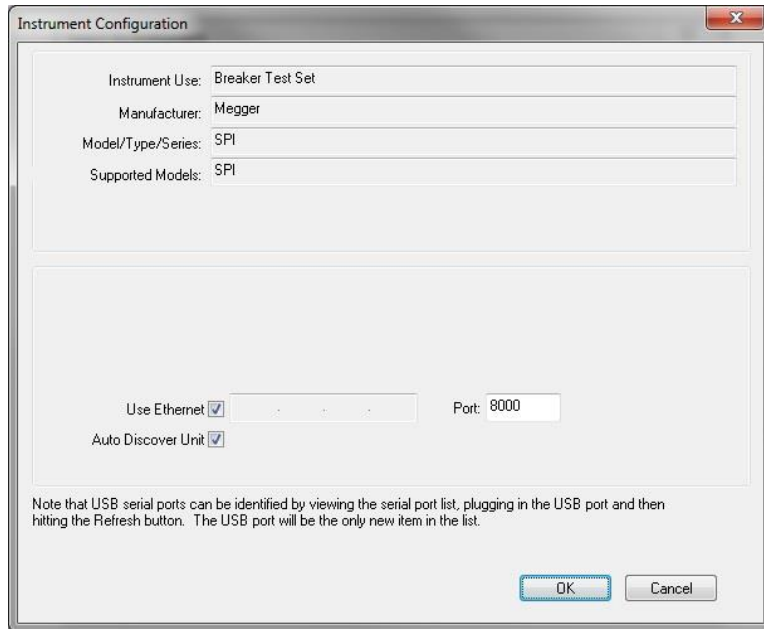


Figure 6 - Instrument Configuration Screen

If the unit is on a network with a DHCP server, the user must use the Auto Discovery mode. Note that the SPI Port selection field should be set to port 8000.

If the software detects a unit, the user will be shown a connection dialog similar to Figure 7. The user can then select the desired SPI unit for connection.

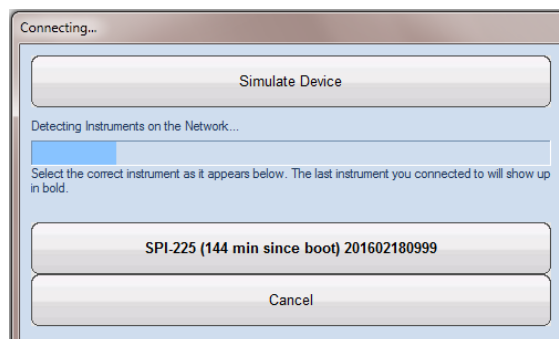



Figure 7 – Connection Dialog

The PC version of the software will then display the main SPI Startup Screen. Note that the connection icon  in the upper left corner will have a green background indicating that the SPI unit is connected and the IP address was automatically set through the Ethernet port. The auto-detect process does not require the user to enter an IP address. Once the software detects and connects to a unit, the connection icon background will turn green and the SPI Startup Screen will appear (as shown in Figure 8).

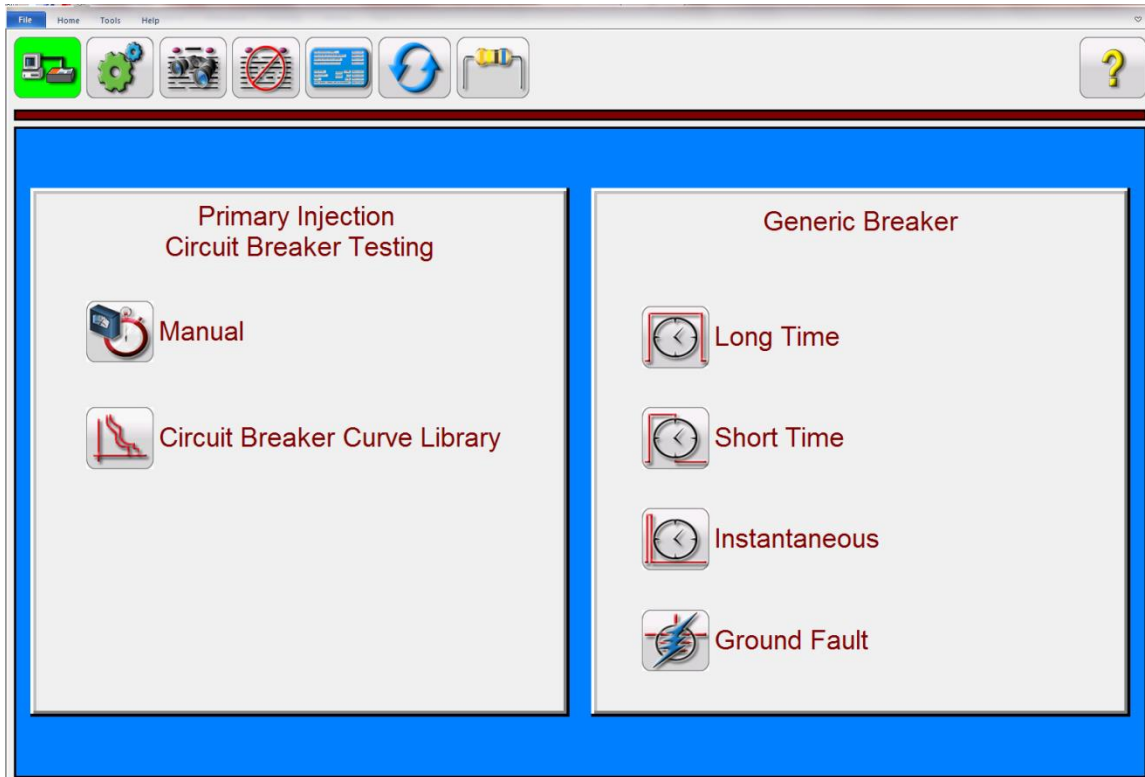




Figure 8 - SPI Startup Screen

The SPI Startup screen provides access to the Manual test screen by pressing the Manual test button , or the Circuit Breaker Curve Library button . The Circuit Breaker Curve Library screen provides automated timing tests of circuit breakers and overload devices using either Generic or Manufacturer Specific time curves. The software has ANSI and IEC standard time curve algorithms built-in for molded case breakers. In addition, it includes time curves and time curve algorithms for different specific molded case and air frame circuit breakers selectable by Manufacturer, Breaker Type, Curve Family, Curve Model, Curve Trip Unit and Curve Name as applicable.

If this is the first time you have started up the SPI software it is recommended that you go to the Configuration Screen first to setup the hardware, maximum durations, test currents, pulse times, and the timer configuration.

2.3.1 Configuration



Pressing the Configuration button will allow the user to configure both the SPI hardware and SPI software. Pressing this button will display the Configuration screen (see Figure 9).

Note: The following button descriptions vary depending on hardware configuration and the version of the SPI software. The STVI version of the software includes extra buttons as indicated with an * in the descriptions below.



Figure 9 – SPI Configuration Screen

2.3.1.1 Max Time

The user can set the Maximum Time in seconds that the SPI will stay ON during a test. The default value is 600 seconds.

2.3.1.2 Max Current

The user can set the Maximum Current that the SPI will output on the selected Output Tap. The default value is 2000 Amps.

2.3.1.3 Tap Verification Current

This is a time saving feature used to automatically determine the Output Tap selected by the user. The user simply connects to the desired output tap, and then to the device under test. Prior to applying a test current the unit will pulse the Tap Verification Current into the load. Based upon the current value read back by the measuring circuit, and knowing the ratio of the output taps, the software will automatically reconfigure for the selected output tap. The default is 10 Amps.

Note: Make sure that the Tap Verification Current value is below any instantaneous setting or ground trip device setting of the device under test.

2.3.1.4 Timer Stop Cfg

Controls the modes to stop the Timer and turn the output off. Pressing the button will present to the user with three selections: Current Actuate, Dry Contacts Normally Open/Closed, and Voltage Applied/Removed, see the following descriptions.

2.3.1.4.1 **Current Actuate Mode**

Current Actuate Mode: Timer will initiate only when the output circuit is completed, and a threshold current of approximately 10% of the selected test current is exceeded. Timer will continue to run until output circuit opens and the current drops below threshold level or output is de-energized by the user.

2.3.1.4.2 **Normally Closed Contact Opening**

With the BINARY INPUT terminals connected to normally closed external contacts, output circuit will remain energized and timer will continue to run until contacts open.

2.3.1.4.3 **Normally Open Contact Closing**

With the BINARY INPUT terminals connected to normally open external contacts, output circuit will remain energized and timer will continue to run until contacts close.

2.3.1.4.4 **Voltage Applied**

With the BINARY INPUT terminals connected to an external monitoring circuit, output circuit will remain energized and timer will continue to run until an AC or DC Voltage is applied.

2.3.1.4.5 **Voltage Removed**

With the BINARY INPUT terminals connected to an external monitoring circuit, output circuit will remain energized and timer will continue to run until an AC or DC Voltage is removed.

2.3.1.4.6 **Post Deb (Debounce time)**

This setting is associated with the BINARY INPUT Terminals, and Normally Open Contacts closing. The Debounce time is set in milliseconds. The trip contacts must stay closed for the duration of the Debounce time setting for the time test to be true. If the contacts open in less than the set Debounce time the timer will continue to run. Once the input condition is true then the time test will conclude. The trip time displayed will be the total test time less the debounce time.

2.3.1.4.7 **Post Volt Thres. (Voltage Threshold)**

This setting is associated with the BINARY INPUT Terminals and Voltage Applied test applications. To serve a wide range of test applications the BINARY INPUT has a programmable voltage threshold. For typical test applications the binary input has a defaulted threshold of 5 volts. A higher threshold voltage helps to eliminate false triggers due to a noisy source. Lower thresholds allow stopping of timer from TTL voltage signals. The allowable voltage applied is 1 to 300 Volts AC or DC, programmable in 1 Volt increments.

2.3.1.5 Help Button

Press this button to access the built-in manual or for help associated with the Configuration Screen.

2.3.1.6 Default Settings Options

Press this button to get access to the settings options of Save as Default, Restore Default, and Restore Factory default settings (see Figure 10).



Figure 10 - Default Settings Options

2.3.1.6.1 Save as Default

Press this button and all of the changes made to the Configuration Screen and most of the default values for all screens are now saved as the power up defaults.

2.3.1.6.2 Restore Default

Pressing this button provides the ability to restore the original system power up defaults.

2.3.1.6.3 Restore Factory

Pressing this button provides the ability to restore the original system factory power up defaults.

2.3.1.7 Display Versions (Information Screen)

Pressing this button will display model, serial number, software and firmware versions, and build dates.

 **This information is useful when calling Megger for service or technical support related issues.**

2.3.1.8 Update Firmware

This button is used to update the SPI firmware.

