MultiCube350/650/950 mV Installation Guide Revision 12

1 Safety

This document gives details of safe installation and operation of the **MultiCube** 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) Meb: <u>http://www.ndmeter.co.uk</u>

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 *MultiCube* is a precision multi-function electricity monitor which measures system power parameters, including kW, Volts and Amps and displays them on an LCD. Measured parameters may be sent to remote systems for storage or display using an optional communications interface (e.g. Modbus[®] RTU RS485, Ethernet or M-Bus).

The *MultiCube* is intended for indoor use, mounting in the faceplate (panel) of an electrical enclosure with only the front keypad/display panel remaining accessible to an operator after installation. Panels should be 1mm to 4mm (0.04" to 0.16") thick with a square cut-out of 92mm (+0.8/-0.0mm) (3.62" +0.03" -0"). Insert the meter from the front of the panel, slide the panel clips from the rear of the case and push firmly against the panel ensuring even pressure on each clip.



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 operator.

Minimum Current Transducer Specification:

Input Current Range:

Output Voltage:

Insulation:

0 to 1.2 In (In = nominal rated current in amps) 0.333Vac (at nominal current) 2.2kV Case to Secondary

If long current transducer secondary cables are used 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.

4.2 Current Transducer Connections

4.2.1 RJ12 Current Cables

- Connection between the meter and each 3-Phase set of current transducers is made using
 - RJ12 to RJ12, 6P6C cable:
 - Crossover Type PIN 1-6; 2-5; 3-4; 4-3; 5-2, 6-1.



Current 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 300Vac.

4.2.2 Current Transducers

Only current transducers supplied by the manufacturer may be used in conjunction with MultiCube meters. The following list of UL & CE recognised current transducers has been approved for use.

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 ¹	400, 600, 800, 1000, 2000, 3000Amps	0.333Vac	127.0 x 76.2mm (5.0" x 3.0")

4.2.3 Current Transducer connection.

The current transducers should be connected to the instrument before the power is applied. The auto detect mechanism detects the transducer on power up of the instrument.

4.2.4 Current Transducer auto detect.

The instrument is designed to automatically recognise the primary current, and other characteristics, of approved current transducers.

4.3 Voltage Connections

4.3.1 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 300Vac.



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.

4.3.2 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.

4.3.3 Voltage Terminals

Voltage:

Terminals L-N (1-2) - 240Vac Terminals Ln-L1 (3-4) Ln-L2 (3-5) Ln-L3 (3-6) – 277Vac Terminals L1-L2; L2-L3. (4-5, 5-6) - 480Vac See section "7 Specification" for absolute limits

Cable: 30-14 AWG, Stripped 5.5 to 6.5mm (0.2" to 0.25") Torque: 0.5Nm (4.4in lb)

4.3.4 Voltage Fuses

 Fuses (US/Canada)

 Rated Voltage
 Type
 Rupture In (A)
 Standards

 ≥ 500Vac
 Fast
 1.0A
 UL248 (US)

 C22.2 No. 248 (CAN)
 C248 (CAN)

Fuses (Other Cou	ntries)		
Rated Voltage	Туре	Rupture In (A)	Standards
≥ 500Vac	Fast	1.0A	IEC 60269 - 2

4.3.5 Auxiliary Mains Fuses

Fuses (US/Canada)

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

Fuses (Other Cou	ntries)		
Rated Voltage	Туре	Rupture In (A)	Standards
≥ 250Vac	Fast	0.1A	IEC 60269 - 2

4.4 Meter Types

The MultiCube is available as MultiCube350mV with 3 current channels, MultiCube650mV with 6 current channels and the MultiCube950mV with 9 current input channels.

Each 3-Phase meter in a MultiCube has 3 current channels which feed into a single RJ12 socket.

Each 3-Phase meter in a MultiCube can be configured, by the user, to measure a single 3-phase load or 3 x single phase loads.

Motor Tupo	3-Phase	Current	Voltage	Possible Load (Configurations
weter Type	Meters	Channels	Channels	3-Phase	Single Phase
				3 x 3Ph	0 x 1Ph
MultiCube050mV	2	0	2	2 x 3Ph	3 x 1Ph
Multicubesson	3	9	3	1 x 3Ph	6 x 1Ph
				0 x 3Ph	9 x 1Ph
MultiCube650mV				2 x 3Ph	0 x 1Ph
	2	6	3	1 x 3Ph	3 x 1Ph
				0 x 3Ph	6 x 1Ph
MultiCube250mV	1	2	2	1 x 3Ph	0 x 1Ph
wullicubesson	Ι	3	3	0 x 3Ph	3 x 1Ph

