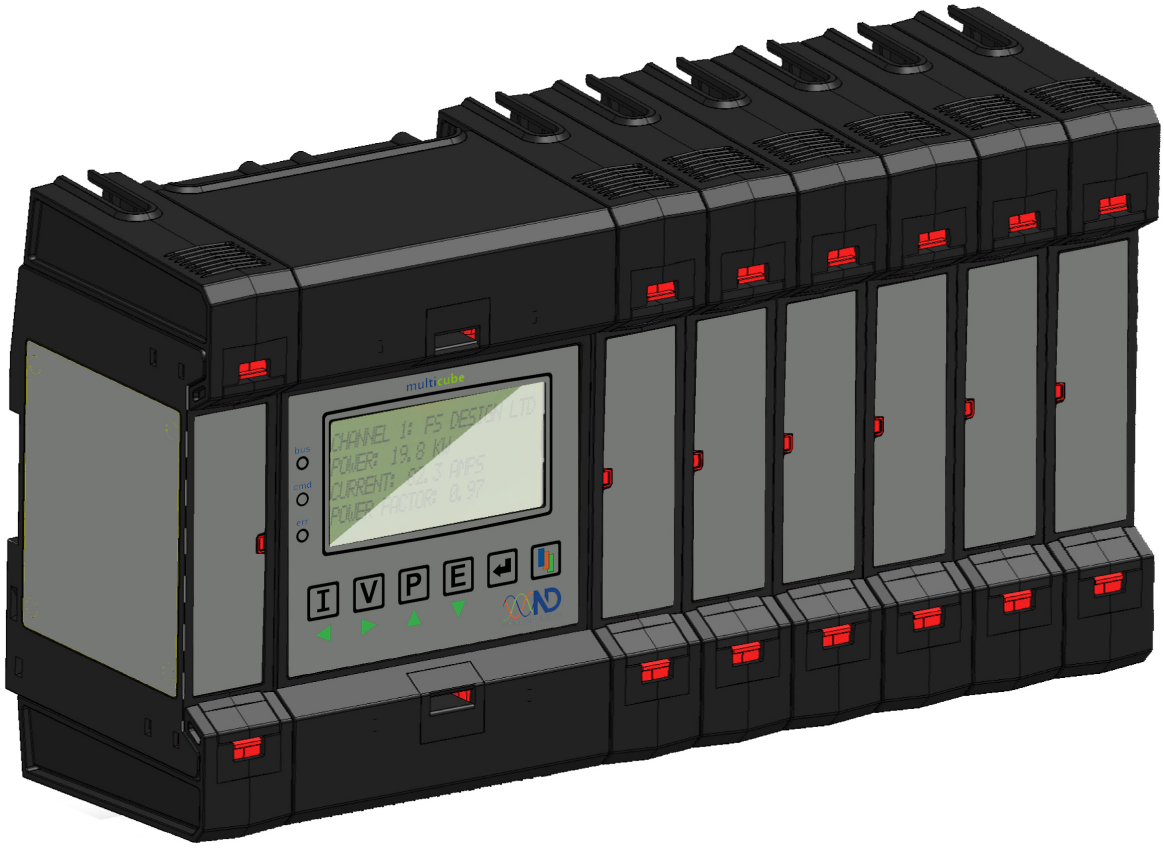
# multicube

***Modular Metering System***
***Installation Manual***




**Revision 13**
**Published October 2016**

# 1. Description

The **multicube** modular electricity metering System simultaneously monitors up to 20 three-phase loads or up to 60 single-phase loads (or a combination of both load types). The system integrates load measurement I/O functions logging and communications in a single, flexible unit which can be tailored to suit a variety of energy management installations.

**multicube** systems are supplied as a combination of the following modular components:

- **1 Master Display Unit**
- **1-10 Option Modules**
  **Sub-Metering Modules (e.g. MC352*)**
  **I/O Modules (e.g. Pulse Output Module(s) PLS12)**
- **1 Communications Module (e.g. Modbus RS485, Modbus TCP/IP and MBUS)**
- **1 Remote Display**

* At least 1 sub metering module is always fitted as the END Module, the END Module must always remain with its original calibrated Master. The serial number of the Master is also printed on the END Module.

## *1.1. Master Display Unit*

The Master Display Unit provides a user interface and local display of metered parameters on a graphic LCD and can optionally log up to 200 days of energy readings from the Sub-Metering Modules.
The Master Display Unit also acts as a power supply and voltage measurement input for all the Sub-Metering Modules, which may be attached to it. This single voltage input point makes wiring much simpler and safer by removing the need for distributed voltage connections.

### *1.1.1. Master Display Unit Supply*

The Master Display unit is available as version 2 only:

| | |
|---|---|
| Version 2 | Isolated data to **multicube** communications modules. |
| | Isolated, 5Vdc regulated power supply 2Watts max. |

The installation guide supplied with each optional communications module provides details of the minimum dc power supply required for correct operation.

## *1.2. Dual Sub-Metering Module – MC352*

The Electricity Metering Module ***MC352*** contains two complete 3-phase electricity meters, each of which may be optionally configured to monitor 3 single-phase loads.
Each electricity meter accurately measures a wide range of power and energy parameters using a range of current input devices selected to suit loads with nominal inputs from 20 to 800 Amps. These specially designed transducers each have a nominal output of 0.33V, are safety-isolated and internally protected against high open-circuit voltages at the output.
Split core current input devices can be fitted to existing power cables where it is inconvenient to remove one end of the cable for connection. Miniature ring type devices are also available for lower currents (up to 60A) providing a lower cost solution, with improved accuracy, where it is possible to slide these over one end of a power cable. Dual Sub-Metering Modules are configured using the Master Display Unit LCD/keypad interface or via the external communications network.

## 1.3. Communications Module

The Communications Module provides a connection point to external systems such as building energy management, billing data collection, SCADA etc. A specific Communications Module may be selected, such as the Modbus RTU - RS485 Module (RTU485), to suit a range of external systems.
The Communications Module provides external access to:

- **Master Display Unit Configuration**
- **Master Display Unit Logged Data (Optional)**
- **Sub-Metering Module Instantaneous Meter Readings and Energy Registers**
- **Sub-Metering Module Configuration**
- **Additional Module Data and Configuration**

### 1.3.1. Further Information

Separate detailed guides are available for each type of communications module in the **multicube** range.

- **multicube Modular Meter Modbus Comms**
- **multicube Modular Meter Modbus TCP**
- **multicube Modular Meter MBus**

### 1.3.2. Remote Display

The remote display allows the readings of each of the loads to be viewed at a distance from the main metering system. The display is housed in an enclosure designed to fit in a standard 92mm square hole. A 128x64 dot graphic LCD is used for the display and four keys on the front of the enclosure allow selection of the readings for display. These keys allow you to step through of the current and voltage readings, the power and energy readings for each load and to step through and select a desired load.

The remote display accesses the data on the **multicube** modular electricity metering System using the Modbus protocol over an RS485 connection. For further information see separate **multicube** remote display Guide.

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# 2. Safety

This manual gives details of safe installation of **multicube** electricity metering systems. Safety may be impaired if the instructions are not followed or the system is used in a manner not specified by the manufacturer. Labels 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.

**Caution Risk of Danger**
**Refer to Instructions**

**Danger**
**Risk of Electric Shock**

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

## *2.1. Maintenance*

The equipment should be maintained in good working order. Damaged equipment must be returned to the manufacturer (or his authorized 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.

**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

# 3. Installation

## 3.1. Intended Use

A **multicube** System simultaneously monitors up to 20 three-phase loads or up to 60 single-phase loads or a combination of both load types. The system is designed for connection to the following power networks:

- **3-Phase 3 or 4 Wire: Nominal 230V Phase to Neutral (400V Phase to Phase)**
- **Single Phase 2 Wire: Nominal 230V Phase to Neutral.**
- **Two Phase 3-Wire: Nominal 120V Phase to Neutral (240V Phase to Phase)**
- **3-Phase 3 or 4 Wire: Nominal 277V Phase to Neutral (480V Phase to Phase)**

The **multicube** should be mounted close to the power system distribution point to minimise the length of voltage and current input connections. Ensure that the voltage cable clamps are securely tightened and all terminal covers are securely fitted before powering up the system.

The meter is designed for connection in an installation with overvoltage category III. This category (CAT III) is for equipment installed at or near the origin of the electrical supply to the building, between the building entrance and the main distribution board.

## 3.2. Mounting

The **multicube** is designed to be mounted on a 35mm symmetrical ("Top-Hat") DIN rail. The minimum length of DIN Rail required depends on the number of standard modules fitted as follows:

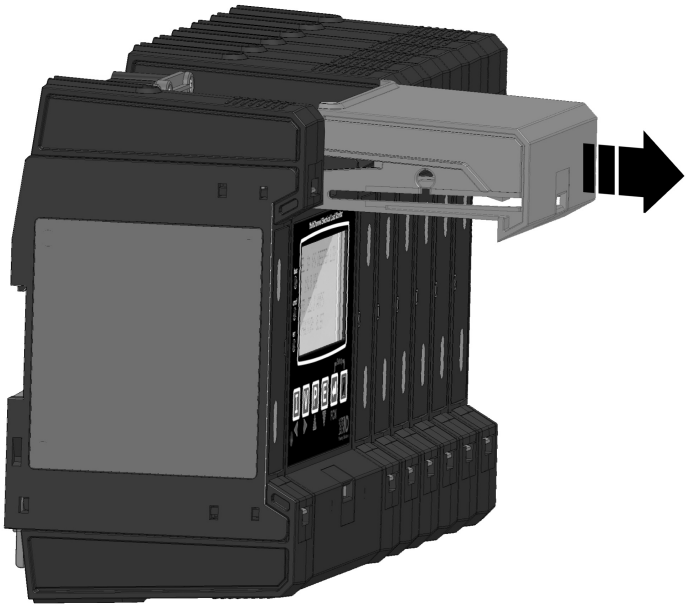
| *Comms Module* | *Master Display Unit* | *Standard Modules* | *Right Hand End Module* | *Overall Length* |
|---|---|---|---|---|
| 29mm | 100mm | 0 = 0mm | 29mm | 158mm |
| 29mm | 100mm | 1 = 29mm | 29mm | 187mm |
| 29mm | 100mm | 2 = 58mm | 29mm | 216mm |
| 29mm | 100mm | 3 = 87mm | 29mm | 245mm |
| 29mm | 100mm | 4 = 116mm | 29mm | 274mm |
| 29mm | 100mm | 5 = 145mm | 29mm | 303mm |
| 29mm | 100mm | 6 = 174mm | 29mm | 332mm |
| 29mm | 100mm | 7 = 203 mm | 29mm | 361mm |
| 29mm | 100mm | 8 = 232mm | 29mm | 390mm |
| 29mm | 100mm | 9 = 261mm | 29mm | 419mm |

To clip the **multicube** on the DIN rail first hook onto the top of the rail then push the bottom of the unit till all the sprung clips click into place. For wall mounting the DIN rail should be first secured to the wall and the **multicube** system clipped on afterwards.

### *3.2.1. Access to Master Display Unit*

The auxiliary mains supply and voltage input terminals are protected by a sliding terminal cover on the Master Display unit. To gain access to these terminals:

1. Insert a flat screwdriver into the slot at the front of the terminal cover.



2. Slide the terminal cover forward to its full extent.
3. Hinge the cover down in front of the display.

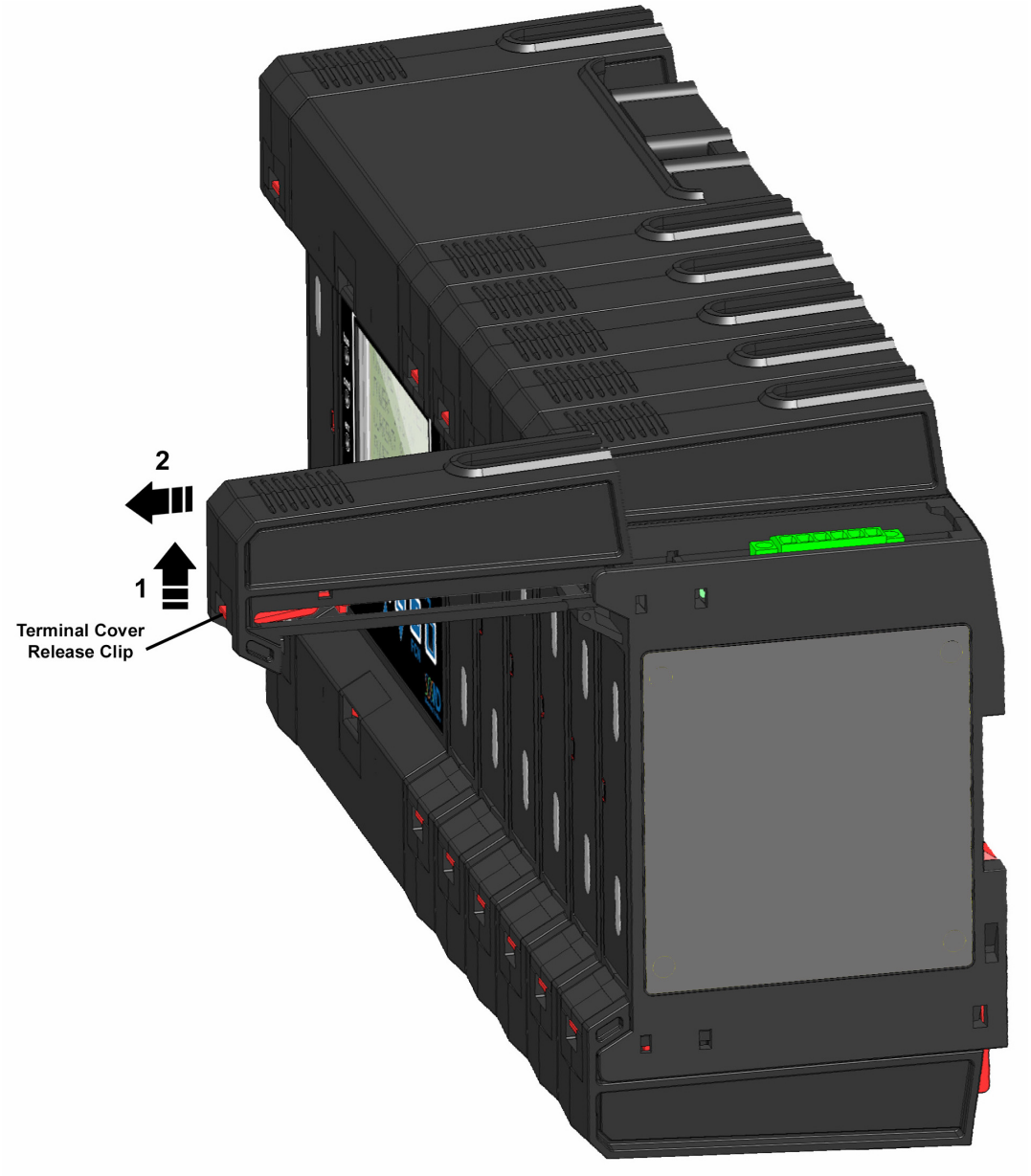
**NOTE: The screwdriver slot may be covered with a tamper evident label (20mm x 18mm) to detect unauthorized access.**

### *3.2.2. Accessing Module Wiring Terminals*

Module wiring terminals are protected by terminal covers as shown in the diagram below. The terminal covers are designed to slide towards the front of the module and are captive so they may not be removed and misplaced.