2.3.1.9 Current Status

Displays the SPI current status screen. This information is mainly for use by Megger support staff.

2.3.1.10 Time Unit

Set the time unit display to seconds or cycles.

2.3.1.11 Bluetooth Pwd



This button allows the user to set the SPI Bluetooth password.

2.3.1.12 Line Freq

This button displays the current Line Frequency.

2.3.1.13 Ld (Load) Connection

This button appears when the user selects one or more Slave units. This button provides for either

Parallel  or Series  connections of multiple SPI units. Press or click on the Ld Connection button to toggle between Series or Parallel. In the parallel mode the SPI software will automatically divide the requested test current by the number of units and output equally the same test current from each unit in parallel so that the currents add across the load to equal the requested current value. If two units are in series, it will set the requested test current from each unit so that the compliance voltage from each unit will add together to push the current through the load.

2.3.1.14 Color Options

Press this button to adjust the colors of the vectors, backgrounds, lettering, etc.

2.3.1.15 Pickup Ramp Rate

Press this button to set the Current Ramp Rate in Amps/Sec to be used in the Pickup Test in the Advanced Screen.

2.3.1.16 Pulse On Duration

Press this button to set the Pulse ON time in Cycles. Used when operating the test set in the Momentary mode in the manual test screen, or when performing Instantaneous Pickup tests in the Automatic Mode.

2.3.1.17 Pulse Off Duration

Press this button to set the Pulse OFF time used in pulse ramping.

2.3.1.18 Ethernet (DHCP) IP Address

The STVI will auto-detect the SPI unit (the DHCP mode does not require the user to input an IP address). If the unit is on a network with a DHCP server, the user must use the Auto Discovery mode. Using the STVI, pressing the DHCP button will produce the Static IP Address Dialog box.



Figure 11 - Static IP Address Dialog Box

If using the PC version it too can auto-discover the SPI unit connected to the PC. On the PC version, the PC might not auto detect due to firewall, VPN settings or anti-virus software. In this case the firewall can be turned off, or you can enter the IP address directly using the PowerDB Instrument Configuration

screen by clicking the SPI icon on the Instrument Selection screen (Figure 12). Un-checking the Auto Discover Unit box will enable the IP address entry box (shown highlighted in red in Figure 12).

The AutoConfig IP address of the SPI225 unit can be found on the nameplate of the unit.

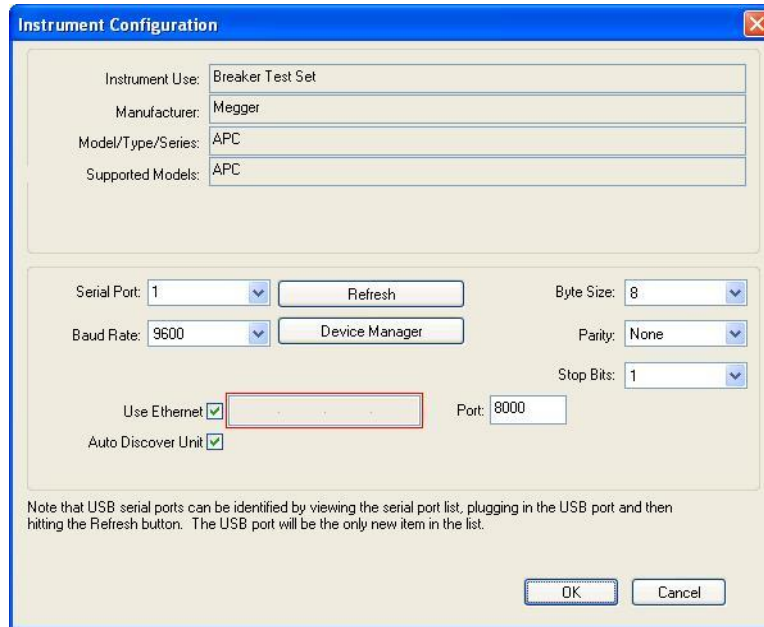


Figure 12 - PowerDB Instrument Configuration Screen

2.3.1.19 Set Date and Time*

Press this button to set the Date and Time in the STVI. This information is critical for saving tests and test results using the internal file manager. The PC version uses the PC time and date.

2.3.1.20 Number Format*

Press this button to set the decimal point number format either as a period or as a comma.


2.3.1.21 Adjust Screen Brightness*

The brightness is adjustable on the STVI. The display will always be visible since hardware limits the brightness from becoming too bright or too dark to be seen. Press this button and use the Control Knob to increase or decrease the brightness. For the PC version use the PC screen controls to adjust the display.

2.3.1.22 Logging*

Select this button to set up the logging with the STVI. The log will store a record of the commands sent to the SPI unit from the STVI (used when troubleshooting).




2.3.1.23 Screen Exit

To exit the screen and return to the previous screen press the green  check button (you will see this same button on other screens).

2.4 Setting Output Currents

Pressing the Requested Current button on the STVI hand held controller will display the following pop-up numeric keypad to enter the required test current. If using the PC version, click in the Requested Current window and use the PC keyboard numeric keys to enter the desired output current value.

2.4.1 Numeric Keypad Entry

The STVI numeric keypad entry provides an interface to the user when entering values using the STVI touch screen. Touching a data entry window (Requested Current or Increment) on the STVI will activate the Numeric Keypad. If using the PC version of the software, click in the window using the mouse. Use the numeric keys to type in the value you want and press the  button (press the Enter key on the PC). Pressing the clear all  will clear the value you just entered. Pressing the clear last digit  button will clear the least significant digit of the value in the display window.

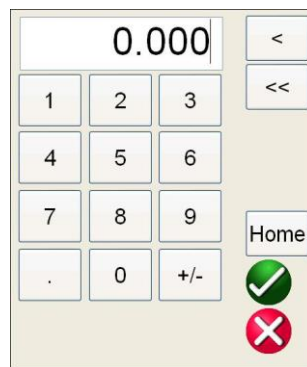




Figure 13 - STVI Numeric Keypad

The  button will enter the value and take you back to the test screen. Pressing Cancel  will return the user to the previous screen that is in use.

2.4.2 Manual Ramping

The output current can be ramped manually using either the Control Knob on the STVI or the up/down arrow keys/mouse wheel on the PC version. The amplitude of each step is set using the Increment Selection Screen (Figure 14) accessed by pressing the Increment button.

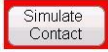



Figure 14 - Increment Selection Screen

Increment – Select the desired increment. The value selected will be shown on the Increment button. The output current will increment in 1, 5, 10, 15, or 20 Amp increments. The Auto button is associated with the control knob on the STVI, see Control Knob for more information.

In the Momentary Mode (see section 3.1.11.1) the output current will come on after pressing the blue Play button, and will only stay on for the Pulse On Duration Time setting in the Configuration Screen (see 2.3.1.15). When rotating the Control Knob, or the up/down cursor arrows on the PC keyboard, the output current will pulse on for the Duration Time with each increment, thus allowing an instantaneous pickup test (Duration Time needs to be set longer than the expected instantaneous pickup time).

In the Continuous Mode (see section 3.1.11.2) the output can be ramped using the control knob or the up/down cursor arrows on the PC keyboard, and the output current will stay on until the device trips or

until the user presses either the Simulate Contact button  or the Red X button  that appear at the top of the test screen.

2.4.3 Control Knob

The control knob will change the value of the output current based upon the increment value setting, after the blue Play button is pressed. Clockwise rotation increases and counterclockwise decreases. In the Auto Increment Mode the control knob uses a speed control algorithm to provide fine adjustment, with a slow rotation (one click equals the lowest increment level), and a larger step adjustment with a faster rotation. The Control Knob can also be used to scroll up and down when viewing the test results in the Add Results and View Results screens, or when viewing the Help screen.

2.4.4 Virtual Alphanumeric Keyboard

The virtual alphanumeric keyboard allows the entry of ASCII text into the appropriate STVI windows. This keypad is used to enter information in the Nameplate Data screen or file names in the file management screen.

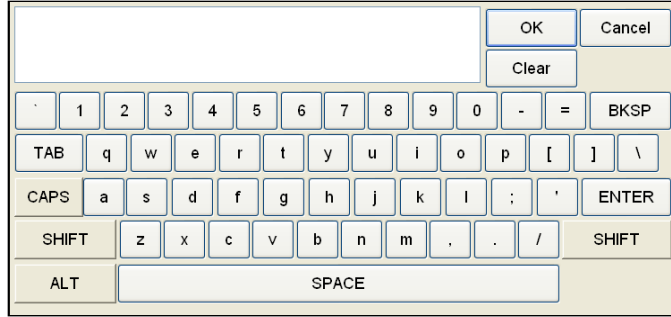


Figure 15 - STVI Virtual Alphanumeric Keyboard

2.5 STVI - File Management

The file management display is used by the STVI hand held controller to access files stored in the STVI's internal memory. This display will allow test files to be loaded, make/change directories, rename files/directories and delete files/directories that were created by the user. To access the File Management system, touch the File Folder icon at the top of the test screen. This icon only appears on the STVI (not on PC version). It provides the user the ability to save tests or open saved tests. If using the PC version users will have the PowerDB file system to save test (job) files (see PowerDB Help). Pressing the File Folder icon presents the user with the following tool bar (Figure 16). It defaults to the Save Current Form icon highlighted.



Figure 16 - STVI File Folder Tool Bar

! Note: Pressing the Power ON/OFF button will power down the STVI but is not required for a safe shutdown.

Pressing on the highlighted folder will provide the user with the following file explorer screen.

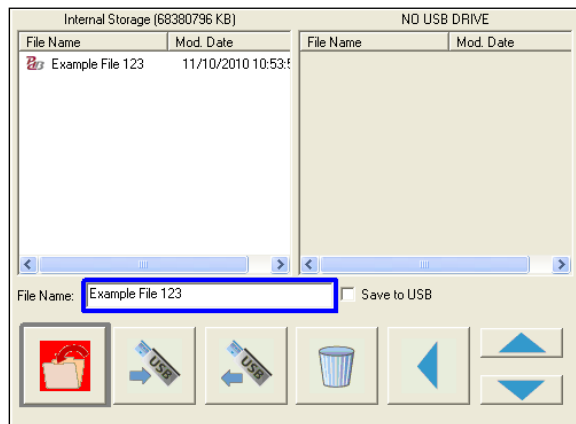







Figure 17 - STVI File Folder Explorer


Press in the File Name field and the user will be provided with the virtual keyboard to enter a file name. The file can then be saved to the internal memory or saved to a USB memory stick. This same window is also used to open saved files. To save results directly to a USB memory stick check the Save to USB box. To transfer test results from the STVI to a USB memory stick use the up down blue colored buttons to selected the desired test result to be transferred and then press on the ⇨USB button. To retrieve a test file from a USB memory stick press on the ⇦USB button to retrieve the selected file from the list of files that appear in the right hand window. To delete a file use the up/down arrows to highlight the file and

then press the trash can  icon. The left pointing blue arrow  is the exit button to go back to the test screen. To open an existing test file from the File Folder tool bar, press the Open File Folder icon  . The user will be presented with the File Folder Explorer. Use the up/down blue arrows buttons to highlight the desired file to be opened, and then press the Open File Folder button in the lower left corner. The user will be presented with a menu bar to open a New Test or to open the file selected showing the date and time of the saved file. Pressing the date/time button will open the saved test. To view the saved results press the More  button in the upper right display next to the vector screen, then press the View Report  button.