Table 1 – Meter Types and User Selectable Configurations

Each 3-Phase Meter in a MultiCube shares a single set of voltage inputs

The phase voltage associated with each CT input, for each meter is fixed (CT1-L1, CT2-L2 and CT3-L3). This is not configurable even when a meter is configured to measure 3 x single phase loads. This is shown in Table 2 below

3-Phase Meter	Voltage Input	MultiCube950mV	MultiCube650mV	MultiCube350mV
	L1	Current 1	Current 1	Current 1
Meter 1	L2	Current 2	Current 2	Current 2
	L3	Current 3	Current 3	Current 3
	L1	Current 1	Current 1	
Meter 2	L2	Current 2	Current 2	
	L3	Current 3	Current 3	
	L1	Current 1		
Meter 3	L2	Current 2		
	L3	Current 3		

Table 2 – Voltages	Associated wit	th input Currents
--------------------	----------------	-------------------

4.5 Typical Connections

The connection diagrams shown here are for a MultiCube950mV. For MultiCube650mV and Cube350mV ignore the unused current inputs.



3 x 3-Phase 3 Wire Connection







9 Single Phase Loads (Single Phase Feed)

NOTE 1 – The auxiliary mains supply to the meter may be fed from any suitably rated AC source.

4.6 Communications Options

Specific wiring schematics for each communications option are provided in a separate installation guide for each option. Communications outputs are 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 (221°F); Insulation 300Vac

4.6.1 RS485 Output Terminals (Optional)

Voltage:Maximum RS485 Voltage (any pair) = 30VdcCable:30-14 AWG, Stripped 5.5 to 6.5mm (0.2" to 0.25")Torque:0.5Nm (4.4in lb)

4.6.2 Ethernet Output (Optional)

Connection: RJ45

Cable: Cat5e FTP (Foil screened)

4.6.3 M-Bus Output Terminals (Optional)

Voltage:Maximum M-Bus Voltage (any pair) = 50VdcCable:30-14 AWG, Stripped 4.5 to 5.5mm (0.18" to 0.22")Torque:0.5Nm (4.4in lb)

4.7 Pulse/Alarm Outputs



Pulse/Alarm 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 (221°F); Insulation 300Vac

4.7.1 Pulse/Alarm Connections

Voltage: Cable:

e: 100Vac (any pair) e: 30-14 AWG, Stripped 6.0 to 7.0mmTorque: 0.5Nm (4.4in lb)



Pulse/Alarm Outputs

4.7.2 Pulse/Alarm Facility

The MultiCubex50 mV has 4 isolated digital outputs that each takes the form of a volt free contact (solid state relay) as shown in the diagram above.

Each output may be independently programmed to provide Pulse or Alarm output functionality. Details on changing the function of each output are provided in Section 5.7.

The default configuration for these outputs is as follows:

	Default	Default		
FIIN			Function	
		MultiCuba950	MultiCuba650	MultiCuba350
Common	С	MallCabe950	MulliCube030	MultiCubesso
A1	Alarm	Event 1	Event 1	Event 1
P1	Pulse	Meter 1 3-Phase kWh	Meter 1 3-Phase kWh	Meter 1 3-Phase kWh
P2	Pulse	Meter 2 3-Phase kWh	Meter 2 3-Phase kWh	Meter 1 3-Phase kWh
P3	Pulse	Meter 3 3-Phase kWh	Meter 1 3-Phase kWh	Meter 1 3-Phase kWh



5 Meter Setup

DOC-MC950-INS-0001-12

MultiCube 350/650/950 mV Installation Guide

5.1 Navigating the Setup Menus

To change one or more setup values use the following sequence:



Notes:

1: Should the password be forgotten, contact the meter manufacturer. See Section 1 for contact information. 2: The factory configured default password is 0000.

5.2 Finish Configuration

To exit the Configuration mode navigate to the Configuration Main Menu - Finish Configuration Page and press enter:



Enter to Quit Configuration Menu and return to normal metering mode

5.3 Configure Factory Defaults

The configuration of the MultiCube meter may be reset to factory defaults as follows:

Setting	Factory Default		
	MultiCube950	MultiCube650	MultiCube350
Meters	3 x 3 Phase	2 x 3 Phase	1 x 3 Phase
System Voltage	480/277	480/277	480/277
Potential Transformer Ratio	Not Fitted (1.0)	Not Fitted (1.0)	Not Fitted (1.0)
CT Auto Direction	ON	ON	ON
Voltage Average Time	1 minute	1 minute	1 minute
Current Average Time	1 minute	1 minute	1 minute
Power average Time	30 minutes	30 minutes	30 minutes
Pulse 1	Meter 1 kWh	Meter 1 kWh	Meter 1 kWh
Pulse 2	Meter 2 kWh	Meter 2 kWh	Meter 1 kWh
Pulse 3	Meter 3 kWh	Meter 1 kWh	Meter 1 kWh
Alarm 1	Not configured	Not configured	Not configured

