# RTMS
# Relay Testing Management Software



## DESCRIPTION

RTMS is the culmination of over 30 years of automatic relay testing experience. RTMS is a Microsoft® Windows® compatible software program designed to manage all aspects of protective relay testing using the Megger SMRT Family of units.

RTMS comes with two different levels, Standard and Enhanced. Every SMRT unit comes with RTMS Software for installing on a PC. The Standard level includes tests for ramping, timing, directional, sequencer, impedance, three-phase differential, and other special test applications such as symmetrical components. The Enhanced level of the software includes tests for synchronizing, frequency test the AVTS Relay Library test modules, IEEE/IEC COMTRADE playback, Power Swing Simulator, SSI file converter, and IEC 61850 Megger GOOSE Configurator.

## Standard Version Features

The most significant feature of the Standard Level of RTMS is its ability to provide the user with a very simple way to test protective relays, for both commissioning and maintenance, from the simple overcurrent to some of the most complex relays manufactured today. Manual operation is simplified through the use of enhanced graphics, intuitive menu screens, and touch screen icon buttons to quickly and easily select the desired test function. The following describes all the Standard level features.

### Manual Test Screen

In the Manual Test screen the pre-selected outputs are set using the Smart Touch View Interface touch screen. Power-up preset default values maybe automatically set from the user defined configuration screen.
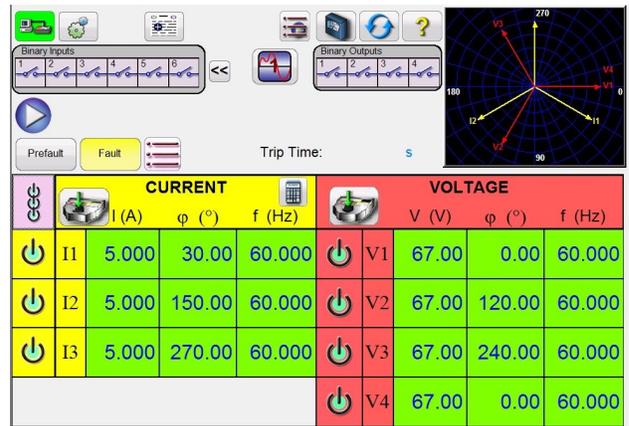


**Manual User Interface[1] - Color Accents when Selected Outputs are on**

A vector graph indicates the relative phase angles of all the outputs, or the user can select to see the positive, negative, and zero sequence vectors displayed. The user may select to have all output amplitudes metered, or have setting values displayed. The user can set Prefault and Fault values, and then toggle back and forth between the two values to monitor contact activity. To do a simple timing test the user can set Prefault time duration in seconds, and then press the Blue Play button. The Prefault values will be applied, then change to the Fault values and start the Timer running. When the relay trips, it will stop the timer, and may turn selected outputs off depending on the user defined Auto-Off configuration. The test results may be saved to the internal memory to download later into a larger database for record keeping an audits.

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1 The number of displayed channels varies depending on which model of SMRT unit is in use.

## Fault Calculator

The Fault Calculator is available in the Manual and Sequencer test screens. The Fault Calculator provides the user with seven different modes of operation. They are Overcurrent, Voltage, Frequency, Impedance, Symmetrical, Power Swing, and Fault Location. Each mode offers a different set of fault calculators depending on the type of relay to be tested. For example, the Impedance Mode offers many of the same test features found in the Click-on-Fault test (see Click-on-Fault feature) where fault amplitudes and angles are automatically calculated and entered into the test screen ready of use. In addition, the user can create harmonic waveforms using the Fault Calculator to sum the default 1 (Fundamental), plus a % 2nd harmonic, plus a % 3rd, % 5th, and % 7th harmonics normally used in the testing of harmonic restrained relays. Up to the 15th harmonic is available.
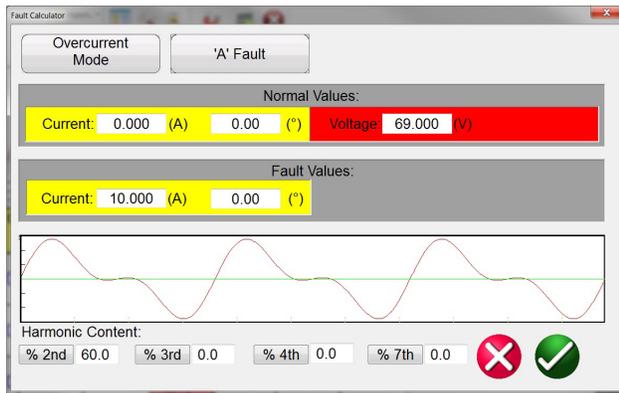


**Fault Calculator Displays Harmonic Waveforms**

In addition to the Fault calculator harmonics, the user can create other harmonics using the Waveform Button in the manual test screen. Here the user can define up to four waveforms, the default 1 (Fundamental), plus a Second (2nd), Third (3rd) and Fourth (4th) harmonic frequency. The frequencies selected do not have to be harmonics of the fundamental. All four waveforms will be summed together to create a harmonically distorted waveform from any or all outputs.

From the manual test screen the user can select from a variety of test options including manual control using the control knob, an automatic smooth ramp, step ramp, pulse ramp, or pulse ramp binary search to determine pickup or drop out of relay contacts, perform relay
specific timing tests, dynamic sequence of tests to include trip and reclose operations, "Click-on-Fault" impedance relay tests, or test three phase transformer, generator, or motor current differential relays. The following are descriptions of each feature.

### Auto Smooth Ramp, Step Ramp, Pulse Ramp and Binary Search Features

The RTMS may be used to automatically determine pickup or dropout of various types of relays. Pressing the Auto Ramp button presents four choices; Smooth Ramp, Step Ramp, Pulse Ramp, and Pulse Ramp Binary Search.