3.0 STVI – Basic Operating Descriptions

This section describes basic operating procedures for using the STVI with the SPI for such applications as basic pickup, basic timing test, paralleling current outputs from multiple SPI units.

3.1 STVI / PC Manual Test Screen

Pressing the Manual  test button will present the user with the Manual Test screen.

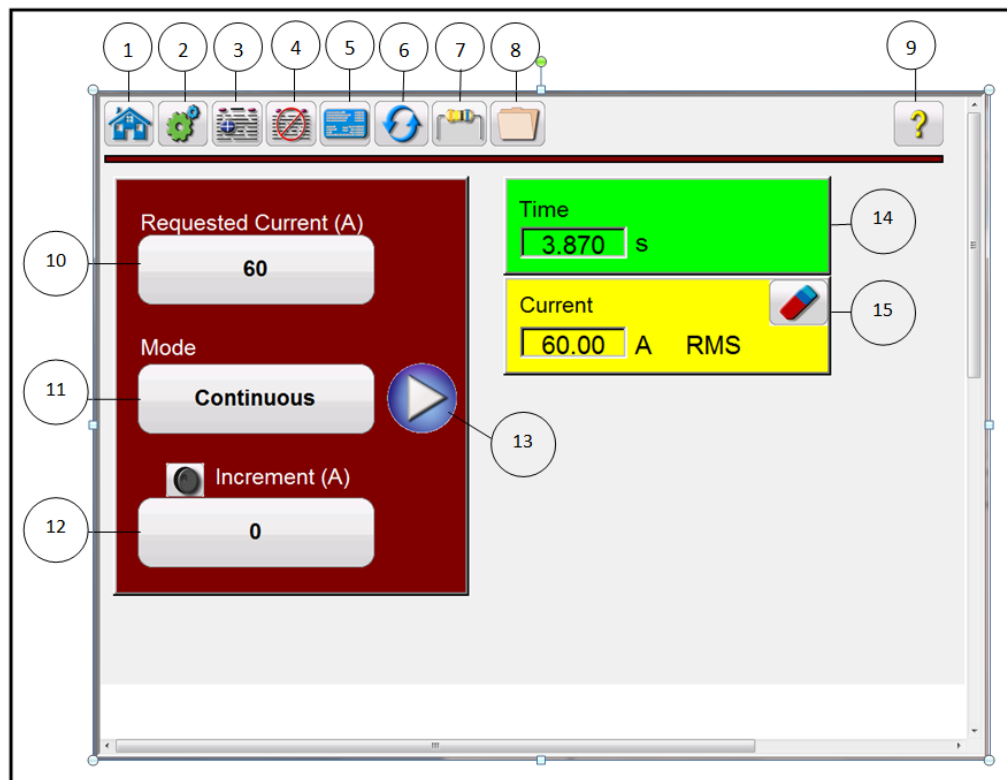


Figure 18 - Manual Test Screen

Note: the Current and Time windows do not appear until the test is started by pushing the blue play button.

3.1.1 ① Home button

The HOME button is used in several screens. Pressing the Home button takes the user back to the Start Up Screen.

3.1.2 ② Configuration Button

Press the button to go to the STVI Configuration Screen. See Section 2.3.1 Configuration for more information of the Configuration Screen.

3.1.3 ③ Add To Report Button

Press this button to either View Report or Add to the Report. It also allows the user to enter limits, comments or deficiencies. Reports can be saved to the STVI internal memory and transferred to PowerDB via a USB memory stick. Previous tests results can be loaded and the 'Retest' option can be used to repeat the test using the same parameters as the previous test.

3.1.4 ④ Clear Results Button

Press or click on the Clear Results button to Clear Active (last test) or Clear All test results that have been added to the report.

3.1.5 ⑤ Nameplate Data Button

Press this button to go to the Nameplate Data entry screen. Here the user can input all the related data associated with the device under test. This information will appear in the Test Result Header.

3.1.6 ⑥ System Reset Button

The SPI unit is self protected against internal overcurrent in the amplifier, and thermal overloads. In the event that the unit should alarm off due to one of these situations the system must be reset before testing can continue. Press the System Reset button to reset the error sensing circuitry.

3.1.7 ⑦ Insulation/Contact Resistance Button

Allows the user to enter insulation and contact resistance data for the device under test. This data is not determined by the SPI test set.

3.1.8 ⑧ File Folder

It provides the user the ability to save tests and test results, or open saved tests or test results (see section 2.5). If using the PC version users will have the PowerDB file system to save test (job) files (see PowerDB Help).

3.1.9 ⑨ Help Button

Press this button to access the online manual or for help associated with the Configuration Screen.

3.1.10 ⑩ Requested Current (A) Amplitude Button

Pressing or clicking this button will provide the user with the virtual numeric keypad (STVI), or use the keyboard (PC version) to enter the desired test current.

3.1.11 ⑪ Mode Button



Pressing or clicking on the Mode button will toggle between Continuous and Momentary Modes.

3.1.11.1 Momentary Mode

In the Momentary Mode the output current will come on after pressing the Blue Play button, and will only stay on for the Pulse On Duration Time setting in the Configuration Screen, see 2.3.1.14. When rotating the Control Knob, or the up/down cursor arrows on the PC keyboard, the output current will pulse on for the Duration Time with each increment, thus allowing an instantaneous pickup test (Duration Time needs to be set longer than the expected instantaneous pickup time).

3.1.11.2 Continuous Mode

In the Continuous Mode the output will stay on until the device trips, or until the user presses either the

Simulate Contact button  or the Red X button  that appear at the top of the test screen. The output can be ramped using the control knob or the up/down cursor arrows on the PC keyboard.

3.1.12 12 Increment Window

Pressing or clicking this window will provide the user with the Increment selection screen to enter the desired increment current level to be used when doing pickup tests (either manually or in the automatic modes). See 2.4.2 for more information.

3.1.13 13 Play button

Pressing or clicking the blue play button will start the test. If in the Momentary Mode the following parameters screen will be displayed for the user to enter the test values and setup the timer stop configuration.

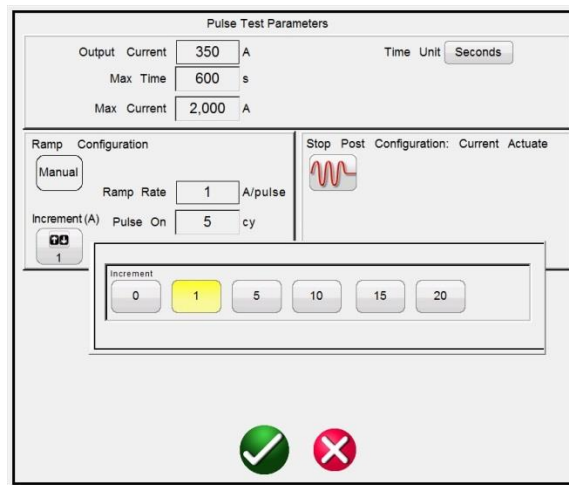






Figure 19 - Momentary Mode Pulse Test Parameters Screen

The Output Current previously set in the test screen will be displayed. The Max Time and Max Current settings from the Configuration screen are displayed. Touch or click in the appropriate window to change the defaulted values. Stop Post Configuration allows the user to set the desired mode to stop the timer and turn the outputs off, see section 2.3.1.3. Press the Increment button to display the Increment values selection window. Select the size of the desired increment Ramp Rate in Amps / Pulse. Press the green

check  button to return to the test screen and start the test. Note that if there are two or more units connected in parallel (see the Parallel | Series button in the test parameters screen) the Pretest current will be equally divided between the multiple units. If in series the Pretest current will be equal to the Pretest Current value setting.

 Make sure that the Pretest Current value is below any instantaneous setting, or ground trip device setting of the device under test.

In the manual test screen, in the Momentary Mode, each time the Control Knob (or the PC cursor arrows) are moved the output will turn on for the Pulse On Time value entered, and will increment the value entered in the Ramp Inc window (up or down). The test is automatically stopped when the Timer Stop condition is true. To manually stop the test or turn the output off, press or click on the red  button, or press the Simulate Contact  button.

If the Continuous Mode is selected the following parameters screen will be displayed (Figure 20).

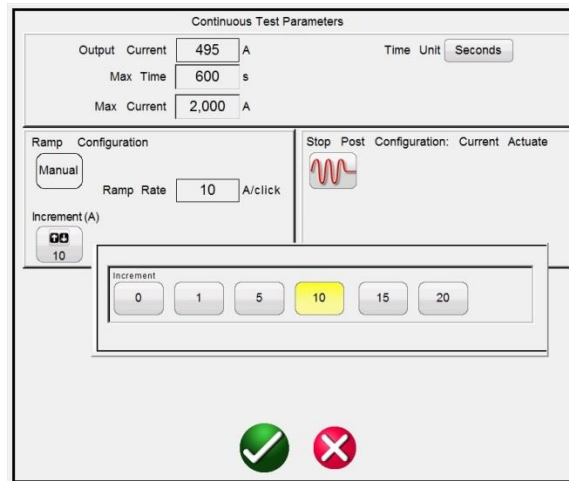




Figure 20 - Continuous Mode Test Parameters Screen

In the Continuous Mode it will apply the test current set in the Requested Current Window, start the timer running, and watch for the device under test to operate. If the device has not operated by the Max Time setting, the test set will turn off indicating Maximum Time was reached. To manually increase / decrease the output current press the Increment button and set the increment value. Once the test has started, each time the PC up/down arrow keys are pressed, or the control knob on the STVI is rotated, the output will increment up or down by the entered value. To manually stop the test or turn the output off, press or click on the red  button, or press the Simulate Contact  button.

3.1.14 **14** Timer Display Window

Displays operating time of the device under test. The Time window does not appear until the test is started by pushing the blue play button.

3.1.15 **15** Output Current Amplitude Window

Displays the test current being applied to the device under test. . The Current window does not appear until the test is started by pushing the blue play button. Pressing or clicking on the eraser in the Current window will clear the recorded test current and time like a reset button.