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FACEDFY FACEDFY FESEE FSE-IN S

HOLA FSE



Enter Sub Menu



Hold Reset Keys



Press and Hold **Reset Keys** to start countdown. **Enter** to **SKIP** factory reset function

Enter from Main Menu to access the Sub-Menu



Hold Reset Keys



Hold **Reset Keys** during a 5 Second Countdown to Factory-Reset

defsow⊳ FACLOFY FESEL done

Release Keys

5.4 Configure Meter Inputs

The meter input configuration may be configured as follows:

Setting	Selection Options
Meter Types	Set the Number of 3-Phase Meters. The remaining current channels are assigned as single phase.
CT Direction	Auto – Per phase auto-correction for CTs reversed on the primary cable OFF – Full 4-Quadrant measurement enabled including import/export power and energy. Note: This setting applies to all current channels in the meter.
CT Phase Reverse	Ph 1-2-3 – Forward Current Phase Rotation (default) Ph 3-2-1 – Reverse Current Phase Rotation The Ph3-2-1 setting may be used if a 3-Phase CT is incorrectly mounted upside down (I1 flows through CT3 and I3 flows through CT1).
System Voltage	Fast List – 110, 208, 400, 480V L-L Fine Adjust - ±1V
PT Ratio	Fast List – 'no Pt', 10, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 Fine Adjust ±1



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Fine Adjust

Fine Adjust



Main Menu

Enter from Main Menu to access the Sub-Menu.

◀ and ▶ to select number of 3-Phase and 1-Phase meters required.

Enter to accept the selected value

 \clubsuit and \blacktriangleright to select CT Direction method Auto or OFF.

Enter to accept the selected value

5A to mV Converter, and 3-phase block CT's, Only

If and I → to select Meter 1 CT Primary Current
 Enter to accept the selected value

If and I → to select system Voltage from a list
 If and I → to adjust system Voltage (steps of 1)
 If a to accept the selected value

◀ and ▶ to select PT Ratio (or No PT) from a list

▲ and ▶ to adjust PT Ratio (steps of 1)
 Enter to accept the selected value

Use ◀ and ▶ to select **Store Changes** or **No Store Changes** before exiting to main menu. **Enter** to store/abort and exit to **Main Menu**

5.5 Configure Rolling Average Times

The MultiCube monitors the average readings of current, voltage and power over user defined time periods using the rolling window method. The average time periods may be programmed as follows:

Setting	Selection Options
Average Voltage Period	This single setting applies equally to the time based averages on all voltage channels. Fast List – 10, 30, 60, 300, 600, 900, 1800, 3600 seconds Fine Adjust - 160 (in 1s steps), then 3003600 (in 300s steps)
Average Current Period	This single setting applies equally to the time based averages on all current channels. Fast List – 10, 30, 60, 300, 600, 900, 1800, 3600 seconds Fine Adjust - 160 (in 1s steps), then 3003600 (in 300s steps)
Average Power Period	This single setting applies equally to the time based averages on all 1Ph and 3Ph power values. Fast List – 10, 30, 60, 300, 600, 900, 1800, 3600 seconds Fine Adjust - 160 (in 1s steps), then 3003600 (in 300s steps)



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Enter Sub Menu

Mode

Mode

Mode

Select Store

No Store

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Fine	Adjust



Fine Adjust

Fine Adjust



Main Menu

Enter from Main Menu to access the Sub-Menu. ◀ and ▶ Select Voltage Ave Period from a list ◀ and ▶ to adjust Voltage Ave Period (steps of 1) or 300) Enter to accept the selected value ◀ and ▶ to adjust Current Ave Period (steps of 1) or 300) Enter to accept the selected value ◀ and ▶ Select Power Ave Period from a list ◀ and ▶ to adjust Power Ave Period (steps of 1) or 300) **Enter** to accept the selected value Use ◀ and ▶ to select Store Changes or No Store Changes before exiting to main menu.

