



C.T. ERROR TESTER 590G-V2 DATASHEET



REDPHASE INSTRUMENTS

Contents

	Section
Key Features	
Application	1
Where it is used	1.1
C.T. Ratio error Measurement	1.2
P.T. Ratio Error Measurement	1.3
Burden Measurement	1.4
Admittance Measurement	1.5
Hardware features	2
Power Source	2.1
Interface	2.2
Case Details	2.3
Transit Case	2.3.1
Case Sizes (LxWxH)	2.3.2
Weight	2.3.3
Operating Ranges	3
P.T. Measurable Test Ranges	3.1
C.T. Measurable Test Ranges	3.2
Admittance range	3.3
C.T. Burden range	3.4
P.T. Burden range	3.5
Measurement Accuracy	4
C.T. Ratio accuracy	4.1
C.T. Phase error accuracy	4.2
Winding resistance accuracy	4.3
External Burden range	4.4
P.T. Turns ratio measurement accuracy	4.5
P.T. Phase error resolution	4.6
Protection Features	5
Power Supply and Consumption	6
Additional features	7
Compliance & Certifications	8
Test Procedure for P.T.s	9
Test Procedure for C.T.s	10
590G-V2 Interface connections	11
Accessories Included	12
Secondary C.T. cable and accessories	12.1
Primary C.T. cable and accessories	12.2
Accessories (Optional)	13
Model 590F (Live C.T. Testing)	13.1
Model 590D-1 (Full load P.T. Testing)	13.2

RED PHASE INSTRUMENTS PTY. LTD. ABN 47 005 176 670

10 Ceylon Street, Nunawading, Melbourne, Victoria, 3131, Australia

Tel: + 61 3 9877 6988 Fax: + 61 3 9878 8508

E-mail: sales@redphase.com.au

KEY FEATURES:

- **PORTABLE AND LIGHTWEIGHT FOR TESTING P.T.s AND C.T.s TO 0.02% ACCURACY OFFLINE IN THE FIELD WITH PRIMARY SIDE VOLTAGE/ CURRENT OUT OF SERVICE. BOTH 50Hz AND 60Hz VERSIONS.**
- **TESTS FOR C.T. CURRENT AND PHASE ERROR FROM 2.5/5 UP TO 75,000/5 or 15,000/1.**
- **TESTS P.T. TURNS RATIO AND PHASE ERROR, FROM 2.2kV/110V UP TO 300kV/110V.**
- **CALCULATES OVERALL C.T. ERRORS UNDER LOAD FROM ADMITTANCE MEASUREMENT ON SECONDARY WINDING. (DOES NOT REQUIRE EXPENSIVE PRIMARY CURRENT INJECTION TESTING.)**
- **CALCULATES OFFLINE ADMITTANCE AT 1.6kHz. THIS CAN PROVIDE A BLUEPRINT TO BE USED AS A REFERENCE FOR FUTURE ROUTINE LIVE C.T. TESTS WITH RED PHASE MODEL 505B.**
The model 505B carries out live Admittance tests rapidly during normal operation with the primary 50/60Hz current present; Does not interrupt supply.
- **MEASURES THE BURDEN OF C.T. AND P.T. SECONDARY CIRCUITS TO ENSURE C.T. AND P.T. NOT OVERLOADED**
- **USER IS ABLE TO CREATE THEIR OWN SET OF INJECTION AND BURDEN TEST POINTS.**
- **CT BATCH TESTING POSSIBLE.**
- **IS ABLE TO STORE UP TO 1000 C.T. AND P.T. RECORDS EACH.**
- **ABLE TO PROVIDE INTELLIGENT CLASS (PASS OR FAIL) RESULTS ASSESSMENT AND ALSO PROVIDE BEST CLASS FIT DETERMINATION.**
- **ABLE TO UP-LOAD AND DOWN-LOAD INFORMATION TO A PC VIA USB INTERFACE.**
- **WORKS WITH INTUITIVE PC RESULTS SOFTWARE**

1.0. APPLICATIONS

1.1. Where it is used

The Model 590G-V2 is a modestly priced, light-weight field portable instrument designed to audit P.T. and C.T. installations in a utility system. The Model 590G-V2 is used for many routine workshop tests, as well as field testing, to an accuracy of 0.02%. It is optimised for testing metering C.T.s, but can also test protection C.T.s for current and phase error at normal burden.