To access the terminals:

1. Push up the terminal cover release clip using a tool.
2. Slide the terminal cover forward to its full extent
3. Flip the terminal cover to sit in front of the module while accessing the wiring terminals.




**NOTE: The release clip may be covered with a tamper evident label (20mm x 18mm) to detect unauthorized access.**

# 4. Schematics

Each ½ of an ***MC352*** Metering Module acts as an independent meter and can be configured during commissioning to monitor a three-phase load or three single-phase loads.

## *4.1. Voltage Circuits Safety*

*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*.

To maintain proper insulation from the mains supply, the measurement neutral should only be connected in power networks where the system neutral is protectively earthed

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; Insulation 600Vac.

## 4.2. Auxiliary Supply

The ***MC352*** requires an auxiliary mains power supply to power the internal electronic circuits. The auxiliary supply circuits must meet or exceed the following specification:

***Terminations:***

Cable: UL-1015; 600Vac; 105°C. 30-12AWG, Stripped 5.5 to 6.5mm
Torque: 0.5Nm (4.4in lb)

***Fuses (US/Canada)***

| Rated Voltage | Type | Rupture In (A) | Standards |
|---|---|---|---|
| ≥240Vac | Time-Delay | 1.0A | UL 248 (US) C22.2 No. 248 (CAN) |

***Fuses (Other Countries)***

| Rated Voltage | Type | Rupture In (A) | Standards |
|---|---|---|---|
| ≥240Vac | Time-Delay | 1.0A | IEC 60269-2 |

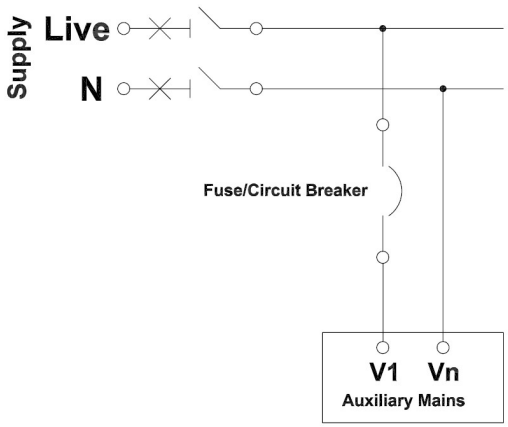



***Figure 4-1 Auxiliary Mains Connection***

## 4.3. Voltage Measurement Inputs

Voltage measurement connections are common for all the slave meters and are made at the Master Display Unit. The voltage inputs are attenuated before being passed on to all metering modules. The voltage input and auxiliary supply circuits must meet or exceed the following specification:

***Terminations:***

Cable: UL-1015; 600Vac; 105°C. 30-12AWG, Stripped 5.5 to 6.5mm
Torque: 0.5Nm (4.4in lb)

***Fuses (US/Canada)***

| Rated Voltage | Type | Rupture In (A) | Standards |
|---|---|---|---|
| ≥500Vac | Time-Delay | 1.0A | UL 248 (US) C22.2 No. 248 (CAN) |

***Fuses (Other Countries)***

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

The auxiliary mains supply may be connected to any one of the measurement phases and system neutral as shown below (Phase 1 and Neutral shown).

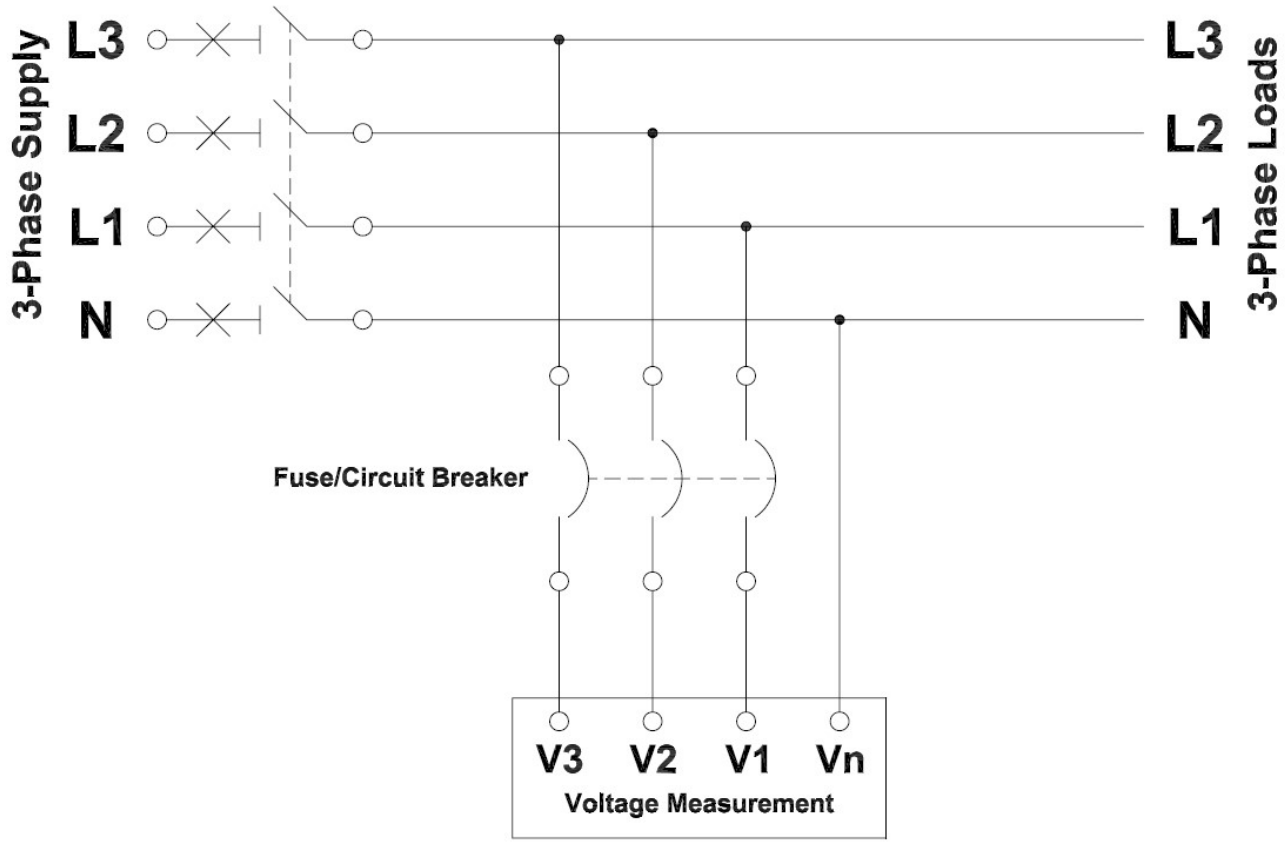



*Figure 4-2 Measurement Voltage Inputs*

## 4.4. Current Inputs MC352

Each phase current input of the ***MC352*** Sub-Metering Module is associated with one of three phase voltage inputs, which are supplied as an attenuated signal from the Master Display Unit. It is essential that current transducers are mounted on the correct associated voltage phase for accurate measurement.
To ensure accurate operation, the Sub Metering Module ***MC352*** *should* only be used with Current Transducers supplied by the manufacturer. These provide an isolated 0.33Vac signal to the current inputs when measuring a nominal primary current.

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

**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) |
| Internal Isolation: | 2.21kV |
| Cable: | Operating Temperature, 105°C<br>Insulated 600Vac<br>Safety Compliant (e.g. UL1015) |

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 or more.

*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.*

*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.*

## 4.5. Measuring 3 Phase Loads

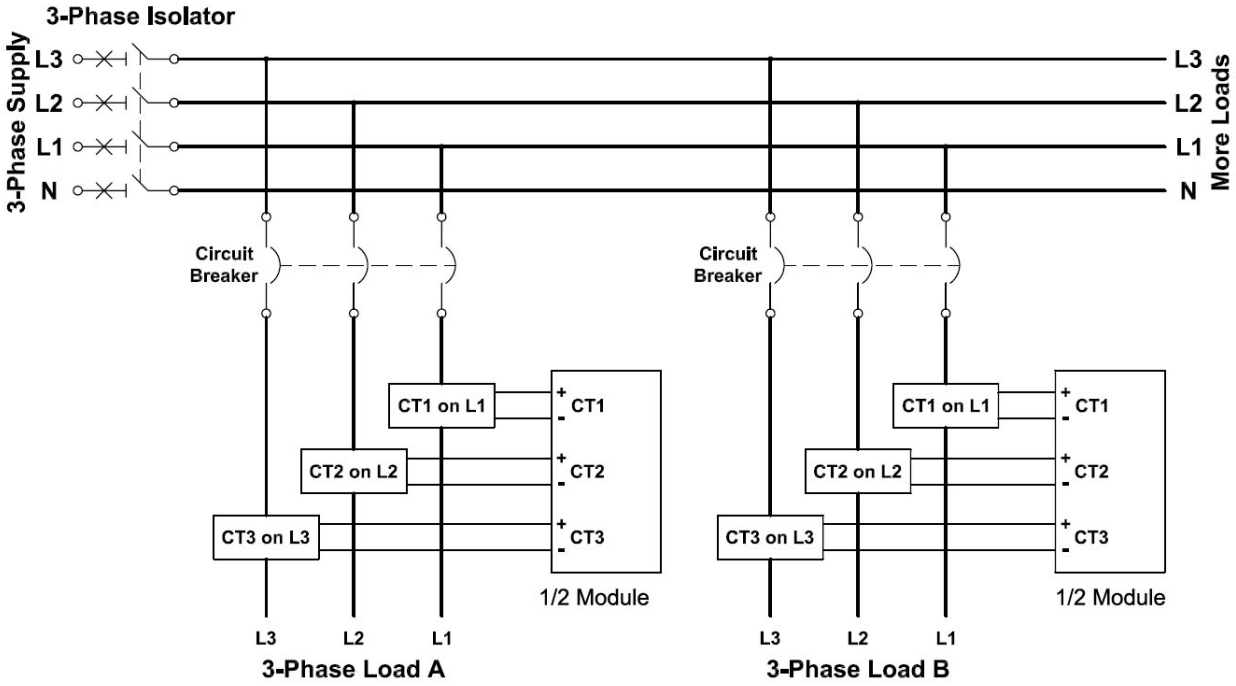



*Figure 4-3 Measuring 2 x 3-Phase 3 or 4 Wire Loads on a MC352*

## 4.6. Measuring Single Phase Loads

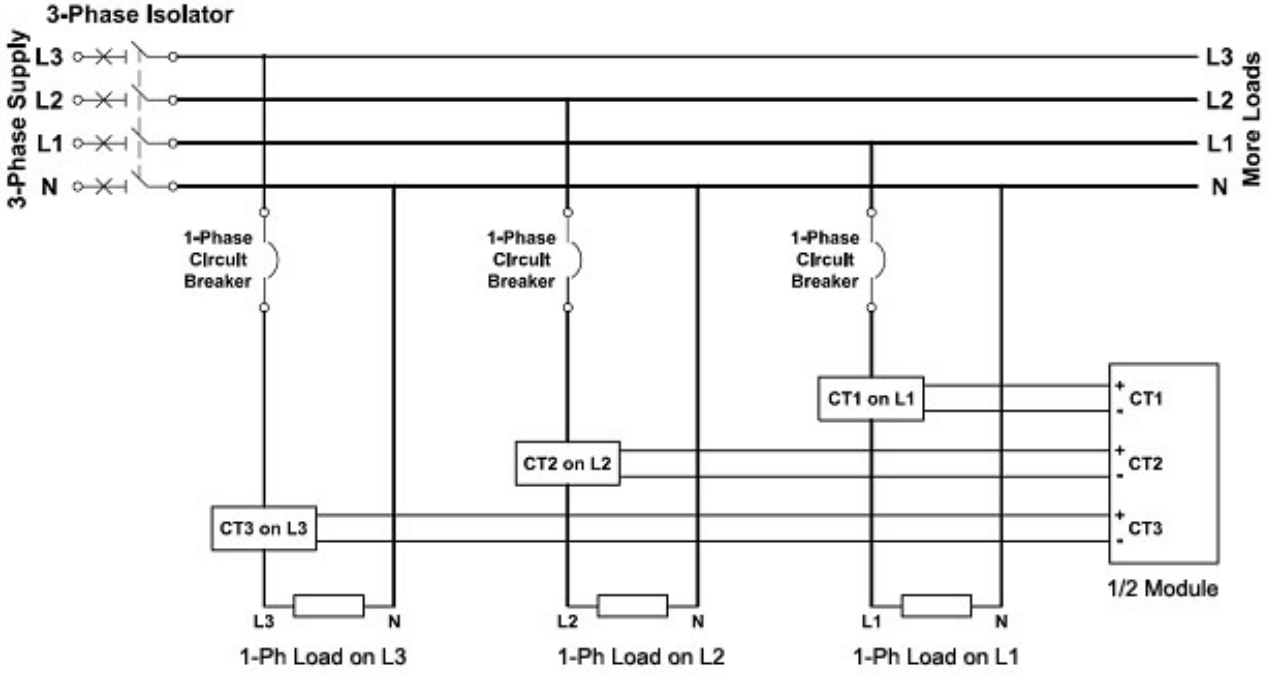


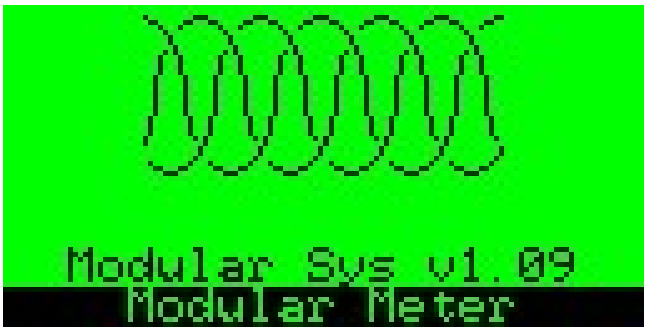

*Figure 4-4 Measuring 3 x Single Phase Loads Using ½ MC352*

# 5. Power Up/Configuration

## *5.1. Powering up a multicube System*

**Before supplying power to the multicube system check all wiring, ensure the unit is securely mounted to a stable surface and clean up all debris, scraps of wire etc.**