Enter to store/abort and exit to Main Menu

5.6 Configure Events

A normal event channel monitors a single input parameter and records when a pre-set value is exceed. A virtual event channel records when more than one normal event channels are triggered simultaneously. The MultiCube has 3 normal event channels and 1 Virtual Event channel which may be configured as follows:

Setting	Select Option
Event Channel Number	Select Which Event to Configure Channel 1-3 = Normal Events Channel 4 = Virtual Event
Input Meter	Select the Event Input – Meter 1-3 or Virtual Meter 4
Input Phase	Select the Event Input – Phase 1 to 3 or Sys
Input Parameter	Select the Event Input – Parameter (Volts, Amps, THD Volts, THD Amps, kW, kVA, kvar, PF, Frequency)
Event Type	Trigger when – Over, Under
Trigger Value	The Event Triggers when this value is exceeded (Over or Under as above)
Release Value	A Triggered Event is released when the input value returns beyond this number
Event Delay	An event is only triggered if the condition is True for this period of time without breaks. (0-20 seconds)
Virtual Event Logic	Select from OR, AND, NOR NAND
Virtual Event	Select Event Channel Set (1, 2 and 3); (1 and 2); (1 and 3), (2 and 3)
Channels	For example Logic=OR, SET=(1 and 2) Event 4 Triggered if Channel 1 or Channel 2 is Triggered

	Conngui		
CONFIG EUENES PFS ENE	Enter Sub Menu		Enter from Main Menu to access the Sub-Menu.
EUESetup SELECE EUENE EY UIFE	V-I Mode ↔ List Select		 ✓ and ➤ Select Virtual Channel 4 Enter to accept the selected value
EUESoup SELECE EY LOGIC ANd	V-I Mode H List Select		 And → Select The Channels Logic Type Enter to accept the selected value
EUESetup SELECE E4 ANd E 1-E2-E3	V-I Mode H H		 And → Select The Events Channel Set Enter to accept the selected value
EUESetup SELECE EY JELAY I SEC	V-I Mode	P E → Fine Adjust	 ◀ and ➤ or ◀ and ➤ to set the delay in seconds Enter to accept the selected value
SELECE SEDFE CHANGES	P E F Select Store No Store	Meter Alin Menu	Use ◀ and ▶ to select Store Changes or No Store Changes before exiting to main menu. Enter to store/abort and exit to Main Menu

Configure Virtual Event Channel 4



Mode

Mode

Fast Adjust

Fast Adjust

Select Store

No Store

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Fine	Adjust

Fine Adjust

Main Menu

Enter from Main Menu to access the Sub-Menu.

◀ and ▶ Select Normal Event Channel 1-3 **Enter** to accept the selected value

◀ and ▶ Select An Input Meter to Trigger the Event (Note Meter 4 is the Virtual Meter) **Enter** to accept the selected value

◀ and ▶ Select An Input Parameter (For THD select "Harmonic") **Enter** to accept the selected value

◀ and ▶ Select the Input Phase (or Sys for System parameters where available) **Enter** to accept the selected value

◀ and ▶ Select Event Type OVER or UNDER Enter to accept the selected value

diaits)

◀ and ▶ Set the Trigger point (Steps of 1 digit) **Enter** to accept the selected value

digits)

◀ and ▶ Set the Release point (Steps of 1 digit) Enter to accept the selected value

 \blacktriangleleft and \triangleright or \blacktriangleleft and \triangleright to set the delay in seconds

Enter to accept the selected value

Use 4 and b to select **Store Changes** or **No** Store Changes before exiting to main menu. Enter to store/abort and exit to Main Menu

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5.7 Configure Digital Outputs

The MultiCube has 4 digital outputs which may be individually configured as an Energy Pulse Output or an Alarm output. The 4 outputs are configured in the factory as follows:

OUTPUT	Default	Default		
PIN	Output Type		Function	
Common	С	MultiCube950	MultiCube650	MultiCube350
A1	Alarm	Not Configured	Not Configured	Not Configured
P1	Pulse	Meter 1 3-Phase kWh	Meter 1 3-Phase kWh	Meter 1 3-Phase kWh
P2	Pulse	Meter 2 3-Phase kWh	Meter 2 3-Phase kWh	Meter 1 3-Phase kWh
P3	Pulse	Meter 3 3-Phase kWh	Meter 1 3-Phase kWh	Meter 1 3-Phase kWh

5.7.1 Pulse/Alarm Output

Any physical digital output (P1-P3 or A1) may linked with a selected Energy Register and is set to pulse (short circuit), for a set ON-Period, after a set Number of Increments, of the linked register. For example a pulse output may be configured to provide 1 pulse per 10 kWh on Meter 1.

A pulse output channel is configured as follows:

5.7.2 Alarm Output

Any physical digital output (P1-P3 or A1) may be linked with an Event Channel and its contacts will close (short circuit) while the Event Condition Result is TRUE.

