

Megger[®]

SMRT series relay test sets



The SMRT solution

SMRT Relay Test Sets, because one size does NOT fit all.

Whether you are an Electric Utility (Generation, Transmission and/or Distribution), Relay Manufacturer or Service Provider, Megger has a **SMRT Solution** for you. We have taken a customized approach to design that ensures our new and existing relay test sets will meet your every need, regardless of the application.

We deliver solutions that helps you work smarter.

Assurance

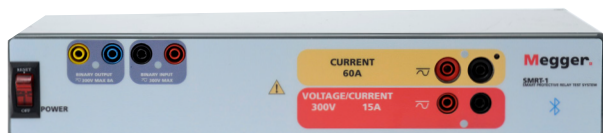
- **Megger stands behind** its relay products with a warranty that is twice the industry standard – that's reassurance you can trust
- **Quality** from product design concept to production
- **Power** where you (still) need it most

Ease of Use

- **Intuitive** yet powerful software is simple enough for the new technician yet comprehensive enough for the most experienced tester
- **Error indication and connection** diagrams provide audible and visual indicators form improved accuracy

Convenience

- **Portability** – Easy to lift and carry, even to the most remote corner on the highest floor in your generating plant or on that flight with you to your next customer site
- **Flexibility** – Combine multiple test sets to increase total number of channels, while controlling from a tablet, STVI or PC



SMRT1



SMRT33



SMRT36



SMRT410



Core features

Powerful

- PowerV™ technology guarantees a flat power curve from 30 to 150 V. This gives you high current output at the low end of the voltage spectrum.
- Constant Power Output (200 VA) of the current amplifiers from 4 A to 30 A providing a high compliance voltage of up to 50 Vrms.
- High Output Current which provides upwards of 300 VA for testing instantaneous elements.

Accurate

- Metered outputs provide extremely high accuracy needed for testing a wide variety of devices.
- All outputs are isolated to provide protection from sudden changes in line voltage, frequency and load impedance.

Reliable

- Voltage outputs are protected from short circuits, current outputs are protected against open circuits and both are thermally protected against prolonged overloads.
- Wide operating temperature range from 32 to 122° F (0 to 50° C) and fully functional after storage temperature from -40 to 158° F (-40 to 70° C).

Quality is in the DNA of the SMRT Family



Megger uses internationally recognized quality design practices for every single component that goes into a SMRT unit. Our stringent circuit board design practices ensure all proper trace clearances are maintained for both voltage and noise reduction. Each individual component is painstakingly selected to ensure that their tolerances will result in the complete system's desired accuracy and repeatability.

High Resolution and Accuracy

- Metered outputs provide extremely high accuracy needed for testing a wide variety of devices
- Eliminates uncertainty with setting values - with metered values, what you see is what you get

High Output Current

- Upwards of 30 Amps at 200 VA per phase continuous for timing tests
- Upwards of 60 Amps at 300 VA for testing instantaneous overcurrent relays

Convertible Voltage Channel

- A main current channel provides the second current source for testing single phase current differential relays, including harmonic restraint for transformer differential relays (Excludes SMRT33)
- Parallel with main current channel to increase output current to 35 Amps continuous, and up to 75 Amps instantaneous per phase
- Convertible voltage channels for applications that require more current channels

Steady-State, Dynamic and transient testing capability

- Programmable waveforms with harmonics
- DFR playback



Core features

Digital binary input and output

- Boolean logic programmable for complex power system simulations
- Binary outputs provide programmable normally closed or normally open contacts to simulate circuit breaker operation for testing reclosing relays

Error indication

- Audible and visual alarms indicate when amplitude or waveforms of the outputs are in error due to short circuit, open circuit or thermal overload

Communication

- Network interface for IEC 61850 test capabilities (KEMA certified to publish and subscribe to GOOSE messages)
- Interconnectivity of STVI with all of the SMRT relay test sets and capability of connecting multiple units together (daisy chaining) to increase total available channels and output

Software

Megger protective relay testing software is designed to manage all aspects of protective relay testing and to facilitate compliance with NERC reliability standards.

The New SMRT XXX

Megger has combined the best aspects of our AVTS and STVI applications to create a powerful and easy to use protective relay testing software: The New SMRT XXX. See page XX for a full description of this robust and dynamic tool.

