Megger

SMRT series relay test sets



EN
ENGLISH

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 the SMRT to ensure 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 for 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



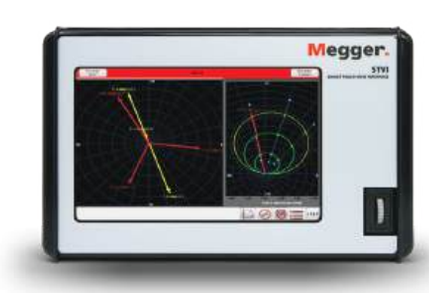
SMRT1 and 1D



SMRT46 and 46D



SMRT410 and 410D



STVI-10



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 32 A providing a high compliance voltage of up to 50 V RMS.
- 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).

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

- Up to 32 A at 200 VA per phase continuous for timing tests
- Up to 60 A at 319 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
- Parallel with main current channel to increase output current to 37 A continuous, and up to 75 A 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

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.



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

- The SMRT unit is certified by KEMA as being compliant with the IEC61850 protocol and being compliant with IEC61850-9-2LE guidelines to publish and subscribe to GOOSE messages and is user configurable to provide Sampled Values for testing or commissioning devices which require Sampled Values.
- 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



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.

Software

Relay Test Management Software (RTMS) is a Microsoft® Windows® compatible software program designed to manage all aspects of protective relay testing using the Megger SMRT family of units, using a PC or a STVI (Smart Touch View Interface).

Every SMRT unit is supplied with RTMS for installing on a PC. RTMS does not require a security dongle or license to operate, and can be loaded on as many customer owned PC's as required.

Relay Test Management Software (RTMS)

RTMS has two different levels, Standard and Enhanced. The Standard level includes the manual test screen, semi-automatic and automatic tests for Simple and Advanced Ramping, Pickup and Timing of Over Current, Under Voltage and Over Voltage relays, Directional Over Current, Sequence tests for Re-closing and Transient Earth Fault simulation, Impedance (both generic and relay specific from various manufacturer's), Three-phase and single-phase Current Differential, IEC61850 GOOSE and IEC61850 9-2LE Sampled Values and other special test applications such as the Fault Calculator, Harmonics Generator, Symmetrical Components, Simplified Power Swing, and much more. RTMS Template Manager has over 400 relay specific templates for full automated testing from different relay manufacturers.

The Enhanced level is hardware enabled when connected to a test set, which has the RTMS Enhanced feature enabled; see the SMRT Ordering Information for details. Enhanced includes tests for Synchronizer, Under / Over, and df/dt (ROCOF) Frequency relay Pick-up and Timing Tests, IEEE/IEC COMTRADE Transient Waveform playback, Enhanced Power Swing/Out of Step Simulator, SSI File Converter and playback.

STVI

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. Fully automated tests can be run from the STVI and no need for a PC.

Compatible vendor software

Enoserv RTS

LabView



SMRT1 and 1D

Single phase relay test sets

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 daisy chain 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.





ISO Certified Manufacturing

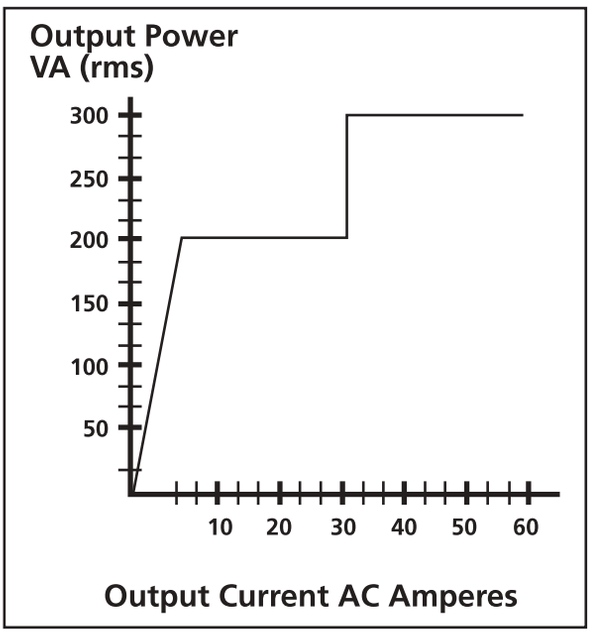
The Megger SMRT family of products are manufactured in our facility located in Dallas, Texas USA. This facility is registered to the ISO 9001:2015 standards requirements. Our Metrology and Repair services are compliant with 10CFR50 Appendix B and part 21 requirements. These standards also have requirements to periodically audit our suppliers as well as conducting on-site audits of our key suppliers.

