

# MRCT Megger Relay and Current Transformer Test Set



- Industry leading test duration using patented simultaneous multi-tap measurements reduces testing time by 20% on multi-tap CT's
- Increased measurement accuracy to support metering class CT testing
- Smallest and lightest 2 kV secondary voltage injection unit on the market
- Integrated single phase relay test system
- General purpose substation secondary circuit testing with 300 V & 60 A generators
- Grouped testing: demagnetization, knee points, ratios, saturation curves, and more
- Measure all ratio's and saturation curves on multi-tap CT's with one lead connection
- Built-in insulation resistance testing

## DESCRIPTION

The Megger MRCT is a light weight, robust, portable unit used to perform demagnetization, ratio, saturation, winding resistance, polarity, phase deviation, and insulation tests on current transformers. The MRCT automatically calculates ratio errors, saturation curves, and knee points. The MRCT provides a microprocessor-controlled variable voltage and current output and precision instrumentation for automatically testing single and multi ratio CTs, reducing testing time and increasing productivity. The MRCT will directly connect to multi ratio CT's and perform all tests – saturation, ratio and polarity, winding resistance and insulation – on all taps with the push of a button and without changing leads.

The MRCT can be controlled via Megger's Smart Touch View Interface (STVI) controller. The STVI controller is a full color, high resolution, LCD touch screen which allows the user to perform manual and automatic testing quickly and easily using the manual test screen, as well as using pre-constructed test routines. The large color display permits the user to easily read all pertinent data while the test is being performed and provides the ability to view the current transformer's saturation curve. The unit can also be configured to come without a Megger STVI and can be controlled via a laptop with Megger's PowerDB software.



Current transformers can be tested in their equipment configuration, such as being mounted in transformers, oil circuit breakers or switchgear. It is necessary for the equipment to be completely isolated from the electrical system prior to testing.

## APPLICATIONS

### Saturation Test

With the single push of a button, the MRCT performs a CT saturation test and calculates the rated knee point. The saturation test can be performed at frequency of 50 or 60 Hz up to 2,000 volts as required by IEC regulations.



The MRCT will calculate the rated knee point in compliance with IEEE C57.13.1, IEC 60044-1 or IEC 60044-6 on both standards as well as of specialized CTs such as PX, TPS, TPX, TPY and TPZ. While the saturation test is being performed, the MRCT will plot the CT saturation curve on the STVI display and automatically provide the user with the rated knee point per the desired IEEE or IEC standard. Many substations CTs include a multi-ratio secondary; therefore the MRCT has the ability to plot and simultaneously display up to 10 CT saturation curves.

### Ratio, Polarity Test

Ratio testing can be performed by using the MRCT. The method used by the MRCT compares a voltage applied to the secondary winding to the resulting voltage produced on the primary winding.

For example, if 1 volt per turn is applied to the secondary winding, the voltage present on the primary winding would be 1 volt. More specifically, if 120 volts were applied to the secondary of a 600:5 current transformer (120:1 ratio), 1 volt would be present on the primary winding.

#### Winding Resistance Test

Measures CT winding resistance with the injection of a test voltage, measuring the DC current and calculating temperature compensated resistance.

#### Demagnetization

Normal operating conditions and typical winding resistance measurements can cause a CT to become magnetized. The MRCT has the ability to automatically demagnetize the CT under test. This automatic demagnetization routine is useful to ensure that the CT saturation test yield correct results. Prior to testing demagnetization is recommended per ANSI C57.13.1.

#### CT Burden

The MRCT measures the connected CT burden load with direct injection of secondary current to a load that is disconnected from the CT. The MRCT measures the secondary voltage in magnitude and angle of the connected burden in VA and power factor.

#### Insulation Resistance Test

In order to ensure that the CT secondary wiring is properly insulated, the MRCT system includes a 500 V, 1,000 V insulation resistance test system. This test ensures that the CT secondary winding and secondary wiring is properly insulated per ANSI C57.13.1.

The MRCT will also automatically switch the test leads to perform all required insulation test. These test include H-L, H-G, L-G.