5.8 Configure Serial Port (Modbus Option)

If the Modbus option is fitted (Meter Models - MultiCubex50mV-MODBUS) then the serial communications parameters may be configured as follows:

Setting	Selection Options
	Set the Range of Modbus IDs
	The user sets the first ID and the MultiCube automatically assigns the correct number of
Modbus ID	consecutive IDs required (see below).
	The maximum start ID is 245 minus the total number of ID's required by the instrument (see table
	below)
Baud Rate	Select the baud rate from: 4800, 9600, 19200, 38400
Parity	Select the parity from: NONE, EVEN, ODD

A number of Modbus IDs need to be reserved for each MultiCube, depending on how many meter points it can measure as follows:

Motor Type	Modbus IDs Required			
Meter Type	Meter Points	Virtual Meter	Main Unit	Total
MultiCube350mV-Modbus	1	N/A	N/A	1
MultiCube650mV-Modbus	2	N/A	1	3
MultiCube950mV-Modbus	3	0 (1 optional)	1	4 (5)

5.9 Configure TCP-IP (Option)

If the Ethernet (MultiCube-IP) option is fitted to the meter the basic TCP-IP communications parameters may be configured as follows:

Setting	Selection Options
TCP-IP Addressing Mode	Select DHCP for automatic network assigned addresses Select Static IP addressing mode for manually assigned TC-IP addressing
Static IP Address	Set the static IP address (this page is shown in DHCP Mode but the value may not be changed)
Default Gateway	Set the Default Gateway address
Subnet Mask	Set the Subnet mask Address

5.10 Configure the Virtual/Residual Meter (optional¹)

The multicube950mV can optionally provide an set of metered readings based on a calculation made from its multiple meter inputs. Two type of configuration are possible for this Virtual Meter:

- Virtual Summation Meter
 - Adds selected 3-Phase Meters to create measurements of TOTAL METERED LOAD \cap
 - VIRTUAL SUM = METER1 + METER2 + METER3
 - Note individual meters may be selected/deselected for the sum
- **Residual Meter**
 - Used to subtract sub-metered loads from an incoming supply measurement. This provides an accurate 0 measurement of TOTAL UN-METERED loads.
 - METER1 must measure the 3-Phase incoming load
 - METER2, METER3 are wired as sub-meters
 - **RESIDUAL = METER1 (METER2+METER3)**

The Virtual Sum or Residual meter displays multiple meter parameters, as a normal multi-function meter (harmonics and THD are not available)

Setting	Selection Options
Calculation	Select Between: VIRTUAL SUM or RESIDUAL LOAD
Meter 1	Select Include to add this meter to the summated readings of the Virtual Meter
Include/Ignore	Select Ignore if this meter is NOT required in the summated readings of the Virtual Meter
Meter 2	Select Include to add this meter to the summated readings of the Virtual Meter
Include/Ignore	Select Ignore if this meter is NOT required in the summated readings of the Virtual Meter
Meter 3	Select Include to add this meter to the summated readings of the Virtual Meter
Include/Ignore	Select Ignore if this meter is NOT required in the summated readings of the Virtual Meter

Enter from Main Menu to access the Sub-Menu.

◀ and ▶ Select to calculation type – Virtual/Residual Enter to accept the selected value

Virtual meter calculations

Enter to accept the selected value

◀ and ▶ Select to Include/Ignore Meter 2 in the Virtual meter calculations

Enter to accept the selected value

Virtual meter calculations **Enter** to accept the selected value

Use 4 and b to select Store Changes or No Store Changes before exiting to main menu. Enter to store/abort and exit to Main Menu

Note 1: This option is only available on the MultiCube 950mV

Main Menu

5.11 Reset Stored Parameters

It is possible to reset stored peak values and energy registers as follows:

Setting	Selection Options
Reset Energies	Reset all energy registers simultaneously to zero
Reset Peak Hold	Reset all peak hold values simultaneously to zero
Reset Ave Peak	Reset all peak average values simultaneously to zero
Reset All	Reset Energies, Peak Hold and Peak Averages
E o P Setup	Meter

FESEE

P-AUE

Press and Hold Reset Keys to start countdown. Enter to SKIP Reset Peak Average function

Release Keys

Select Store

No Store

Main Menu

Hold Reset Keys during a 5 Second Countdown to Reset Peak Average

◀	and	• to select Store Changes or No Store
Ch	ange	es before exiting to main menu.
F	nter	to store/abort and exit to Main Menu

ore/abort and exit to Main Menu

5.12 Configure Password

The configuration setup menus can be password protected. This menu allows the password to be changed.

Password value	Notes
0000 (factory default)	Setting the password to 0000, removes the requirement for a password to be entered before accessing the setup configuration menus.
0001 – 9999	A password is requested before access to setup configuration menus is granted.

Select Store No Store

Change Value

Main Menu

Enter from Main Menu to access the Sub-Menu.

flashing cursor beneath.

◀ and ▶ Increment/Decrement selected digit.

