

# UTILITY TEST SOLUTIONS



## RED PHASE INSTRUMENTS

## SUBSTATION EARTH TESTING PRODUCTS

CURRENT INJECTION SYSTEMS  
FREQUENCY SELECTIVE MULTIMETERS  
GRID AND METAL BONDING TESTER  
IMPULSE IMPEDANCE TESTER



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Delivering Test Solutions Reliably for 40 years.

Since 1976 power companies have relied on test solutions from Red Phase Instruments to provide assessment data of vital electrical and utility infrastructure.

A trusted quality manufacturer, our equipment is built to withstand the rigours of continual field work and long term use by service personnel.

With some products still in service after 25+ years we are a constant and reliable utility partner that provides quality test equipment and engineering services at the most technical level.

With an approachable attitude, Red Phase Instrument's technical staff are easy to reach, providing utilities with the confidence that assistance and advice is a phone call away.

**UNIQUE  
CUSTOMIZED  
RUGGED**

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Wonthaggi Australia

## EARTH TESTING

**R**ed Phase Instruments design and manufacture rugged, quality earth testing and measurement equipment. Constantly innovating we are developing an ever increasing portfolio of products that will assist earthing professionals with the assessment of an electrical installations integrity.

### Product areas

**Current Injection Equipment:** Assessing the performance of an electrical installation's earthing system under current fault conditions can only be performed with a current injection source. This current source when properly managed will simulate a lower level, (off frequency), current fault in and around an electrical installation. This induced current will produce various potentials throughout the test site and these can be measured using a similarly tuned multimeter.

**Lightning impedance:** To measure the impedance of an earthed structure under lightning impulse conditions requires being able to simulate or imitate the spectral response of the impulse. Our instrument allows for two shaped current impulses to be applied to a structure such as a pylon tower footing to determine a Direct impedance path measurement and an Electrode Impedance measurement analogous to a Fall of Potential test at low frequency.

**Grid / Ground Bonding:** The bonding integrity between electrical equipment and the earth grid to which it is connected can be compromised over time due to weather induced changes in soil chemistry and at times equipment handling. A reliable indicator of a metallic structure's grid bond can be determined with a continuity test at both D.C. and alternating D.C. levels.

# EARTH TESTING

## CURRENT INJECTION

Model : 4061

Type : 200VA Current Injection unit with  
3G / 4G connectivity and control

Supply : Mains supply, universal input

**T**he 4061 is a current injection source that is used to inject current into an earth loop at a selectable frequency from 40Hz to 69Hz.

The 4061 has 7 tap settings to closely match typical earth loop impedances from 2 Ω up to 128 Ω which will cover most test situations. The 4061 automatically selects the most closely matched tap to the earth loop impedance so that as much power as possible is being injected into the site under test at a constant rate. This provides the operator with the confidence that the clearest and most unambiguous results will be measured during potential and current branch determinations.

For impedances outside the existing tap range, the earth loop current will be less than maximum but still sufficient for testing most small to medium electrical assets.

Optionally the operator may consider our larger and more powerful 2kVA and 8kVA injection systems for larger or more inductively challenging environments which the test loop may be subject to.

The 4061 comes with an on board Web Server and data modem giving the operator the flexibility of remote control and status monitoring via their mobile phone or tablet. Also an in-built GPS feature together with our tunable multimeters allows the operator to take current branch phase angle readings without the need for a separate phase reference cable.

Whilst using the 4061 in a Fall of Potential set up, to inject current into an earthed system, typical measurements taken by an operator with a tuned multimeter on-site would be:

- Step Potential
- Touch Potential
- Ground or Earth impedance
- Current splits / branching

## EARTH SYSTEM TESTING

3G / 4G Wireless Control and injection status monitoring via mobile phone / tablet



Voltage Input Range	85 to 264 VAC
Output Power	200VA
Output Voltage Max	160VAC
Selectable Frequency Range	40Hz to 69Hz
Seven Transformer Taps	From 2 Ω at 10A to 128 Ω at 1.25A
GPS Phase Synch	Available
Remote Control	via Mobile Phone



# 2KVA INJECTION SYSTEM

## CURRENT INJECTION

Model : 4046

Type : 2kVA Current Injection Unit

Supply : 220-240Vac, 50 or 60Hz

**EARTH SYSTEM TESTING**



**T**he 4046 is a switch mode current injection source that is used with the Model 4047C shown below to inject a current at a selectable frequency into an earth loop. A feedback control loop from the 4047C indicates to the 4046 what adjustment to the voltage magnitude is required to maintain the chosen RMS current.