### Smooth Ramp, Step Ramp, Pulse Ramp and Pulse Ramp Binary Search Selection Bar

The first selection is the Smooth Ramp, and will ramp the output by applying a value based upon entry of an increment value /

second. The second selection, Step Ramp, will ramp the output by applying a value and then waiting a specific amount of time before incrementing. For example, to automatically ramp output current the user will select the channel to be ramped, input Start and Stop Amplitudes, an Increment (A), and a Delay time in Cycles (B).

Pulse Ramp will start at user defined prefault condition, increment up or down returning to the prefault condition between each increment. Instead of Delay time the user sets the Pulse Cycles time, which applies the fault value to the relay for the specified time.
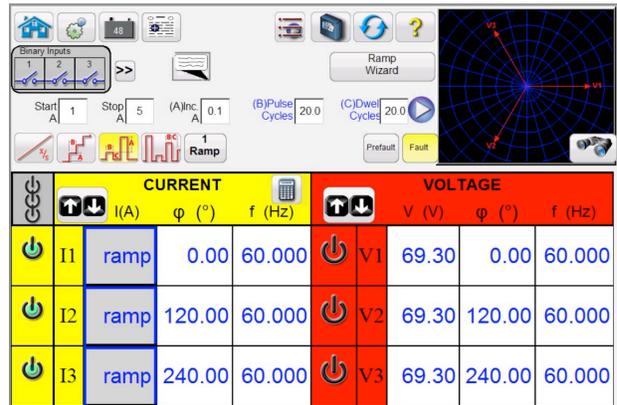


**Three Phase Pulse**

The user can select a 2nd, 3rd and 4th ramp if desired, changing the size of the increment with each ramp. This feature is most used when doing instantaneous pickup tests. The output current, or voltage, can be incremented in large steps getting to the pickup point quickly, and then reduce the size of the increment to zero-in on the pickup value. This reduces the test time, heating of the relay under test, and provides a very accurate test result. This feature is also used when testing multi zone distance relays using three phase voltage and currents. Set the Pulse Cycles duration just long enough for the intended zone to operate. If you are not sure exactly where the pickup value of the relay is, you can use the Pulse Ramp Binary Search feature.

### Timing Test Feature

Built-in timing tests are provided for a wide variety of protective relays, including Overcurrent, Voltage, and Frequency relays. To make it even easier and faster, the RTMS has ANSI, IEC, BS142, and IEEE Standards time curve algorithms built-in. RTMS also includes time curves and time curve algorithms for hundreds of specific relays. The user can select from a pull-down list of different manufacturers (over 20 different manufacturers and growing), then select the relay model number, and/or curve shape (inverse, very inverse, definite time etc.). The list includes relay manufacturer's digitized log-log, and semi-log, electromechanical relay time curves

### Overcurrent Test Feature

The Overcurrent test feature can perform all tests associated with electromechanical and microprocessor based overcurrent relays such as;

- Phase Pickup Ground
- Pickup Neutral
- Pickup Phase
- Instantaneous
- Ground Instantaneous
- Neutral Instantaneous
- Phase Directional
- Ground Directional
- Neutral Directional

- Phase Timing (L1, L2, L3, L1-L2, L2-L3, L3-L1, and L1 L2-L3)
- Neutral Timing (L1, L2, L3)
- Ground Timing

In the following example, the MiCOM P124, Short Time Inverse curve relay with a 1 Amp Pickup, 25 Amp Instantaneous, and a number 2 Time Dial was tested.
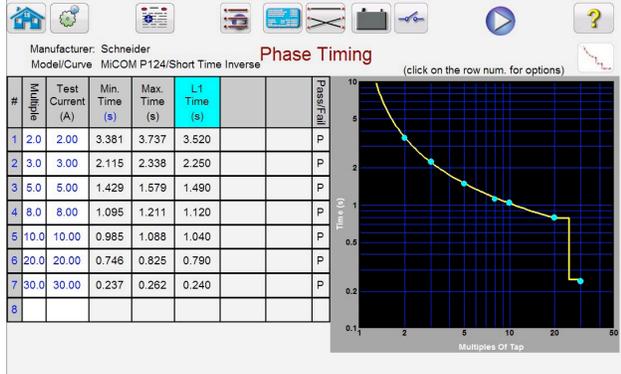


**Timing MiCOM P 124 Overcurrent Relay**

By entering the appropriate values in the setting screen, 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. It will then automatically provide Pass/Fail assessment of the results. Up to 15 test points may be selected. If the test Multiple is changed, the appropriate theoretical trip time will change automatically.

**View Test Reports**

To view the test result, press the Add Results to Report and View button. The user can now enter appropriate information relative to the test in the Test Report header. See the following example report.
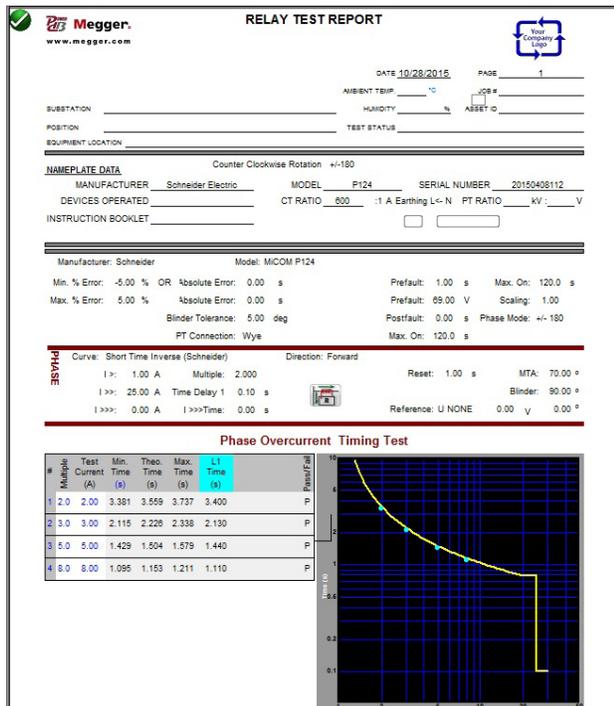


**Test Report MiCOM P124 Timing Test Report**

Note that the software automatically compared the Operating Time to the theoretical and made a Pass Fail determination based upon

the manufacturer's time curve characteristic. If the recorded test point is out of specification, it appears red in color. If it is within specification, it will be green in color. This provides excellent visual As Found reporting. If the data is imported into a PC, reports can be generated that summarize the comments and failures of every test you perform for future reporting and audit requirements.