When power is applied to a multicube a system hardware check is carried out to determine which modules are connected and how these are configured. The power up screen displays the progress of this system configuration check.




| *Symbol* | *Meaning* |
|---|---|
|  | Module Position Empty |
|  | Module present but not recognised by the system |
|  | Recognised Module |

Other information on the Power up screen, such as software version, may be required when contacting the manufacturer for technical support.

## 5.2. Configuring a New Multicube System

All new **multicube** systems are factory configured and calibrated with at least the following components:

1. A Master Display unit
2. At least 1 Metering Module* (eg ***MC352*** dual meter).

Default settings are provided which can be user configured during commissioning to suit the site to be monitored and host communication requirements. Default settings are as follows:

| *Setting* | *Default Setting* |
|---|---|
| System - Name | "Modular Meter" |
| System – Volts Demand Period | 30 minutes |
| System – Amps Demand Period | 30 minutes |
| System – Power Demand Period | 30 minutes |
| System – Logging (optional) | Disabled |
| System – RS485 (optional) | Modbus ID = 1<br>Baud = 9600<br>Parity = None |
| Meters – Load Name | "< Meter N >" |
| Meters – Communications | Load Modbus IDs = 2,3,4<br>From left to right, top to bottom |
| Meters – CT Type | Split CT 150A-0.33V<br>(XFR/S0142/150)` |
| Meters – Load Type | 3-Phase |
| Meters-Autorotate | Enabled |

On power up, **multicube** systems recognise and accept their factory configured modules. Changes to the system hardware configuration may be made in the field such as adding/removing modules providing the original minimum component hardware configuration (above) is maintained.

* The END Module must always remain with its original calibrated Master. The serial number of the Master is also printed on the END Module to keep them paired.

## 5.3. Configuring a Modified Multicube System

Hardware changes made to a multicube system such as adding/removing modules are detected during the power up and may require action, by the user, to confirm these changes before the system accepts the new configuration.

### 5.3.1. After Adding New Modules

When connecting a new measurement module to an existing MultiCube Modular system, the **measurement voltage must be present** when the unit is powered up, in order for the meter to self calibrate the new module into the system.
The display on the master module will ask for the acceptance of this configuration change by the user
If one or more new modules are detected during power up checks, the following screen is displayed:


The detected modules are recognised and shown in their position and the user is requested to accept these changes.

Use the keys to select YES or NO and the key to confirm the selection.

**NOTE: The "Configuration Changed" screen times out after approximately 30 seconds.**

#### 5.3.1.1. Selecting NO (default)

If NO is selected (or the screen is allowed to timeout with YES or NO selected):

- **The system continues to operate unchanged with previously configured and accepted modules.**
- **New modules are skipped when selecting loads in normal operation.**
- **Existing communications IDs (e.g. Modbus) remain unchanged regardless of physical position in the multicube system.**
- **New modules are not available on the communications (e.g. Modbus) system.**

#### *5.3.1.2. Selecting YES*

If YES is selected.

- **New modules are added to the multicube system and made available for display.**
- **Existing communications IDs (e.g. Modbus) remain unchanged regardless of physical position in the multicube system.**
- **New modules are available on the communications (e.g. Modbus) system with consecutive IDs that start at the previous largest ID+1.**

**NOTE: In order for the data logger (optional) to record data from new module(s), the user must STOP the current LOGGING SESSION and start a new one.**

#### *5.3.1.3. Power Cycle without Voltage Present*

If modules are added to a Modular Meter system they are automatically calibrated, to match the display master. This process requires all 3 phase voltages to be present on the master (>20% Nominal Voltage) during power up. Once modules have been successfully calibrated, to match a master, they are automatically recognized, by that master, on future power cycles.

### *5.3.2. After Removing Modules*

If power up checks determine that one or more modules have been removed, the following screen is displayed:


**NOTE: The "Configuration Changed" screen times out after approximately 30 seconds.**

Press ↵ key to remove the message or wait for the screen to timeout.

- **The system continues to operate with the configuration of the remaining modules unchanged.**
- **Communications IDs (e.g. Modbus) of the remaining modules are unchanged regardless of their physical position in the multicube system.**
- **Removed modules may return invalid data on the communications (e.g. Modbus) system.**
- **Logged data for removed modules is not available.**

**If a module is removed permanently it is advised that the system is reconfigured using the "*Renumber Slaves*" the option in the *Setup - Advanced* menu. This removes all trace of the modules and renumbers the other modules to fill the gap. Renumber modules get default configuration.**

### 5.3.3. *After Replacing Modules*

If a module is replaced by an un-configured module of the same type (for example when replacing a faulty module) the user is given the choice of configuring the replacement module with the same user settings as the module being removed.
When connecting this module to an existing MultiCube Modular system, the measurement voltage must be present when the unit is powered up, in order for the meter to self calibrate the new module into the system.
The display on the master module will ask for the acceptance of this configuration change by the user.


The detected module(s) are recognised and shown in their position and the user is requested to accept the changes.

Use the keys to select YES or NO and the key to confirm the selection.

**NOTE: The "Configuration Changed" screen times out after approximately 30 seconds.**

#### 5.3.3.1. *Selecting NO (default)*

If NO is selected (or the screen is allowed to timeout with YES or NO selected):

- **The system continues to operate unchanged with previously configured and accepted modules.**
- **Replacement modules are skipped when selecting loads in normal operation.**
- **Existing communications IDs (e.g. Modbus) remain unchanged regardless of physical position in the multicube system.**
- **New modules are not available on the communications (e.g. Modbus) system.**
- **Removed modules are not available on the communications (e.g. Modbus) system.**
- **Logged data for removed modules is not available.**

#### 5.3.3.2. *Selecting YES*

If YES is selected.

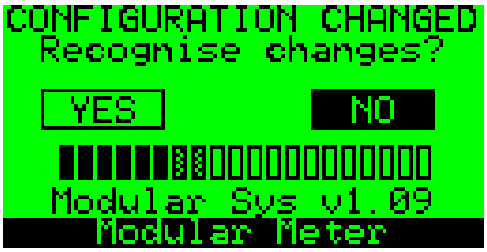
- **New modules are added to the multicube system, in place of removed modules and are made available for display.**
- **New modules which replace removed modules are automatically configured with the settings of the removed modules.**
- **Existing communication IDs (e.g. Modbus) remain unchanged providing the number of modules in the multicube system is not changed.**
- **Logged data for replaced modules is not lost.**

## 5.4. Power Cycle without User Intervention

If a Modular metering system power cycles, without the user present, for example a temporary site power outage the behavior would be as follows:

### 5.4.1. Changes not Recognised

If a Modular meter system configuration has been modified for example by adding, removing or moving modules, but the changes have not been successfully recognised, by the user, then the following page will be displayed at each power up:




**Default Power-up Screen – Modified Modular Meter**

If the user is not present to accept the configuration changes, within 1 minute of power-up, the Modular meter system will not save the changes in permanent memory and the meter will operate in its pre-change state.
This power up sequence will be repeated until the user selects ”Yes”, when the above display is shown, to recognize the changes.

### 5.4.2. Changes Recognised

If a Modular meter system configuration has been modified for example by adding, removing or moving modules, and the changes have been successfully recognised, by the user, then the ***CONFIGURATION CHANGED*** page will not be shown during power up. The power-up sequence will then be as described in Section 5.6.1. The Modular Meter System will then operate with the latest recognised configuration.

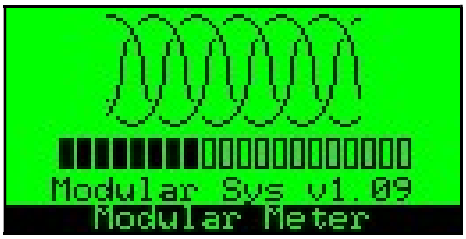
## 5.5. Reconfiguration of a Modified System

It is recommended that a process of reconfiguration is carried out if significant changes are made to a Modular meter system, for example when adding, removing or replacing multiple modules.
This process ensures that modules are re-numbered in sequence, missing modules are removed from memory and new modules are listed in order. Full system re-configuration is available from the “Advanced” settings menu accessed as described in Section 5.15.7.

## 5.6. Testing a Modified System

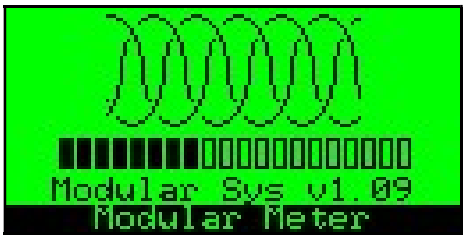
In order to ensure that configuration changes to a Modular Meter system have been successful, it is required to power cycle the system after changes have been accepted by the user as described in Section 5.3.
If all changes are successful, the display will follow the normal power up sequence as follows:

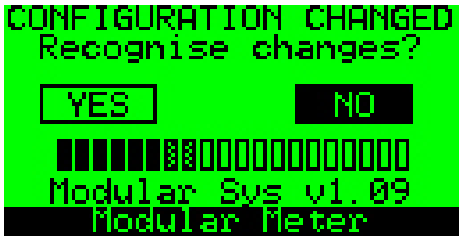
### 5.6.1. Power Cycle Sequence – Configuration Changes Successfully Recognised





### 5.6.2. Power Cycle Sequence – Configuration Changes Not Recognised

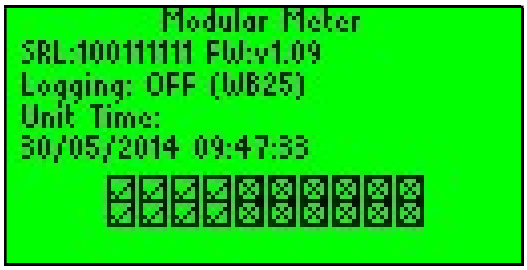



### *5.6.3. Check the System Information Pages (Firmware Version > 1.07)*

It is also recommended that the System Information Pages (Page 22) are used to confirm the configuration changes as follows:

1. Take a note of the Master Serial Number (SRL: 100111111 below)




**Master System Information**

2. Check each slave System Information Page to make sure the slave's recognised Master is the one installed in the system (MASTER SRL: 100111111).


**Meter Slave System Information**

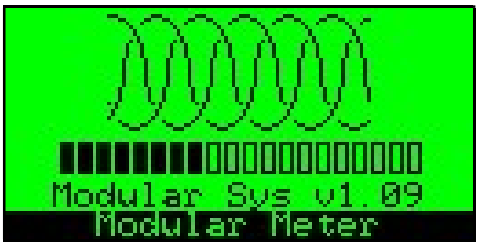
Example:

| MASTER | SLAVE | Slave Recognised Master | Result |
|---|---|---|---|
| SRL: 100111111 | 1 | MASTER SRL:100111111 | Configured OK |
| | 2 | MASTER SRL:100111111 | Configured OK |
| | 3 | MASTER SRL:12345678 | NOT RECOGNISED |
| | 4 | MASTER SRL:12345678 | NOT RECOGNISED |
| | 5 | MASTER SRL:100111111 | Configured OK |
| | 6 | MASTER SRL:100111111 | Configured OK |
| | 7 | MASTER SRL:100111111 | Configured OK |
| | 8 | MASTER SRL:100111111 | Configured OK |

- Slaves May Not Recognise a master in the following conditions:
  - Configuration changes are not manually recognised by the user during power up as described in Section 5.4.1
  - A slave module added to an existing Modular Meter system cannot be calibrated and therefore will not recognise its new master serial number, if no voltage is present at the measurement input during power up. This is described in Section 5.3.1.3.

## *5.7. Powering-Up a Configured Multicube System*

- **Switch on the auxiliary supply to the unit**




The power up screen details the software version for the Master Display Unit and a progress bar shows connection of each Sub Module as it is automatically identified. This screen is displayed for approximately 10 seconds.

- **Connected Loads List**


Use the ▽ △ keys to select a load from the list and press ↵ to show the default measurement page for the highlighted load.

