

# ***Rail310V***

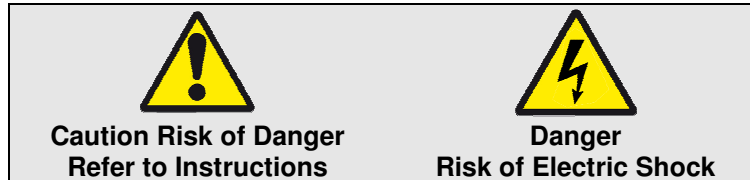
## ***Installation Guide***

### ***Revision 2***



## **1 Safety**

This instruction sheet gives details of safe installation and operation of the **Rail310V** electricity meter. Labels on each meter give details of equipment ratings for safe operation. Take time to examine all labels before commencing installation. Safety symbols on the meter have specific meanings as:



Safety may be impaired if the instructions are not followed or the meter is used in a manner not specified by the manufacturer.



Contains no user serviceable parts. Field wiring and commissioning should only be carried out by qualified personnel, in compliance with applicable national regulations.  
e.g. National Electrical Code (NEC) for US; Canadian Electrical Code for Canada

### **For further Information contact the manufacturer:**

Address: Northern Design (Electronics) Ltd: 228 Bolton Road, Bradford, West Yorkshire, BD3 0QW. (UK)  
Web: <http://www.ndmeter.co.uk>  
Email: [sales@ndmeter.co.uk](mailto:sales@ndmeter.co.uk)

## **2 Maintenance**

The equipment should be maintained in good working order. Damaged equipment must be sent to the manufacturer (or his authorised agent) for repair. The meter may be cleaned by wiping lightly with a soft cloth. No solvents or cleaning agents should be used. All inputs and supplies must be isolated before cleaning any part of the equipment.

## **3 Intended Use**

The **Rail310** is a precision electricity monitor which measures 3 single phase loads in one meter and displays kW, Volts and Amps. Measured parameters may be sent to remote systems for storage or display using an optional RS485 Modbus communications interface.

The **Rail310V** is intended for mounting on a standard 35mm "Top-Hat" Din Rail in a standard, secure, electrical switch enclosure so that only the front display is accessible to the end user after installation.



*The safety of any system containing the meter as a component remains the responsibility of the system manufacturer. After installation in a system, the ratings of the overall system, which reflect the ratings of the meter, must be visible to the user.*



*Only the front panel of the **Rail310V** may remain accessible to the user after installation in a suitable switch enclosure.*



*A suitably located and easily reached switch or circuit breaker must be included as part of the installation. This could, for example, be a safety-interlocking device on the door/front panel of the electrical enclosure. This switch/circuit breaker must be marked as the disconnecting device for the equipment and must comply with the relevant requirements of IEC 60947-1 and IEC 60947-3.*



*Disconnect / Isolate all supplies before commencing installation.*

## 4 Standard Connections

### 4.1 Current Transducers



Only current transducers which meet the manufacturer's specifications should be used.



*Current Transducer (CT) connections are not galvanically isolated from the voltage inputs and must therefore not be accessible to the operator after installation. Installed CT cables and any extensions to these, must not be accessible to the user.*

#### Minimum Current Transducer Specification:

Input Current Range:	0 to 1.2 In (In = nominal rated current in amps)
Output Voltage:	0.33Vac at In
Insulation:	600Vac (Core to secondary conductors)
Cable:	Operating Temperature, 105°C (221°F) Insulated 600Vac

The following list of UL & CE recognised current transducers has been approved for use with the Cube/Rail series of meters:

Part Number	Primary Current (XXX)	Secondary	Window Size
XFR/S0142/XXX	5, 10, 30, 50, 75, 100, 150, 200Amps	0.333Vac	19.1 x 19.1mm(0.75" x 0.75")
XFR/S0152/XXX	75, 100, 150, 200, 300, 400, 600Amps	0.333Vac	31.8 x 31.8mm (1.25" x 1.25")
XFR/S0162/XXX	100, 200, 300, 600, 800, 1000, 1500Amps	0.333Vac	50.8 x 50.8mm (2.0" x 2.0")
XFR/S1142/XXX	5, 10, 30, 50, 70, 100, 150, 200Amps	0.333Vac	19.1 x 19.1mm(0.75" x 0.75")
XFR/S1152/XXX	50, 70, 100, 150, 200, 250, 300, 400, 600Amps	0.333Vac	31.8 x 31.8mm (1.25" x 1.25")
XFR/S1162/XXX	100, 200, 300, 400, 600, 800, 1000, 1200, 1500Amps	0.333Vac	50.8 x 50.8mm (2.0" x 2.0")
XFR/S1172/XXX <sup>1</sup>	400, 600, 800, 1000, 2000, 3000Amps	0.333Vac	127.0 x 76.2mm (5.0" x 3.0")

**NOTE 1:** Model XFR/S1172/XXX is only approved for use up to an ambient temperature of 30°C (86°F). All other models are approved for use up to 55°C (131°F).

If the current transducer secondary cables require extending, care must be taken to avoid pickup of electrical interference. With suitable low capacitance screened cables, the cable can be extended to 100m (328Ft) or more.



*Extensions to the supplied current transducer cables must ensure all connections remain inaccessible to the operator after installation.  
All cables and connections must meet the minimum specifications provided.*

### 4.2 Voltage Connections



To maintain proper insulation from the mains supply, the neutral wire should only be used in power networks where the system neutral is protectively earthed at some point.

#### 4.2.1 Voltage Cables



Voltage cables must be rated for safe use in the electrical enclosure which houses the meter (e.g. UL1015) and must meet the following minimum specification: Temperature: 105°C (221°F); Insulation 600Vac.

#### 4.2.2 Auxiliary Mains Supply

The meter is powered from an auxiliary mains supply which is required to energise the metering circuit and display. This can be connected in parallel with one of the measurement phase voltages if it is rated correctly.



Ensure the auxiliary mains supply L-N is powered from a correctly rated and fused AC source as specified on the meter label.

#### 4.2.3 Voltage Terminals

Voltage:	277Vac (2-3, 3-4) 480Vac (4-5, 5-6)
Cable:	30-11 AWG, Stripped 6.0 to 7.0mm (0.24" to 0.28")
Torque:	0.5Nm (4.4in lb)

#### 4.2.4 Voltage Fuses

Fuses (US/Canada)

Rated Voltage	Type	Rupture In (A)	Standards
≥ 500Vac	Fast	1.0A	UL248 (US) C22.2 No. 248 (CAN)

Fuses (Other Countries)

Rated Voltage	Type	Rupture In (A)	Standards
≥ 500Vac	Fast	1.0A	IEC 60269 - 2

#### 4.2.5 Auxiliary Mains Fuses

Fuses (US/Canada)

Rated Voltage	Type	Rupture In (A)	Standards
≥ 250Vac	Fast	0.1A	UL248 (US) C22.2 No. 248 (CAN)

Fuses (Other Countries)

Rated Voltage	Type	Rupture In (A)	Standards
≥ 250Vac	Fast	0.1A	IEC 60269 - 2

### 4.3 Communications Options

The RS485 communication port is safety isolated from the measurement voltages at a minimum of 3.5kV.



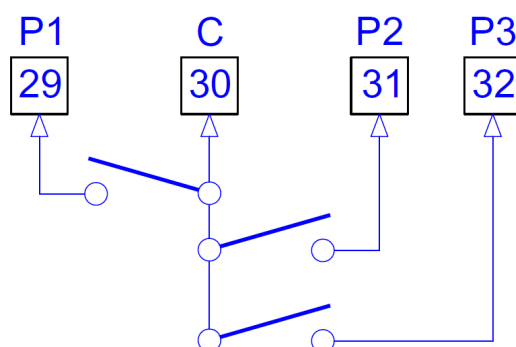
Communications cables running within an electrical enclosure may come close to high voltages and therefore must be insulated to the following minimum specification:  
Safety Compliant: e.g UL1015; Operating Temperature: 105°C (131°F); Insulation 600Vac

#### 4.3.1 RS485 Output Terminals (Optional)

Voltage: 30Vdc  
Cable: 30-11 AWG, Stripped 6.0 to 7.0mm (0.24" to 0.28")  
Torque: 0.5Nm (4.4in lb)