1.2. C.T. Ratio Error Measurement

The traditional method of testing of C.T.s using primary injection is very costly. The Model 590G-V2 tests a C.T. by measuring the turns ratio and the 50Hz admittance of the C.T. secondary winding. These tests require the C.T. to be offline for only a few minutes. From these tests the performance of the C.T. is automatically calculated to typically within 0.02% for 120%, 100%, 20% and 5% of rated current at any Power Factor (PF). These nominal primary load levels for testing can be customized by the user at any time up to 400% if required.

1.3. P.T. Ratio Error Measurement (No Load)

The Model 590G-V2 will test the turns ratio of a single phase inductive P.T. at a reduced level of energization with its own internal solid state voltage source. Tests on a variety of P.T.s up to 500kV rating has established that a reduced energization level will give results valid within 0.02% or better in nearly all cases. Since the conventional testing of P.T.s at rated energization levels is expensive, time consuming and frequently neglected the Model 590G-V2 can provide an affordable alternative.

1.4. Burden Measurement

The burden of the metering circuit can be measured by connecting the C.T. or P.T. Secondary cables to the Model 590G-V2. This will check that the C.T. and P.T. will not be overloaded under normal service conditions.

1.5. Admittance Measurement

The integrity of a C.T. can be guaranteed in future at minimal cost by performing a 1.6kHz admittance test with the 590G-V2. The result is stored and then referred to as a characteristic blueprint for this C.T.. It may be referenced in future on line (Live) admittance tests performed by the Model 505B Live C.T. Tester.

Remaining connected online the 505B takes less than a minute to perform the 1.6kHz admittance test.

The admittance of a C.T. is a very sensitive indicator of shorted turns and other common faults which can cause metering errors of 1 to 20% which can be easily overlooked for years. Many hundreds of the Model 505B's have been sold to cost conscious utilities and it is a unique answer to what is a serious revenue loss problem.

2.0. HARDWARE FEATURES

2.1. Power Source

The Model 590G-V2 has its own internal solid state voltage source to test P.T.s and C.T.s. The source can generate up to 160V at 50Hz or 60Hz, and 2V at 1.6kHz. To avoid spurious results caused by 50Hz pickup from nearby equipment, the tests are carried out at 51Hz and the micro-processor control locks on to the 51Hz signal only. The software extrapolates the 51Hz test results for an actual 50Hz performance.

2.2. Interface

The alphanumeric keyboard on the front panel can be used to enter information about the item to be tested. Above the keyboard is a backlit 6 inch graphic LCD screen which displays the keyed information and final test results.

2.3. 590G-V2 Case .

The Model 590G-V2 uses the well known "Pelican" brand injection moulded plastic case. The case is robust and hard wearing. There is an internal aluminium chassis and an aluminium front panel with a reverse screened "Lexan" polycarbonate finish.

2.3.1. Transit Case

A transit case is also provided as standard for transportation. Purpose built from ABS plastic, it is foam lined and offers suitable protection for the 590G-V2 during transportation to and from site. The case has room for test leads and accessories.

2.3.2. Case Sizes (L x W x H)

590G-V2 case: 410mm X 330mm x 180mm.
Transit case: 640mm X 260mm X 510mm

2.3.3. Weight

590G-V2: ~7kgs
Transit case: ~6kgs
Test leads & accessories: ~3kgs



3.0. OPERATING RANGES

3.1. P.T. Measurable Test ranges

No load voltage ratio only

- Maximum ratio 510kV / 110V
- Minimum ratio 2.5kV / 100V
- VA rating from 1 to 300VA.

3.2. C.T. Measurable Test ranges

Maximum ratio	75,000/5 or 15,000/1
Minimum ratio	2.5/5 or 10/1
VA RATING 1A Secondary	Typically 150VA.
VA RATING 5A Secondary	Typically 300VA.
Selectable % Primary I	1% to 400%.
Selectable % BURDEN	10% to 100%
Selectable PF	0.5 to 1.0

The 590G-V2 computes the C.T. performance at the selected PF.