Advanced Visual Test Software (AVTS):

AVTS gives you automatic and manual control of all Megger SMRT relay test sets – AVTS is a Microsoft® Windows® XP®/Vista®/7 software program designed to manage all aspects of protective relay testing. AVTS is available in three versions: Basic, Advanced and Professional.

Basic includes Online Vector, Ramp and Click-On-Fault controls with the ability to import, save and execute test modules.

Advanced includes the Test Editor, Dynamic Control, SS1 Converter, End-to-End test macros and basic programming tools for creating and editing test modules.

Professional includes all of the features of the Basic and Advanced versions plus DFR Waveform Viewer, One-Touch Test, Modbus, and Waveform Digitizer.

STVI Application:

The Smart Touch View Interface™ (STVI) is Megger's handheld controller for our SMRT relay test sets. The STVI simplifies manual testing of complex relays through its graphical interface, intuitive menu and touch screen buttons which provide visual and tactile assurance for your testing requirements.

Compatible vendor software:

Enoserv RTS

LabView

Assurance by Design



A design that is hard to build will lead to inconsistent quality. Everything in our SMRT Units - from the internal PCB to the individual modules - is designed with manufacturability in mind. The units are designed to keep up with you in the field and can withstand mechanical stress in accordance with international standards for vibration, transit drop, free fall and topple shocks. Internal sensors allow autonomous temperature monitoring and control, ensuring worry-free operation in all climates and conditions.



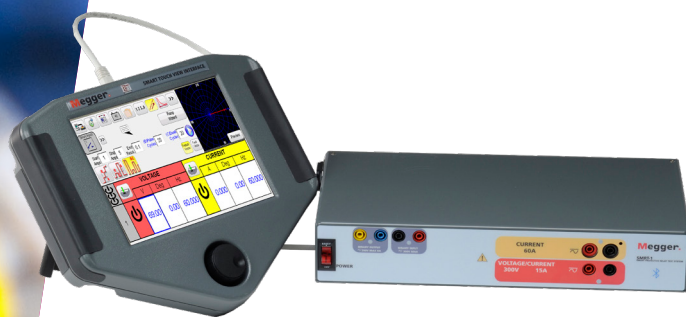


SMRT1

Single-Phase Test Set

For your single-phase testing applications, the **Megger SMRT1 Relay Test Set** is the best and most powerful testing device on the market. It is designed to operate in the field, yet with its high power output and accuracy it is an excellent tool for lab use as well. The SMRT1 can test all single-phase relays, and for applications that require three-phase capabilities simply parallel it with multiple SMRT1 test sets. This versatile feature gives you the ability to use the SMRT1 by itself or in conjunction with other Megger SMRT relay test sets to test more complex relay schemes like three-phase directional power, distance, loss of excitation, and/or multiple current channel applications.

The SMRT1 is our ultraportable, single-phase relay testing solution. Weighing just under 9 lbs, it is the smallest and lightest unit in the SMRT Family and in the market. It is highly versatile and ruggedly built for field testing and rack mountable for lab tests. Pound for pound, the SMRT1 provides the highest regulated test current on the market.



Connect 3 SMRT1 units for 3-phase testing: 3 x 300 V @ 150 VA plus 3 x 60 A @ 300 VA, yet they still weigh less than 30 pounds.

Transit Bag

ISO Certified Manufacturing



All SMRT units are manufactured in-house to our exacting quality standards. Megger is ISO9001 certified, with strict supply chain standards that include annual on-site inspections and audits of our key suppliers.