SMRT1 and 1D

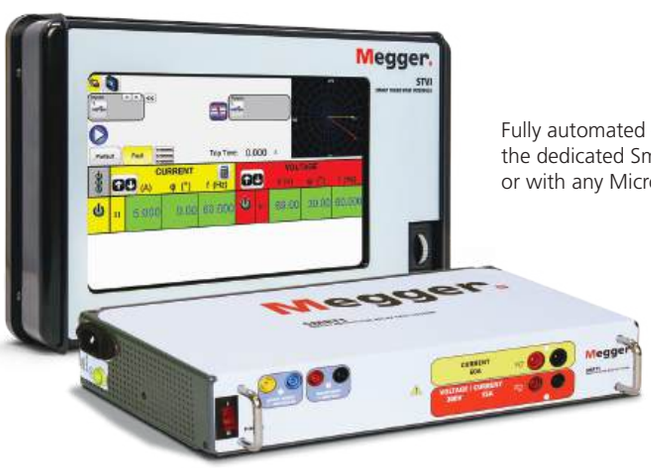
Single phase relay test sets

As a standalone unit the SMRT1 and 1D has the "smart" combination of high compliance voltage and high current to test electromechanical, solid-state, and microprocessor-based over-current relays.

The SMRT1 test system can be manually controlled with Megger's STVI and the SMRT1D with the Integrated on-board display. The STVI, with its large, full color, high resolution, TFT LCD touch screen and the SMRT1D, with its integrated bright LCD touch screen display allows the user to perform manual, steady-state, and dynamic testing quickly and easily using the manual test screen, as well as using built-in pre-set test routines for most popular relays.



Current amplifier output power curve



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



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.

SMRT46
Advanced three-phase test set



The **SMRT46** 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 SMRT46 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 SMRT46 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