The bottom line (Highlighted Text) gives details of the selected module:

- **The Communications ID (eg Modbus ID).**
- **The selected channel ("Ph1"-"Ph3" or "3-Ph" for 3-Phase Loads)**
- **The Current Transducer nominal primary current.**

Un-commissioned systems will display default names and all meters will be set to measure 3-Phase loads. It may be useful to refer back to this ***Connected Loads List*** after commissioning to check the system configuration.

### 5.7.1. System Information Pages

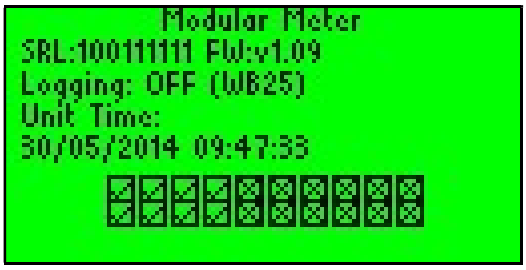
The system information page provides the user with details of the connected modules at any time during operation of the multicube system.

**Select *System Info***
**From the**
***CONNECTED LOADS***

**View the**
**System Information page**


**Select to View**
**Master/Module(s) Information**

**Return to Module List**




Module present and configured

Module not present

Module present but not yet configured

#### 5.7.1.1. Master Information


User Name for the Master Display Unit
Serial Number for the Master Display Unit  Firmware version
Logging status (ON/OFF)
Date & time

Module status by position

#### 5.7.1.2. Selected Slave Information (MC352)


Selected Module: Serial Number  Firmware Version
Master serial number
Voltage: System, Nominal, Calibration Adjust
Current Transformer: Primary amps  Secondary volts  Phase adjust
Phase Multiplier
Current Demand Periods  (seconds/10)
Power Demand Periods  (seconds/10)
Module Status – Selected Module Highlighted
Module Position (Type)  Comms ID  Meter Type

- **Default Measurement Page**


This page shows measured values from the selected meter/load. This data is meaningless for an unconfigured **multicube** system as the programmed Current Transducers may not match the physical devices fitted.
The bottom line (Highlighted Text) shows details of the selected load as:

- **The Communications ID (eg Modbus ID).**
- **The programmed Load Name (Up to 14 Characters)**

An LED is illuminated on the selected Module to indicate which phase is displayed on the LCD.

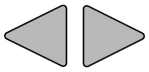
| | | |
|---|---|---|
| **Display Current parameters for the selected load.** |  | ***Press/Release to show next page*** ***Press/Hold for fast scroll*** |
| **Display Voltage parameters for the selected load.** |  | |
| **Display Power parameters for the selected load.** |  | |
| **Display Energy parameters for the selected load.** |  | |
| **Select a load to be displayed (The LED associated with the selected load is illuminated)** |  | ***Press/Release to select next Load*** ***Press/Hold to select from a Load List*** |

**Note:** A different set of parameter display pages is available for single phase and 3-phase loads. For a list of available pages refer to Section 6.3.

- **Password Entry Screens**

Some programming features may be protected by a user password. Two levels of password are supported allowing more advanced features to be protected for use only by authorised users.

**Move to:**
**Next / Previous Digit**
**ESC / OK**



**Increment / Decrement Digit**

**Confirm:**
**OK – Issue the Password**
**ESC – Return to Prev Screen**


***NOTE:*** If a password of 0000 is set, the password entry screen is not shown and immediate access is granted.

If an incorrect password is entered the user is returned to the previous screen.

The factory Set Default Passwords are:

**Level 1**: 0 0 0 0
**Level 2:** 1 1 1 1

To change the user passwords refer to Section 5.15.6

## 5.8. System Name

Each **multicube** system can be given a user defined '***Name'*** so it may be individually identified. Names are up to 14 Alpha-Numeric characters and are entered in the ***Setup Main*** page as follows:

**Enter Setup Mode**

***Hold Setup Keys for 5 Seconds***

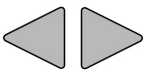
**Select *System Name* from the *SETUP MAIN* Menu**


**View/Edit the System Name**

**Switch between *Character Entry Mode* and *Function Key Mode***


**Function Key Mode**

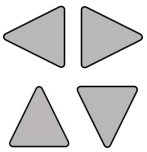
| | |
|---|---|
| < - | Previous Character |
| - > | Next Character |
| a/A | Lower/Upper Case |
| OK | Accept New Name |
| ESC | Abandon Changes |

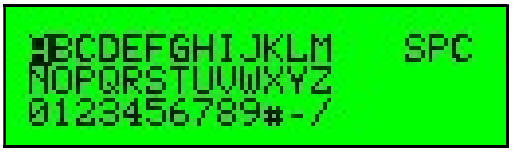



**Function Key Mode**

**Character Entry Mode**

**Select Character**






**Character Entry Mode**

**Enter Selected Character in Current position.**

## 5.9. Setup Each Electricity Meter Module (MC352)

Each Electricity Metering Module ***MC352*** contains two complete 3-phase electricity meters, each of which may be optionally configured to monitor 3 single-phase loads.

### To configure a Meter Module:

- **Select the Current Transducer Type matching those connected. Suitable CTs are supplied by the manufacturer and are labelled with the type.**
- **Configure the meter to measure a 3-phase load or 3 individual single-phase loads.**
- **Set Autorotate Mode On/Off.**
- **Give each load a useful name, to be displayed on the LCD and available via Comms.**

**NOTE: The 3 inputs of each *1/2 MC352* must be connected using the same type of CT.**

### 5.9.1. Select a Current Transducer Type

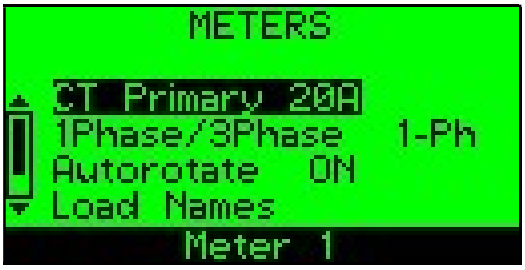
**Enter Setup Mode**

***Hold Setup Keys for 5 Seconds***

**Select *Meters***
**From the Main Menu**


**View/Edit the Meter Setup**

**Select a Meter Module**




**Show CT List**

**Match the CTs Connected to this Meter to a type in the List**


**Accept the CT Selection**

### *5.9.1.1. If User Spec CT is Selected*

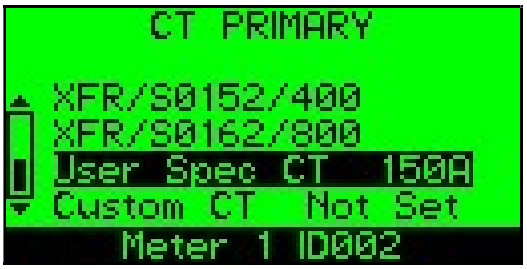
It is possible to enter a user CT Specification for each Meter in place of selecting standard devices from the list. This is an advanced option, which is only required in exceptional circumstances and should not be used without technical support. A ***Level 2 Password*** is required when selecting a ***User Spec CT***. This can be entered as described above.

**NOTE: The *MC352* is designed to compensate for small phase errors produced by each standard current transducer on the list. When a *User Spec CT* is used with the *MC352* this phase error should match the specification of the device used or potential measurement errors will occur at low power factors. Current Transducers/Transformers not approved for use with the *MC352* may permanently damage the Meter inputs.**

### *5.9.1.2. Enter a User Defined CT Specification*

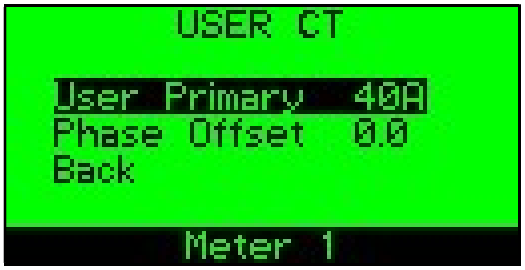
**Select *User Spec CT***
**From the *CT PRIMARY* list**

**View/Edit the User Spec CT**

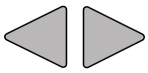



**Select The User Primary**

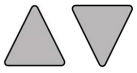
**Edit the Primary Current**



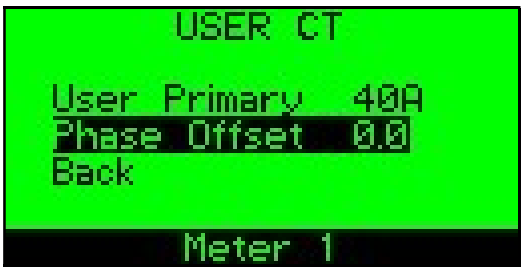
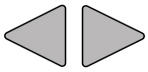
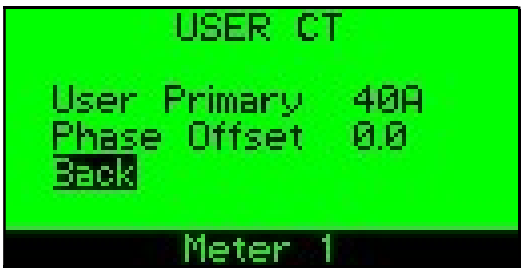

**Move to:**
**Next / Previous Digit**
**ESC / OK**



**Increment / Decrement Digit**



**Confirm:**
**OK – Issue the Password**
**ESC – Return to Prev Screen**

| | | |
|---|---|---|
| **Select Phase Offset**<br><br>**Edit the Primary Current** |  <br><br>  |  |
| **Move to:**<br>**Next / Previous Digit**<br>**ESC / OK**<br><br>**Increment / Decrement Digit**<br><br>**Confirm:**<br>**OK – Issue the Password**<br>**ESC – Return to Prev Screen** |  <br><br>  <br><br>  |  |
| **Select Back when User CT is defined.**<br><br>**Accept the User CT Specification for the selected Meter.** |  <br><br>  |  |

### *5.9.2. Custom CT Selection*

A single **Custom Current Transducer Specification** may be defined, by an authorised user, and will then be available for selection from the Standard CT list.
A **Custom Current Transducer Specification** is defined by setting its CT Primary, and Phase Offset.
Refer section 5.15.7.1

**NOTE: Current Transducers/Transformers not approved for use with the *MC352* may permanently damage the Meter inputs.**
**NOTE: The Custom CT specification is entered in the Advanced Settings Menu, which requires a Level 2 Password as, described above.**

### *5.9.3. Set the Meter Module to Measure a 3-Phase or 3 Single Phase Loads*

**Select *1Phase/3Phase***
***The current mode is shown:***
***3-Ph or 1-Ph***

**Toggle Meter Types**
**3-Ph – 3 Phase Load**
**1-Ph – 3 x Single Phase**


### *5.9.4. Set Autorotate Mode ON/OFF*

When the ***Autorotate*** function is ***ON*** (default) the orientation of each current transducer on its associated conductor is irrelevant. If a CT is placed the wrong way round then the ***Autorotate*** system will automatically compensate for this.
If measurement of ***Export power/energy*** is required to then it is necessary to switch ***Autorotate OFF*** and ensure the CTs are mounted the correct way round on the conductors.

**Select *Autorotate***
***The current mode is shown:***
***ON or OFF***

**Toggle *Autorotate***
**ON - Normal Operation**
**OFF – Import/Export Power**

### *5.9.5. Set a Name For Each Meter*

An alphanumeric name may be associated with each load so that it may be identified on the LCD and over the Modbus or other communications link. Each measured load requires a name, so a meter measuring a single 3-phase load requires a single name while a 3 x Single Phase meter requires three names.

**Select *Load Names***

**View/Edit the Load Name(s)**

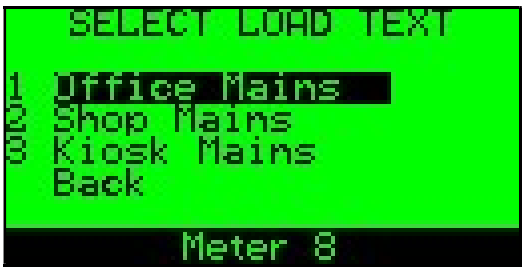

**Select** The Meter to Edit


3-Phase Load (Single Name)

**Note:**
**3-Phase Meters Require 1 Name.**
**1-Phase Meters Require 3 Names**

**Select a Load Name**

**Edit the Load Name**

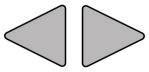



3 x Single Phase Loads (3 Names)

Switch Between:
Character Entry Mode
and
Function Key Mode


**Function Key Mode**

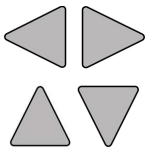
| | |
|---|---|
| < - | Previous Character |
| - > | Next Character |
| a/A | Lower/Upper Case |
| OK | Accept New Name |
| ESC | Abandon Changes |



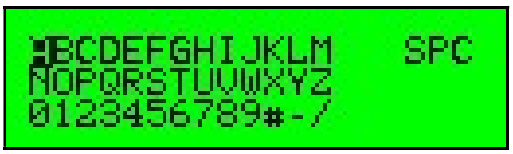

Function Key Mode

**Character Entry Mode**

Select Character



Enter Selected Character in
Current position.




Character Entry Mode

### *5.9.6. Repeat Meter Setup for All Meter Modules*

Repeat the programming sequence for all attached loads as described above.

Select *Back* when Meter
Programming is complete

Return to *SETUP* Menu

## 5.10. Test Mode

A series of load tests may be quickly performed to check the installation and validate connections.