**Note:** Disconnect all electronic loads before performing this test.

#### Data Storage and Printing

The MRCT test system not only permits accurate and automated CT testing, but also catalogs and stores test results within the STVI for simple retrieval by software at a later date. All cataloged test results can be uploaded to Megger's PowerDB™ Lite for report generation and saturation curve plotting on a computer or STVI. PowerDB Lite also has the ability to operate the MRCT with no operator intervention, thus providing a completely computer controlled automated test system.

#### Upgradeability

The MRCT includes the ability to upgrade testing capability. With various configurations and accessories the MRCT system can be upgraded as new testing needs are developed.

### FEATURES AND BENEFITS

- Industry leading test duration using patented simultaneous multi tap measurements** - The MRCT system can provide concurrent measurement of voltages on all taps during CT saturation, and ratio and polarity testing. This allows the MRCT system to calculate the knee points and ratios of all windings at the same time thus eliminating the need for multiple tests on a CT. This will drastically reduce testing time.



The MRCT is available in 2 onboard display/enclosure options.

- Automated Test Plans with CT Saturation, Ratio and Polarity, Winding Resistance and Insulation Testing** - The microprocessor controlled output fully automates testing of CTs. The MRCT will directly connect to multi ratio CTs and perform all tests – saturation, ratio and polarity, winding resistance, and insulation – on all taps with the push of a button and without changing leads.
- Direct Connection to Multi Ratio CTs** - The MRCT will directly connect to all taps on multi ratio CTs to eliminate lead changes required to test all inner-winding CT ratios, saturation curves and knee points. The MRCT will test all programmed taps with the push of one button.
- Full Color, High Resolution, LCD Touch Screen** - Menu screens and touch screen function buttons are provided to quickly and easily select the desired test function. Tests results can be saved to the unit for download to a memory stick to transfer or print test reports.
- CT Saturation, Ratio and Polarity, Winding Resistance, and Insulation Automated Testing** - The microprocessor-controlled output fully automates testing of CTs. This automated testing simplifies CT testing and reduces testing time. Automated testing is accomplished directly on the Megger's STVI or via PowerDB Lite.
- CT Demagnetization** - During operation and routine DC winding resistance testing, it is possible for a CT to become magnetized. The MRCT includes an automated CT demagnetization function, which allows determination of accurate knee point and ratios thus providing stable, repeatable test results, and reduces test time.
- Insulation Test** - The MRCT includes a 500/1,000 V insulation test system to verify the CT secondary winding and secondary wiring. This insures that the secondary insulation has not degraded and will continue to perform its function during high current faults.
- Test Result Report** - The MRCT offers storage of complete test files in an easy-to-use, versatile format that permits upload to PowerDB Lite, or printing test results using the optional external printer. These options provide a simple, complete, easy way to store over 200 test results and saturation curves. All test results can be cataloged and stored in the MRCT.

## SPECIFICATIONS

<b>Input</b>	100 to 132 V or 200 to 264 V, 1 $\phi$ , 50 or 60 Hz, 15 A max.
<b>Output</b>	
<b>Voltage</b>	<b>Continuously variable in three ranges:</b> 0 to 30 V at 5.0 A max (15 minute on, 5 minute off) 0 to 300 V at 1.0 A max (15 minute on, 5 minute off) 300 to 2000 V at 1.0 A max (5 minute on, 5 minute off)
<b>Current</b>	
<b>Output Current</b>	Power Max V/Duty Cycle
<b>30 Amperes</b>	200 VA (282 peak) 6.67 V rms (15 minutes on, 5 minutes off)
<b>60 Amperes</b>	600 VA 90 cycles
<b>Instrumentation</b>	
<b>Voltmeters</b>	
<b>Output</b>	
<b>Resolution</b>	0.0000 to 1.9999/19.999/199.99/1999.9
<b>Ranges</b>	0 to 2/20/200/2000 V
<b>Accuracy</b>	$\pm 0.5\%$ of reading typical $\pm 1.0\%$ of reading typical max
<b>Input</b>	
<b>Primary Voltage Measurement</b>	
<b>Ranges</b>	0 to 0.35/2.0/20.0/200.0/600.0 V
<b>Resolution</b>	0.0001 to 1.9999/19.999/199.9/600 V
<b>Accuracy</b>	$\pm 0.02\%$ of reading and $\pm 0.02\%$ range typical $\pm 0.05\%$ of reading and $\pm 0.05\%$ range maximum
<b>Secondary Voltage Measurement</b>	
<b>Ranges</b>	0 to 2/20.0/200.0/2000.0 V
<b>Resolution</b>	0.0000 to 19.999/199.9/1999.9 V
<b>Accuracy</b>	<b>0 to 999.9 V</b> $\pm 0.02\%$ of reading and $\pm 0.02\%$ range typical $\pm 0.05\%$ of reading and $\pm 0.05\%$ range maximum <b>1000 to 2000 V</b> $\pm 0.08\%$ of reading and $\pm 0.08\%$ range typical $\pm 0.2\%$ of reading and $\pm 0.2\%$ range maximum
<b>Ammeter</b>	
<b>Output</b>	
<b>Ranges</b>	0.0 to 1.0/10.0/60.0 A
<b>Resolution</b>	.001/.01
<b>Input</b>	
<b>Excitation curve testing</b>	
<b>Range</b>	0.00 to 0.1/1.0 A
<b>Accuracy</b>	$\pm 0.08\%$ of reading $\pm 0.08\%$ range typical $\pm 0.2\%$ of reading $\pm 0.2\%$ range maximum