Enter to accept the selected value

Use 4 and b to select Store Changes or No Store Changes before exiting to main menu. Enter to store/abort and exit to Main Menu

6 Parameter Displays

6.1 Keypad

6.2 LCD Layout

Кеу	Range	Description
Meter Number	1 to 9	Use Meter Key to select a meter to display
Transducer	1 to 3	Parameters are displayed, associated with this current transducer input socket on rear
Phase	1 to 3	Parameters are displayed associated with this voltage phase and individual transducer
Meter Type	1 or 3-Ph	Displayed meter is configured as Single or 3-Phase
Legends	various	Measurement units of displayed parameters
Measurement	various	None = Instantaneous
Mode		"Max Hold" = Largest instantaneous value recorded
		"Avg" = Time averaged value
		"Avg Max" = Largest average value recorded
		"Avg Min" = Smallest average value recorded

6.3 Front Panel LEDs

In normal operation the front panel LEDs P1-P3 are linked with the physical isolated digital outputs P1-P3 which may be configured as pulse outputs or Alarms as described in Section 5.7.

6.4 Selecting a Metered Load

The MultiCube is configured during commissioning to measure a combination of Single and 3-Phase loads. The Meter key is used to switch between meters, for each configuration, as follows

3 x 3-Phase Meters	9 x 1-Phase Meters	1 x 3-Ph 6 x 1-Ph	ase Meters ase Meters
Meter Ph 545 3-Ph 1 200.0 A 2 200.0 A 3 2.000	Meter 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	Meter Ph 11 2 3	2000 * 2000 * 2000 *
Meter Ph 595 2 1 200.0 A 2 200.0 A 3 2.000	Meter 1 - 2 1-Ph 2 5 0.0 0 ^ 2 3 0.0 v 1.0 0 cose	Meter 2	2-1 t-Ph 50.00 x 230.0 v 1.000 cose
Meter Ph 545 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph	Meter 3 5 0 0 0 x 4 2 3 0 0 x v 1-9 1-Ph A 2 3 0 0 v L 0 0 x v L 0 0 x 1 0 x 1 0 0 x 1 1 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1	Meter J	2-2 1-Ph 50.00 A 230.0 v 1.000 cose
Ph U IF 3-Ph 2000 3-Ph 2000 A 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph 3-Ph	Meter 2 - 1 I-Ph 4 5 0.0 0 A 2 3 0.0 V 1 0 0 cose	Meter 4	2-3 50.00 A 230.0 v 1.000 cose
	Meter 2 - 2 t-Ph 5 5 0.0 0 A 2 3 0.0 V 1 0 0 cose	S	3 - 1 1.Ph 50.00 A 230.0 V 1.000 cose
	Meter 2 - 3 1-Ph 5 0.0 0 A 2 3 0.0 V 1 0 0 cose	B	9-2 1-Ph 50.00 ^ 230.0 v 1.000 cose
	Meter 3 - 1 1-Ph 5 0.0 0 A 2 3 0.0 V 1 0 0 cose	Metor	9-9 1-Ph 50.00 ^ 290.0 v 1.000 cose
	Meter 3-2 1-Ph 5000 A 2300 v 1000 cose	°	U IF 2000 3-Ph 2000 A 2.000 A
	Mater 3 - 3 1-Ph 9 5 0.0 0 A 2 3 0.0 V 1 0 0 cose		
	1 2 0.0 ^{3-Ph} 2 2 0.0 ^A 3 2 0.0 0		

Note: When the virtual meter is configured to calculate a residual load the top legend "U IF" is replaced by "FE5"

6.5 Current/Voltage Display Pages

Voltage & Current Page Selection Key

3-Phase Meter

Meter Ph 545 1 1 200.0 3-Ph 2 200.0 4 3 2.000
--

Phase Currents

Phase Volts

Line-Line Volts

	545 200.0 3-Ph
Ło	600.0 🔒
In	15.0

Amps – 3-Ph Ave, Total & Neutral

Note: When the virtual meter is configured to calculate a residual load the top legend "[] IF" is replaced by "FE5"

1-Phase Meter

Amps, Volts, Power Factor

Virtual/Residual Meter

Ph	200.0 ^{3-Ph}
2	2000 *
З	2.000

Phase Currents

1 530.0

Phase Volts

Line-Line Volts

Note: When the virtual meter is configured to calculate a residual load the top legend "U IF" is replaced by "FE5"

Note: When the virtual meter is configured to calculate a residual load the top legend "U IF" is replaced by "FE5"

6.8 Display Modes

Select alternate display mode (depends on parameter).

Example - Amps Display Modes

NOTE: When a new parameter page is selected, Instantaneous Display Mode, is automatically selected.