3.2 Selection of SPI225 Output Terminals

The Megger Model SPI225 primary injection test set has multiple output terminals to provide a wide range of current-voltage capabilities. There are three output terminals to choose from: 25 Amp at 70 V, 125 Amp at 14 V, and 500 Amp at 3.5 V. The terminal with the lowest current rating provides an output with the highest voltage for testing devices of low current requirements but with higher impedance characteristics. The highest current rated output terminal provides high current availability for testing devices of high current requirements of relatively low impedance. Should the current required for the device to be tested exceed the ability of the lowest tap or the impedance of the device to be tested require more voltage to "push" the current than is available from the highest current tap, the medium range current tap can be utilized to provide the current or voltage necessary to perform the desired test.

Should the test current requirement exceed the maximum output capability of the unit, multiple SPI units can be operated in parallel to multiply the maximum output current, see section 3.3.1. If the load has significant impedance two or more units (output tap dependent) may be operated in series to multiply the maximum output voltage "pushing" the test current, see section 3.3.2.

Note that the SPI units are high current test sets and a good supply voltage is required for proper operations. When possible, avoid the use of any type of power strips and small gauge extension cords. When extension cords must be used, use only properly rated cords with sufficient current capability. Additionally, when maximum current capability is required, remember that the SPI can be powered from a 240 AC supply. This can help to obtain maximum current output from the test set.

3.2.1 Selection of Output Leads

The Megger SPI unit is equipped with output connecting bars and a 125 A output tap for attachment of the provided high current test leads or other leads suitable for the test application.

The SPI unit comes with appropriate test leads and attachments rated for the output of the unit. There are two sets of leads provided with the SPI unit. One set are heavy-duty high current leads (AWG 4/0 cables with lead adapter) that connect to the 500 Amp output tap (Figure 21).



Figure 21 - High Current Test Lead

There is also a dedicated test lead (AWG #6 cable assembly with lead adapter) that connects to the 125 Amp output tap. It has a special twist lock connector that plugs into the 125 Amp output tap and works in



Figure 22 - 125 Amp Twist Lock Connector

conjunction with the 500 Amp (black) return cable. Both leads include unique screw connections to allow different test connector adapters to be screwed into the end of the test lead. There are three round test probes that vary in size from 0.3 to 0.125 inches in diameter that will fit most small molded case circuit breakers. In addition, there are two different sized clamps that screw into the end of the test lead adapter that allows the user to connect directly to the **de-energized** bus where the circuit breaker cannot be removed (Figure 23).

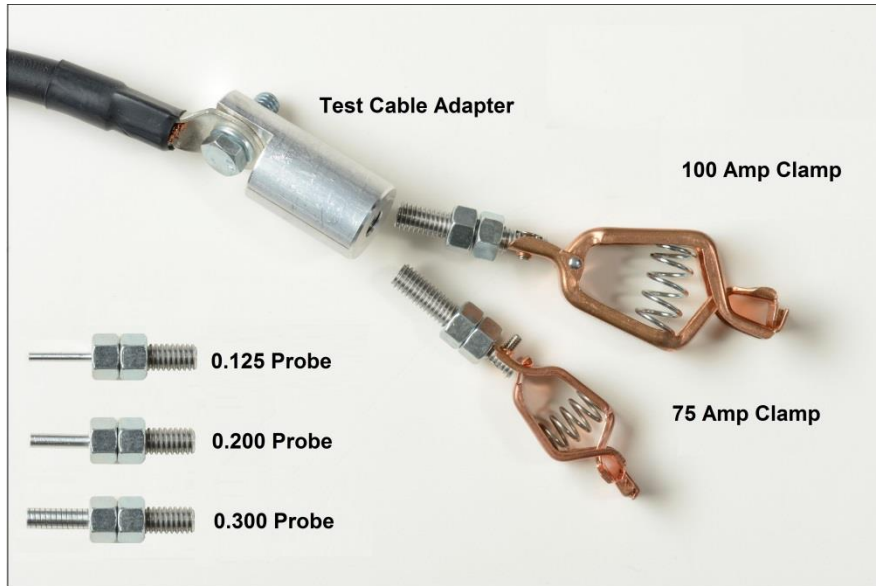


Figure 23 - Test Lead Adapter with Screw-in Accessories

Due to the voltage drop from the inductive reactance of the test circuit, a significant loss of current will result for each inch of test lead. Therefore, when choosing test leads (other than the leads provided) the length and size of leads chosen will determine the maximum available test current. It is worthwhile to sacrifice cross section of test leads for the sake of reducing length. Every inch of lead that can be eliminated provides worthwhile increase in available test current. Heating is not a significant problem in testing, even though the leads may become hot. Paralleling of sufficient cables provides higher test currents. Each cable can be fitted with a compression lug on each end, and then bolted to the output terminals of the test set and the device under test.

The two cables between the test set and the device under test can be twisted together or bundled with tape or cord to maintain close proximity, which helps to minimize inductive reactance.

3.3 SPI225 Output Current and Overload Capability

The current rating of the output terminals may be exceeded for short durations provided the voltage rating is sufficient to "push" the desired current through the device under test and the connecting test leads. The overload capacity, represented by multiples of rated current, versus TIME ON and TIME OFF are given below.

<u>%Rated Current</u>	<u>Maximum Time ON¹</u>	<u>Minimum Time OFF</u>
100 (1x)	30 minutes	30 minutes
200 (2x)	3 minutes	8 minutes
300 (3x)	30 seconds	4 minutes
400 (4x)	7 seconds	2 minutes

¹ Time On will vary depending on the ambient temperature. The SPI is protected against thermal overload.


Where more current is required than one unit can provide, multiple units may be operated in parallel, see section 3.3.1 for parallel operation. Where more compliance voltage is required due to load impedance two units may be operated in series, see section 3.3.2.

3.3.1 Parallel Operation

Each SPI current output tap is capable of providing a full rated output; see the appropriate output terminal ratings. For example - the SPI225 using the 500 Amp output tap can provide a maximum of 500 Amps for 30 minutes on followed by 30 minutes off, and up to 2000 Amps for 7 seconds on followed by 2 minutes off. If more than 2000 amps is required, two or more units may be connected in parallel to provide 1000 Amperes each for 30 minutes (with 2 each SPI225 units in parallel), or up to 8,000 amperes for 7 seconds (4 each SPI225 units in parallel).

NOTES:

1. Parallel or series operation of SPI's can only be performed using the 500 amp tap.
2. Each unit should be supplied power via separate circuits with a common phase angle (do NOT use 180 degrees out of phase circuits or 120 degrees out of phase circuits from a 3-phase source).
3. The output leads from paralleled SPI's should run from each SPI directly to the input terminals of the device under test (this provides for maximum current capability).
4. It is suggested that the output cables from each of the SPI's outputs be twisted to help minimize the inductive reactance and obtain maximum current (this is especially helpful with longer cables).

 Note: When operating multiple SPI units in parallel or series they should not share the same power circuit. Each unit should be powered from independent circuits of the same phase angle with appropriate current ratings. Do NOT use out of phase circuits to power parallel/series connected SPI units.

3.3.1.1 Two SPI Units in Parallel

To assist in multiple unit operations the SPI units may be stacked on top of each other. Use the following guidelines to parallel the 500 Amp current channels of two units:

1. Stack the Master SPI unit on top of the Slave SPI unit. Connect an Ethernet cable from the Master Unit Ethernet port labeled OUT to the Slave unit Ethernet port labeled IN.
2. Connect the high current test cables to the 500 Amp Output Terminals of each SPI unit and then directly to the device under test (paralleling the cables directly at the DUT input terminals). Using cables from both SPI units to the device under test helps to provide the maximum current capacity. It is not recommended to parallel the two SPI units directly at the output tap terminals and use one set of leads to the device under test.
3. Connect the STVI (or PC) to the Master unit STVI port (or the IN port for the pc). When the Select Number of Slave Units menu appears press or click on 1.
4. Power up the SPI units within 1 to 2 seconds of each other. The boot-up process will detect that there are multiple SPI units in a Master/slave configuration.
5. When the Select a Tap window appears, select the 500 Amp tap. The test screen will now appear.
6. Observe the Connection icon in the upper left hand corner of the screen. You will note the number 1 appears in the Connections icon indicating that you now have control of the Master and 1 slave unit.
7. The STVI software, knowing there are two SPI units, will automatically divide the current equally between the two current output terminals. When setting an output, simply enter the value of the desired output current. For example, for an output of 2000 Amperes, enter 2000, and with 2 SPI 500 Amp output terminals in parallel each unit will be providing 1000 Amperes.
8. See Simple Manual Timing Test for step by step operation.

3.3.1.2 Three or Four SPI Units in Parallel

To parallel the current channels of three or four units, perform the following:

1. Stack the Master unit on top of the Slave units. Interconnect the two slave units together using the top Slave unit Ethernet port labeled OUT, and connect to the bottom Slave unit Ethernet port labeled IN (repeat if stacking 4 units). Connect the Master Unit Ethernet port labeled OUT to the top Slave unit Ethernet port labeled IN.
2. To parallel three or four SPI units together on the 500 Amp output terminals you will need to use multiple high current cables to connect the output terminals directly to the device under test. It is recommended that separate test leads be run from each SPI unit directly to the device under test.





Figure 24 - Three SPI Units in Parallel

3. Connect the current outputs to the device under test using properly rated output test leads. If using test leads other than those supplied by Megger insure that the cable has sufficient size to carry the test current.
4. Power up all the SPI units within 1 to 2 seconds of each other. The boot-up process will detect that there are multiple SPI units in a Master/slave configuration.
5. With the STVI (or PC) connected to the Master unit STVI port (or the IN port for a pc), when the Select Number of Slave Unit menu appears press or click on the number of slave units in use.
6. When the Select a Tap window appears, press or click on 500 Amp tap. The test screen will now appear.
7. Observe the Connection icon in the upper left hand corner of the screen. You will note that the number of slave units appears in the Connections icon indicating that you now have control of the Master and slave units.
8. The software will automatically divide the requested current equally between the connected SPI units. When setting an output, simply enter the value of the desired output current. For example, with a three unit stack for an output of 3000 Amperes, enter 3000, and with 3 SPI 500 Amp output terminals in parallel each unit will be providing 1000 Amperes.
9. See Simple Manual Timing Test for step by step operation

3.3.2 Series Operation

Up to four SPI units (500 Amp tap) may be connected in series in order to increase the available compliance voltage for high impedance test applications. The series connection should be used only when the parallel connection does not have sufficient voltage to "push" the desired test current through the test leads and the device under test. To series the current channels of two units, perform the following:

1. Stack the Master SPI unit on top of the Slave SPI unit. Connect an Ethernet cable from the Master Unit Ethernet port labeled OUT to the Slave unit Ethernet port labeled IN.
2. Use the short high-current cable to interconnect the COMMON of the top unit to the 500 A output terminal of the lower unit together. Connect current output to the device under test as shown in the following figure (Figure 25) using properly rated output test leads. If using test leads other than those supplied by Megger insure that the wire has sufficient size to carry the test current.
3. Connect the STVI (or PC) to the Master unit STVI port (or the IN port for the pc). When the Select Number of Slave Units menu appears press or click on 1.
4. Power up the SPI units within 1 to 2 seconds of each other. The boot-up process will detect that there are multiple SPI units in a Master/slave configuration.
5. When the Select a Tap window appears, select the 500 Amp tap. The test screen will now appear.
6. Observe the Connection icon in the upper left hand corner of the screen. You will note the number 1 appears in the Connections icon indicating that you now have control of the Master and 1 slave unit.
7. For series operation, the user will need to access the Configuration Screen  and use the Ld Connection icon to select the Series operation  icon (see section 2.3.1.12).
8. The STVI software, knowing there are two SPI units in series, will automatically supply the requested current to both units. Simply enter the value of the desired output current.
9. See Simple Manual Timing Test for step by step operation.