## Phase Angle Measurement

### 3 digits

<b>Range</b>	0 to 360 degrees
<b>Resolution</b>	1 minute
<b>Accuracy</b>	$\pm 3$ minutes typical $\pm 6$ minutes maximum

### Ratio

#### Secondary Voltage Injection Method

Range	Accuracy
0.8 to 2000	$\pm 0.02\%$ typical $\pm 0.05\%$ maximum
2000 to 5000	$\pm 0.03\%$ typical $\pm 0.1\%$ maximum
5000 to 20000	$\pm 0.05\%$ typical $\pm 0.2\%$ maximum

#### Winding Resistance Test

<b>Measuring Range</b>	0 – 30 $\Omega$
<b>Accuracy</b>	(at 20° C) $\pm 1\%$ , 0 – 30 $\Omega$

#### Insulation Test

<b>Test Voltage</b>	1000 VDC, 500 VDC
<b>Measuring Range</b>	20 G $\Omega$ , 10 G $\Omega$
<b>Short Circuit Current</b>	1.5 mA nominal
<b>Test Current on Load</b>	1 mA at min. pass values of insulation (as specified in BS7671, HD 384 and IEC 364)
<b>Accuracy</b>	1000 volts $\pm 3\%$ $\pm 2$ digits $\pm 0.2\%$ per G $\Omega$ 500 volts $\pm 3\%$ $\pm 2$ digits $\pm 0.4\%$ per G $\Omega$

#### Communication Interfaces

Ethernet

#### Environment

<b>Operating</b>	-10° C to 50° C
<b>Storage</b>	-30° C to 70° C
<b>Enclosure</b>	The unit is housed in a rugged enclosure suitable for use in outdoor substations.

#### Standards

IEC 61010, CSA 22.2, CE

#### Dimensions

 14" H X 7.5" W X 12" D  
(36 H X 19.3 W X 30.5 D cm)

#### Weight

36.7 lb (16.7 kg)

## DESCRIPTIONS OF HARDWARE OPTIONS AND ACCESSORIES

### RELAY TESTING OPTION

#### DESCRIPTION

The MRCT can be configured to include the functionality to test electromechanical, solid-state and microprocessor based over-current relays, including voltage controlled, voltage restraint and directional over-current; test under/over voltage, single-phase impedance, single-phase power, directional, synchronizing, auto-synchronizing, negative sequence under/over voltage, current balance, frequency, volts/hertz, reclosing, thermal and various other relays