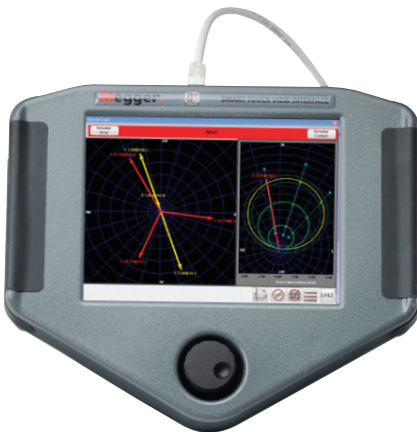
SMRT33

Basic Three-Phase Test Set

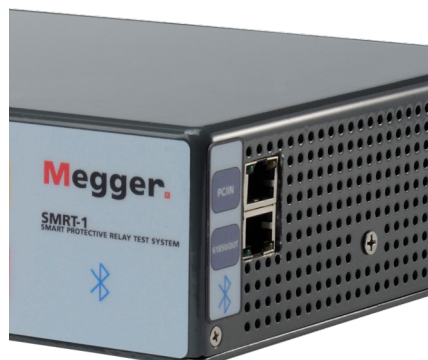
The **SMRT33** is our entry-level, three-phase relay test set. It is designed for users that require three-phase capability but with lower instantaneous current output and fixed voltage channels.

It is the most compact in its class while still providing very high output for its size and weight.

The SMRT33 provides high power in both the voltage and current channels to test virtually any type of protective relay used in heavy industrial, distributed generation and low to medium voltage distribution substations. With its high compliance voltage and current, the SMRT33 can test electromechanical, solid-state and microprocessor-based overcurrent relays, including high impedance directional ground overcurrent. In addition to this functionality, the unit includes the capability to test IEC 61850 devices.



Fully automated and manual testing with the dedicated SmartTouch View Interface, or with any Microsoft Windows™ PC.



Bluetooth™ enabled for wireless control and data transfer



Soft Case

PCB and Component Testing



While most manufacturers outsource PCB production, we start from raw PCBs. The PCBs pass through a state-of-the-art Automatic Optical Inspection (AOI) to detect any missing or incorrect components. Electrical and functional tests are then performed to ensure all components are free from defects.

SMRT36

Advanced Three-Phase Test Set

The **SMRT36** is our best-selling three-phase relay test set. It can be configured with up to 3 Voltage-Current modules to test virtually all types of protective relays used in heavy industrial, distribution and transmission substations as well as generation facilities.

The SMRT36 is the smallest, most powerful three-phase relay test set on the market. This versatile test set may be customized by adding any number of Voltage-Current, or "VIGEN", modules needed for specific test applications. For electric utility use, the SMRT36 with three VIGEN Modules provides complete three-phase testing of three-phase impedance, directional power, negative sequence overcurrent and other devices that require a three-phase four-wire connected source. With three modules, output current and VA is tripled for high instantaneous or high burden overcurrent relays. The voltage channels are convertible to provide up to 6 current channels.



Transit case



Binary Input/Output



Daisy chain multiple units for even more testing capability.

Individual Module Testing



Each completed PCB is placed into its respective module – power supply, voltage/current generators, etc., and each module is then individually tested and verified to work prior to installation into a SMRT unit.

Full System Testing



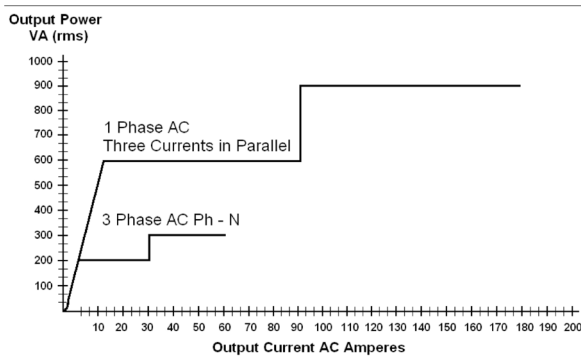
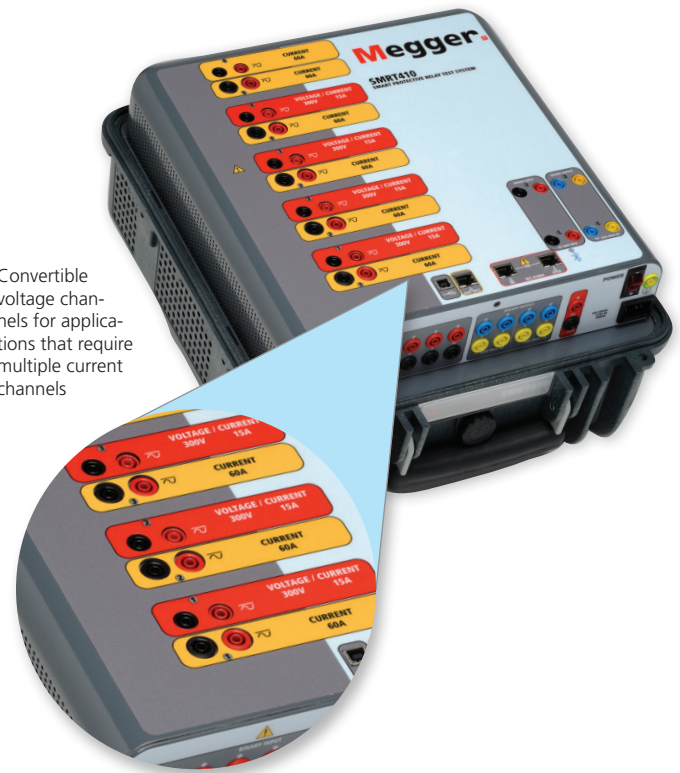
Each completed SMRT unit undergoes a full systems test, with every input and output tested to their full operating range and limits. The unit is then stress tested in a thermal chamber, where the temperature is cycled to thermal extremes. Next, we conduct safety, shock, vibration, transit drop, free fall and topple tests to both IEC and ISTA standards.