Use the short high current lead to connect the COMMON of the top unit to the 500 A output terminal of the lower unit together (see Figure 25). Connect the current output of the top (Master) unit to the device under test and the return to the COMMON of the bottom (slave) unit using properly rated output test leads. If using test leads other than those supplied by Megger insure that the cable is of a sufficient size to carry the test current.

NOTES:

1. Up to four SPI units may be connected in series. Do not attempt to series connect more than four SPI units.
2. Each unit should be supplied power via separate circuits with a common phase angle (do NOT use 180 degrees out of phase circuits or 120 degrees out of phase circuits from a 3-phase source).
3. Only the 500 Amp tap can be used for SPI units in a series connection.



Figure 25 - Series Connection of Two SPI Units

3.4 Manual Test

The manual test section is designed for general purpose high current test applications or primary current tests such as motor overload relays, etc. It may also be used to test single pole molded case circuit breakers by configuring the Timer Stop for Current Actuation, see section 2.3.1.4 (Timer Stop Cfg) for more information.

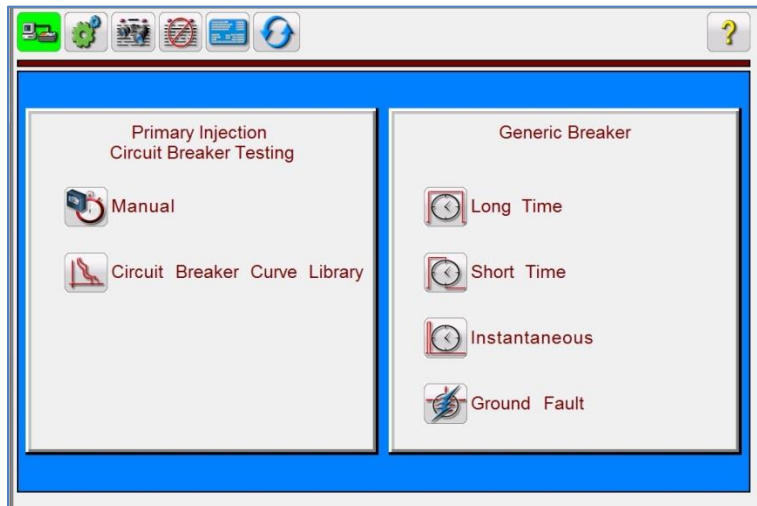






Figure 26 - SPI Start Up Screen

3.4.1 Timing Test

1. Press the Manual Test  button.
2. Select the appropriate output terminal (see section 3.2, Selection of Output Terminal) and connect one end of a high-current lead to one side of the thermal element or current coil in the overload relay or breaker. Connect the other test lead to the COMMON terminal of test set.
3. To monitor dry contacts, connect a pair of light leads (timer leads) from Normally Closed Contacts or Normally Open Contacts of overload relay to the binding posts of the BINARY INPUT terminals of the test set.
4. Enter the desired test current value in the Requested Current field (section 3.1 item 9) using the numeric keypad or PC numeric keys.
5. Set the Mode to Continuous (section 3.1 item 10).
6. Press the Blue Play button, and the Continuous Test Parameters screen will be displayed.
7. In the Continuous Parameters screen, you can leave the Max Time and Max Current settings, or change them to new values, see section 3.1 for more information. Select the desired Time Unit (Seconds or Cycles). Set the Tap Verification Current to an appropriate value (see section 2.3.1.3.) Set the Stop Post Configuration to the appropriate timer stop mode. Press or click on


the green  check button. This will return you to the test screen and the output current will turn on and the timer will start running.

8. When the device under test trips, the output will automatically turn off and the Timer will stop indicating the trip time.
9. To save the test result, press the Add to Report button . The results have now been added to the report and the report is shown. Note that the values are not actually saved to file until you press the File Folder icon and save them as previously defined. The user can now enter appropriate information relative to the test in the Test Report header.



Megger.
www.megger.com

SPI PRIMARY INJECTION TEST REPORT



CUSTOMER Megger

ADDRESS Dallas, TX

SUBSTATION Pecan Street

POSITION _____

EQUIPMENT LOCATION _____

DATE 4/27/2017

AMBIENT TEMP. F C

HUMIDITY _____ %

TEST STATUS _____

PAGE 1

JOB # _____

ASSET ID _____

MANUFACTURER _____

BREAKER TYPE _____

FUSE CAT. NO. _____

TRIP UNIT TYPE _____

STYLE NUMBER _____

SN / SO NO. _____

SENSOR TAPS _____

CUBICLE CODE _____

CATALOG NO. _____


FRAME SIZE (F) _____

MOUNTING B.I. D.O.

THERMAL MEMORY ON OFF


ZONE INTLK TARGETS

ALL TESTS PASSED



Test	Nominal I(A)	Tolerance		Measured		Pass/ Fail
		Min (s)	Max (s)	I (A)	t(s)	
Timing Test	60.00	13.500	15.500	60.00	14.990	PASS

Figure 27 - Example SPI Test Report

When using the STVI, use the **Control Knob** to scroll up and down to view all results. Note that there is a space in the upper right corner for a company logo to provide a finished and professional look (see Tools menu, Options dialog on the pc). Also note the Options  button just above the recorded results section. Pressing this button will present the user with a number of possible choices for the recorded results (Figure 28).

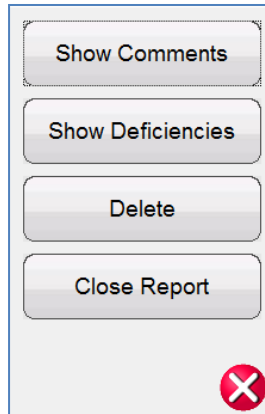




Figure 28 - Report Options Screen

The user can select to show or hide Comments and/or Deficiencies in the test report. The user may also choose to delete the selected test section or close the test report.

Contact Resistance and/or Insulation Resistance test results can also be added to the Test results using the Insulation/Contact Resistance button . Press either Close Report to return to the test screen or press Cancel to return to the report. To exit the report, press the Check  button in the top left corner or select the Options button followed by the 'Close Report' button.

3.4.2 Testing Instantaneous Pickup

- 1) Select the appropriate output terminal (see section 3.2, Selection of Output Terminal) and connect one end of a high-current lead to one side of thermal element or current coil on the overload relay or breaker. Connect the other test lead to the COMMON terminal of the test set.
- 2) To monitor dry contacts, connect a pair of light leads (timer leads) from Normally Closed Contacts or Normally Open Contacts of overload relay to binding posts of test set BINARY INPUT terminals.
- 3) Enter the desired starting current value (normally start at a value of 20% below the expected pickup) by pressing the Requested Current window, and enter the amplitude using the numeric keypad.
- 4) Press the Mode button and set to the Momentary Mode.
- 5) Press the Blue Play button, and the Pulse Test Parameters screen will be displayed (Figure 28).

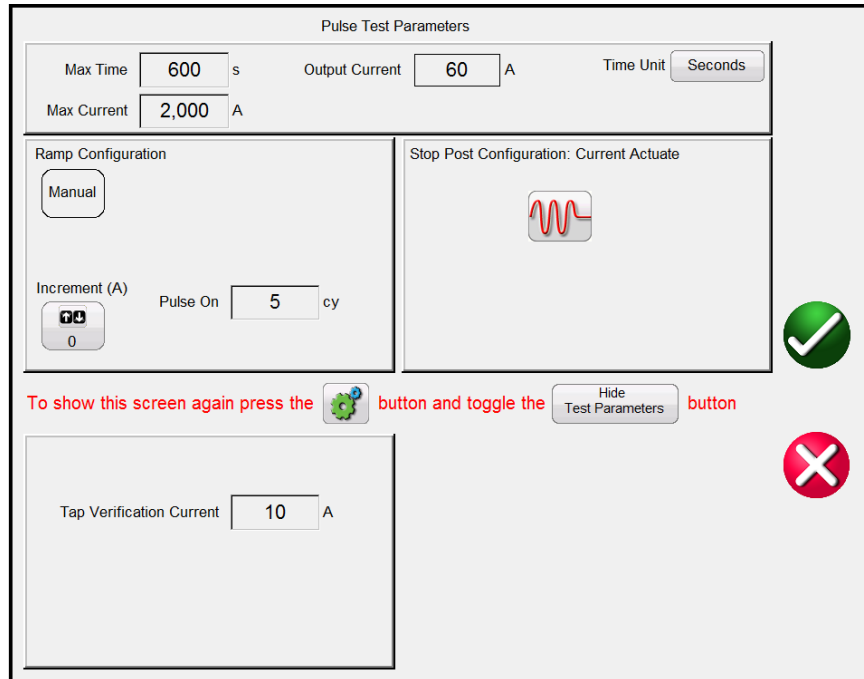




Figure 29 – Pulse Test Parameters

- 6) In the Pulse Test Parameters screen (Figure 29):
 - Set the desired **Max Time** and **Max Current** settings (see section 3.1).
 - Select the desired **Time Unit** (Seconds or Cycles).
 - Set the desired Ramp **Increment (A)** in Amps/Pulse by pressing the Increment button. Then set the desired **Pulse On** duration in Cycles
 - Set the **Tap Verification Current** to an appropriate value (see section 2.3.1.3).
 - Set the **Stop Post Configuration** to the appropriate timer stop mode.
- 7) Press or click on the green  check button. This will return you to the test screen. Using either the Control Knob on the STVI, or the PC up and down arrows, manually ramp the output until the relay contacts either picks up or the device trips. Note that the output will turn on for the Pulse On duration time setting each time the control is moved up or down. Note if you try to ramp the current too fast it will prevent the immediate ramp and display a message about cool down time.
- 8) When the device under test trips, the output will automatically turn off and Timer will stop indicating the trip time. The Instantaneous Pickup value will be displayed in the Current window.
- 9) If this test is a continuation of the previous timing test, you simply press the Add to Report the Pickup test value. The results have now been added to the report and the report is shown. Note that the

values are not actually saved to file until you press the File Folder icon and save them as previously defined.