6.9 Average Maximum/Minimum and Peak Hold Values

6.9.1 Peak Hold Values

The largest RMS value measured in during every 1 second period is recorded as the "Peak Hold" value. These registers may be simultaneously reset in the configuration menu.

6.9.2 Time Averaged Values

Various parameters may be averaged, over user specified integration periods (T), and presented as time-averaged values on the display. The maximum and minimum of these time averaged values which occur after a reset function are stored and displayed.

For convenience three independent integration periods are defined, allowing the user to provide different functionality of this feature, for Voltage, Current and Power parameters.

For example it may be useful to provide smoothed voltage and current readings, integrated over 10 second periods, which remove short term fluctuations due to mains impedances and load changes. In the same meter the average power readings taken over each 30 minute period may be required to closely match the behaviour of Power Demand registers on a fiscal meter.

To calculate each Time-Averaged value:

- 1. Each specified integration period is split into 60 Sub periods.
 - a. For integration periods <60 seconds a sub period occurs each second.
- 2. The parameter is measured each second.
- 3. The average of all 1 second measurements in each sub period is logged.
- 4. The average of all sub periods is shown as the Time Averaged Result.
 - a. This is updated each sub-period.
 - b. Oldest sub period data is replaced by the newest measured average.

This results in a "Sliding Window" time-average, of all 1 second measurements, of a selected parameter, updated at intervals of 1 sec to Ti/60 whichever is greatest.

Parameter	Av	Average Timer		
	Volts Tv	Amps Ti	Power Tp	Hold
Amps - Phase Amps		✓		✓
Volts - L-N	✓			✓
kW Total (1Ph, 2Ph or 3Ph)			✓	✓
kVA Total (1Ph, 2Ph or 3Ph)			✓	\checkmark
kvar Total (1Ph, 2Ph or 3Ph)			✓	✓

6.10 Meter Settings Preview Menu

A summary of the meter configuration may be conveniently previewed in the Meter Settings Preview Menu.

LOG OF E 1-E2-E3 O SEC	Event 4 Logical OR Trigger Event if either Event 1, 2 or 3 Triggered Zero Seconds Delay	Meter
PULSE PULSE LEN D.1 FREE D.1 kwn	Digital Pulse Output 1 Pulse Output 1 Pulse Every 0.1kWh, Pulse Length 0.1 seconds Pulse on Meter 1, 3-Phase kWh	Meter ←
Metor P2 Setup 3.Ph 2 PULSE LEN D.1 FREE D.1 kwh	Digital Pulse Output 2 Pulse Output 1 Pulse Every 0.1kWh, Pulse Length 0.1 seconds Pulse on Meter 2, 3-Phase kWh	Meter
Mater P3 Setup 3-Ph 3 PULSE LEN D.1 FREE D.1 kwh	Digital Pulse Output 3 Pulse Output 1 Pulse Every 0.1kWh, Pulse Length 0.1 seconds Pulse on Meter 3, 3-Phase kWh	Meter
	Digital Pulse Output 4, Alarm 1 Set to Event 1	Meter

6.10.1 Modbus Connection Information (Option)

The following setup information page is shown if the Modbus option is fitted.

Modbus Serial Port (Option) Modbus RTU Protocol ID Range (4 Addresses) Baud Rate

,

Metei

Modbus Communication Test page

Received Count (Valid packets addressed for this meter) Error Count (Number of errors since entering this page) Last Error Code

Error Codes	Meaning
000	No Modbus Error
010	Serial Packet Framing Error
028	Incomplete Modbus Packet
030	Checksum Error
040	Invalid Modbus Packet

6.10.2 Installation Aid – Auto CT Rotate Enabled

This page provides a summary of the current and voltage input pairings and can be used to check input connections. When the meter is configured with auto CT rotation enabled the Installation aid operates as follows:

NOTE: For this page to provide accurate information the following conditions must first be met! :

- Currents must greater than 5% nominal
- Each Phase PF must be greater than 0.5
- Expected Load type should be known (Inductive/Capacitive)

Each 3-Phase meter is displayed on a single row Voltage Phase Rotation: "123" – Phase-1-Phase2, Phase-3 TOP ROW: Shows Current Phase Sequence 1-2-3 Assuming an Inductive load MID ROW: Shows Current Phases Sequence 1-2-3 Assuming a capacitive load BTM ROW: Shows insufficient current to make test

Example Installation Aid Display – Auto CT Rotate Enabled

The Installation Aid:

- Checks voltage phase rotation (Should be 1-2-3)
- Pairs up each current channel with the closest (phase angle) voltage
 - o Uses CT reversal if required
 - Determines the phase sequence for current
 - o Determines load type (Inductive/Capacitive) required for best results
- Displays the results on a single page

Using the Installation Aid

- Connect all CTs and Voltages to the Meter
- Apply a load (PF>0.5, I>5%, V>48V)
- Display the Installation Aid
- Compare the displayed results with your expectations
 - Does the display show the correct load type Capacitive/Inductive
 - If NOT Check wiring and repeat

6.10.3 Installation Aid – Auto CT Rotate Disabled

With auto CT rotate off it is not possible to determine current phase sequence in the presence of export loads. In this case the Installation Aid provides a display of each phase current to show if it is currently in an import or export condition.