Tests can be performed in any sequence such as phase pickup, phase directional, phase timing etc. and all test results are automatically recorded in that sequence, and added as additional pages to the report. See the following example report, page 2 Phase Overcurrent Directional Test for the GE SR745 relay.
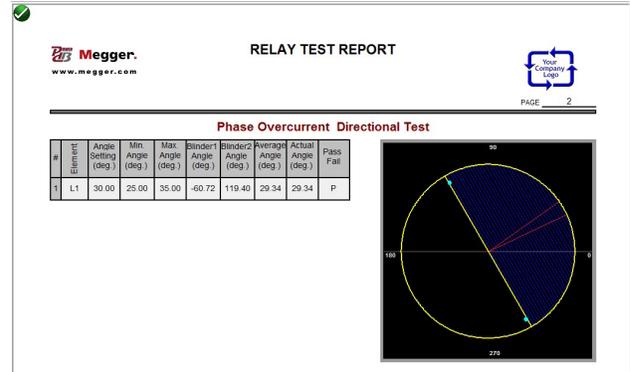


**Page 2 Phase Directional Test**

Note that the software automatically compared the actual angle to the theoretical and provided a Pass assessment.

**State Sequence Timing Test Feature**

Pressing the State Sequence button on the test menu list takes the user to the Sequence Timing Test Screen. There are up to 15 programmable steps available in the Sequencer Test Screen.
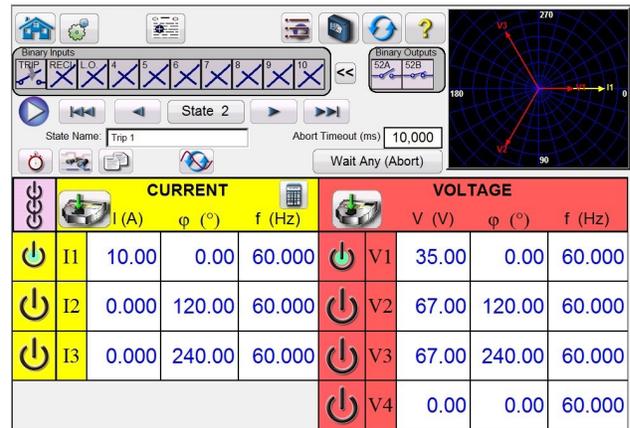


**Multi-State Sequence Test Screen**

By default, 9 states are already labeled as Prefault, Trip1, Reclose 1, etc. up to Lockout in step 9. Therefore, it is initially setup for a four shot trip, reclose to lockout scenario. The user is free to change the labels, or use the default labels. With each state the user may input values of voltage, current, phase angle, frequency and set the Binary Input sensing for each state. Both single pole and three pole trip can be simulated. There are default values and binary settings for a single phase trip and reclose scenario already programmed in. The user can either use the defaults or change them to suit the application. The Total Time to Lockout is also included in the setting and indicates where the total timer starts and stops. This allows for 1, 2, 3, or 4 shots to lockout including trip and reclose times. The user can set conditional settings such as Wait IRIG time setting (for dynamic End-to-End tests), Wait milliseconds, Wait cycles, Wait

any contact (OR), and Wait all contacts (AND). The user can set the Binary Outputs to simulate the breaker 52a and/or 52b contacts.

Once all of the Binary Inputs, Outputs, Prefault, Fault and Reclose settings are completed, the user can then press the Preview button to get a visual representation of the voltage and current outputs, as well as a visual of the binary inputs and outputs for each stage of the simulation. The following figure illustrates a sample sequence.
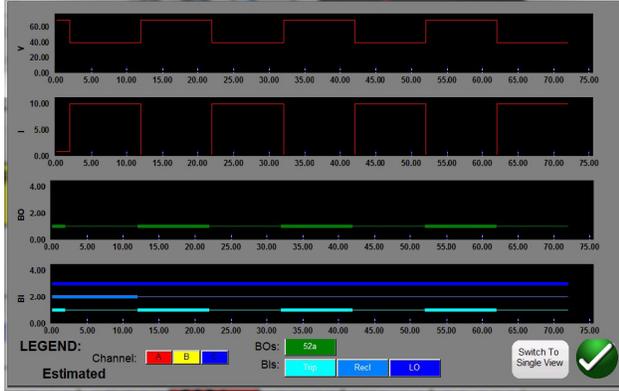


**Sample Sequence Voltage, Current, Binary Inputs and Outputs**
### Impedance Relay Click-On-Fault
Click-On-Fault (COF) is one of the choices in the Standard test menu list. COF provides automatic tests of Impedance (distance and loss of excitation) relays. It includes Pulse Ramp, Pulse Ramp Binary Search, and Shot test capabilities.

### Selection of Relay Operating Characteristics

Select from one of the predefined generic relay characteristics of MHO, Half MHO or QUAD (Quadrilateral), or import a RIO or XRIO file supplied by a number of relay manufacturers, or select the specific relay from the Relay Library files. The Relay Library currently includes distance relays from ABB, ALSTOM, AREVA, GE, MICOM, SEL, PROTECTA, SIEMENS, SIFANG, NARI, and TOSHIBA. There are numerous other library test files, which are still being tested and field evaluated. Therefore, as new relay library files become available a new level of the software will be posted to the website for download and field upgrades.