SMRT410

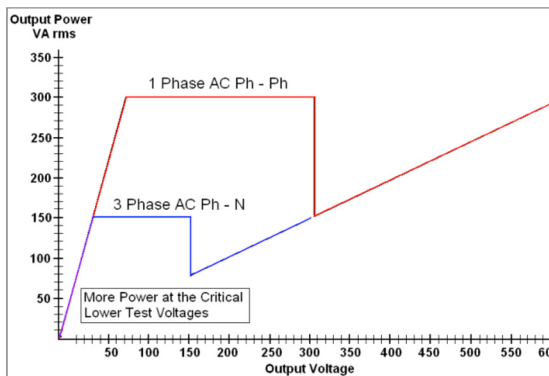
Advanced Multi-Phase Test Set

The **SMRT410** is our premier relay test set. The SMRT410 test set has high compliance voltage and current to test all electromechanical, solid-state and microprocessor-based overcurrent relays, including voltage controlled, voltage restraint and high impedance directional ground overcurrent.

With 4 voltage channels and 6 high current channels, the SMRT410 meets every testing need. It can be configured with up to 4 Voltage-Current modules, with a 5th slot to accommodate a double-current module or a single-voltage channel - the convertible voltage channels provide up to 9 currents to handle the most difficult of testing needs.



High compliance voltage of 50 V @ 4 A provide a constant power output of up to 30 A @ 200 VA rms



PowerV™ technology guarantees a flat curve from 30 to 150 V, eliminating range switching

SMRT36D

Three phase test set



The “D” in SMRT36D and SMRT410D indicates these units include an integrated Smart Touch View Interface (STVI) providing stand-alone testing capabilities (no PC required)

The easy to use touchscreen provides varying levels of manual to completely automatic control of the test sets

The USB port provides easy and safe access to test results for data retention and reporting

Megger’s new SMRT36D and SMRT410D protective relay test sets are ideally suited for testing today’s modern relays and legacy electromechanical relays, yet designed to meet the future challenges associated with testing the new generation multi-phase smart grid relays. With their powerful testing capability and comprehensive relay management which facilitates compliance reporting, the “D” series offers the complete package for your testing needs.

SMRT410D

Multi-phase test set



Many test sets are designed to be controlled by a PC; however, with more stringent security regulations from a compliance and IT perspective, having a built-in screen is not just a convenience anymore. It is becoming essential in some sectors for the test set to operate as a self-contained unit which removes the need to obtain rights and permissions from your IT department.

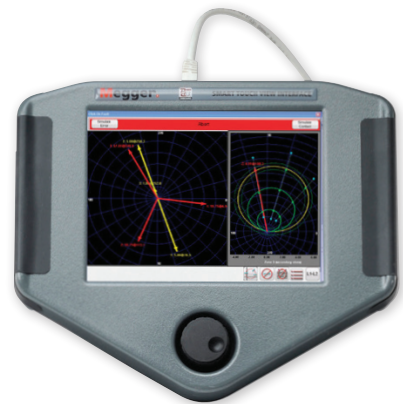
The SMRT "D" Series solves this issue.