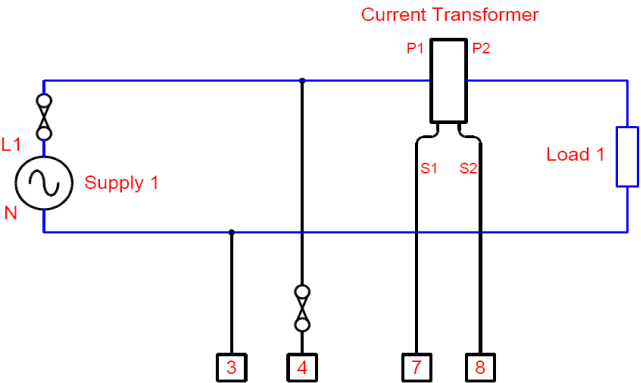
### 4.4 Pulse Outputs

Three isolated pulse outputs are provided for connection to external systems such as Building Energy Management Systems (BEMS), data loggers, remote counters etc. Each pulse output is triggered by a change in the associated real energy register (kWh) of each load. The pulse rate (amount of energy associated with each pulse) and pulse length may be set to suit the external system.

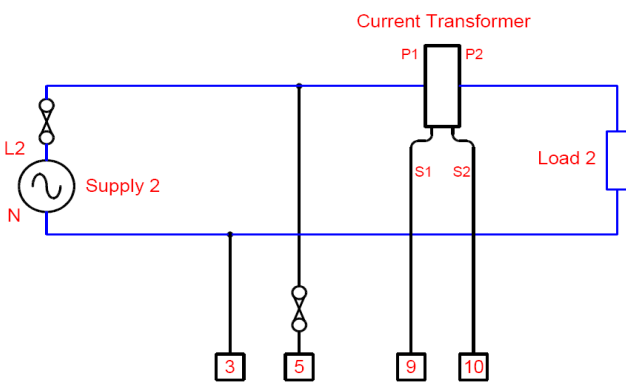


Pulse output cables running within an electrical enclosure may come close to high voltages and therefore must be insulated to the following minimum specification:  
Safety Compliant: e.g UL1015; Operating Temperature: 105°C (131°F), Insulation 600Vac