### Definition of Operating Characteristic and Tests

There are several new innovations in the new COF that make testing distance relays easier and faster. For example, selecting the Generic QUAD characteristic provides the following user input screen.
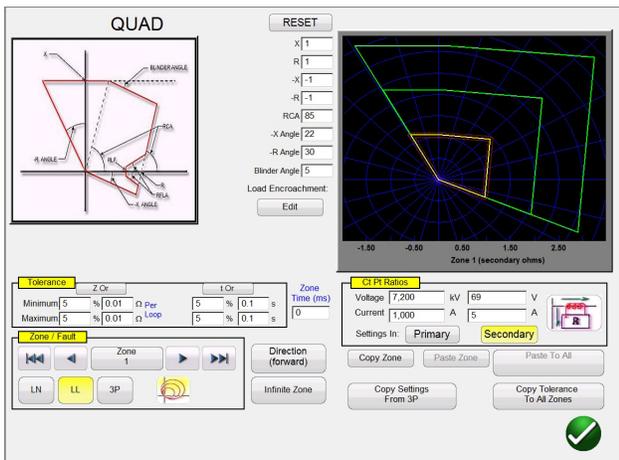


**Generic QUAD Setting Screen**

Here the user selects which Zone (up to 20 zones may be defined),

type of fault, direction, tolerance values, inputs the reach, max torque (line) angle; any offset, or load encroachment settings. For phase to earth faults there are three types of compensation factors to choose from depending on the type of impedance characteristic. The software draws the operating characteristic(s) of the relay defined by the user settings. The user may select to view single zone or multiple zones. Pressing the green check button takes the user to the COF test setup screen, as shown in the following figure.
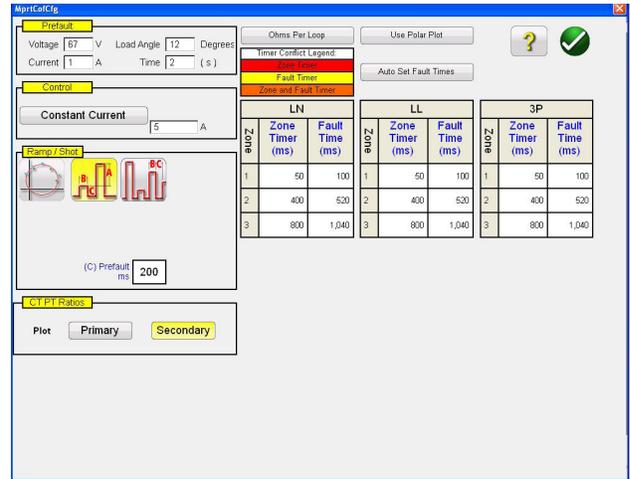


**Generic QUAD Test Setup**

From this screen the user can select:

**Test**
- Pulse Ramp
- Pulse Ramp Binary Search
- Shot

**Timing of**
- Phase to Ground
- Phase to Phase
- Three Phase

**Test Source**
- Constant Voltage
- Constant Current
- Constant Source Impedance

**Displayed**
- Primary Values
- Secondary Values

## Creating Search Lines or Shot Test Points

The user can easily define up to 10 search lines or test points per fault type, per zone. Test options include,

The Independence Test option provides maximum freedom to the user to select any test line, at any angle, around the operating characteristic.

The Origin Test option the user clicks a point outside the operating characteristic, and the test line will be drawn to the origin or the intercept of the R and X-axis.

The Shots Test Points option is used to create one or more test points, each to replicate a fault at a particular magnitude and angle. This type of test provides a quick GO, NO/GO test of the relay after a settings change.

The user does not even have to draw the test lines. There are two Quick Test Options the user may select. The first option draws three test lines for any of the selected Quick Test solutions. The second Quick Test the user may select the desired number of test points by pressing the Test Points button and select from the list. If none of the standard test points or phase rotations meets the user's needs, they can enter the desired values in the window provided.

### IEC 60255 Test Option

To comply with regulations, which require testing to the IEC 60255 standard, the IEC 60255 option is provided. All defined test lines will automatically be drawn perpendicular to the relay operating characteristic.

### Prefault Settings

For testing relays, which require a prefault load condition, the user can set the prefault load voltages and currents. This is normally used when testing accelerated tripping or dynamic over-reach characteristics.

### Performing Tests

The user then simply presses the blue Play button and the test begins. To save even more time the user can select the Play All button and the software will automatically test all define zones and faults in sequence. Based upon the user input the software will calculate all of the fault values and angles for each defined test point, and then make PASS/FAIL determination of the test results.

A real-time test screen will display the relay operating characteristic with the defined test lines in the right half of the screen with the test vector moving in the impedance plane. In the left half it will display either the test vectors of voltage and currents being applied in real-time, or it will display the Positive, Negative and Zero Sequence vectors being applied, see the following example.
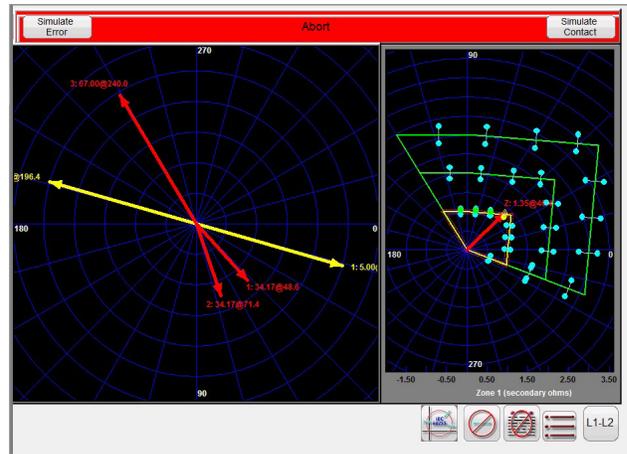


**Generic QUAD Real-Time Test Screen**

In the above figure a Zone 1, Pulse Ramp, Phase L1-L2 fault is being performed. Note the real-time test amplitudes and angles are displayed in the left half, with the test results displayed in the right half. The tests are being performed to the IEC 60255 standard.