Improved low current accuracy at currents below 100 mA

New convertible voltage channels (15 Amps at 120 VA)

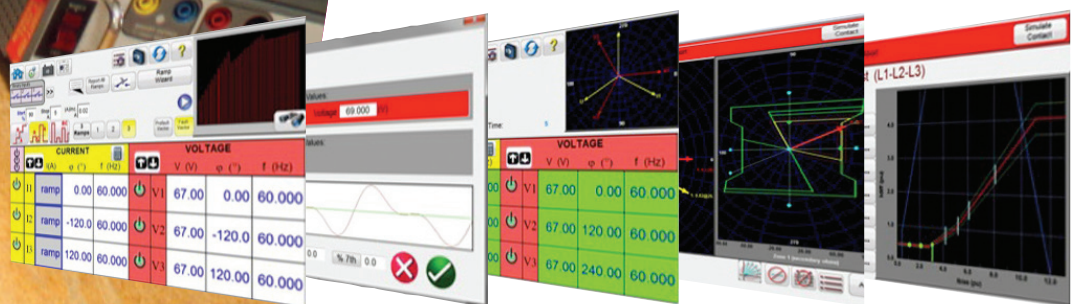
Battery Simulator comes standard

Maximum power output of 100 W (for those relays with dual power supplies)



... Software Preview

The AVTS and STVI software you know and rely on have been combined into a more powerful software package called SMRT XXX. SMRT XXX is the new common software platform for all SMRT test sets, allowing you to operate the hardware from a PC, the STVI handheld controller, or the integrated displays on the new SMRT36D and SMRT410D. Together, SMRT XXX and PowerDB is your complete relay testing solution, from running complex automated test plans to relay management and compliance reporting.



RMS software distinctive features

Default Start-up Vector Screen

- General purpose test screen for setting voltage and current sources
- Built-in Fault Calculator for fast and easy settings of output values
- Color indicates which outputs are selected and on

Automatic Ramping Modes

- Step Ramp, Pulse Ramp, and Pulse Ramp Binary Search Capabilities to
- Automatically Determine Pickup and Dropout of relays
- Ramp Wizard available to perform various types of tests
- Pulse Ramp Binary Search define unknown operating characteristics

Fault Calculator

- Select Type of Fault (Phase to Ground, Phase to Phase, etc.)
- Select the Fault Mode (Overcurrent, Voltage, Impedance Symmetrical)
- Create and view harmonic waveforms
- Impedance and Symmetrical Modes will automatically calculate all phase amplitudes and phase angles, and enter them into the manual test screen

Automatic Timing Tests on Overcurrent, Voltage and Frequency Relays

- Hundreds of built-in Time Curves and time curve algorithms from 21 different relay manufactures, as well as ANSI, IEC, and IEEE Standards
- Graphical display draws actual time curves (electromechanical) or time curve algorithms (microprocessor based relays, or Standards)
- RMS Software automatically evaluates test results to the manufacturers time curve and user defined Pass/Fail tolerance
- Perform up to 8 test points on the curve

Creates Test Reports

- Save/View/Print test results from Power DB Database
- Software automatically compares the Operating Time to the theoretical and make a Pass/Fail determination based upon the manufacturers time curve characteristic
 - Pass shows a green dot
 - Fail shows a red dot

Click-On-Fault Impedance Relay Test Screen Provides Dual Graphics

- Right side graphic window displays relay operating characteristic
- Moving Vector shows impedance and angle as it moves in real time down the user defined ramp line
- Left side graphic displays actual test vector values of voltage and current
- Phase values of amplitudes and angles are displayed in real time
- Or, user may select to view positive, negative and zero sequence components in real time