C.T. TYPES: Single and multiple primary turn, parallel winding compensation, composite core.

3.3. Admittance measurement range

50/60Hz	100uS to 100mS + 0.5%
1.6kHz	100uS to 50mS. + 0.5%

3.4. C.T. Burden measurement range

1A Type	0 to 25 Ohms / 25VA
5A Type	0 to 12 Ohms / 300VA

To achieve this the 590G-V2 typically injects 0.5A up to a limit of 25V to measure the C.T. burden value

3.5. P.T. Secondary burden range

100V / 110V	0 to 300VA
-------------	------------

4.0. MEASUREMENT ACCURACY

4.1. C.T. Ratio accuracy:

Ratio Range	Ratio Accuracy
2.5/5 to 20,000/5	0.02%. Typical
20,000/5 to 75,000/5	0.05%. Typical

%Injection Range	Ratio Accuracy
5% to 120%	0.02%
120% to 200%	0.03% to 0.05%
200% to 400%	0.05% to 0.1%

4.2. C.T. Phase error accuracy

5 to 120% Primary I: 1 min

4.3. Winding Resistance Accuracy

Resolution to 1 mΩ + 0.2 %

4.4. External Burden

Resolution to 1 mΩ + 0.2 %

The 590G-V2 will also test **split core C.T.s** to an accuracy of 0.02% at 120% and 100% current at 100% burden. As the current and burden level decrease the action of the split core causes more current ratio measurement error.

4.5. P.T. Turns ratio measurement accuracy

To 0.02% from 1.5kV/100V to 500kV/110V.
To 0.03% from 500kV/110V to 1000kV/110V

4.6. P.T. Phase error resolution

To 1min.

5.0. PROTECTION FEATURES.

- Fuses for Mains input, 12V battery supply and internal power amplifier.
- Flashing LED when terminals are live.
- Buzzer to indicate error conditions.

6.0. POWER SUPPLY & CONSUMPTION

Mains Supply	85 - 264 VAC, 50/60Hz
Power Rating Min	20VA
Power Rating Max	50VA
Auxiliary Supply	12V DC car battery
Aux supply and battery monitoring feature	
Standby current consumption:	1.1A
Maximum current consumption:	6.0A
Includes a low battery shutdown feature.	

7.0. ADDITIONAL FEATURES

Auto class assessment to 0.1 class

Batch testing

Test points customizable for any burden from 0 to 100% and integral injection test points up to 400%.

Comes with PC Windows Test Report software with easy to understand results format



8.0 COMPLIANCE & CERTIFICATIONS

CE Compliance Assessed against **EN 61010-1:2001**

In accordance with: **LVD 2006/95/EC**

EMC Compliance Assessed against **EN 61326-1:2006**
EN 61326-2-2:2006
EN 61000-3-2:2006
EN 61000-3-3:2008

In accordance with: **EMC 2004/108/EC**

9.0. TEST PROCEDURE FOR P.T.s

Isolate the P.T. primary side, and connect it to VA and COM terminals of 590G-V2.

Isolate the P.T. secondary side, and connect it to 590G-V2 "VB" and "COM" terminals.

Key in P.T. test data including:

- Primary voltage
- Secondary voltage
- VA rating and
- Serial number.

Start the test.

The voltage and phase error results are given on the large LCD display

All test results can be stored for later download to a PC or laptop.

10.0. TEST PROCEDURE FOR C.T.s.

8.1. Isolate the C.T. primary side. Use a length of cable to place one turn through the window of the C.T. and connect it to "VB" and "COM" terminals of 590G-V2.

8.2. Isolate the C.T. secondary side, and using the 4 wire test lead supplied with the 590G-V2 and connect the secondary to the group of 4 terminals marked "VA" and "COM".

8.3. Test data for the C.T. is keyed in. This includes: Primary current; secondary current; VA rating; PF; % burden ; accuracy class; Model No. and serial number.

8.4. The test which takes around 1 minute are then displayed on the LCD as results at 120%, 100%, 50%, 20% and 5% current at both 100% and 25%VA burden. At the end of this test various options are available including saving the test results.