SMART PRIMARY INJECTION TEST REPORT

Substation: South 40 Position: _____ Page: _____

EQPT. LOCATION: N. P. Date: 6/20/2013

ASSET ID: 465 Ambient Temperature: 32 °C Humidity: _____ % Job #: 83473

TEST EQUIPMENT USED: SPI 835(sim20100614) Tested By: SHR

MANUFACTURER: GE SN / SO NO.: _____ FRAME SIZE(F): _____

BREAKER TYPE: _____ SENSOR TAPS: 20 MOUNTING: B.I. D.O.

FUSE CAT. NO.: _____ CUBICLE CODE: _____ THERMAL MEMORY: ON OFF

TRIP UNIT TYPE: CR124 CATALOG NO.: _____ ZONE INTLK TARGETS

ALL TEST PASSED

Test	Nominal I(A)	Tolerance		Measured		Pass/Fail
		Min (s)	Max (s)	I (A)	t(s)	
Timing Test	60.00	35.000	55.000	60.00	53.141	PASS

CONTACT: _____

INSULATION: _____


Test	Nominal I(A)	Tolerance		Measured I (A)	Pass/Fail
		Min (A)	Max (A)		
Pickup Test	120.00	110.00	125.00	120.00	PASS

Figure 30 - Example Timing and Instantaneous Test report

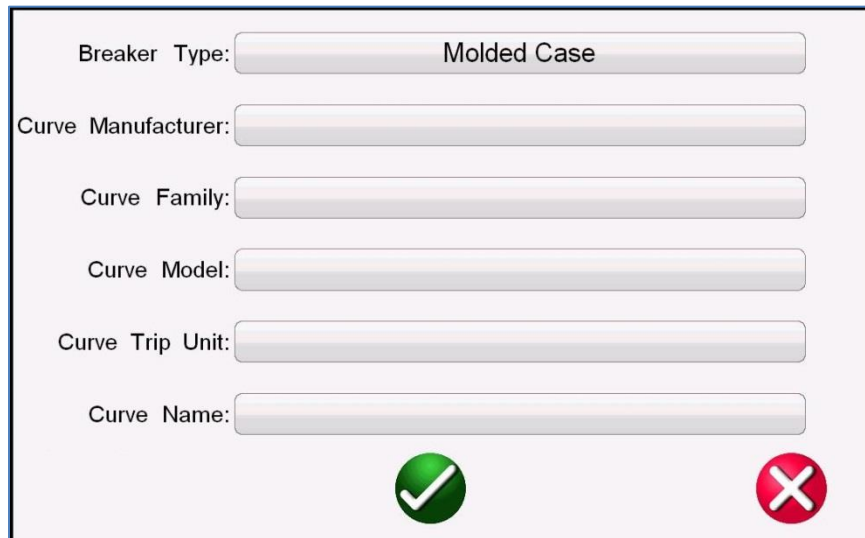
3.5 Advanced Pickup and Timing Test

Pressing the Circuit Breaker Curve Library test button icon will present a selection menu where the user may select either Generic or a specific Manufacturer. Pickup and Timing tests are provided for a wide variety of molded case and low voltage air frame circuit breakers. This includes time curves and time curve algorithms for different specific breakers selectable by manufacturer, model number, frame size, and curve shape (inverse, moderately inverse, etc.). In addition it also includes ANSI and IEC standards time curve algorithms located in the Manufacturer Specific pull-down menu.

3.5.1 Advanced Timing Test Setup

Press the Select Circuit Breaker Curve Library  button. The user will be presented with a menu where the user can select the type of device to be tested either manufacturer specific or generic.

3.5.1.1 Breaker Manufacturer and Curve Selection



Breaker Type:

Curve Manufacturer:

Curve Family:

Curve Model:

Curve Trip Unit:

Curve Name:



 

Figure 31 - Breaker Type and Manufacturer Curve Selection Screen

Breaker Type – There are two Breaker Types to choose from, Air Frame, and Molded Case.

Curve Manufacturer – Touch or click on the window and the user will be presented with a list of various manufacturers for which the STVI software has time curves. If a particular breaker manufacturer is not present in the listing, it means that the manufacturer is not available, or it may be a new device which has not yet been programmed into the STVI software. Check the Megger website for a possible STVI upgrade download. New STVI upgrades are available from time to time, which may include new manufacturers, or new breakers.

Curve Family – Curve Family only appears when selecting Molded Case Breakers. Touch or click in the window and the user will be presented with a list of various Family of molded case breakers from the Manufacturer for which there are time curves programmed into the STVI software. If a particular family of molded case breakers is not present in the listing, it means that the manufacturers' family of molded case breakers is not available, or it may be a new device which has not yet been programmed into the STVI software. Check the Megger website for a possible STVI upgrade download. New STVI upgrades are available from time to time, which may include new time curves families.

Curve Model - Touch or click in the window and the user will be presented with a list of various Models of either molded case, or air frame breakers from the Manufacturer for which there are time curves programmed into the STVI software. If a particular model is not present in the listing, it means that the manufacturers' model of circuit breaker is not available, or it may be a new device which has yet not been programmed into the STVI software. Check the Megger website for a possible STVI upgrade downloads. New STVI upgrades are available from time to time, which may include new models and time curves.

Curve Trip Unit / Name – Depending on the model device under test there may only be one choice available. For example, for Molded Case Breakers, the Trip unit will be Thermal Magnetic for time delay and instantaneous trip operation. Curve Name may include whether or not it is a single pole or a multi pole breaker and it's rating in amps.

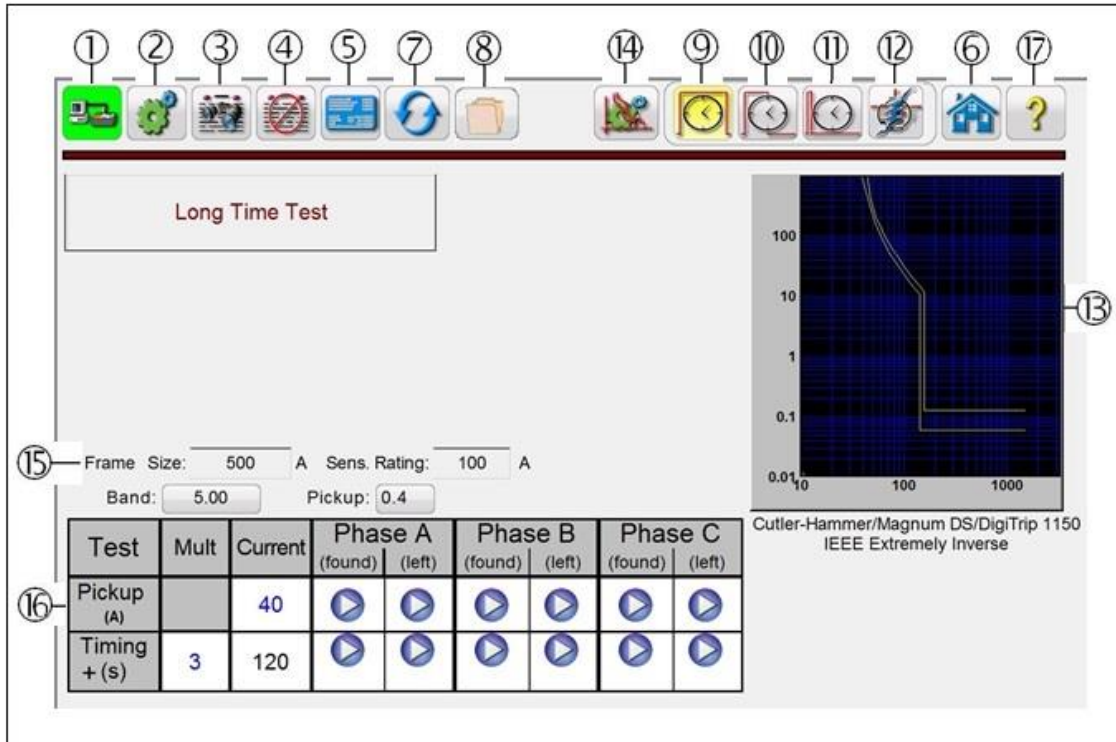


Figure 32 - Advanced Pickup and Timing Test Screen

3.5.2 Advanced Pickup and Timing Test Screen

Selection of a specific manufacturer's circuit breaker will result in a test screen looking something similar to the above test screen. Obviously curve wave shapes will vary depending on the breaker selected, and whether or not it includes Long Time, Short Time and Instantaneous curves. A description of the breaker selected and/or the curve will appear below the Time-Current curves displayed as in the example above. Different icons and input setting windows will appear or disappear depending on the breaker selected. The following descriptions are provided for each possible icon and setting window shown in the above figure.

3.5.2.1 ① PC or STVI to SPI connection button

Click on the button and the PC or the STVI will auto detect the SPI unit connected and automatically set the IP address through the Ethernet ports. If the button shows two red Xs it indicates that there is no communication to the SPI. If the background color is green it indicates that the unit is 'on-line' and ready for operation.


3.5.2.2 ② Configuration button

Press the button to go to the STVI Configuration Screen. See Section 2.3.1 Configuration for more information of the Configuration Screen.

3.5.2.3 ③ View Report button

This button will add the present test result to the report. It also displays the report and allows the user to, enter limits, comments or deficiencies. Reports can be saved to the STVI internal memory and

transferred to PowerDB via a USB memory stick. Previous tests results can be loaded and the 'Retest' option can be used to repeat the test using the same parameters as the previous test.

3.5.2.4 ④ **Clear Results button** 

Press or click on the Clear Results button to Clear Active (last test) or Clear All test results that have been added to the report.

3.5.2.5 ⑤ **Nameplate Data button** 

Press this button to go to the Nameplate Data entry screen. Here the user can input all the related data associated with the device under test. This information will appear in the Test Result Header.

3.5.2.6 ⑥ **Home button** 

Pressing the Home button takes the user back to the Start Up Screen.

3.5.2.7 ⑦ **System Reset button** 

The SPI unit is self protected against internal overcurrent in the amplifier, and thermal overloads. In the event that the unit should alarm off due to one of these situations the system must be reset before testing can continue. Press the System Reset button to reset the error sensing circuitry.

3.5.2.8 ⑧ **File Folder** 

It provides the user the ability to save tests and test results, or open saved tests or test results (see section 2.5). If using the PC version users will have the PowerDB file system to save test (job) files (see PowerDB Help).