Sequencer (Dynamic) Testing Capability

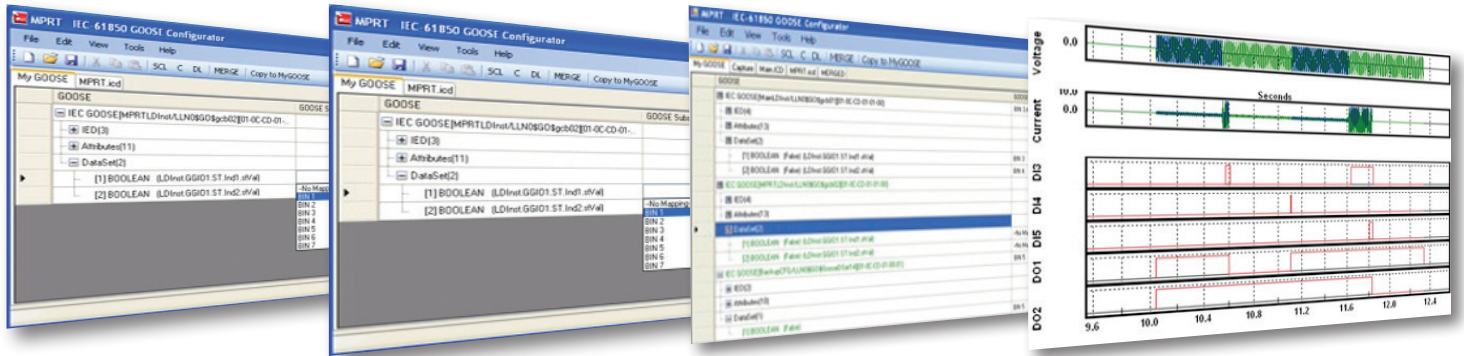
- Provides automatic multi-state dynamic testing, up to 15 states, including lockout
- Can perform End-to-End Tests using IIRIG-B input
- Graphical binary input and output setup

Differential Relay Test Includes:

- (4) Four Slope Characteristic Models to choose from
 - Line Segments (Example: G.E. SR745)
 - Slope Through Origin (Examples: SEL387, SEL587)
 - Slope From X Axis (Example: Siemens 7UT613)
 - Slope From Base Point (Examples: ABB RET 670 and Areva/Schneider P63X)
- (7) Seven IBias Equations to choose from
 - Touchscreen to input test points
 - Real-time test displays test results including Pass/Fail evaluation

Megger GOOSE Configurator with Integrated IEC61850 Testing

The Megger GOOSE Configurator provides easy to use tools for testing relays and substations using the IEC 61850 protocol. The configurator allows relay test engineers and technicians to import parameters from configuration files in the SCL format and use it to configure the SMRT test sets to subscribe to preselected GOOSE messages by assigning the data attributes from received GOOSE messages to the appropriate binary inputs. This provides both manual and automatic testing of the relay using SMRT RMS.



- Use the “C” Capture tab to “sniff” the network and capture GOOSE messages from IEDs
- Use MERGE Feature to compare captured GOOSE messages with the SCL file
- Captured and verified GOOSE messages can then be copied to “My GOOSE”
- GOOSE “Subscriptions” are assigned to Binary Inputs using the pull-down window
- GOOSE “Publications” are assigned to Binary Outputs using the pull-down window

Once all the selected IEDs are in My GOOSE the appropriate GOOSE message indicators are assigned to Binary Inputs for monitoring by the test set unit.

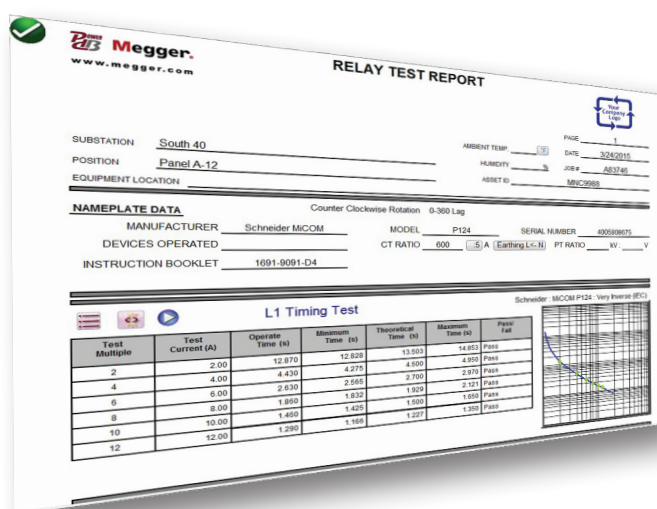
The Subscriptions and Publications are then downloaded into the test set ready to test.