Daisy chain multiple units for even more testing capability



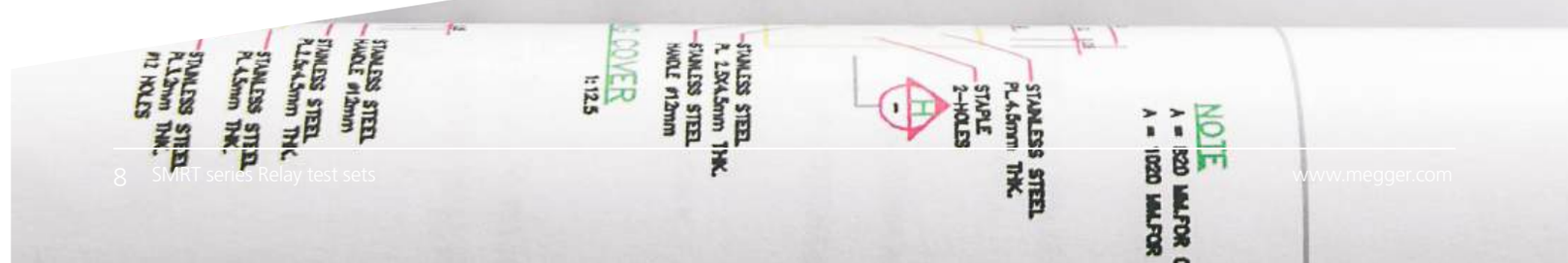
Binary Input/Output

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

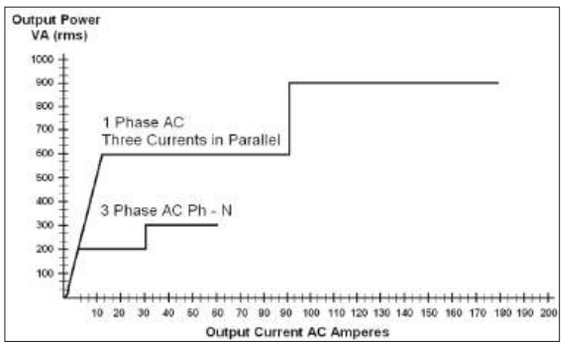
Each completed SMRT unit undergoes a full systems test, with every input and output tested to their full operating range and limits. The unit is then stress tested in a thermal chamber, where the temperature is cycled to thermal extremes. Next, we conduct safety, shock, vibration, transit drop, free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



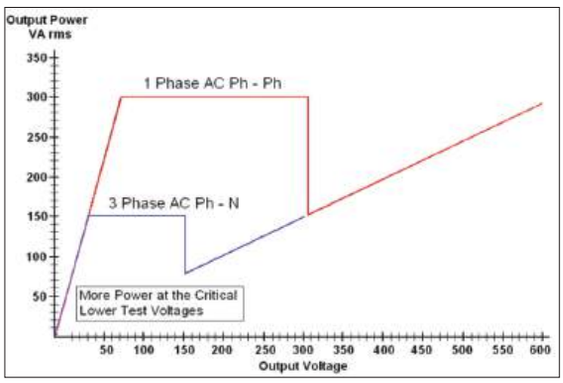
SMRT410
Advanced multi-phase test set

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.

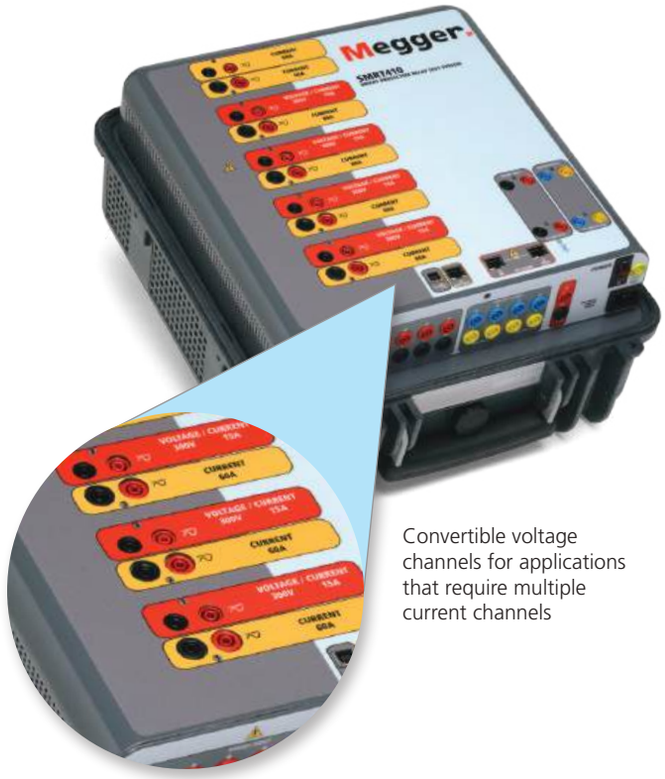
With 4 voltage channels and 6 high current channels, the SMRT410 meets every testing need. It can be configured with up to 4 Voltage- Current modules, with a 5th slot to accommodate a double-current module or a single-voltage channel - the convertible voltage channels provide up to 9 currents to handle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



High compliance voltage of 50 V @ 4 A provide a constant power output of up to 32 A @ 200 VA RMS



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



Convertible voltage channels for applications that require multiple current channels



SMRT46D
Advanced three-phase test set



Megger's **SMRT46D** 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.