3.5.2.9 ⑨ **Long Time Delay Test Selection button**

Press this button to perform a Long Time Delay test.

3.5.2.10 ⑩ **Short Time Delay Test Selection button**

Press this button to perform a Short Time Delay test.

3.5.2.11 ⑪ **Instantaneous Test Selection button**

Press this button to perform a Instantaneous test.

3.5.2.12 ⑫ **Ground Trip Test Selection button**

Press this button to test a ground trip element.

3.5.2.13 ⑬ **Time Curve Test Display**

When a breaker or time curve is selected the time curve characteristic will appear in this display window.

3.5.2.14 **Select Breaker Curve button**

Press this button to select a time curve. See 3.5.2 Advanced Pickup and Timing Setup for details.

3.5.2.15 **Frame Size, Sensitivity Rating, Band and Pickup windows**

Click or press the provided windows to enter the frame size, sensitivity rating, Band setting and Pickup % of the breaker under test. These values will be used in the testing and evaluation of the breaker. For example, when you change the Band setting you will note in the displayed time curve characteristic the tolerance band will move accordingly with the change.

3.5.2.16 **Pickup and Timing Test Selection windows**

Here is where the tests get executed by the user using the blue Play buttons. This is similar to the blue Play button in the manual test screen. There are two types of tests listed, Pickup and Timing. The Timing test Multiple (Mult) is automatically selected for the user depending on which breaker element is being tested. There are two play buttons for each phase, As Found, and As Left.

3.5.2.16.1 **Automated Pickup Tests**

This feature is used to do pickup tests on breakers equipped with solid-state Long Time, Short Time, Instantaneous, and Ground Fault trip devices. With a breaker curve selected, the output current will start automatically ramping when the Pickup blue play button is pressed or clicked on. For the LTD and STD pickup tests the user will be instructed to press or click on the Simulate Contact button when the appropriate breaker Pickup LED lights. The current will start at 80% of the Sensor Multiple Setting * the Sensor Rating * Pickup Value. The current will continue to ramp up based upon the Pickup Ramp Rate setting until the Simulator Button is pressed, or Max Current or Max time settings are reached. For Instantaneous and Ground Fault pickup tests the output current will Pulse Ramp based upon the Pickup Ramp Rate, Pulse On Duration, and Pulse Off Duration settings. The current will start Pulse Ramping at 80% of the Sensor Rating * Pickup Value. The output current will be the incremented value for the Pulse On duration time, before going back to the predefault state. The output will then stay at the predefault value for the Pulse Off time before progressing to the next increment level until the breaker operates, or Max Current is reached.

3.5.2.16.2 **Automated Timing Tests**

For Long Time Delay elements the default test multiple is 3 times the Sensor Rating * Sensor Multiple * Pickup. For Short Time Delay elements the default test multiple is 1.5 times the Sensor Rating * Sensor Multiple * Pickup. To change the test multiple; press or click in the Multiple Window and enter the desired value. Up to three test points can be performed and recorded. To see all three default multiples, press or click on the + symbol in the Timing Window next to the Multiplier window. The default Multiples are 3, 5, and 7.

3.5.2.17 **Help Button**

Press this button to access the built-in manual for help,

3.5.3 Manufacturer Specific Timing Test (Advanced Automated Testing)

Tests should be conducted in accordance with the manufacturer's test specifications. Following the Timing Test setup described in 3.5.2, returning to the Timing Test Screen the user will see something similar to the following figure. Based upon the breaker selected only the appropriate tests will be presented, Long Time, Short Time, Instantaneous, Ground Fault. If the breaker selected does not have a Short Time and/or Ground Fault (as in the following example) only the Long Time and Instantaneous trip curves will be presented.

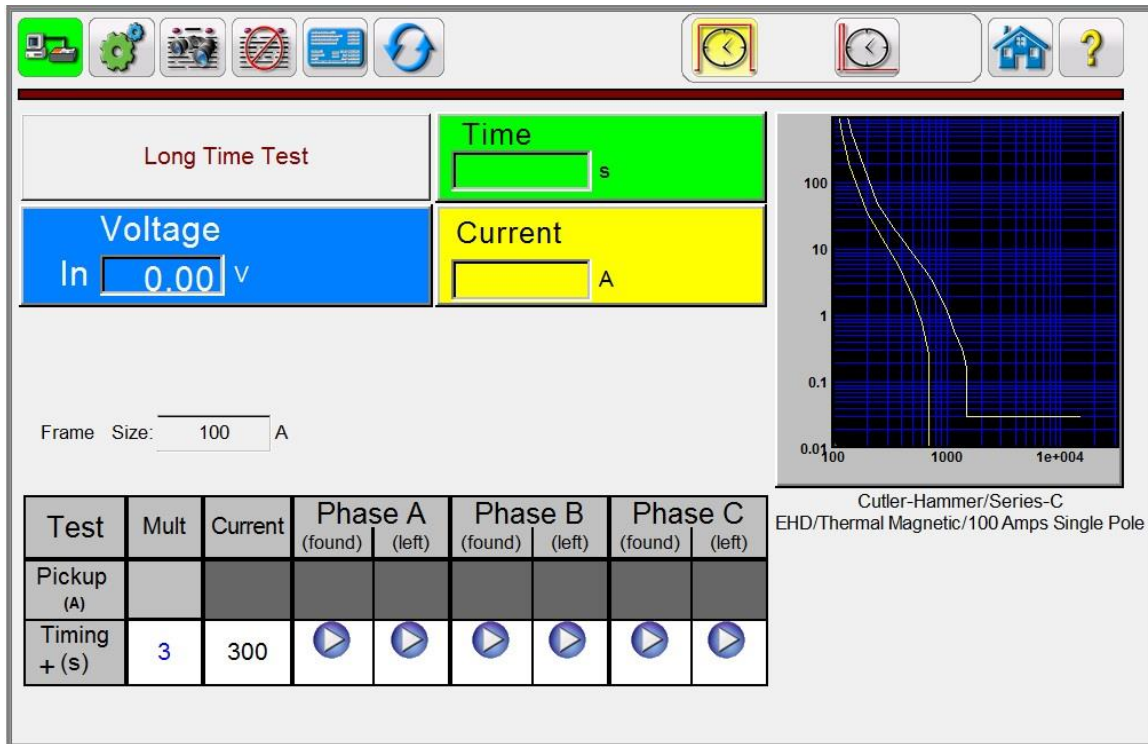





Figure 33 - Example Timing Test

(Cutler-Hammer/Series-C/EHD Molded Case Circuit Breaker)

Mult (Multiple) – This is the multiple of the Pickup or Tap value that will be applied to the device under test under test. The user is free to change the values to any desired multiple(s). The default test multiple is 3. Up to 3 test points maybe defined. To access the other two test multiples, press or click on the + symbol in the **Timing** window. The default Multiples 3, 5, and 7 will appear.


Timing Test

1. Press or click on the Advanced Test  button, and select the desired Manufacturer Specific breaker to be tested by selecting from the available curves. Enter any necessary settings as described above in section 3.5.2.

2. Connect the appropriate SPI output terminals to the breaker under test.
3. Press or click on the Blue play button. The Test Parameters screen will appear. Set the appropriate Max Current, Max Time, and Tap Verification Current. If testing a device with a set of trip contacts, connect the Binary Input terminal to sense the device under test. Press the Tmr Stop Cfg button. The default setting is Current Actuate . Select for the appropriate sensing Normally Open, Normally Closed by pressing the contact , or Voltage Applied, or Voltage Removed by pressing the  button. For more details on the Timer Stop Configuration see section 2.3.1.4. Press the green check button to return to the test screen. The test current will be applied. When the device under test trips, the Timer will stop indicating the trip time and the output current will be turned off. Two values are recorded, As Found and As Left. To rerun the test for the As Left, close the breaker and simply click in the As Left window and the test will run again.



Application Note: Sometimes the first operation of the breaker will be slower and out of tolerance if the breaker has not been operated in a number of years. Rerunning the test after the breaker has been exercised with the As Found trip may operate, As Left, within the specified time curve characteristic.

4. To View the test result, press the View Reports  button. The user can now enter appropriate information relative to the test in the Test Report header.

3.5.4 Generic Timing Test - (Advanced Manual Testing)

Tests should be conducted in accordance with the manufacturers test specifications. Because this is a Generic test, all four possible tests are available on the tool bar to select from: Long Time, Short Time, Instantaneous, and Ground Fault. With the selection of each possible test selection the Pickup and Timing test bar will change appropriately. Following the Timing Test setup described in 3.5.2, returning to the Generic Timing Test Screen the user will see something similar to the following figure (Figure 34).

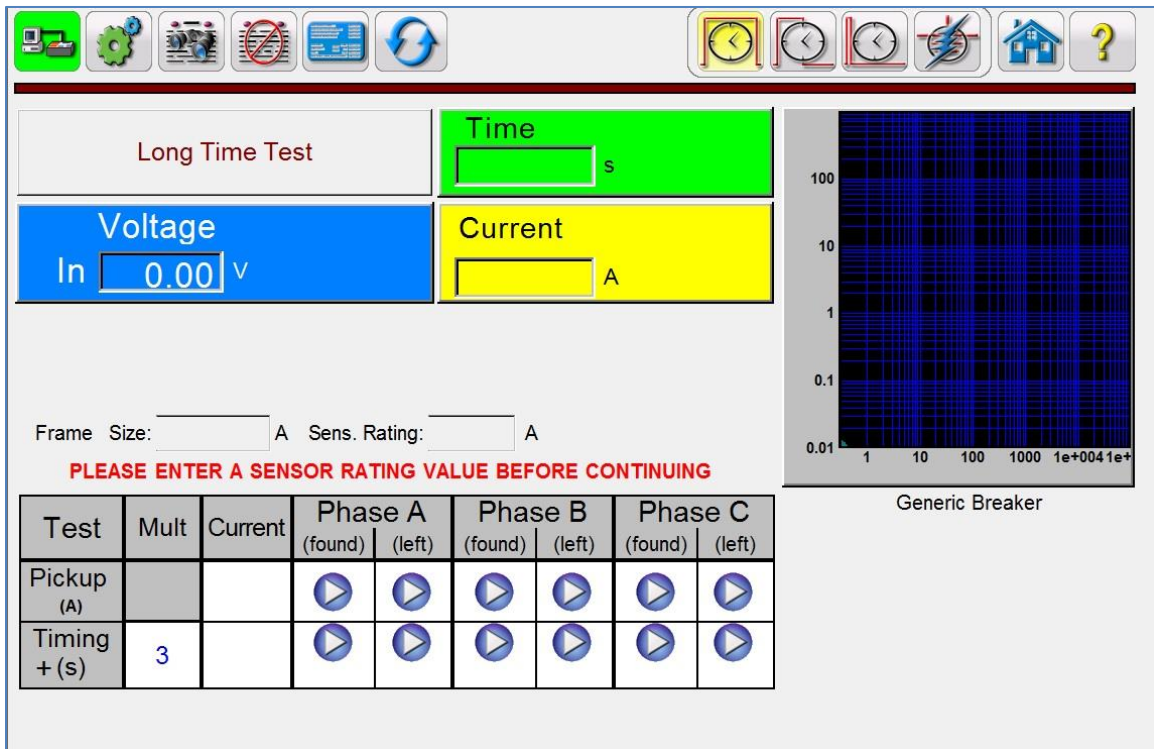






Figure 34 - Advanced Generic Pickup and Timing Test

Mult (Multiple) – This is the multiple of the Pickup or Tap value that will be applied to the device under test under test. The user is free to change the values to any desired multiple(s). The default test multiple is 3. Up to 3 test points maybe defined. To access the other two test multiples, press or click on the + symbol in the **Timing** Window. The default Multiples 3, 5, and 7 will appear.