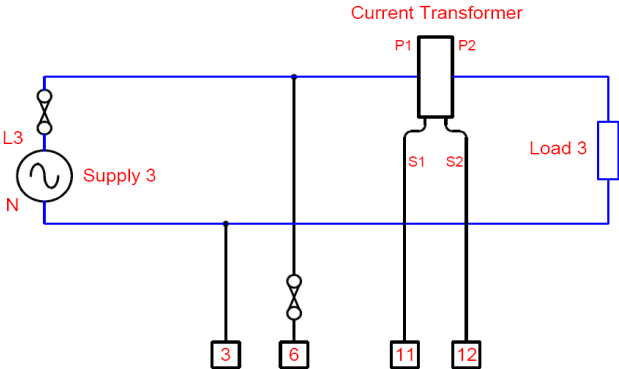
Typical Connections



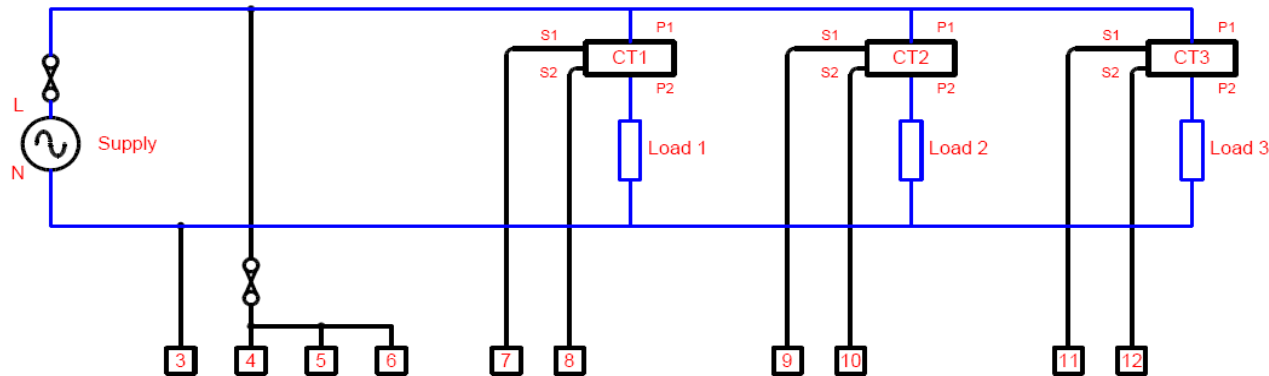
Meter 1 Measurement Input Connections



Meter 2 Measurement Input Connections




Meter 3 Measurement Input Connections



Meters 1-3 with Common Voltage Input

## 5 Operation


### 5.1 Current Displays

Press  to select the individual phase current displays. The 3 LEDs indicate which meter is currently displayed.



**Meter1-3 Current Display**


### 5.2 Voltage Displays

Press  to select the individual phase voltage displays. The 3 LEDs indicate which meter is currently displayed.



**Meter 1-3 Voltage Display**


### 5.3 Power Displays

Press  to select the individual meter power (kW) displays. The 3 LEDs indicate which meter is currently displayed. All 3 phase LEDs are lit when the SUM of all 3 meters is displayed.



**Meter 1-3 Active Power**



### 5.4 Energy Displays

Press  to select individual meter kWh pages. The 3 LEDs indicate which phase is currently displayed.



**Active Energy Registers<sup>(Note 1)</sup>**

**Note 1:** Scaling of the energy registers is set by the nominal input currents and voltages and remains constant during operation of the meter. Energy registers will each accumulate from zero to 99,999,999 then restart from zero.

Press  and  together and hold for 2 seconds to reset the displayed value. This feature is disabled by default. Refer to Rail310 option links guide to enable. The reset function works simultaneously on kWh registers of all 3 loads.

## 6 Programming

### 6.1 Programming Menu

To enter programming mode:



Hold  and  together for 5 Seconds.


A **Security Code** may be required before changes to programmed parameters are allowed. This is only required if a **Security Code** greater than zero is set via serial communications. This is then stored in non-volatile memory during power interruptions.



4-Digit Security Code



To Enter A Security Code:

Press  or  to change each digit. (Lowest significant digit first).

Press  to select next most significant digit.

When a valid code is input the programming menu is displayed.

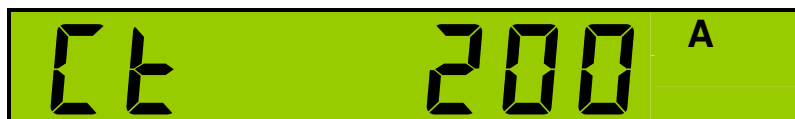
To change a Programmable Value:

Press  or  until the required value is set.

To Move to The Next Setting:

Press  until the next page in the list is displayed. Parameters are set in the following order:

#### Program Menu Pages



Current Sensor Primary



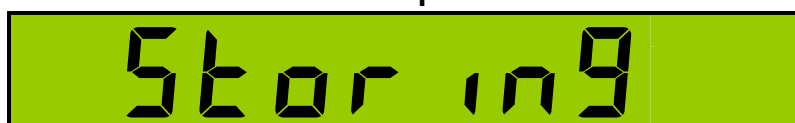
Output Pulse Rate



Pulse On Time



Pulse Output Test






Changes Are Stored to Non-Volatile Memory

After the last parameter is set the new values are stored and the meter continues to measure with the new settings.

## 6.2 Pulse Output Test

This feature allows the pulse output hardware and external system connections to be commissioned without a measured load. The LCD shows **Pto** (off) and **Ptr** (run) and the number of test pulses. The test pulse rate is set automatically dependant on the programmed pulse length (maximum 0.5Hz).

Press  to start/stop the test pulses on all three outputs.

Press  and  together to stop the test pulses and simultaneously reset the test counter.

## 6.3 Current Sensor Type Selection (CT)



Current sensor types are selected from a table of preferred types identified by their nominal primary current rating. The following types may be selected.