8.6. All test results can be stored for later downloading to a PC.

8.9. After the 50Hz / 60Hz C.T. test, a 1.6kHz admittance test may be carried out if required. This will measure the complex admittance of the secondary for storage in memory.

8.10. To complete testing the P.T. and C.T. installation, the 590G-V2 can be connected to the two wires of the P.T. or C.T. Metering burden. This will give an indication if the P.T. or C.T. is overloaded.

11.0. 590G-V2 CONNECTIONS

USB Port

For download of results data to PC.

RS232 Port

For connection to a Model 590D-1 , use a straight thru cable.

Clip-On 1

590F1 High Voltage accessory connector

Clip-On 2

590F2 Low Voltage accessory connector

Printer

Connector for optional thermal printer

Battery

Connector for external 12 Volt dc supply such as a car battery.

VA & VB Injection / Sense Terminals

C.T. / P.T. primary and secondary connection terminals.

Mains

IEC connector.

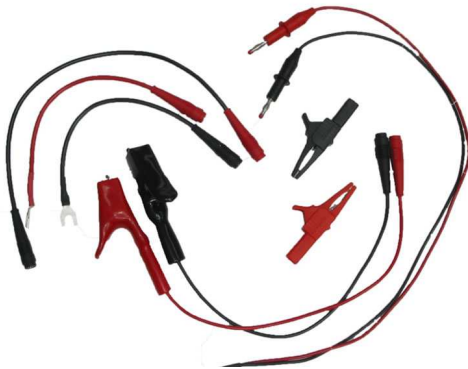
12.0. ACCESSORIES INCLUDED

12.1. Secondary C.T. cable and accessories



Cable	Length
1 x Secondary cable :	8m
2 x Male to Female cables	150mm
2 x Female to spade cables	150mm

12.2. Primary C.T. cable and accessories



Cable	Length
1 x Primary cable :	8m
1 x Interconnection cable	350mm
2 x Female to spade cables	150mm

Other cables included

1 x Battery cable & clamps	5m
1 x USB cable	1.8m

Other connectors included

2 x Red + 2 x Black crocodile clips

Please note:

Existing accessory cables are also used for testing P.T.s.

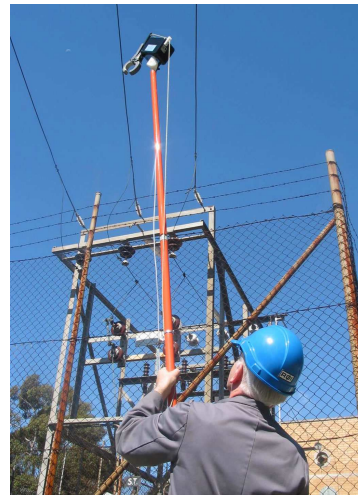
13.0. ACCESSORIES (Optional)

13.1. Model 590F (Live C.T. Testing)

The 590F series comprises a range of options covering low current < 20 Amp CT installations to > 2500 Amp sites. Using a hot-stick, High Voltage installations up to 100kV above ground potential may also be measured.

The kit can also be supplied for HV only, for LV only or for both HV and LV C.T. testing. This allows live testing of C.T.s on customer loads to an accuracy of typically 0.1%.

Used in combination with the 590G-V2 which is usually located at the metering end of the C.T. secondary, the HV version clip-on is mounted on a suitably rated hot-stick and has a 6 metre fibre optic cable which terminates in a small interface unit. The interface unit communicates over a special RS485 cable with the 590G-V2. A 100m RS485 cable reel is supplied with the HV version as a standard.



13.2. Model 590D-1 (Full load P.T. Testing)

Used in conjunction with the 590G-V2 the 590D-1 utilizes a high power switch mode voltage source for full load simulation testing of inductive P.T.s with up to 3 windings.

Tests can be performed on inductive P.T.s up to a 500kV rating. At 25% and 100% burden the P.T. may be tested over 80%, 100% & 120% of applied primary voltage.



Every care has been taken to ensure that the above data is correct at the time of printing. Always refer to the latest data sheet when purchasing. RED PHASE INSTRUMENTS reserves the right to alter specifications without notice.