Tests were conducted using GE UR D60 and SEL 421 relays to simulate a breaker failure scenario, where the Megger test set provides the trip currents to both relays and simulates the circuit breakers associated with each relay.

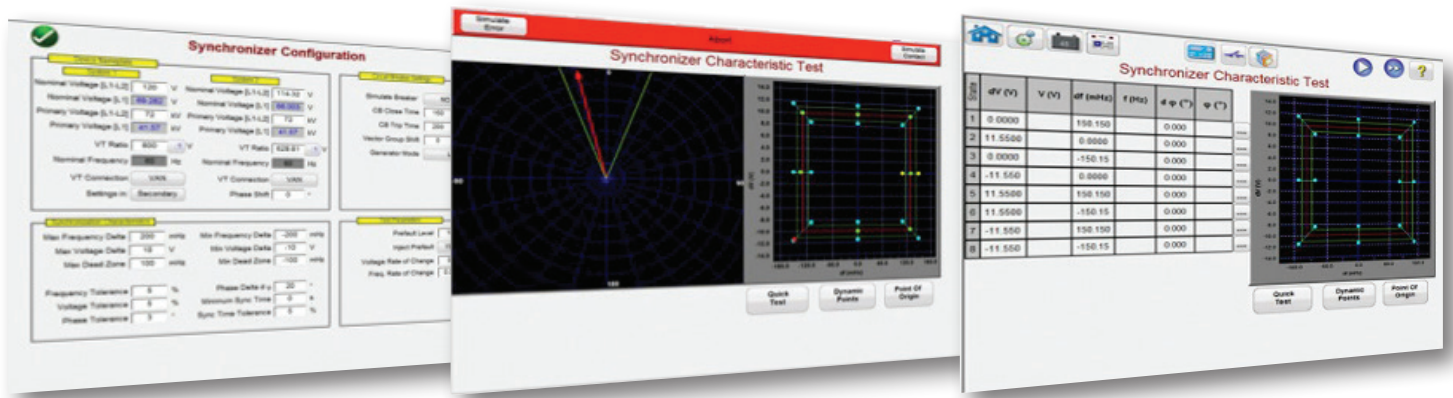
Reporting

Megger SMRT Software provides powerful reporting capabilities which gives you clearer visibility for relay management and provides a customizable relay test report which can be saved for internal use and compliance reporting or used to execute repeated testing. In addition to showing the location of the relays in the system, the user can also look at the historical test records of all relays. This includes relay settings and recorded test results.

The test report is fully customizable – add your logo to our default template, or completely change it to match your company’s existing reporting standard and format. This makes it easy to generate your custom reports to comply with all current and future reporting requirements as specified by the NERC PRC-005-2 standard. The report can be printed immediately or exported to other common digital file formats such as Microsoft™ Word or Adobe™ PDF.



NEW Enhanced SMRT xxx Features



Synchronizing Relay Test Feature

- Synchronizer Configuration Screen
 - Inputs for System 1 and 2
 - Inputs for Voltage and Frequency Deltas
 - Closing and Trip times of the Circuit Breaker for breaker simulation
 - Inputs for Rate of Change of the Voltage and Frequency changes

Synchronizer Relay Characteristic Test Options

- Provides quick and easy testing of synchronizer relays
- Four test options available;
 - Quick Test, where the software draws 4 test lines with two Delta Voltage, two Delta Frequency
 - Dynamic Test, where software will automatically draw eight test lines, with two Delta Voltage, two Delta Frequency, and four Dynamic test lines where both Frequency and Voltage are run in Delta
 - Point of Origin Test, similar to the Dynamic but includes origin as a test point
 - Uses draws their own test lines

Synchronizer Relay Quick Test Screen

- Software will automatically draw 4 test lines with two Delta Voltage lines and two Delta Frequency lines
- Provides quick and easy testing of synchronizer relays

Synchronizer Relay Real-Time Test Screen Provides Dual Graphics

- Right side graphic window displays relay operating characteristic
 - Test point moves in real time down the defined ramp line
 - Successful test results are shown with a green dot inside the user defined tolerance band
 - Failed test points show as red X outside of tolerance band
- Left side graphic the user can observe the synchro scope as the test voltage rotates



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SMRT_BR_en_V01

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