- The "D" in SMRT46D 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



SMRT410D
Advanced 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 A at 120 VA)
- Battery Simulator comes standard
- Maximum power output of 100 W (for those relays with dual power supplies)









Software Preview

RTMS is the 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 SMRT46D and SMRT410D. Together, RTMS and PowerDB Pro is your complete relay testing solution, from running complex automated test plans to relay management and compliance reporting.



RTMS distinctive features

Default Manual Test Screen

- General purpose test screen for easily manipulating Voltage, Current and Phase Angles
- Includes the option to select to have all output amplitudes metered or have setting values displayed
- Ability to do a simple timing test by setting Prefault and Fault values and recording the time in ms, s or cycles

Simple and Advanced Ramp Features

- Can be used to automatically determine pickup and/or dropout of various types of relays
- Simple Ramp choices: Stair Ramp, Pulse Ramp, and Pulse Ramp Binary Search
- Advanced Ramp choices: Smooth Ramp, Stair Ramp, and Pulse Ramp
- Up to 24 different ramps can be defined

Fault Calculator

- Available in the Manual, Ramp, and Sequencer test screens
- Select between seven different modes of operation: Overcurrent, Voltage, Frequency, Impedance, Symmetrical, Power Swing, and Fault Location
- Ability to superimpose up to 3 harmonics on the fundamental frequency on any or all outputs
- The Impedance Mode offers the option to set the healthy Current, Phase Angle and Voltage values and the fault amplitudes and angles are automatically calculated and entered on the test screen ready for use and in addition the user can set to use Constant Current, Constant Voltage or Constant Source Impedance.

Pickup and timing tests for Overcurrent, Under Voltage, and Over Voltage relays.

- RTMS has ANSI, IEC, BS142, and IEEE Standards time curve algorithms built in for hundreds of specific relays and from over 25 different relay manufacturers.
- When the timing test is conducted the test results will automatically be plotted and compared to the theoretical values from the relay specific time curve that was selected.
- RTMS automatically evaluates test results to the manufacturers time curve and user defined Pass/Fail tolerance
- Tests can be performed in any sequence such as phase pickup, phase directional, phase timing etc.

Report Options

- Save/View/Print test results from Power DB Database
- RTMS 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
  - Reports can be generated that summarize the comments and failures of every test you perform for future reporting and audit requirements.

Click-On-Fault Impedance Relay Test Screen Provides automatic tests of Impedance relays

- Includes Pulse Ramp, Pulse Ramp Binary Search, and Shot test capabilities.
- Predefined generic relay characteristics: MHO, Half Circle, QUAD (Quadrilateral), and IEEE QUAD.
- Impedance Relay Library currently includes distance relays from the major Relay Manufacturers
- The MCE tool is used for creating impedance relay operating characteristics using a combination of Lines, Arc's and/or MHO circles.
- Easy Z provides a quick approach to testing an impedance relay.
- Unknown Impedance Characteristic test feature is used to find unknown impedance operating characteristics.