#### APPLICATIONS

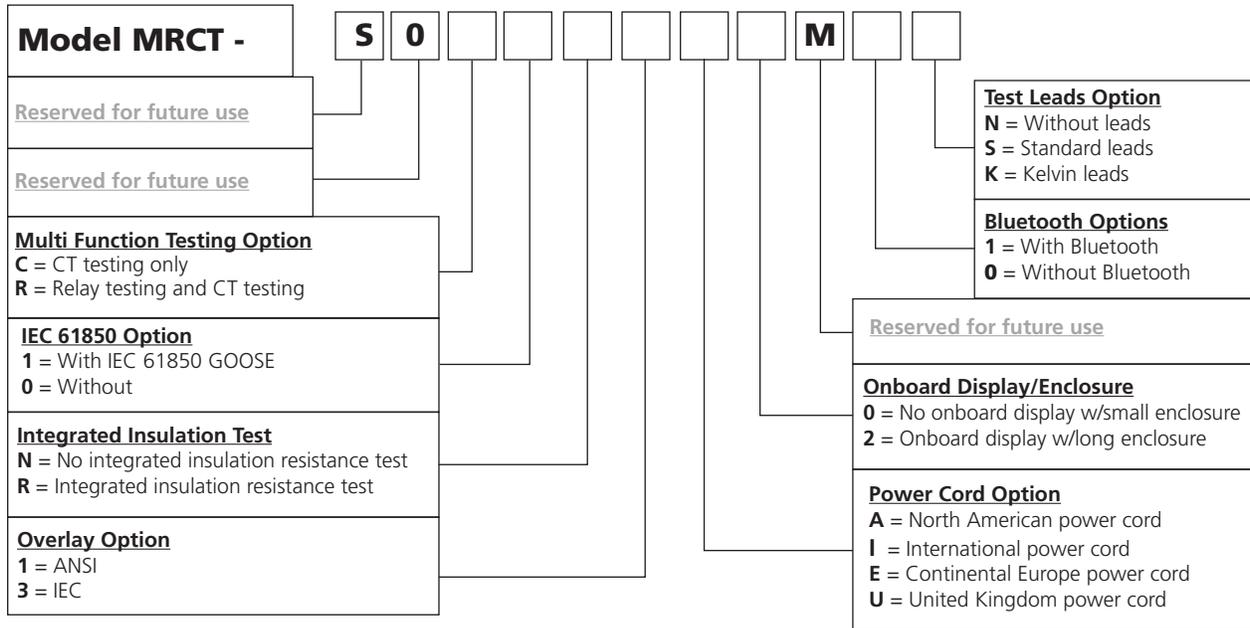
The current channel is rated for 30 amps @ 200 VA continuous, up to 60 amps @ 300 VA for short durations. It has a unique flat power curve from 4 to 30 amps that insures maximum compliance voltage to load at all times. With a high compliance voltage of 50 volts the SMRT1 has the capability to test high impedance over-current relays. The voltage channel can provide a variable output of 0- 30/150/300 Volts at 150 VA of output power, and has a unique flat power curve from 30 to 150 volts insuring maximum output power to the load at all times. With the voltage channel converted to current, it can perform minimum operating point, slope and timing on current differential relays, including harmonic restraint transformer differential relays (which can be tested one phase at a time).

## RELAY OPTION SPECIFICATIONS

<b>Outputs</b>	All outputs are independent from sudden changes in line voltage and frequency. This provides stable outputs not affected by sudden changes in the power source. All outputs are regulated so changes in load impedance do not affect the output.
<b>Output Current</b>	Output power ratings are specified in AC rms values and peak power ratings.
<b>Output Current Power Max V / Duty Cycle</b>	1 ampere 15 VA 15.0 V rms continuous 4 amperes 200 VA (282 peak) 50.0 V rms continuous 15 amperes 200 VA (282 peak) 13.4 V rms continuous 30 amperes 200 VA (282 peak) 6.67 V rms continuous 75 amperes 300 VA (424 peak) 5.00 V rms 90 cycles <b>DC 200 Watts</b>
<b>AC Voltage Output</b>	Outputs are rated with the following Ranges: Output volts power max I 30 volts 150 VA 5 amps 150 volts 150 VA (see Power V) 300 volts 150 VA 0.5 amps DC 150 watts <b>Duty Cycle:</b> Continuous
<b>Metering</b>	Measured output quantities such as AC amperes, AC Volts, DC volts or DC amperes, and time may be simultaneously displayed on the large, color TFT LCD, optional STVI touch screen. The AC and DC outputs display the approximate voltage/current output prior to initiation of the outputs.
<b>AC Voltage Amplitude</b>	
<b>Accuracy</b>	$\pm 0.05\%$ reading + 0.02% range typical, $\pm 0.15\%$ reading + 0.05% range maximum
<b>Resolution</b>	.01
<b>Measurements</b>	AC RMS
<b>Ranges</b>	30, 150, 300V
<b>AC Current Amplitude</b>	
<b>Accuracy</b>	$\pm 0.05\%$ reading + 0.02% range typical, $\pm 0.15\%$ reading + 0.05% range maximum
<b>Resolution</b>	.001/.01
<b>Measurements</b>	AC RMS
<b>Ranges</b>	30, 60A
<b>DC Voltage Amplitude</b>	
<b>Accuracy</b>	0.1% range typical, 0.25% range maximum
<b>Resolution</b>	.01
<b>Measurements</b>	RMS
<b>Ranges</b>	30, 150, 300V
<b>DC Current Amplitude</b>	
<b>Accuracy</b>	$\pm 0.05\%$ reading + 0.02% range typical, $\pm 0.15\%$ reading + 0.05% range maximum
<b>Resolution</b>	.001/.01
<b>Measurements</b>	RMS
<b>Ranges</b>	30A