### Easy Z Impedance Relay Test

The RTMS Easy Z provides a quick approach to testing an impedance relay. The following is the Easy Z Impedance Test Screen. All tests are performed from this one screen.
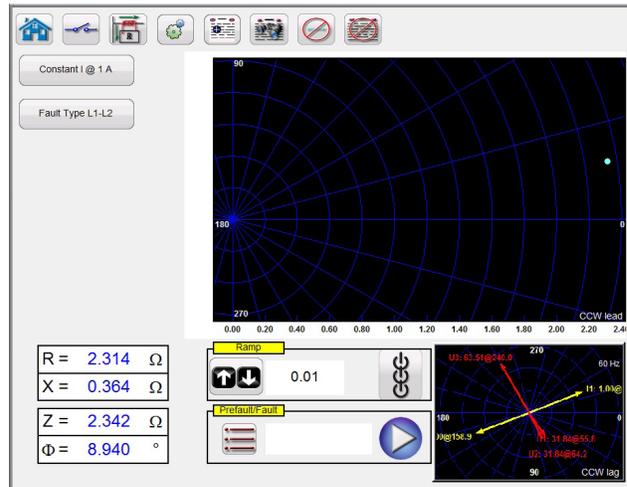


**Easy Z Test Screen**

CT Polarity Directional button  sets the phase angle of the output currents either into or out of the zone.

Constant Source button  provides the user with a selection of different methods to perform the tests. Some manufacturers require Constant Voltage and ramp current, some require Constant Current and ramp voltage.

Fault Type selection button  provides the user with the Fault Type selection window. The user can select Three Phase fault, Phase to Phase fault, or Phase to Ground fault. Note there is no ground compensation in the Easy Z test screen. For tests using ground compensation calculations see the Click On Fault test.

In the Ramp selection window the user can ramp outputs in terms of Z, R, X or the angle Phi. The increment of the ramp is also selected in this window. For example, the user desires to ramp impedance Z in 0.01 Ohms as shown above.

## Transformer Differential Test Feature

The Transformer Differential Test feature provides automatic tests of three phase Transformer Current Differential relays.
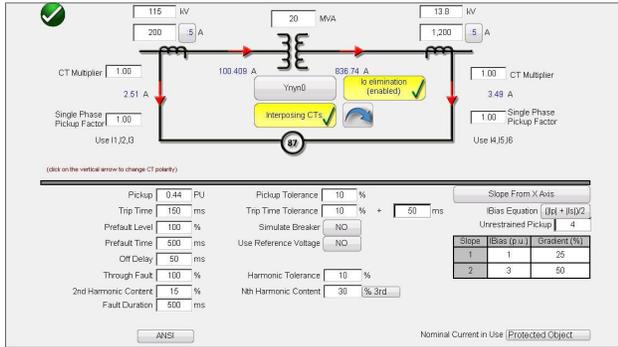


**ANSI Transformer Differential Model**

## Transformer Model and Nameplate Settings

There are two transformer differential models to choose from, ANSI and IEC. Each model will present a transformer graphic commonly used for either European or North American style transformer protection. The Transformer Model and Nameplate section includes transformer data, primary and secondary winding configurations, interposing CT's, CT ratios, CT connections, selection of Io (zero sequence) elimination, and other relay setting values and characteristics. From this information, the software will automatically calculate what values of current and phase angle relationships are applied to the relay in the tests, thus reducing errors and saving time.

Test selection includes; Stability (Through Fault), Pickup, Timing, Slope, Harmonic Block and Harmonic Shot tests.

## Definition of Slope Characteristic and Tests

There are several innovations in the new Transformer Differential Test feature that makes testing three phase transformer differential relays easy and fast. For example, the slope characteristics vary by manufacturer design. Four options 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) and Slope From Base Point (i.e. ABB RET670 and Areva/Schneider P63x). In addition, different relay manufacturers use different I Bias equation methods for restraining the operation of the differential elements. The Transformer Differential Slope test provides seven different biasing (restraint) equations from which to choose. For example, the Siemens 7UT5X, 7UT6X and SEL 487 and 787 relays use the biasing equation (|Ip| + |Is|). The user simply touches the screen to create test lines associated with the slope characteristic. The following is an example test being performed with four test lines.
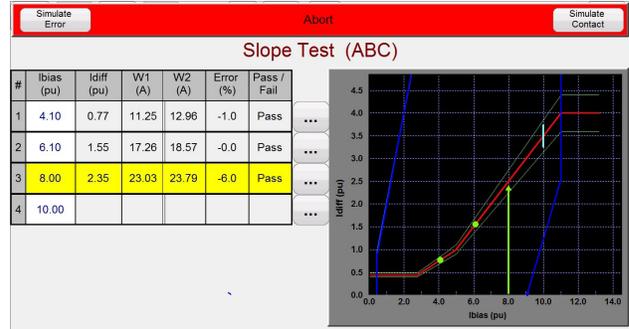


**Transformer Differential Slope Test**

Note the test amplitudes are displayed in the left half (includes Pass/Fail) with the test results displayed in the right half along with the slope characteristic.