Timing Test

1. Press or click on the Automated Timing  button, and select the Generic Breaker button. Enter the settings as described above in section 3.5.2.
2. Connect the appropriate SPI output terminals to be used for testing the breaker.
3. Press or click on the Blue play button. The Test Parameters screen will appear. Set the appropriate Max Current, Max Time, and Tap Verification Current. If testing a device with a set of

trip contacts, connect the Binary Input terminal to sense the device under test. Press the Tmr Stop Cfg button. The default setting is Current Actuate . Select for the appropriate sensing Normally Open, Normally Closed by pressing the contact , or Voltage Applied, or Voltage Removed by pressing the  button. For more details on the Timer Stop Configuration see section 2.3.1.3. Press the green check button to return to the test screen. The test current will be applied. When the device under test trips, the Timer will stop indicating the trip time and the output current will be turned off. Two values are recorded, As Found and As Left. To rerun the test for the As Left, close the breaker and simply click in the As Left window and the test will run again.



Application Note: Sometimes the first operation of the breaker will be slower and out of tolerance if the breaker has not been operated in a number of years. Rerunning the test after the breaker has been exercised with the As Found trip may operate, As Left, within the specified time curve characteristic.

4. To View the test result, press the View Reports  button. The user can now enter appropriate information relative to the test in the Test Report header.

4.0 Warranty Statement

Megger warrants the product is free of defects in material and workmanship for a period of one (1) year from date of shipment. This warranty is non-transferable. This warranty is limited and shall not apply to equipment that has damage, or cause of defect, due to accident, negligence, and improper operation, faulty installation by the purchaser, or improper service or repair by any person, company or corporation not authorized by Megger. Megger will, at its' option, either repair or replace those parts and/or materials it deems to be defective.

The warranty is in lieu of all other warranties, either expressed or implied on the part of Megger and in no event shall Megger be liable for the consequential damages due to the breach thereof.

5.0 Service Data

5.1 Preventive Maintenance

The unit utilizes surface mount technology (SMT) and other components which require little or no service except for routine cleaning, etc. The unit should be serviced in a clean atmosphere away from energized electrical circuits.

5.1.1 Examine the unit every six months for:

Dust and Dirt	To clean the unit, never use spray liquids or industrial cleaners. Some cleaning solvents can damage electrical components, and should never be used. Use a lightly damp cloth (not dripping wet) to wipe off the unit. Remove dust with dry, low pressure, compressed air.
Moisture	Remove moisture as much as possible by putting the test set in a warm, dry environment.

5.1.2 Upgrading STVI Software

Upgrade via Megger Website

To download the newest STVI software from the Megger website:

1. Obtain the serial number of your unit – this will be needed to obtain the latest software.
2. Go to WWW.Megger.com
3. **Log In.** You will need to register before you can log in to the Megger site.
4. Go to **Software Downloads**
5. Click on **STVI**
6. You will see instructions to enter the serial number of the STVI unit and then click on “Submit”. The serial number is 12 digits long. Make sure you enter all 12 digits. There will be two versions of the software. One is for your PC and one is for the STVI. For the STVI unit select the “**STVI XX.X Onboard Install**” link. The software will be downloaded onto your PC as a zip file. Unzip the file to your pc. Then carefully **Select All** the files and folders that were unzipped and **Copy** them to the root directory of a USB memory stick. Note that the update will not work correctly if all the files/folders are not in the proper location on the USB memory stick.

Upgrade via Compact Disk

Where internet access may not be available or blocked on your computer, Megger can provide a CD with the latest version of software on it. Contact your local Megger representative to order a copy of the firmware.

How To Download STVI Software into STVI

USB Memory Stick: With the STVI powered up, insert the USB memory stick into the USB port on top of the STVI. If the Windows “Removable Disk (E)” Explorer screen appears, press the Cancel button, and then go to the STVI Configuration Screen and press the Update Firmware button. Press the “**STVI**” button. A window will appear stating that there is a software upgrade available and will ask if you want to execute the upgrade. Press Yes and the unit will automatically upgrade the software. When complete, power down the STVI by disconnecting the Ethernet cable. Wait about 5 to 10 seconds and reconnect the cable. Observe the STVI display screen. When the basic test screen appears, press the Configuration button, then press the Display Versions button and verify that the update was successful by checking the version of the software.

5.2 Updating SPI225 Firmware

Download Firmware Upgrade via Megger Website

To download the newest firmware from the Megger website,

1. Go to WWW.Megger.com
2. **Log In.** You will need to register before you can log in to the Megger site.
3. Go to **Software Downloads**
4. Click on **SPI225**
5. Click on the version of firmware displayed, i.e. **Firmware 1.XXXX**

The firmware will be downloaded onto the user’s PC as a zip file. Extract (unzip) the file to a temporary folder.

Firmware Upgrade via STVI USB Port


Download the firmware to your PC from the Megger website as outlined above. Unzip the file, and copy the *.ldr file. Create a directory on the root of the USB memory stick named “**Megger\Update**” and paste the downloaded *.ldr file into the “Update” folder. Connect the STVI to the SPI225 unit via the Ethernet cable, and power up the test system. Then insert the USB stick into the USB port on the top of the STVI. To perform the upgrade, access the STVI **Configuration Screen** and press the **Update Firmware** button. Then select “**SPI**” from the Update Firmware dialog. At this point the user will be presented with the IP Address selection screen with the serial number of the unit shown. Select the unit by touching the serial number and the upgrade process will automatically start. That’s all there is to it. Observe the STVI display screen and the unit. At the completion of the update process there will be an instruction to reboot (turn off and back on) the test system.

PC and STVI Software: If using the PC version of the STVI software, it is very similar to the STVI. Upon clicking on the Update Firmware button, the familiar Windows *Open File* browser dialog box will appear. Using the *Look In* pull-down menu, navigate to where the new firmware was downloaded onto the PC, click on the file SPI_Firmware__X.XXX.ldr (SPI Loader). You will be requested to select a unit from the IP Address screen. Select the unit by clicking on the serial number and the upgrade process will automatically start. At the completion of the download, there will be an instruction to reboot (turn off and back on) the test system. Note that after rebooting the SPI unit, if using the PC version of the STVI software you will have to restart the STVI software on your PC in order to regain control of the SPI unit

5.3 Service and Repair Instructions


Basic troubleshooting information has been provided to guide the technician to the possible source of a problem.

Since the STVI uses Surface Mount Technology, repairs of the individual printed circuit boards are beyond the scope of the basic troubleshooting guide, and should be referred to the Service Department at Megger or handled through the Megger Representative.

 If the unit is still within the original warranty period, or limited warranty period following factory servicing, **the factory must be contacted before attempting any repairs or the warranty will be void.**

5.3.1 Basic Troubleshooting


The troubleshooting information relies on the technician to have a good understanding of the operation of the unit. The technician should contact the factory should they have any questions regarding the operation of the unit. Provide the Megger the serial number of the STVI when making inquiries.

 **WARNING** It is necessary to energize the SPI to properly troubleshoot the STVI. The technician must take all applicable safety precautions for working with the possible energized outputs of the SPI.

NOTES

Before suspecting a failure in the STVI review the Description of Controls and Theory of Operation sections to ensure that the problem is not a result of operating error.

Common causes of malfunctions, other than improper operation, are bad Ethernet cable or cable connectors, or incorrect power input (voltage above or below specified limits).

 **NOTE:** Under no circumstance should the technician take the STVI apart without following proper ESD protection and handling procedures. Failure to do so, will damage sensitive parts.

5.3.1.1 Power Input

Input voltage affects the whole unit, including the 48 Volts DC to the STVI from the PoE port, and may or may not cause permanent damage if voltage is incorrect. These problems can often be corrected by simply using a better source of input power. See unit front panel for input voltage rating.

Some symptoms are as follows:


1. Low voltage: Erratic operation, no display, or a dim display.
2. High voltage: Circuit breaker operation on SPI unit, power supply failure.
 - a. For SPI1 and MPRT 8430 units, the STVI uses the PoE power supply. It has an LED that lights up under normal operation. If not lit, then the PoE power supply has failed and needs to be replaced, PN: 90001-736.

- b. For SPI, the internal power supply needs to be repaired or replaced, contact the factory for further instructions.

5.3.1.2 Ethernet Cable


Basic troubleshooting of the Ethernet communication cable as follows,

1. No power - Check power source and line cord. If the SPI powers up, but the STVI display does light up, check the cable and cable connectors. Typical problem is usually a broken conductor or cracked cable connector. Replace cable to see if this resolves issue.
2. Erratic Manual Control / Missing Channels on STVI Display
 - a. Communication cable is not properly connected, thus cannot receive proper commands.
 - b. Internal problem with communications inside the SPI, see SPI in Addendum A. Communication cables inside the SPI unit may require reseating.

 Contact the factory for a Repair Authorization Number and return instructions if service is required. A Repair Authorization (RA) number will be assigned for proper handling of the unit when it arrives at the factory. Any non-warranty repair cost incurred for the repair or replacement of parts and/or materials shall be the responsibility of the purchaser.


Provide the factory with model number, Unit serial number, nature of the problem or service required, return address, your name, and how to contact you should the factory need to discuss the service request. You may need to provide a purchase order number, cost limit, billing, and return shipping instructions. If an estimate is requested, provide the name and contact information.

6.0 Preparation for Reshipment

 Save the original shipping container for future use. The shipping container is designed to withstand the rigors of shipping via a common commercial carrier.

Pack the equipment appropriately to prevent damage during shipment. If a reusable container is utilized, the unit will be returned in the same shipping container if it is in suitable condition.

Add the Return Authorization Number to the address label of the shipping container for proper identification and quicker handling.

 NOTE: Ship the equipment without nonessential items such as test leads, etc. These items are not needed by the factory to perform service.