**ORDERING INFORMATION**

Style Number Identification



**DESCRIPTIONS OF HARDWARE OPTIONS**

**Multi Function Testing Option**

Customers can choose which type of testing functionality they want the MRCT unit to come with. Enter the letter **C** for the unit to come with the current transformer testing capability only, or enter the letter **R** for the unit to also have relay testing functionality.

**IEC 61850 Option**

If the MRCT is configured to test relays, Megger GOOSE Configurator software may be used in the testing or commissioning of IEC 61850 compliant devices. In order for the MRCT to be able to subscribe as well as publish GOOSE messages, the MRCT must be configured to test relays and the IEC 61850 feature needs to be enabled. Enter the number **2** for the unit to come with the ANSI overlay. Enter **3** for the unit with the IEC overlay.

**Integrated Insulation Test**

Enter **R** for the unit to come with an integrated insulation resistance test capability. Enter **N** for the unit without an integrated insulation test.

**Bluetooth Option**

For customers who wish to have a wireless control of the SMRT unit, enter the number **1** for the unit to come with the Bluetooth option installed. Enter **0** for without.

**Power Cord Option**

Customers can choose which type of power cord they want the unit to come with.

**A option** – NEMA 5-15 to IEC60310 C13 connectors, UL & CSA approved for countries with NEMA outlets.

**I option** – International color coded wires (light blue, brown and green with yellow stripe) insulation jacket stripped ready for male connector with IEC 60320 C13 connector. CE marked.

**E option** – CEE 7/7 Schuko plug to IEC 60320 C13 connector. CE marked.

**U option** – United Kingdom power cord with IEC 60320 C13 connector, and 13 amp fuse. CE marked.

**Test Leads Option**

Enter the letter **N** for the unit without test leads. Enter the letter **S** for the unit to come with set of standard test leads. Enter the letter **K** for the unit to come with both standard and Kelvin test leads.

**Test Leads and Accessories**

All units come with a power cord (see power cord option), and Ethernet communication cable, and instruction manual CD. All other accessories vary depending on the options selected, see table of optional accessories.

DESCRIPTION	Part Number
<b>Included Standard Accessories</b>	
Power cord - Depending on the style number, the unit will come with one of the following	
Line cord, North American	620000
Line cord, Continental Europe with CEE 7/7 Schuko plug	50425
Line cord, International color coded wire	15065
Line cord, United Kingdom	90002-989
Ethernet crossover cable for interconnection to PC, 210cm (7 ft.) long (1 each)	620094
Instruction manual	80989

**Table of Accessories**

Accessories are supplied with the selection of either the standard test leads option, the Kelvin test leads option, and/or the relay option. With the selection of the standard test leads option; the number and type of leads and accessories included are outlined below. If desired, test leads and accessories can be ordered individually, see description and part numbers.