## Multi-Phase Test Applications

In addition to standard test applications, the RTMS software is easily configured for multi-phase test applications. Manually testing Bus Differential protection schemes can require a dozen or more test currents. The RTMS software automatically configures with multiple Megger relay test systems interconnected with a simple RJ45 Ethernet cable. As an example, with two SMRT46 units interconnected the RTMS software can provide 12 manually controlled currents simulating 6 currents into and 6 currents out of the zone of protection. The RTMS software can automatically configure up to 30 currents. In the following example test screen the 12 currents shown represent the Prefault test application. Pressing the blue play button would apply the simulated fault, start the timer. When the relay operates, the outputs are turned off and records the operating time.



**12 Currents Simulating a Bus Differential Scheme**

## Transducer Testing

In conjunction with the Transducer Hardware Option in the test set, the RTMS Transducer Test provides a quick approach to testing all types of single phase and three phase electrical transducers (Volts, Amperes, Watts, VARs, etc.). The transducer hardware "T" option can either be ordered with the new test set or later as a factory hardware upgrade. If the unit hardware includes the transducer inputs, the RTMS software will automatically provide the Transducer test icon .

Pressing this icon button will take the user to the Transducer test screen where the user can select the type of transducer, and up to 5 test points. Measured DC output values are compared to the

theoretical, and the software makes a pass/fail determination.

## Enhanced RTMS Software Features

As a hardware option in the SMRT Family of units, the following additional Enhanced test features are available in the RTMS software; see SMRT Ordering Information for details.

### New Synchronizer Test Feature

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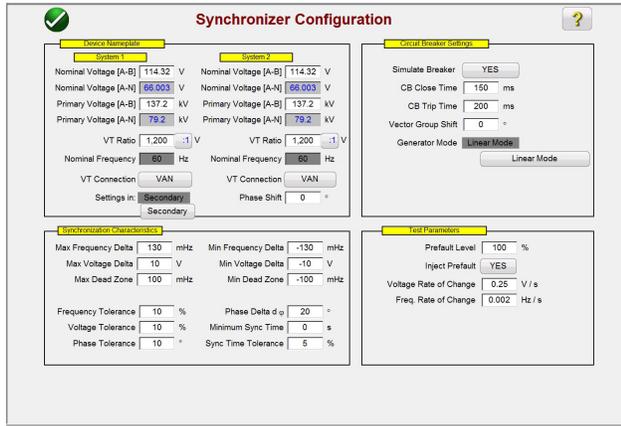


**Synchronizing Configuration Screen**

In the Device Nameplate section the user inputs information associated with System 1 and System 2, which includes Phase – Neutral or Phase - Phase Primary and Secondary voltage information. In the Synchronizing Characteristic section the user inputs the Voltage and Frequency Delta values as well as the tolerance values of the relay under test. In the Circuit Breaker section the user inputs values associated with the Closing and Trip times of the Circuit Breaker for breaker simulation. In the Test Parameters section the user inputs the desired Rate of Change for the Voltage and Frequency changes.

### Creating and Performing Tests

There are three options available to the user regarding the selection of test lines. Selection of the Quick Test, the software will automatically draw 4 test lines with two Delta Voltage lines and two Delta Frequency lines. Selection of the Dynamic Points, as shown in the following figure, draws eight test lines, with two Delta Voltage, two Delta Frequency, and four Dynamic test lines where both Frequency and Voltage are run in Delta. If either of these two options does not meet the user's needs, the user is free to select their own test points by touching or clicking on the test screen points outside and inside the characteristic similar to the Click-on-Fault for Impedance relays.
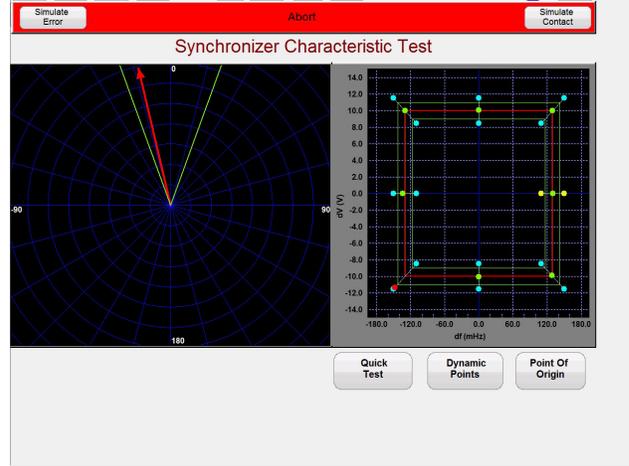


**Dynamic Synchronizing Test Screen**

In the left side of the test screen the user can observe the synchro scope as the test voltage rotates, while in the right side the user can observe the dynamic test point closing in on the close characteristic for the relay in real time. When the relay close is captured the test results are shown similar to the above where the green dots indicate a passing test result.

### New Frequency Relay Test Feature

The all new Frequency Relay Test feature provides automatic tests of Under/Over Frequency and df/dt type relays.
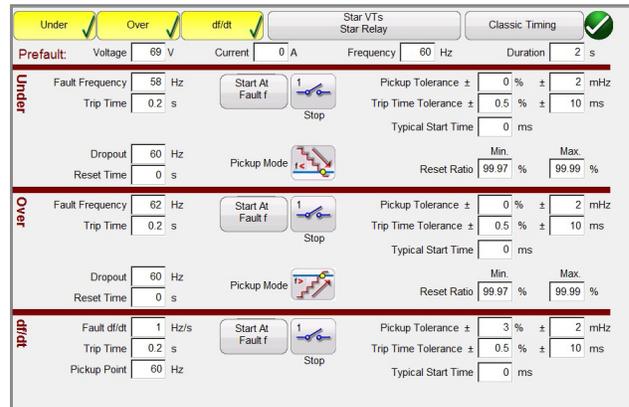


**Frequency Relay Configuration Screen**

In the Frequency Test Configuration screen the user selects the type of relay to be tested, Under, Over or df/dt. For three phase test applications the user can select how the VT's and the Relay inputs are connected Star, Delta, and Open Delta. The user inputs the Prefault Voltage(s), Current(s), System Frequency and Duration Time of the prefault values before starting the test. For Pickup tests, the user can select a single ramp down or up depending on the relay type, or select a double ramp to determine pickup and dropout for dual setting relays.