The 4046 comes with a GPS add-on feature which, together with our tunable multimeters allows the operator to take current branch phase angle readings without the need for a separate phase reference cable.

Output Power	2000VA
Selectable Frequency Range	40Hz to 70Hz
GPS Phase Synch	Available

## CURRENT INJECTION

Model : 4047C

Type : 2kVA Coupling Transformer

Supply : Powered via 4046

**EARTH SYSTEM TESTING**



**T**he 4047C galvanically isolates the 4046 from the earth loop. To maximize output power, the 4047C has multiple output voltage and current taps to achieve the optimum impedance match between the load and the 4046.

Note: The 4047C is designed for continuous operation at 2kVA.

Input Voltage	180V AC nominal
Output Voltage Max	800V AC
No. of Transformer Taps**	Eight, from 5 Ω at 20A to 400 Ω at 2 A

\*\* : 4047C transformer output taps can be customized



# 8KVA INJECTION SYSTEM

## CURRENT INJECTION

Model : 4041

Type : 8kVA Current Injection Unit

Supply : 3-phase, 300-430Vac, 50 or 60Hz

EARTH SYSTEM

TESTING



**T**he 4041 is a switch mode current injection source that is used with the Model 4043 shown below to inject a current at a selectable frequency into an earth loop. A feedback control loop from the 4043 indicates to the 4041 what adjustment to the voltage magnitude is required to maintain the chosen RMS current.

The 4041 comes with a GPS add-on feature which, together with our tunable multimeters allows the operator to take current branch phase angle readings without the need for a separate phase reference cable.

Output Power	8000VA
Selectable Frequency Range	40Hz to 70Hz
GPS Phase Synch	Available

## CURRENT INJECTION

Model : 4043

Type : 8kVA Coupling Transformer

Supply : Powered via 4041

EARTH SYSTEM

TESTING



**T**he 4043 galvanically isolates the 4046 from the earth loop. To maximize the output current, the 4043 has multiple output voltage and current taps to achieve the optimum impedance match between the load and the 4046.

Note: The 4043 is designed for continuous operation at 8kVA.

Input Voltage	350V AC nominal
Output Voltage Max	800V AC
No. of Transformer Taps **	Eight, from 1 $\Omega$ at 90A to 80 $\Omega$ at 10A

\*\* : 4043 transformer output taps can be customized



## EARTH TESTING



### MULTIMETER

**Freq Selective  
Multimeter**

Model : 4031-R and 4031-L

Type : Tunable Multimeter

Supply : Internal 3.7V lithium battery, rechargeable

**T**he 4031 is a truly portable series of frequency selective multi-meters, purpose built for the detection of a tuned AC signal generated by Red Phase Current Injection equipment.

The 4031 is able to measure the following parameters easily and accurately which are important for the safety of both the general public and utility personnel:

- Step and touch voltages
- Fall of Potential (3 and 4 point)
- Current branching with cable-less phase synch
- Soil Resistivity Measurement (Wenner or Schlumberger)

The 4031 comes with either a Lemo rogowski current input, 4031-R, or a Flex Lem rogowski current input, 4031-L.

Voltage Input Range	200 Volts
Current Input Range	200 & 300 Amps
Selectable Frequency Range	40Hz to 70Hz
GPS Phase Synch	Available
Record Download	Via USB

### MULTIMETER

**Freq Selective  
Multimeter**

Model : 4025E

Type : Tunable Multimeter

Supply : 6V Rechargeable sealed lead acid battery

**T**he 4025E is a frequency selective multimeter purpose built for the detection of a tuned AC signal generated by Red Phase Current Injection equipment.