DESCRIPTION	Part Number
<b>Optional accessories included in standard set of test leads and descriptions</b>	
	<b>Standard test leads option</b>
<b>Accessory carry case:</b> Use to carry power cord, Ethernet cable, optional STVI and test leads, (1 each)	2003-725
<b>Set of primary test leads:</b> H1, H2 test leads 40 ft (12.192m) (4 each)	2003-164
<b>Set of secondary test leads:</b> 5 Tap ( X1, X2, X3, X4, X5) Test Leads, 20ft (6.096m) (1 each)	2004-005
<b>Ground lead,</b> green with yellow, with large ground clip, 20 ft, (1 each)	2003-724
<b>Large test clip,</b> red, 40mm opening (1 each)	640266
<b>Large test clip,</b> black, 40mm opening (1 each)	640267
<b>Alligator clip,</b> black, 4.1mm (5 each)	90004-427
<b>Spade lug adapter (small):</b> Small lug fits most new relay small terminal blocks.	
<b>Lug adapter, RED,</b> 4.1 mm, use with test leads up to 1000 V/20 amps CAT II (5 each)	684004
<b>Cable/spade lug adapter (large):</b> Large spade lug fits older relay terminal blocks, or STATES® Company FTP10 or FTP14 test paddles, ABB or General Electric test plugs with screw down terminals (5 each)	684003
<b>Screw in banana test jack</b> (5 each)	90004-599
<b>USB memory stick</b> (1 each)	830029
With the Kelvin test leads option, a complete set of standard test leads are included as well as set of Kelvin leads. If desired, Kelvin test leads can be ordered individually, see description and part numbers.	

DESCRIPTION	Part Number
<b>Accessories included in Kelvin set of test leads and descriptions</b>	<b>Relay option</b>
<b>Set of Kelvin test leads:</b> Test leads, 20ft ( 6.096 m) (2 each)	90004-684
With the relay testing option the number and type of leads and accessories included are outlined below. If desired, test leads and accessories can be ordered individually, see description and part numbers.	
<b>Accessories included in standard set of relay test leads and descriptions</b>	<b>Relay option</b>
<b>Sleeved pair of test leads:</b> Keeps the test leads in pairs and from getting entangled. Sleeved test leads, one red, one black, 200 cm (78.7") long, 600 V, 32 amperes CAT II (4 pair)	2001-394
<b>Cable/spade lug adapter (small):</b> Small lug fit most new relay small terminal blocks. Lug adapter, <b>red</b> , 4.1 mm, use with test leads up to 1000 V/ 20 amps CAT II (4 each)	684004
Lug adapter, <b>black</b> , 4.1 mm, use with test leads up to 1000 V/ 20 amps CAT II (4 each)	684005
<b>Jumper lead:</b> Used to common returns together on units with floating ground returns, or parallel of current channels. Jumper lead, black, 12.5 cm (5") long, use with voltage/current outputs, 600 V, 32 amps CAT II (1 each)	2001-573
<b>Smart Touch View Interface</b>	
The MRCT is available with the STVI-1, with an external Power over Ethernet (PoE) interface unit. The PoE power supply has two Ethernet ports. One port labeled <b>Data &amp; Power Out</b> connects to the STVI Ethernet port, and the <b>Data In</b> port connects to the PC/IN port on the MRCT.	
<b>Smart Touch View Interface (STVI-1 includes the following)</b>	STVI-1
Smart Touch View Interface (1 each)	STVI-1
Power over Ethernet Interface (1 each) The PoE interface unit comes with a NEMA 5-15 power cord only. Other power cords are optional, and must be ordered separately (see <b>Power Cord Option</b> for descriptions and part numbers)	90001-736
STVI Ethernet cable assembly, 210cm (7 ft.) long (1 each)	620094

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**UK**  
Archcliffe Road Dover  
CT17 9EN England  
T +44 (0) 1304 502101  
F +44 (0) 1304 207342  
UKsales@megger.com

**UNITED STATES**  
4271 Bronze Way  
Dallas TX 75237-1019 USA  
T 800 723 2861 (USA only)  
T +1 214 333 3201  
F +1 214 331 7399  
USsales@megger.com

**OTHER TECHNICAL SALES OFFICES**  
Valley Forge USA, College Station USA,  
Sydney AUSTRALIA, Täby SWEDEN, Ontario  
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