### 5.10.1. Connection Test:

**To test a load:**

- **Ensure the load to be tested is ON and in a normal operating mode.**
- **For import/export meter types ensure the load is importing current**
- **Step through the load tests**
- **Isolate the system and correct installation errors where required.**

***NOTE:* Very low Power Factor measurements (<0.55) are used to indicate installation errors. If the load measured actually produces such a low PF then test results may be invalid.**
***NOTE:* If more than one error occurs simultaneously the first error in the list below will be shown until the error has been corrected.**

**Following tests can be performed for each load:**

- **Power factor test**
- **CT Rotation test**
- **Voltage input test**
- **Current input test**

### *Installation errors:*

✓ ***No Error Detected***

- **The Current Transformer appears to be on the correct phase (Power Factor > 0.55).**
- **Sufficient load current is flowing for a valid test.**
- **The phase voltage is healthy (Greater than 40V Phase to Neutral).**

**V0** ***Insufficient Phase Voltage to carry out a Valid Test***

- **Check that the voltage wiring and ensure circuit breakers are ok.**

**I0** ***Insufficient Load Current to carry out a Valid Test***

- **Check that the load is running before carrying out the test. (Indication below 5% of rated current.)**

***Current Transformer Mounted on the Wrong Phase Cable***

- **This results in low power factor and kW measurements.**
- **Check the wiring and move the CTs to the correct phase.**

**aR** ***Current Transformer Reversed on its Cable (Auto CT reverse activated)***

- **This occurs when the CT is reversed on its cable and indicates that the meter is automatically correcting for this error.**
- **There is no need to rotate the CT in this case this symbol is shown purely for information.**

## *Current Transformer Reversed on its Cable (Import/export meter)*

- **This result is only valid for import/export meter types.**
- **This results in negative kW measurements.**
- **Check the wiring and rotate the CT on its phase cable.**

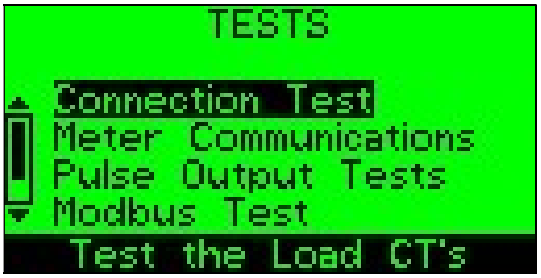
**Enter Setup Mode**  *Hold Setup Keys for 5 Seconds*

**Select Test Mode from the Main Menu** 

**Enter Test Mode** 


**Select Connection Test** 

**Enter Connection Test Mode** 

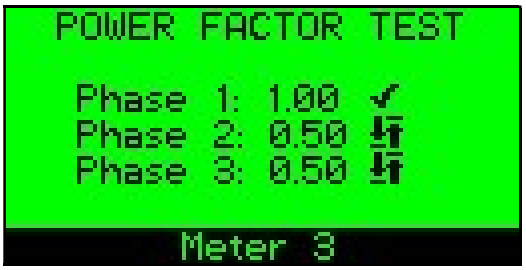



## Connection Test - Power Factor

**Select Meter to Test** 

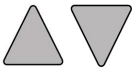
**Next / Previous Test** 

**Exit Connection Test Mode** 

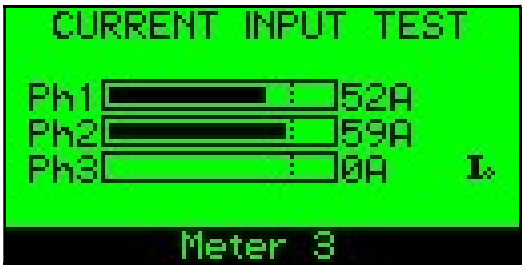



## Connection Test – Amps

**Select Meter to Test** 

**Next / Previous Test** 

**Exit Test Mode** 

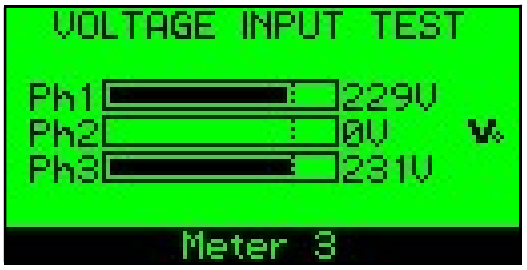


## Connection Test – Volts

Select Load to Test

Next / Previous Test

Exit Test Mode

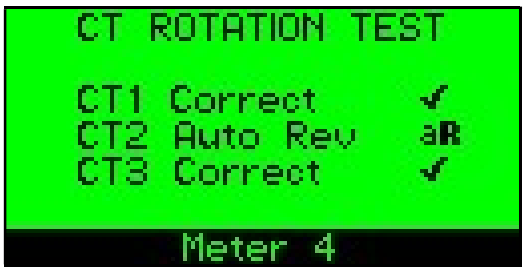



## Connection Test – CT Rotation

Select Load to Test

Next / Previous Test

Exit Test Mode



## 5.11. Reset Saved Data

Various stored parameters may be reset to zero using the programming menus.

- **"All Loads" – Reset all meter modules simultaneously**
- **"All Demands" – Reset Volts, Amps and Power Demands simultaneously**
- **"All Energy" – Reset all energy registers simultaneously**

**Enter Setup Mode** — *Hold Setup Keys for 5 Seconds*

**Select Reset from the *SETUP MAIN* Menu**

**Enter the Reset Menu ***

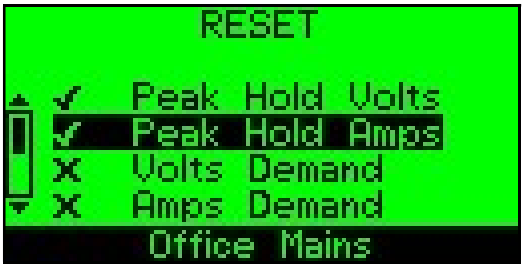

**Select a single load or All Loads to reset.**

**Select One or More Parameters to Reset**

**Toggle Between:**

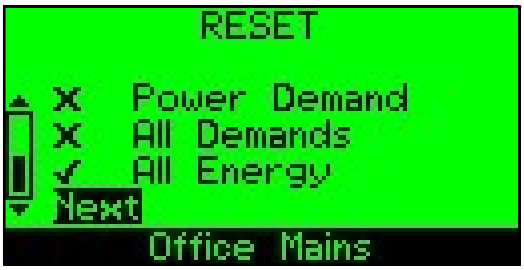
✓ **Reset Stored Value**

✘ **Don't Reset Stored Value**




**Select Next from the *RESET* Menu**

**Proceed With Reset ****




***WARNING MESSAGE***

***CONFIRM*: Perform Resets**
***CANCEL*: Exit Without Reset**


*** If passwords are enabled enter your password as described above.**

**** Exit to main menu if no parameters are selected**

## 5.12. Setup Modbus RS485 Communications (Optional)

Each **multicube** fitted with the Modbus RS485 communications option is assigned a range of unique IDs. Further information on this is available in the ***Multicube System - Communications Manual***.

- **The user assigns a unique ID for each multicube in the Modbus network leaving gaps for the Master Display Unit to automatically assign a further set of consecutive IDs (2 for each module).**
- **The user selects a baud rate to suit the Modbus system setting.**
- **The user set the Parity to suit the Modbus system setting.**

**Note: Parity is set to NONE for the majority of Modbus systems.**

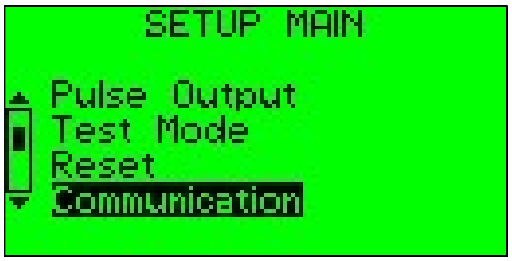
---

**Enter The *SETUP MAIN* Menu**   ***Hold Setup Keys for 5 Seconds***

---

**Select *Communication* from the *SETUP MAIN* menu** 

**Enter the Communication Setup Menu** 

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### Set The Modbus ID

---

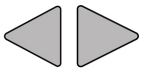
**Select Modbus ID from the menu** 

**Enter to change the value** 


---

***WARNING MESSAGE***

---

***CONFIRM*: Change the Modbus ID**
***CANCEL*: Exit Without change in Modbus ID**  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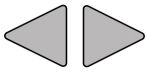
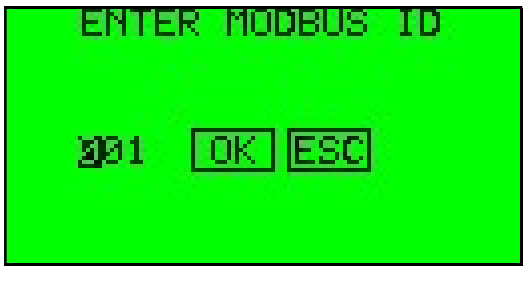
**Select a *Digit*, *ESC* or *OK*** 

**Change the Digit Value.** 

***Range:001 to 200***
***OK* – Accept new value**
***ESC*- Reject new value** 

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## Set The Baud Rate

Select *Baud Rate* from the *Communication Menu*

Enter to Change the Value


Select the desired baud rate

Enter to accept the selection


## Set The Parity

Select *Parity* from the menu.

Enter to Change the Value (NONE, ODD, EVEN)


## Return To the *SETUP MAIN* Menu

Select *Back* from the menu

Exit to *SETUP MAIN* menu

## 5.13. Setup Modbus TCP/IP Communications (Optional)

Each **multicube** fitted with the Modbus TCP/IP communications option is assigned a range of unique IDs. Further information on this is available in the ***Multicube System - Communications Manual***.

- **The user assigns a unique ID for each multicube in the Modbus network leaving gaps for the Master Display Unit to automatically assign a further set of consecutive IDs (2 for each module).**
- **The user sets up the multicube for DHCP (automatic IP addressing) or Static IP addressing.**
- **The user sets the network parameters for the meter (IP address, Default Gateway, Subnet Mask)**

### 5.13.1. Automatic IP Addressing (DHCP Enabled)

When DHCP is enabled the **multicube** automatically obtains a free IP address from the Ethernet network to which it is connected. The process is carried out as follows:

- **multicube requests an IP address from any DHCP server on the network.**
- **A DHCP server offers an address to the multicube**
- **If the multicube has previously obtained the same address from a DHCP server on this network it will accept it and continue with this address.**
  **If the multicube is offered a different address it will keep issuing DHCP requests for up to 5 minutes.**
  **After 5 minutes the multicube will accept a new address offered by any DHCP server.**
- **The multicube obtains the Default Gateway and Subnet Mask from the DHCP server.**

The processes of re-trying to obtain a previous IP address reduces the chances of address hopping on power fail even on networks with multiple DHCP servers.
The DHCP process is initiated after the **multicube** is power cycled and when the addressing mode is changed on the LCD from Static to DHCP addressing mode.

### 5.13.2. Static IP Addressing

When Static IP Addressing Mode is selected the network administrator assigns a free/unused IP address which is outside the reserved ranges of any DHCP servers on the network.
The advantage of assigning a fixed IP address is that this will remain constant on the network until the user changes it on the **multicube**.
The disadvantage of this approach is that it is possible for more than one device on a network to have the same address leading to possible data corruption.

**NOTE:**
**When changing from DHCP mode to static addressing the user must enter the Setup page on the LCD and change the parameters before the multicube changes operating mode with the new parameters.**

## Enter Communications Setup

Enter The *SETUP MAIN* Menu

*Hold Setup Keys for 5 Seconds*

Select *Communication* from the *SETUP MAIN* menu

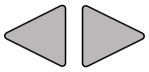
Enter the Communication Setup Menu


## Set The Modbus ID

Select Modbus ID from the menu

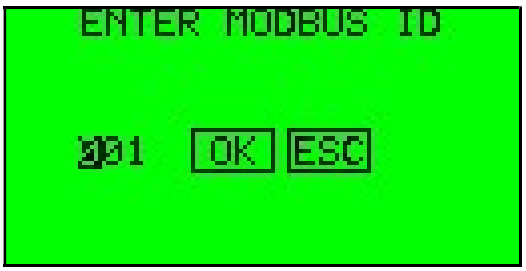
Enter to change the value


Select a *Digit*, *ESC* or *OK*



Change the Digit Value.

*OK* – Accept new value
*ESC*- Reject new value




## Set The IP Addressing Mode

Select DHCP from the Communication Menu

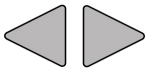
Enter to Change the Value Between Static/DHCP

## Set The Network Parameters

**Select IP settings from the menu**

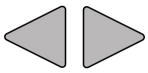
**Enter to change the value**


**Select a Parameter From the Table**

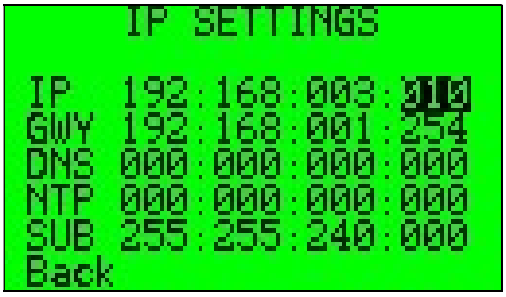


**View IP settings (IF DHCP is set)**
**Change the Digit Value (can be changed only if Static is set)**

***Select Back***



***To Return to Communications Menu***



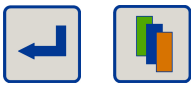

## Return To the *SETUP MAIN* Menu

**Select *Back* from the menu**

**Exit to *SETUP MAIN* menu**

## 5.14. Test Modbus Communications (Optional)

The **multicube** system provides a facility for testing the RS485 communications network connection if the Modbus option is fitted. This allows communications problems to be identified and remedied during commissioning.

**Enter Setup Mode**  *Hold Setup Keys for 5 Seconds*

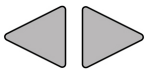
**Select *Test Mode* from the *SETUP MAIN* menu** 

**Enter Test Mode** 

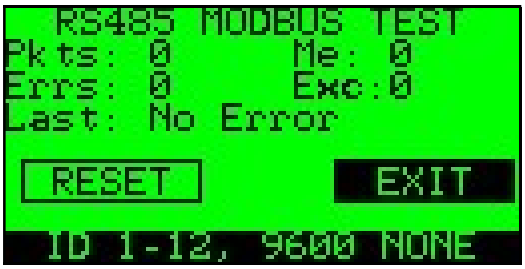

**Select *Modbus Test*** 

**Enter Modbus Test Mode** 


### Modbus Test Mode

**Select: RESET or EXIT Button** 

**RESET – Reset Test Results**
**EXIT – Leave Modbus Test** 




### Pkts:

Total Number of ***RTU Framed Modbus Packets*** detected on the RS485 Bus. These may be complete or incomplete packets. The structure/content of these packets is not examined in detail unless they are addressed to ***ME***.