Sequencer (Dynamic) Testing Capability

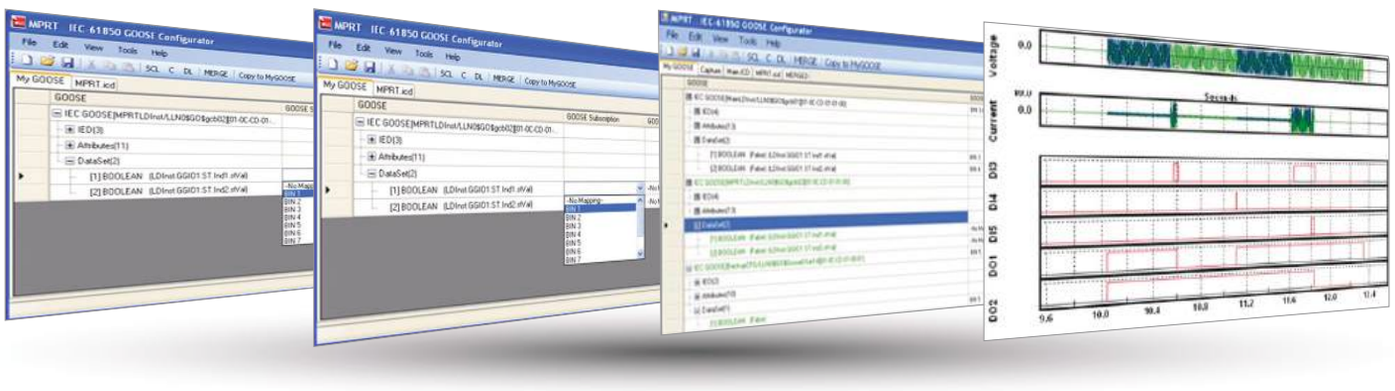
- There are up to 200 programmable states available, with up to 99,999 iterations.
- Can perform End-to-End Tests using IRIG-B input
- Graphical binary input and output setup

Differential Relay Test

- The Differential Relay provides a quick and easy approach to testing three-phase Transformer, Generator, Motor, and single-phase Transformer, differential relays.
- The multi-instances feature provides the capability to select multiple Differential relays to test and combine into one test result file.
- Test selection includes Stabilization (Through Fault), Pickup, Timing, Characteristic, Characteristic Shot, 2nd Harmonic Block and nth Harmonic Shot tests.
- Five different slope characteristics from different manufacturers are provided, which cover the various designs: Line Segments (i.e. G.E. SR 745), Slope Through X Axis (i.e. Siemens 7UT613), Slope Through Origin (i.e. SEL 387 and 587), Slope from Base Point (i.e. ABB RET670 and Areva/Schneider P63x) and Cubic Spline (i.e. G.E. T60).

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 RTMS.



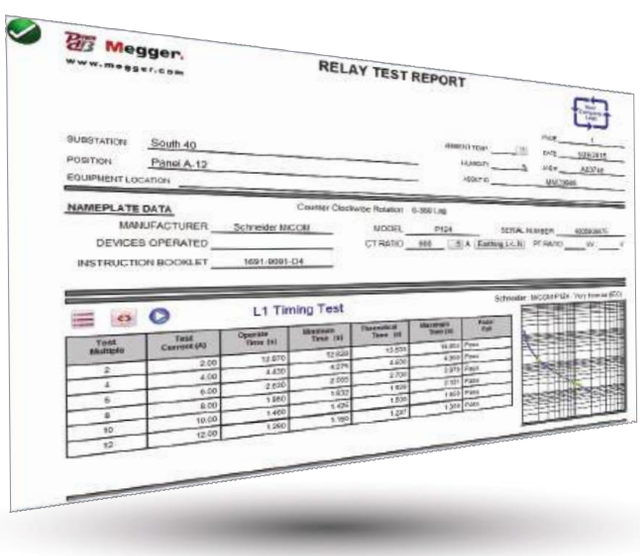
- Use the "C" Capture tab to "sniff" the network and capture GOOSE messages from IEDs
- Use MERGE Feature to compare captured GOOSE messages with the SCL file
- Captured and verified GOOSE messages can then be copied to "My GOOSE"
- GOOSE "Subscriptions" are assigned to Binary Inputs using the pull-down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

Sampled Values Analyzer (SVA) IEC 61850 9-2-LE

The Megger Sampled Values Analyzer (SVA) Configurator software provides the capability to configure the SMRT test set (with the IEC 61850 Sampled Values hardware enabled) to publish three IEC 61850-9-2 LE data streams of four voltages and four currents per stream for testing or commissioning devices which require Sampled Values. In addition, the SVA software can be used to analyze sampled packet data on the IED Network.