For timing tests, the user can select the classic timing mode where a step function is used, or use the ramp feature and start the timing test at a specific set point. The Timing test records the Prefault Frequency, the frequency ramp up or down depending on the type of relay test, the recorded Fault Frequency and the recorded operating time with Pass/Fail indication see the following example.

**OVER-FREQUENCY TIMING RESULTS**

| Test Value (Hz) | Expected Trip Time (s) | Min Trip Time (s) | Max Trip Time (s) | Trip Time (s) | Pass/Fail |
|---|---|---|---|---|---|
| 51.500 | 2.000 | 1.925 | 2.075 | 2.008 | Pass |
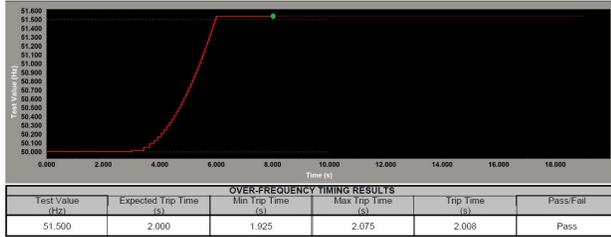
**Over Frequency Timing Test**

Note the frequency ramp up to a value slightly above the relay set point. The green dot indicates the relay operation was a pass. A red dot would indicate a fail.

### AVTS Relay Test Modules

The RTMS software includes the AVTS (Advanced Visual Test Software) Relay Test Library, which provides relay specific test modules covering different relay manufactures.

### Time Saving

Each relay test module is an extremely valuable product for any relay test technician or engineer. It provides the user with a quick, easy way to test a specific model of relay to the relay manufactures specifications, as well as eliminates the time and costs associated with users having to create their own test templates.

### One-Touch™ Test Modules

Megger One-Touch Test modules are currently available for a variety of SEL (Schweitzer Engineering Lab) and General Electric UR relays. One-Touch Test will open the communication link between RTMS and the relay under test, as well as automatically download relay settings. Test modules, which are One-Touch capable, save you time, money, and remove the possibility of human error when reading and entering hundreds of relay settings. Tests are conducted to the settings that are downloaded.

### Verified Test Modules

Relay manufacturers are introducing new relays, and changing firmware to existing relays every day. Megger has field experienced relay application engineers dedicated to creating and verifying new test modules for new relays, and relays with updated firmware. These test modules are tested and verified using the relays (with various revisions of firmware) to verify that the test modules will work for virtually all possible combinations of realistic settings.

### 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 units to test relays with transient waveforms captured from digital fault recorders, or simulated faults using EMTP/ATP type programs. The RTMS COMTRADE feature includes extending the prefault data so that relays that require the prefault for proper polarizing will function properly under transient test conditions. This especially important when performing end-to-end tests using the COMTRADE playback feature in RTMS. Timing maybe started in conjunction with the fault application, thus timing the replay event.
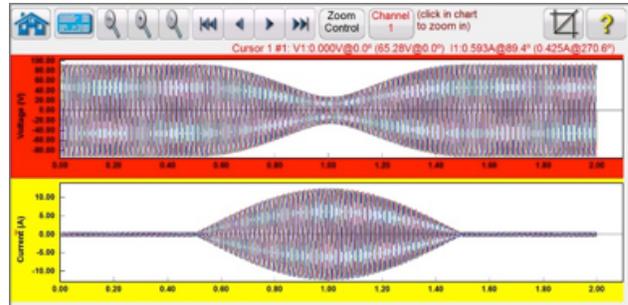


**Power Swing COMTRADE Simulation**

End-to-End test capability is provided, and allows GPS triggering of DFR files to be played back directly from the interface using either a programmable pulse on a binary input, or an IRIG-B time signal from a GPS unit.

Other tools are provided for review and evaluation of the waveforms such as zoom control. Displayed values include, Cursor #, Sample #, Voltage Channel Selected, RMS Magnitude, RMS Angle, (Peak Magnitude, Phase Angle), Current Channel Selected, RMS Magnitude, RMS Angle, (Peak Magnitude, Phase Angle), Cursor to Cursor difference time in ms. In addition, the Iterations window provides the capability to cycle the relay through several iterations of the same fault.

### 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. See the Power Swing input-setting screen in the following figure.
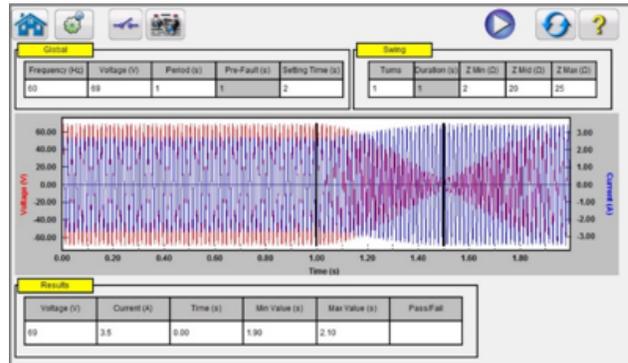


**Power Swing Input Setting Screen**

## Power Swing Waveform

The Graphic window displays the power swing waveforms that will be played. If more than 1 Turn is specified the display will include each turn.