### Me:

Total Number of ***RTU Framed Modbus Packets*** starting with ***Any ID in My Range*** including that of the ***Display Unit*** and all connected **Modules**. These may be complete or incomplete packets. The structure/content of these packets is examined in detail for errors.

## Errs:

This is a count of the Errors seen in RTU Framed Packets starting with Any ID in My Range including that of the Display Unit and all connected Modules. Exception errors are not counted here.
The following errors are identified:

- **Short Packet Length**
- **Long Packet Length**
- **Invalid Checksum**
- **Invalid Function Type**

## Exc:

This is a count of the Exception Errors seen in RTU Framed Packets with Any ID in My Range including that of the Master Display Unit and all connected Modules.

## Last:

This provides details of the last error to occur including ***Exception Errors***

## STATUS LINE:

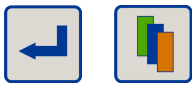
The bottom line of the LCD (Highlighted) shows the current configuration of the Modbus Port.

- **ID 1-13** **The Range of IDs used by the system including the Display and Slave Modules**
- **9600** **The baud rate of the Master Display Unit.**
- **NONE** **Parity (NONE=No Parity, EVEN = Even Parity, ODD = Odd Parity)**

## 5.15. Setup Logging (Optional)

The **multicube** system can be supplied with a built in data logger (Ref Section 7) which can store historical profiles of energy registers in flash memory that will be retained when power is removed from the system.

**Enter Setup Mode**



*Hold Setup Keys for 5 Seconds*

**Select *Logging***
**from the SETUP MAIN menu**


**Enter the Logging Menu**

***NOTE:*** **New meters are supplied with logging STOPPED. Only when the logger is STOPPED can a new session can be setup or major changes made to the logger configuration. This prevents corruption of the data format in during an ongoing log session.**

### *5.15.1. Make Minor Real Time Clock Adjustments (Logger is Running)*

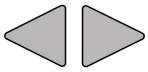
It is possible to make minor adjustments to the real time clock while a log is in progress without stopping the logger. This may affect indexing of stored data on the day that the time is changed.

**ADJUST TIME – WHILE LOGGER IS RUNNING**

**Select *Adjust Time***

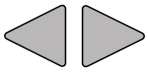
**Change the time**


**Select CONFIRM or CANCEL**



**CONFIRM – Continue**
**CANCEL – Return To Menu**


**Select HOUR : MIN : SEC OK or ESC**



**Change the Time Digits**

**OK – Set New Time**
**ESC – Escape / No Change**


**NOTE: Small time changes in the middle of a logging period will have least affect.**

### *5.15.2. Setup a New Log Session (Logger Must be Stopped First)*

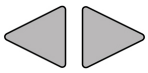
- **The user stops any ongoing data logging. Logged data will be lost when a new log is started so it is recommended that stored data be downloaded first.**
- **The user sets up a new logging session**
- **The user starts the new logging session**
- **Logging continues with the oldest data being replaced by the newest data when the logger is full (above).**
- **Stop The Logger**

#### Stop Logging

**Select Stop Logging**

**Enter to STOP LOGGING!**


**Select CONFIRM or CANCEL**



**CONFIRM – STOP LOGGING**
**CANCEL- Continue Logging**


#### Set A New Logging Period

**Select *Period* from the menu**

**Enter to select he Period**


**Select New Logging Period**

**Accept New Period**

## Select Loads to Add to The Data Logger

**Select *Logged Loads* from the menu**

**Enter into logging loads selection menu.**


**Highlight a Load**

**Toggle Between:**

- ✓ **Add Load to Logger**
- ✘ **Remove Load from Logger**


**When all desired Loads are selected *Go to Back* (Last Item).**

**Exit to *LOGGING* menu.**

### *5.15.3. Setting Up The Real Time Clock/Calendar*

A fully functional real time clock (RTC) is provided with the data logging option on the **multicube** system. The RTC is battery backed and will keep time in the event of power failure to the system. Setup of the RTC is only allowed when the Logger is STOPPED. Features of the RTC are described in detail in Section 7.

## Set the Daylight Savings Period

**With logging Stopped –**
**Select Date & *Time***

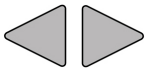
LOGGING SETUP LCD PAGE

**Change the Time**

**Select Daylight Savings from the SET DATE & TIME Menu**

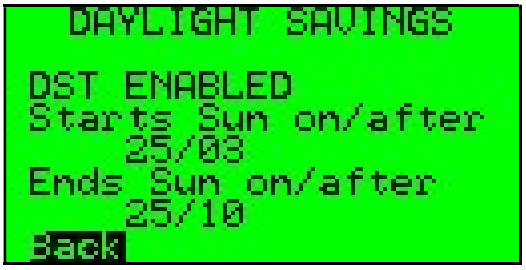
**Change the Daylight Savings Settings**


**Select from:**
**DST Enabled, Start/End Date, Back**



**Edit the selection.**

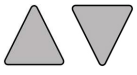
**Select "Back" and Press to Return to SET DATE & TIME Menu**



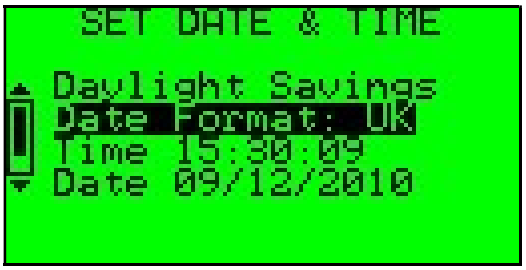

**Note: Setting the dates for Daylight Savings does not affect the real time clock or the data logger operation. The daylight savings setting merely allows Day Data files, stored in the logger, to include a flag on days when daylight saving should be applied in external systems.**

## Set the Date Format

**Select Date Format UK (US)**



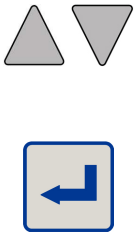
**Toggle between UK and US Formats:**
**UK = DD/MM/YY**
**US = MM/DD/YY**



## Set the Current Time

Select *Time hh:mm:ss*

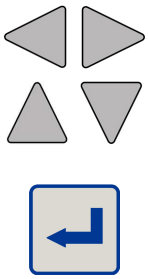
Change the Time

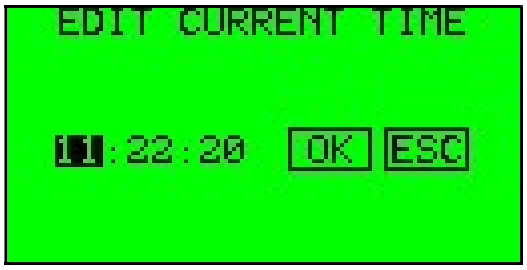



Select HOUR : MIN : SEC *OK* or *ESC*

Change the Clock Digits

*OK* – Accept new time
*ESC* - Reject new time

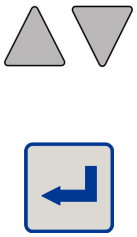





## Set the Real Time Clock (Date)

Select *Date*

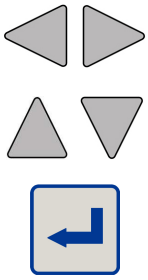
Change the Calendar Date




UK: Select DAY / MONTH / YEAR
US: Select MONTH / DAY / YEAR
*Select OK* or *ESC*

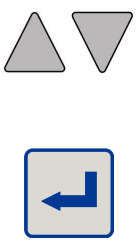
Change the Calendar Digits

*OK* – Accept new Date
*ESC* - Reject new Date




When the RTC Setup is complete:
*Select Back*

Return to *LOGGING* menu.



### *5.15.4. Setting Up Energy Tariffs*

**multicube** systems fitted with the Data Logging option allow energy accumulated during preset tariff periods to accumulate in up to 8 sets of Energy Tariff Registers. A full description of the Tariff register system is described in detail in Section 7.

#### Setup Energy Tariffs

**With logging Stopped –**
**Select Tariffs**

**Setup new Tariffs**

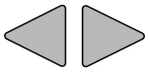

#### Set the Tariff Costs

**Select *Tariff Costs***

**Change the Costs**


**Select Tariff N Menu Item**

**Select Tariff 1 – Tariff 8**
**(Current settings are shown)**



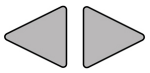

**Select kWh cost/kvarh Cost Menu Item**

**Change the kWh/kvarh Tariff N Cost**

### *5.15.4.1. Setting Tariff Costs*

Each of the 8 Tariffs has a cost associated with it which is stored in the logger and may be used by external systems for bill validation calculations. The values set have no effect on other values stored in the **multicube** system but merely allow the user to maintain a local record of historic costs.

**Select a Digit OK or ESC**
***OK* – Accept new Tariff Cost**
***ESC* - Reject new Tariff Cost**



**Change The Digit Value**


**Select Back to return To Tariff Menu**

**Return to Main Tariff Menu**

### *5.15.4.2. Defining Tariff Day Structures*

Up to 8 Tariff Day Types may be defined for the **multicube** system as described in Section 7. A Day Type is defined by setting up to 8 consecutive periods which make up the day each of which may be associated with a selected Tariff. The values set have no effect on other values stored in the **multicube** system but merely allow the user to maintain a record of historic Tariff periods.

For example a Day Type may define:

| Day Type 1 | | | |
|---|---|---|---|
| Period | Start Time | End Time | Tariff |
| 1 | 00:00 | 07:30 | T3 |
| 2 | 07:30 | 15:30 | T1 |
| 3 | 15:30 | 18:00 | T6 |
| 4 | 18:00 | 00:00 | T1 |

Day Types are setup graphically as:

## Setting Up A Day Type (See Section 7)

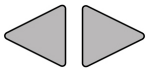
**Select *Day Periods***

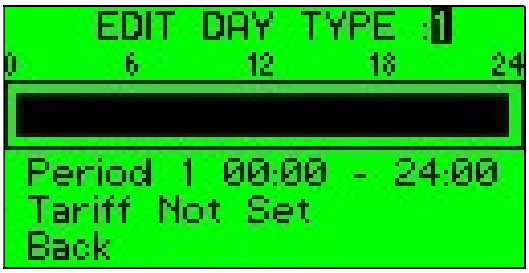
**Define/Change Day Periods**


### Select The Day Type 1-8 To Program

**Select 'EDIT DAY TYPE'**

**Select Day Type 1 – Day Type 8**
**(Current settings are shown)**



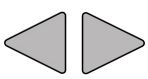


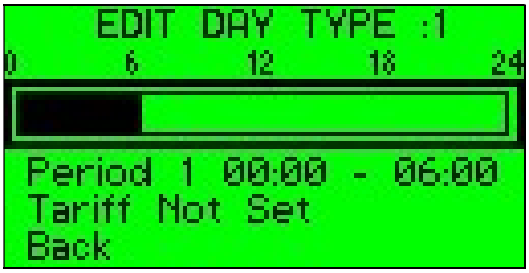

### Define The Day Type Time Periods

**Select The Time Period Graphic for the selected Day Type**

**Select A Time Period to Adjust**
**(Selected period is highlighted)**

**Adjust the Start/End Times for the Selected period**



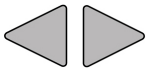


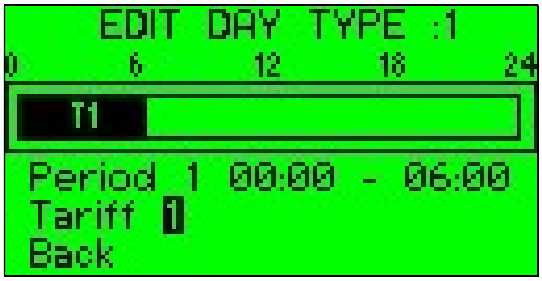
**Associate a Tariff With Each Period**

**Select 'Tariff' option.**

**Select Each Time Period**
**(Selected period is highlighted)**

**Select a Tariff Number to associate with the selected Time Period.**

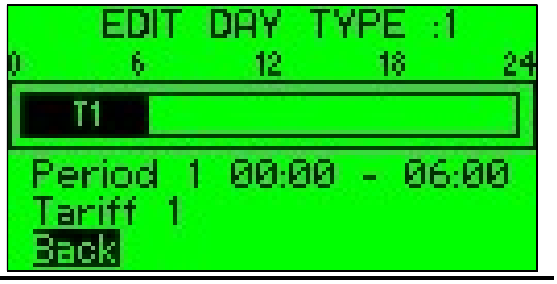





**Return to Main Tariffs Menu**

**Select Back**

**Return to Main Tariffs Menu**




### *5.15.4.3. Defining Tariff Week Structures*

Up to 8 Tariff Week Types may be defined for the **multicube** system as described in Section 7. A Week Type is defined by selecting a Day Type for each day of the week allowing a comprehensive Tariff profile to be programmed for each week. The values set have no effect on other values stored in the **multicube** system but merely allow the user to maintain a record of historic Tariff periods.