5, 50, 100, 150, 200, 400, 800.

**Note:** Current sensors **MUST** be from the **Rail310V** range of input devices supplied by the manufacturer. Use of other sensors may affect accuracy & safety

### 6.3.1 Fine Adjust

**Fine Adjust Mode** allows values other than those provided by the default tables to be set. To enter/exit **Fine Adjust Mode**:

Hold  and  together for 2 Seconds while setting **CT**. **Fine Adjust Mode** is indicated by a decimal point after "CT".

## 6.4 Pulse Rate Selection Table (Counts)

1, 2, 5, 10, 100, 1000

## 6.5 Pulse On-Time Selection Table

100ms ,200ms, 500ms, 1s, 2s, 3s, 5s, 10s, 20s

## 7 Specification

<b>INPUTS</b>	
System	3 Single Phase Meters
Voltage Un	277V L-N
Current Sensors	
Output @ Nominal In	0.333Vac
Accuracy	±1% (0.1In – 1.2In)
Phase Error	5A-50A Models <2.5° at 0.5In. Other models <2.0° at 0.5In
Measurement	Voltage 20% to 120% Un (300VL-n)
Range	Current 0.2% to 120%
Frequency Range	Fundamental 45 to 65Hz Harmonics Up to 30th harmonic at 50Hz
Voltage Burden	<0.1VA per phase
Overload	Voltage x4 for 1 hour Current x2 Continuous
<b>DISPLAY</b>	
Type	Custom, Supertwist, LCD
Data Retention	10 years min. Stores kWh & Meter set-up
Format	8 x 6.66mm high digits with DPs & 3.2mm legends
Scaling	Direct reading. User programmable CT CT Primary programmable from 5A to 25kA
Legends	Wh, kWh, MWh etc. depending on user settings
<b>AUXILIARY SUPPLY</b>	
Standard	230V 50/60 Hz ±15%
Options	110V 50/60 Hz ±15%
Load	5 Watt Max.
<b>METER ACCURACY      All errors ± 1 digit</b>	
kWh	Better than Class 1 per EN 62053-21 & BS 8431
kW	Better than Class 0.25 IEC 60688
Amps & Volts	Class 0.1 IEC 60688 (0.01In – 1.2In or 0.1Un – 1.2Un)
<b>OVERALL METERING ACCURACY</b>	
5A-50A Models	Better than Class 2 Meter with Class 1 CTs
Other Models	Better than Class 1 Meter with Class 1 CTs
<b>Pulse Outputs</b>	
Function	1 Pulse per unit of energy
Scaling	Settable between 1 & 1000 counts of kWh register
Pulse Period	0.1 sec. default; Settable between 0.1 and 20 sec
Rise & Fall Time	< 2.0ms
Type	N/O Volt free contact. Optically isolated BiFET
Contacts	100mA ac/dc max ; 70Vdc/33Vac max ; 5W maximum load
Isolation	3.5kV 50Hz 1 minute
<b>MODBUS® Serial Comms (Option)</b>	
Bus Type	RS485 2 wire + 0v. ½ Duplex, ¼ unit load
Protocol	MODBUS® RTU with 16 bit CRC
Baud Rate	4800, 9600 or 19,200 User settable
Address	1 – 247 User settable
Latency	Reply within 250ms max.
Command Rate	New command within 5ms of previous one
Isolation	3.5kV
<b>GENERAL</b>	
Temperature	Operating -10°C to +55°C (14°F to 131°F) Storage -25°C to +70°C (-13°F to 158°F)
Humidity	< 75% non-condensing
Environment	IP20 (when correctly mounted, as described, in a panel) Altitude <2000m (6561ft)
<b>MECHANICAL</b>	
Enclosure	DIN 43880, 6-Modules Wide
Material	Noryl® with fire protection to UL94-V-O. Self extinguishing
Dimensions	106 x 90 x 58mm (Cut out 106 x 45mm) 4.17" x 3.54" x 2.28" (Cut out 4.17" x 1.77")
Weight	~ 150 gms
<b>SAFETY</b>	
Conforms to	EN 61010-1 Overvoltage Category III & BS 8431