NOTE: For this page to provide accurate information the following conditions must first be met! :

Each Phase PF must be greater than 0.5

Meter 123 Setup 1 1 - 1 - 1 2 0 - 0 - 0 3 E - E - E	Each 3-Phase meter is displayed on a single row Voltage Phase Rotation: "123" – Phase-1-Phase2, Phase-3 TOP ROW: Shows Meter1: Phase1-Phase3 = Import Current MID ROW: Shows Meter2: Phase1-Phase3 = Zero Current BTM ROW: Shows Meter3: Phase1-Phase3 = Export Currents	
Example Installation Aid Display – Auto CT Rotate Disabled		

The Installation Aid:

- Checks voltage phase rotation (Should be 1-2-3)
- Detects import/Export current direction
- Displays the results on a single page

7 Specification

INPUTS		
System	3 Phase 3 or 4 Wire Unbalanced Load or Single Phase	
Voltage Un	480/277. 3 Phase 3 of 4 Wire. Others to order.	
Current In	0.33V From Custom Smart CTs	
Measurement	Voltage 20% to 120% Un	
Range 45-65Hz	Current 0.2% to 120%	
Frequency Range	Fundamental 45 to 65Hz	
	Harmonics Up to 80th harmonic at 50Hz	
	Individual to the 63 rd	
Burden	Voltage <0.1VA per phase	
Overload	Voltage x4 for 1 hour	
	Current x2 Continuous	
DISPLAY		
Туре	Custom, Supertwist, LCD	
Data Retention	10 years min. Stores kWh & Meter set-up	
Format	3 Rows x 8 Digits + Legends	
Scaling	CT Primary Auto Detected from 5A to 25kA	
	PT Scaling Factor from 1 to 1000	
Legends	Wh, KWh, MWh etc. depending on user settings	
AUXILIARY SUPPLY		
Input	100-240Vac (+/-10%)	
Frequency	45-65Hz	
Load	4 Watt Max.	
METER ACCURACY All en	ors ± 1 digit	
kWh	Better than Class 0.5 per EN 62053-22 & BS 8431	
Kvarh	Better than Class 1 per EN 62053-24 & BS 8431	
kW & kVA	Better than Class 0.25 IEC 60688	
kvar	Better than Class 0.5 IEC 60688	
Amps & Volts	Class 0.1 IEC 60688 (0.01In – 1.2In or 0.1Un – 1.2Un)	
	$\pm 0.2^{\circ}$ (0.05In - 1.2In and 0.2Un - 1.2Un)	
Neutral Current	Class 0.5 IEC 60688 (0.05In – 1.2In)	

PULSE OUTPUTS	
Function	1 Pulse per unit of energy
Scaling Dulas Pariad	Settable between 1 & 1000 counts of energy register
Pulse Period Riso & Fall Timo	0.1 sec. default, Settable between 0.1 and 20 sec
	< 2.0115 N/O Volt free contact. Optically isolated BIEET
Contacts	100mA ac/dc max : 100V/ ac/dc max : 5W/ maximum load
Isolation	3.5kV 50Hz 1 minute
MODBUS® Serial Comms (Option)	
Bus Type	RS485 2 wire + 0v. 1/2 Duplex, 1/4 unit load
Protocol	MODBUS® RTU with 16 bit CRC
Baud Rate	4800, 9600, 19,200 or 38,400 User settable
Address	1 – 244 User settable
Latency	Reply within 250ms max.
Command Rate	New command within 5ms of previous one
Isolation	3.5kV
GENERAL	
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	IP54 (when correctly mounted, as described, in a panel) – Indoor Use Only Altitude <2000m (6561ft)
MECHANICAL	
Terminals	Rising Cage. 4mm ² (12 AWG) cable max.
Enclosure	DIN 43700 96 x 96
Naterial	Mablex® with fire protection to UL94-V-O. Self extinguishing
Dimensions	3 78" x 3 78" x 3 29" (2 83" hehind the nanel)
Weight	~ 250 gms
SAFETY	
Conforms to	EN 61010-1 Ed3 2010 Transient Overvoltage Category III Pollution Degree 2
Also	BS 8431

E. & O. E.

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