For example a Week Type may define:

| Week Type 1 | |
|---|---|
| Day of Week | Selected Day Type |
| Monday | Day Type 1 |
| Tuesday | Day Type 2 |
| Wednesday | Day Type 2 |
| Thursday | Day Type 2 |
| Friday | Day Type 3 |
| Saturday | Day Type 4 |
| Sunday | Day Type 5 |

Week Types are setup graphically as:

## Setting Up A Week Type (See Section 7)

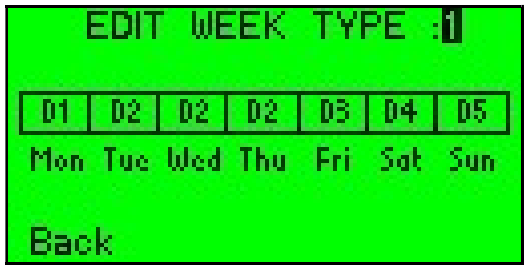
**Select 'Week *Types*'**

**Define/Change Day Periods**


## Select The Week Type 1-8 To Program

**Select 'EDIT WEEK TYPE'**

**Select the Week Type to Edit**
**(Current Setting are Shown)**

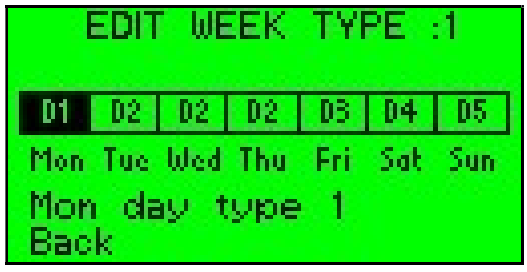



## Program The Week Type

**Select The Week Type Graphic**

**Select A Day of the week**
**(Selected day is highlighted)**

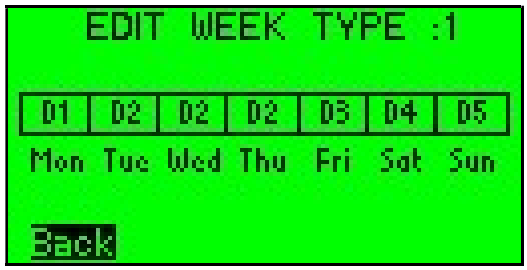
**Select a Day Type**
**For each day of the week**




## Return to Main Tariffs Menu

**Select Back**

**Return to Main Tariffs Menu**



### *5.15.4.4. Defining Tariff Seasons*

Up to 8 Seasons per year may be defined for the **multicube** system as described in Section 7. Each season is defined as being a calendar period with a constant Week Type. For example we may have tariffs configured as Week Type 1 during the winter and Week Type 2 consistent throughout the summer. The values set have no effect on other values stored in the **multicube** system but merely allow the user to maintain a record of historic Tariff periods.

Seasons are setup graphically as:

#### Setting Up A Season (See Section 7)

**Select 'Seasons'**

**Define/Change the Seasons**


#### Define the Seasons Start/End Dates

**Select the season Graphic.**
**(Highlighted when selected))**

**Select a Season to change.**
**(Highlighted period in graphic)**

**Edit the Start/End date.**
**(Detailed below graphic)**


#### Define The Week Type For Each Season

**Select the 'Week Type' Number**
**(Highlighted when Selected)**

**Select a Season**
**(Highlighted period in graphic)**

**Select a Week Type for the selected season.**


#### Return to Tariffs Menu

**Select Back**

**Return to Main Tariffs Menu**

### Return to Logger Menu

Select Back

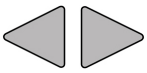
Return to Logger Menu


### Start the New Log Session

Select '*Start Logging*'

START Log Session


Select *CONFIRM* or *CANCEL*



*CONFIRM* – Start Logging
*CANCEL*- Don't Start Logging


### Complete Logger Setup

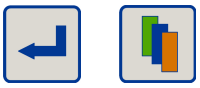
Select *Back*

Return to main Menu

### *5.15.5. Setup Demand Periods*

Various average demand parameters are available in the **multicube** system. These are time-averaged values derived from standard instantaneous readings.
The time period over which each parameter is averaged can be programmed to suit end user applications. For example a 1-minute average Amps Demand measurement may be set to provide a current profile, which smoothes out small fluctuations caused by minor load switching.

**Enter Setup Mode**



*Hold Setup Keys for 5 Seconds*

**Select *Demand Periods* from the *SETUP MAIN* menu**

**Enter the Demand Periods Menu**


## Set a New Demand Period

**Select the Demand Parameter to Change**

**Select The Load associated with the demand periods***

**Set the Demand Period for the Selected Parameter.**


**Select the Demand Period**

**Change the Demand Period**


**Select another Demand Parameter (Amps, Power) to Change**

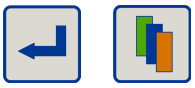
**Select Back when all Periods are set on all loads**


* A single Voltage Demand Period is set for the system as a whole and affects all loads.

### *5.15.6. Setup Passwords to Restrict Keyboard Access*

Some programming features may require a user password. Two levels of access may be set, each of which has a unique password. Only a user with access to Level-2 can modify passwords.
A Level-1 Password is required to access the Main Menu. Some Main Menu Items require the level-2 Password as detailed in the Table below.
If a password is set to 0000 then the associated password screens will not be shown.
Default factory password settings are Level-1 = 0000 and Level-2 = 1111. With these settings only level-2 screens, shown below, will require password entry.

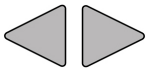
| Main Menu Item | Access Level |
|---|---|
| Reset | 2 |
| Logging | 2 |
| Passwords | 2 |
| Advanced | 2 |

**Enter Setup Mode**  ***Hold Setup Keys for 5 Seconds***

**Select *Passwords* from the *SETUP MAIN* menu** 


**Set New Password(s)** 

## Enter Existing Level 2 Password

**Move to:**
**Next / Previous Digit**
**ESC / OK** 

**Increment / Decrement Digit** 

**Confirm:**
**OK – Issue the Password**
**ESC – Return to Previous Screen** 

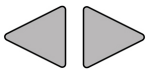
## Set new Password(s)

Select the Password

Change the Password


## Edit The Existing Password

Move to:
Next / Previous Digit
ESC / OK



Increment / Decrement Digit

Confirm:
OK – Accept New Password
ESC – Return to Prev Screen


Select Back to Return to Main Menu

### 5.15.7. Advanced Settings Menu

Advanced settings should only be used by authorised personnel with an in depth understanding of the **multicube** metering system and its application in its installed location.

#### 5.15.7.1. Custom CT Primary

A user-defined Current Transducer can be configured which can then be selected from the list available for selection in *Meter Setup*. The ***Custom CT*** is defined by its Primary Current and a Phase Compensation values required to ensure accurate measurements at poor power factors.

***WARNING:*** **If incorrect parameters are set for the *Custom CT* this can lead to significant reading errors.**

**Enter Setup Mode**  ***Hold Setup Keys for 5 Seconds***

**Select *Advanced***
**from the *SETUP MAIN* menu** 

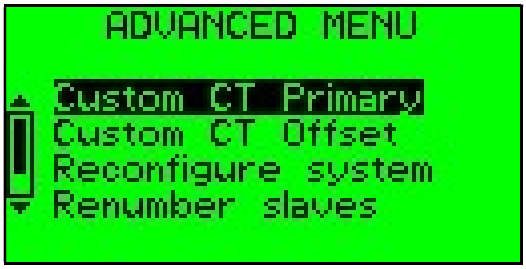
**Enter the Advanced Settings Menu *** 

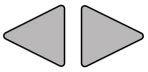

* A Level 2 Password may be required to gain access to the Advanced Menu. This is entered as described above.

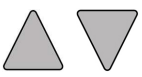
## Enter The Custom CT Primary Current

**Select *Custom CT Primary*** 

**Change the Primary Current** 




**Select:**
**Digit or *OK* or *ESC*** 

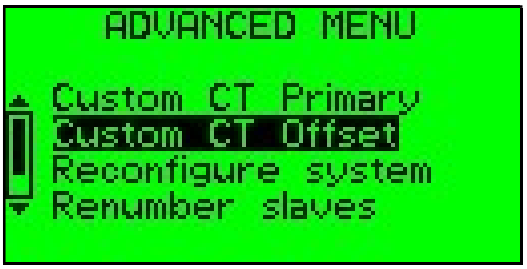
**Change the Digit** 

***OK* – Accept new Value**
***ESC* - Reject new Value**
**Range: 5 - 25000** 

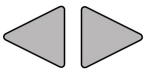
## Enter The Custom CT-Phase Offset

Select *Custom CT Offset*

Change the Phase Angle

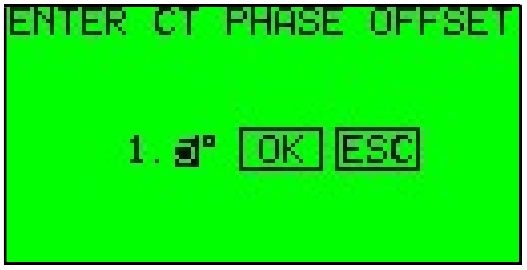



Select:
Digit or OK or ESC



Change the Digit

*OK* – Accept new Value
*ESC* - Reject new Value




## Return From Advanced Menu

Select another Advanced Setting to Change or

Select *Exit*
to Return to Meter Display pages

# 6. Meter Operation

Different measured loads are shown on the graphics LCD using the keypad on the **Master Display Unit**. Different sets of display pages are available for 1-Phase and 3-Phase loads.

## 6.1. Display Scaling

### 6.1.1. Voltage Scaling

| *System voltage (PT Primary) (Volts)* | *Voltage Display Resolution* |
|---|---|
| 650V to 1200V | 0.1 V |
| 1201V to 9000V | 1V |
| 9001V to 55000V | 0.01kV |

### 6.1.2. Current Scaling

The display resolution for all current (amps) parameters is set to provide 4 digits of resolution at the nominal CT Primary input.

| *CT Primary (Amps)* | *Current Display Resolution* |
|---|---|
| 1A to 8A | 0.001 A |
| 9A to 80A | 0.01 A |
| 81A to 800A | 0.1A |
| 801A to 8000A | 1 A |
| > 8000A | 0.01 kA |

### 6.1.3. Power Scaling (Meters Configured for a Single 3-Phase Load)

| *CT Primary (Amps)* | *System Power Display Resolution* | *phase Power Display Resolution* |
|---|---|---|
| 5A – 35A | 0.01kW | 0.001kW |
| 36A to 350A | 0.1kW | 0.01kW |
| 351A to 3500A | 1kW | 0.1kW |
| >3500A | 0.01MW | 1kW |

### 6.1.4. Energy Scaling (Meters Configured for a Single 3-Phase Load)

| *CT Primary (Amps)* | *System Energy Display Resolution* |
|---|---|
| 5A – 35A | 0.01kWh |
| 36A to 350A | 0.1kWh |
| 351A to 3500A | 1kWh |
| >3500A | 0.01MWh |

### 6.1.5. Power Scaling (Meters Configured for a 3 x Single Phase Loads)

| *CT Primary (Amps)* | *Power Display Resolution* |
|---|---|
| 5A – 35A | 0.01kW |
| 36A to 350A | 0.1kW |
| 351A to 3500A | 1kW |
| >3500A | 0.01MW |

### 6.1.6. Energy Scaling (Meters Configured for a 3 x Single Phase Loads)

| *CT Primary (Amps)* | *Energy Display Resolution* |
|---|---|
| 5A – 35A | 0.01kWh |
| 36A to 350A | 0.1kWh |
| 351A to 3500A | 1kWh |
| >3500A | 0.01MWh |

## 6.2. Sliding Window Demand

Average values of Volts, Amps kW, and kvar are calculated over a user programmable time period. The displays show the averages for the most recent time period ending at the time the display was last updated. The demand period is continuously updated as time progresses hence the term "***Sliding Window Demand***".

## 6.3. Load Display Menus

Each metered load is represented in display menus which are accessed using the user keypad on the ***Master Display Unit.***

### 6.3.1. Capacitive and Inductive Loads

Measured parameters such as kvar and Power Factor are displayed with a symbol indicating the type of load:

Inductive Loads:  Capacitive Loads: 

### 6.3.2. 3-Phase Load Display Menus

**3-Phase Current Display Menu**

 **Select Current Pages**  **Select Load**


**Instantaneous Phase Currents**
- Phase 1 Current
- Phase 2 Current
- Phase 3 Current


**Peak Hold Phase Currents**
- Peak Hold Phase 1 Current
- Peak Hold Phase 2 Current
- Peak Hold Phase 3 Current


**Current Demand (Sliding Window) Ref 6.2**
- Current Demand Phase 1
- Current Demand Phase 2
- Current Demand Phase 3


**Peak Current Demand (Sliding Window) Ref 6.12**
- Peak Hold Current Demand Phase 1
- Peak Hold Current Demand Phase 2
- Peak Hold Current Demand Phase 3


**Min Current Demand (Sliding Window) Ref 6.12**
- Minimum Hold Current Demand Phase 1
- Minimum Hold Current Demand Phase 2
- Minimum Hold Current Demand Phase 3


**Current Total Harmonic Distortion (THD)**

%THD Phase 1 Current

%THD Phase 2 Current

%THD Phase 3 Current

## 3-Phase Voltage Display Menu


**Select Voltage Pages**

**Select Load**


**Instantaneous Phase to Neutral Voltages**

Phase 1 to neutral volts

Phase 2 to neutral volts

Phase 3 to neutral volts


**Instantaneous Line-Line Voltages**

Line 1 – Line 2 volts

Line 2 – Line 3 volts

Line 3 – Line 1 volts


**Peak Hold Phase to Neutral Voltages**

Peak Hold Phase 1 Volts

Peak Hold Phase 2 Volts

Peak Hold Phase 3 Volts


**Voltage Demand (Sliding Window) Ref 6.12**

Voltage Demand Phase 1

Voltage Demand Phase 2

Voltage Demand Phase 3


**Peak Voltage Demand (Sliding Window) Ref 6.12**

Peak Hold Voltage Demand Phase 1

Peak Hold Voltage Demand Phase 2

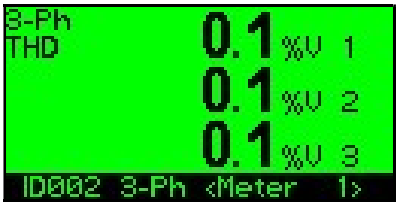
Peak Hold Voltage Demand Phase 3


**Min Voltage Demand (Sliding Window) Ref 6.12**

Minimum Hold Voltage Demand Phase 1

Minimum Hold Voltage Demand Phase 2

Minimum Hold Voltage Demand Phase 3




**Voltage Total Harmonic**

- %THD Phase 1 Volts
- %THD Phase 2 Volts
- %THD Phase 3 Volts

## 3-Phase Power Display Menu

**Select Power Pages**

**Select Load**


**Instantaneous System Power**

- System Real Power kW (P)
- System Reactive kvar (Q)
- System Power Factor (COSΦ)