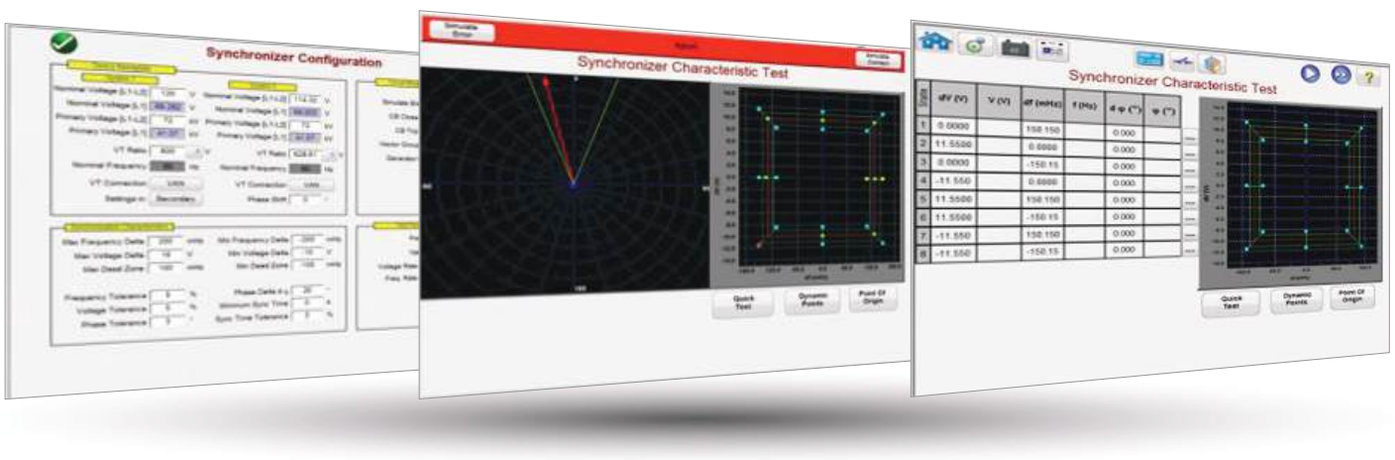


Reporting

RTMS 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.

RTMS Enhanced Features



Synchronizing Test Feature

The Synchronizer Test feature provides automatic tests of synchronizing and sync-check type relays.

Frequency Relay Test Feature

The Frequency Relay Test feature provides automatic tests of Under/Over Frequency and df/dt (ROCOF) type relays.

COMTRADE Viewer and Playback

The COMTRADE test feature supports the IEEE C37.111 and IEC 60255-24 file formats. This test feature provides the capability for the SMRT/FREJA units to test relays with transient waveforms captured from digital fault recorders, or simulated faults using EMTP/ATP type programs.

Power Swing Simulator

The Power Swing simulation tool provides realistic testing of power swing blocking elements in today's modern relays. In addition to power swing block, it can also perform Out-of-Step tests.

SS1 File Converter

SS1 files are generated using Power System Simulation software programs by Electrocon® CAPE™ or Aspen One-liner®. By modeling the power system and using the SS1 files, the relay can then be tested dynamically using realistic system test scenarios.

PowerDB Pro

PowerDB is a powerful software package providing data collection and management for all your acceptance and maintenance activities. Test data can be imported from many Megger instruments including Protective Relay, Insulation Power Factor, Circuit Breaker, Instrument Transformer, Power Transformer Ratio and Winding Resistance, Insulation Resistance, Battery Impedance, Discharge, and many other test sets. Built-in test forms support consistency in procedures and reports. Data and test results are synchronized to your company's central database. Result and summary reports can be easily generated.

Full database capabilities include:

1. Centralized Database Management
2. PowerDB Inspection
3. Data Analytics
4. Data markers and scheduling
5. Data Collection
6. Dashboard
7. Compliance
8. Alert Manager
9. Inspection Application
10. Standardized Forms
11. Routine calibration



Megger Limited
4545 West Davis Street
Dallas, TX 75211
United States

www.megger.com

SMRT_BR_EN_V02

The word 'Megger' is a registered trademark. Copyright © 2024