## 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. The SS1 File Converter will read the SS1 file and create a dynamic state sequence playback file. This file can be used in two ways. The first method of use is as a standard dynamic test. One application is the testing of impedance relays. By modeling the power system using simulation software, the relay can then be tested dynamically using realistic system test scenarios using actual line load conditions. The dynamic test can be used stand-alone or as part of a more complex test module. The other application is as an End-to-End playback file, similar to a COMTRADE playback file.
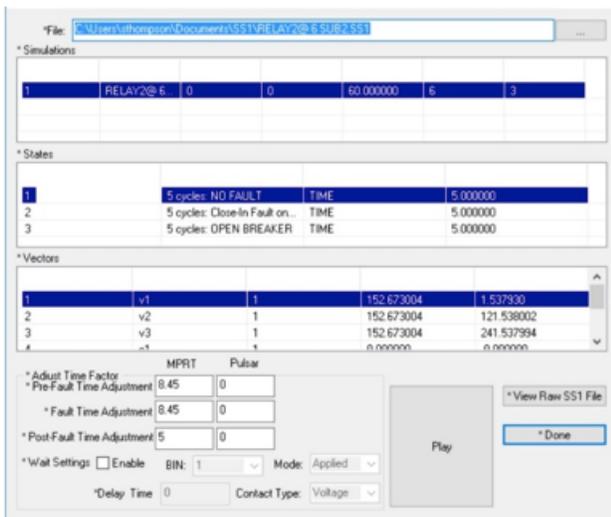


**Example of the SS1 File**

## IEC 61850 Megger GOOSE Configurator

The Megger GOOSE Configurator (MGC) provides mapping of the binary inputs and outputs of the SMRT test set to the desired GOOSE messages. The GOOSE messages are read from available SCL (Substation Configuration Language) files or may be automatically detected by scanning the substation network in search of available published GOOSE messages. This scanning process is known as GOOSE "sniffing". The MGC also provides advanced network troubleshooting tasks such as comparing the GOOSE messages available on the network with the GOOSE messages described in the SCL files with GOOSE MERGE/ COMPARE functionality; this is also a powerful tool for validating the horizontal communication description (GOOSE) in the supplied SCD file at Factory Acceptance Tests (FAT) in IEC 61850 substations. This type of verification is also known as GOOSE Consistency Check.

An SCL file is an XML (Extensible Markup Language) file that describes the IEDs available in one IEC 61850 substation (SCD file) or can just describe only one single IEC 61850 device (ICD, CID files). In the SCL file there are several IEC 61850 information available (logical nodes in the IEDs, GOOSE messages sent by the IEDs, GOOSE messages received by IEDs, Reporting information to SCADA etc.).

## IEC 61850 Relay Testing – General Description

The SMRT relay test system is connected to the IEC 61850 station bus (or directly to the Ethernet port of the relay) and is programmed to map the trip GOOSE message from the tested IED to a chosen binary input. The mapped binary input is programmed to stop the timer of the SMRT test set. This last action is done from RTMS software. For testing IEC 61850 relay applications, where the protection relay needs an external signal to allow protection functions (e.g. external direct inter-trip command, or external auto-recloser start, or breaker failure start), it is necessary to "energize" the IEC 61850 relay with a GOOSE message. The SMRT relay test set, which is connected to the IEC 61850 station bus, is now programmed to map a binary output to a defined GOOSE message that is published by the SMRT unit. The test set activates its binary output when the test requires it, which means that the GOOSE message changes its status from "0" (false) to "1" (true). In a practical situation both applications (publishing of a GOOSE message and subscription of a GOOSE message), are often used simultaneously..
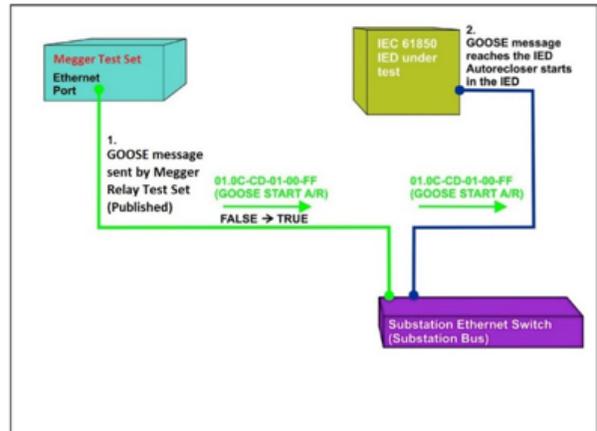


**External energization (auto-recloser start) test of an IEC 61850 IED**
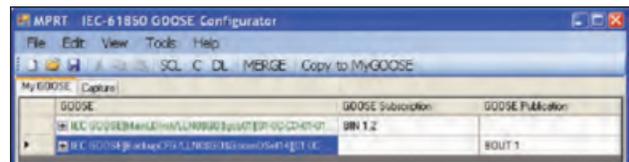


**MGC 'My GOOSE' with Assigned Binary Inputs and Outputs**

After the appropriate assignments of binary inputs and outputs have been made, the My GOOSE test file can be saved for reuse. Use basic test tools or standard test features in RTMS to perform automatic tests.

The MGC provides mappings of Boolean and Bit Strings and/or simulation of STRuct, Integer/Unsigned, Float and UTC datasets. The SMRT meets the IEC 61850-5 standard, Type 1A, Class P 2/3, for high speed trip and reclose simulations.

## Ordering Information

A copy of the RTMS software for PC test applications comes with every SMRT unit as a standard accessory. The software can be loaded onto as many PC's as the customer wishes, without need of a software license, or security dongle to operate. Included in the RTMS software are Enhanced test features such as the new Synchronizing and Frequency relay test features, as well as the AVTS Relay Test Library. To use the Enhanced test features require that the SMRT unit be hardware enabled, with an RTMS Enhanced license (similar to the IEC 61850 hardware license). As a way of Megger saying thank you to all of our current SMRT customers, all older SMRT units (units shipped prior to December 2015) are already hardware enabled to use these valuable software testing tools. All new SMRT units ordered beginning in December 2015 will require the purchase of this new hardware enabled option either when ordering a unit, or later as a field upgrade.

To order an SMRT unit with the Enhanced test features, see the SMRT Ordering Information under Internal Software Options.