The 4025E is able to measure the following parameters easily and accurately which are important for the safety of both the general public and utility personnel:

- Step and touch voltages
- Fall of Potential (3 and 4 point)
- Current branching with cable-less phase synch
- Soil Resistivity Measurement (Wenner or Schlumberger)



Voltage Input Range	800 Volts
Current Input Range	200 & 300 Amps
Selectable Frequency Range	40Hz to 70Hz
GPS Phase Synch	Available
Record Download	Via USB
Current Input	Lemo & Flex Lemo





# EARTH TESTING

## LIGHTNING IMPULSE TESTER

Model : 4051

Type : 32 Amp Impulse Impedance tester

Supply : 12V Rechargeable sealed lead acid battery

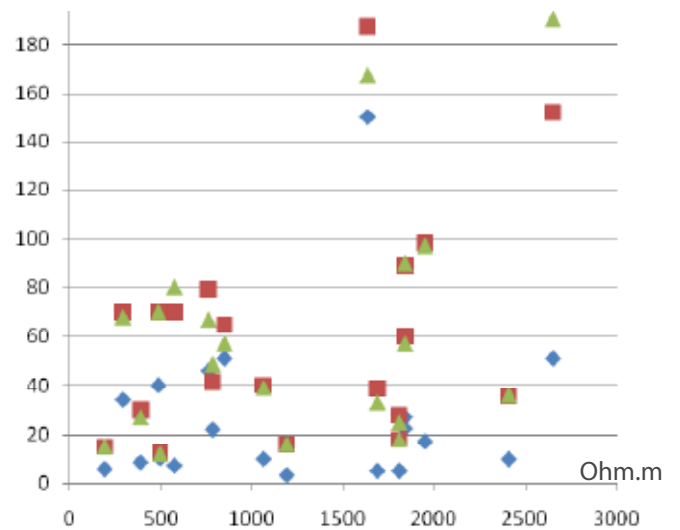
The lightning impulse impedance test instrument is used to measure the impulse ground impedance of a transmission pylon footing or other grounded structures without the need to disconnect the overhead ground conductor.

Portable and battery operated, the 4051 tests a grounded structure's lightning impedance by applying a selected impulse profile signal at up to 32A directly to the Pylon footing. The resulting peak load current and voltage is measured and the impedance figure is determined from this.

The chart at right shows the impedance results of 20 tower footings against soil resistivity using a standard 3 point fall of potential set up. The impedance tests performed were:

- A 128Hz low frequency test
- Two impulse tests conducted using the 4051

Pylon footing Impedance per tower in Ohms

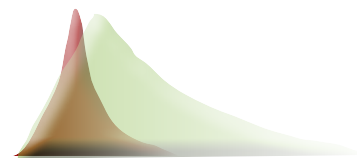


- Low frequency 128Hz test indicated by: ◆
- 8 / 20uS impulse test indicated by: ■
- 10 / 350uS impulse test indicated by: ▲

Up to 5 further impulse profiles are available on the 4051 upon request.



Impulse Impedance  
Testing



Pulse Current Output	0.5A to 32 A
Maximum Pulse Voltage	800V
Impedance Range	0.5 Ω to 300 Ω



# EARTH TESTING

Metal/Grid Bond  
Testing

## EARTH CONTINUITY TESTER

Model : ECT-4

Type : Continuity Meter for metallic and ground or grid bonded structures

Supply : External Lithium battery pack

The Model ECT-4 is used to test the continuity of connections of bonded structures within an earthing system or grid such as a substation. Such structures include the electrical equipment itself and peripheral elements such as the equipment guards and the substation’s fencing.



The ECT-4 comes with a 10 metre and 100 metre extension cable allowing the operator to move the test probe to multiple test points around the grid. To extend the test length, further extensions can be ordered in multiples of 100 metres. When running on its external power source it can last over 5 hours from full charge. To maintain battery integrity the unit has a battery status indicator and a low battery shutdown feature.

Other features:

The ECT-4 has a rugged ergonomic pistol grip probe for easy handling. The stainless steel probe pins rotate and retract when pressed onto a bonded metallic structure, making for easier connection to metal through corroded and painted surfaces. The probe’s LCD display provides voltage, current and resistance data during tests and 3 push buttons allow the operator to adjust the test modes and change the current ranges.

Output Voltage: Battery	14.4 Vdc
50Hz and 60Hz rejection	100dB
Selectable Current Levels	1 A, 2A and 3 Amps
Accuracy	± 0.05% w.r.t. full scale
Resistance Resolution	10uΩ from 0 to 0.2Ω
Resistance Resolution	100uΩ from 0.2Ω to 4.0Ω
Output Current Accuracy	± 2%
Current Stability	< 10ppm / second

Operating Current Modes:

- Forward D.C.: Continuous
- Reverse D.C.: Continuous
- Pulsed Cycle: Forward, Reverse and Bipolar





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