**kW Demand (Sliding Window) Ref 6.12**

- kW Demand
- Peak Hold kW Demand
- Minimum Hold kW Demand


**System Frequency, Neutral Current, kVA (S)**

- Frequency (Measured on Volts Ph1)
- Neutral Current
- System Apparent Power kVA


**Per Phase kW (P1-P3)**

- Phase 1 Real Power (kW)
- Phase 2 Real Power (kW)
- Phase 3 Real Power (kW)


**Per Phase Reactive Power (kvar)**

- Phase 1 Reactive Power (Inductive shown)
- Phase 2 Reactive Power (Inductive shown)
- Phase 3 Reactive Power (Inductive shown)


**Per Phase Power Factor (COS Ø )**

- Phase 1 Power Factor (Capacitive shown)
- Phase 2 Power Factor (Capacitive shown)
- Phase 3 Power Factor (Capacitive shown)

## 3-Phase Energy Display Menu

**Select Energy Pages**

**Select Load**


**Total System Import Energy**

Real Energy kWh

Reactive Energy (kvarh)

Apparent Energy (kVAh)

### *6.3.3. Single-Phase Meter Display Menus*

***NOTE:*** **Each single-phase load is associated with a phase voltage determined by its position in a 3-Phase metering module. The phase voltages connected to the Master Display Unit are numbered Ph1 - Ph3 and this is indicated on the single-phase pages as "Ph1" - "Ph3".**

## Single-Phase Current Display Menu


**Select Current Pages**

**Select Load**


**Instantaneous Phase Current**

- Phase Current
- Peak Hold Phase Current
- Bar Graph of Amps Scale = 0 - 120% CT Prim


**Current Demand (Sliding Window) Ref 6.12**

- Phase Current Demand
- Peak Hold Phase Current Demand
- Minimum Hold Phase Voltage Demand

## Single-Phase Voltage Display Menu


**Select Voltage Pages**

**Select Load**


**Instantaneous Phase to Neutral Voltage**

- Phase to Neutral Voltage
- Peak Hold Phase Voltage
- Bar Graph of Volts Scale = 0 - 120% Vnom


**Voltage Demand (Sliding Window) Ref 6.12**

- Phase Voltage Demand
- Peak Hold Phase Voltage Demand
- Minimum Hold Phase Voltage Demand

## Single-Phase Power Display Menu


**Select Power Pages**

**Select Load**


**Instantaneous Phase Powers**

- Single Phase Real Power (P)
- Single Phase Reactive Power (Q)
- Single Phase Power Factor (COSΦ)


**Power Demand (Sliding Window) Ref 6.12**

- Single Phase kW Demand
- Single Phase Peak Hold kW Demand
- Frequency (From Phase 1 volts)

## Single-Phase Energy Display Menu


**Select Energy Pages**

**Select Load**


**Single Phase Total Import Energy**

- Single Phase Real Energy (kWh)
- Single Phase Reactive Energy (kvarh)

# 7. Data Logger/Tariffs (Optional)

## *7.1. Data Logger*

The **multicube** system can be supplied with a richly featured energy data logger which stores historic ***kWh*** and ***kvarh*** profile data for up to 1000 days. The data logger also provides a store for up to 8 sets of accumulating ***kWh*** and ***kvarh*** Tariff Registers.
Once configured by the user the logger runs continuously, automatically replacing the earliest data with the newest.
Storage is in conveniently structured data files which hold 15, 20 or 30 minutes period energy register totals for each single day. Each ***Day Data File*** also holds summary information for that day allowing user software to review a comprehensive history.
The data in the logger is made available via the communications system (e.g. Modbus) as described in the appropriate **multicube** ***System - Communications Manual***.

### *7.1.1. Storage Capacity*

The logger can store up to 1000 days of energy profile data depending on the total number of loads being monitored. Each Sub-Metering Module configured as a 3-phase meter stores 1 Load Profiles and each Sub-Metering Module configured as 3 x 1 Phase stores 3 Load Profiles. It is the total number of Load Profiles stored which determines the logger capacity in days as:

| **Total Load Profiles** Single + 3 Phase | **Logger Capacity** Number of Days |
|---|---|
| 1-7 | 1,000 |
| 8-15 | 500 |
| 16-23 | 333 |
| 24-31 | 250 |
| 32-39 | 200 |
| 40-47 | 166 |
| 48-55 | 142 |
| 56-60 | 125 |

### 7.1.2. Daily Data Stored For Each Load

| Data Description |
|---|
| Number of days since the logger was first started. |
| Calendar Date as Day - Month – Year |
| Day Data File Index. Incremented every time a *Day Data File* is stored. This may be used to speed up data searching. |
| Daylight Saving Flag |
| Total kWh registered up to the start of the logged day |
| Total kvarh registered up to the start of the logged day |
| kWh recorded in each sub period (15, 20 or 30 minutes) for 25 hours. |
| kvarh recorded in each sub period (15, 20 or 30 minutes) for 25 hours. |
| Start/End times for up to 8 Tariffs T1-T8. Saved every day so historic tariff changes can be recorded. |
| Associated values for up to 8 Tariffs T1-T8. Saved every day so historic tariff changes can be recorded. These are user set numbers 0-65000 which are stored along side the energy data but have no affect on it. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T1 Tariff periods. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T2 Tariff periods. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T3 Tariff periods. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T4 Tariff periods. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T5 Tariff periods. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T6 Tariff periods. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T7 Tariff periods. |
| Total kWh and kvarh registered up to the start of the logged day measured during all T8 Tariff periods. |

### 7.1.3. Logger Clock

The Logger clock should ***ALWAYS*** be set to local time ***WITHOUT DAYLIGHT SAVING APPLIED***. This ensures that no data is lost on the days when Daylight Saving starts and ends. For example in the UK always set the Logger Clock to Greenwich Mean Time (GMT). This approach is the standard method used for data logging electricity values.
The logger clock is accurate to within 30 seconds per month. It is recommended that it is adjusted (via the communications interface or the control panel) regularly to ensure it is synchronised to other clocks in the system.

### *7.1.4. Daylight Saving*

Although the data in the Logger is internally time-stamped without daylight saving time applied the **multicube** allows the user to record a flag in days when Daylight Saving is applied locally throughout the year. Storing this ***Daylight Saving Flag*** does not affect the data in the logger but merely provides a method by which stored data may be adjusted when it is read from the logger at a later date. In order to facilitate this retrospective shift of the time stamp, 25 hours of data are stored every day from 23:00 on the previous day to 24:00 on the day of the log.

### *7.1.5. When is Data Stored/Available*

New ***Day Data Files*** are opened at 00:00h each day and available for reading from 01:30 that day. The totalised energy registers accumulated up to each logged day are stored at 00:00h and account for all time since the meter was first commissioned (or the values were manually reset).

### *7.1.6. Logger Status Information*

A table of logger status information is available for reading using the communication interface which allows the user to keep track of its progress. The status information available includes:

- **Logger status (running or stopped)**
- **Number of loads being logged**
- **Maximum number of days which can be stored (dependant on number of loads)**
- **Memory status (full/overwriting or not full)**
- **Number of days since the logger was started**
- **Earliest day available for download**
- **Latest day available for download**

### *7.1.7. Starting/Stopping the Logger*

Once the logger is setup it is recommended to leave it running allowing the oldest stored data to be overwritten by the latest. Regular downloads of the logger data reduces the download times and ensures the data is backed up.
If the logger configuration requires changing, for example to add/remove loads or to change the logging period, the logger must be stopped so that it may be reformatted. This is necessary to ensure that all Day Data Files in the logger are formatted equally. The following rules apply:

- **Stopping the logger prevents new data being added**
- **After the logger is stopped it is still possible to read the old logged data files**
- **The logger configuration can only be changed when the logger is stopped**
- **The meter configuration can only be changed when the logger is stopped.**
- **The logger date can only be set when the logger is stopped.**
- **Small adjustments to the logger clock are possible while the logger is running.**
- **Starting the logger always resets the file format using the latest configuration (even if it has not been changed) and old data is lost at this point.**

### *7.1.8. Power Failures*

If the power supply to the **multicube** is removed for a period of time the following applies:

- **No measurement or logging can occur while the auxiliary power is removed.**
- **If power-up occurs in the same sub-period:**
  **Accumulation re-starts for that period on power-up resulting in a lower count at the end of this sub-period.**
- **If power-up occurs in a later sub-period during the same day:**
  **Energy accumulated in the part completed power fail period is stored to the logger**
  **Missing sub-periods are filled with energy values of zero**
  **Accumulation re-starts part way through the power-up sub-period.**
- **If power-up occurs on a later day:**
  **Energy accumulated in the part completed power fail period is stored to the logger.**
  **Energy accumulated in periods to the end of the power-fail day is logged as zero.**
  **Energy accumulated in periods on the power-up day before the power-up period is logged as zero.**
  **Accumulation re-starts part way through the power-up sub-period on the power-up day.**

## 7.2. Multiple Tariffs (Optional)

The kWh and kvarh energy measured during preset tariff periods is accumulated in up to 8 sets of energy registers. For example: The Sum of all kWh energy measured by a 3-Phase Slave 1 Meter during all Tariff 1 periods throughout the year are accumulated in Slave 1 Tariff 1 kWh. The Tariff registers option is only available as an add-on option to the data logger.

### 7.2.1. Tariff Values

Up to 8 Tariffs may be programmed, each defined by its number (T1-T8) and an associated value (0-65000). Tariff values are set by the user and recorded along with the energy profile in the Day Data Files so that historic changes to values such as cost may be conveniently recorded for future reference. The Tariff Values have no effect on the accumulating Tariff Registers.

### 7.2.2. Tariff Day Types

Up to 8 ***Tariff Day Types*** may be user defined which are split into a maximum of 8 time periods to suit a local energy tariff structure. A single Tariff is assigned, using its number, to each tariff period in each Tariff Day Type.

***Example:*** To set a weekday tariff saved to Day Type 1 with:

A Day-time Tariff of T3 from 07:00h to 19:30h

A Night-time Tariff of T6 from 19:30 to 07:00

| ***Day Type 1*** | | |
|---|---|---|
| Day Period 1 | 00:00 – 07:00 | Tariff = T6 |
| Day Period 2 | 07:00 – 19:30 | Tariff = T3 |
| Day Period 3 | 19:30 – 24:00 | Tariff = T6 |

### *7.2.3. Tariff Week Types*

Up to 8 ***Week Types*** may be user defined each of which is made up of ***7 Day Types***.

**Example:** A summer week has different weekday and weekend tariffs as:

***Monday to Friday***

**Day time from 07:00 to 19:30 = T3**

**Night time from 19:30 to 07:00 = T6**

***Saturday and Sunday***

**From Friday at 19:30 to Monday at 07:00 = T2**

| ***Monday Day Type 1*** | | |
|---|---|---|
| Day Period 1 | 00:00 – 07:00 | Tariff = T2 |
| Day Period 2 | 07:00 – 19:30 | Tariff = T3 |
| Day Period 3 | 19:30 – 24:00 | Tariff = T6 |

| ***Tuesday – Thursday Day Type 2*** | | |
|---|---|---|
| Day Period 1 | 00:00 – 07:00 | Tariff = T6 |
| Day Period 2 | 07:00 – 19:30 | Tariff = T3 |
| Day Period 3 | 19:30 – 24:00 | Tariff = T6 |

| ***Friday Day Type 3*** | | |
|---|---|---|
| Day Period 1 | 00:00 – 07:00 | Tariff = T6 |
| Day Period 2 | 07:00 – 19:30 | Tariff = T3 |
| Day Period 3 | 19:30 – 24:00 | Tariff = T2 |

| ***Saturday – Sunday Day Type 4*** | | |
|---|---|---|
| Day Period 1 | 00:00 – 24:00 | Tariff = T2 |

| ***Summer Season Week Type 1*** | |
|---|---|
| Monday | Tariff Day Type 1 |
| Tuesday | Tariff Day Type 2 |
| Wednesday | Tariff Day Type 2 |
| Thursday | Tariff Day Type 2 |
| Friday | Tariff Day Type 3 |
| Saturday | Tariff Day Type 4 |
| Sunday | Tariff Day Type 4 |

### *7.2.4. Tariff Seasons*

Up to 8 periods of each calendar year (seasons) may be defined by selecting start and end dates. A single ***Tariff Week Type*** is assigned to each season to define the tariff structure for the period.

**Example:** **2 Seasons (Winter and Summer) Using 2 Week Types**

| *Tariff Week Type 1* | |
|---|---|
| 30th November - 22nd March (Winter) | Tariff Week Type 1 |
| 23rd March – 29th November (Summer) | Tariff Week Type 2 |

This structured approach simplifies setting of Tariff periods for a year while maintaining flexibility to suit most tariff structures.

### *7.2.5. Tariffs in the Data Logger*

In addition to displaying kWh and kvarh accumulated during Tariff periods T1-T8 the **multicube** system records T1-T8 time periods relevant to each day in the data logger. This data does not affect the logged energy but provides historic tariff information locally in the unit. This information can be downloaded with the energy profile to produce historic tariff weighted energy data.
Each day the logger stores the Tariff Number for each period and the associated Tariff Value dependant on the tariff structure and calendar date.

# 8. Specification

## *8.1. Modular Metering System*

| | | |
|---|---|---|
| ENVIRONMENT | | |
| **Temperature** | Operating<br>Storage | -10°C to +55°C<br>-25°C to +70°C |
| **Humidity** | < 75% non-condensing | |
| **Altitude** | <= 2000m | |
| **Environment** | IP54 standard | |
| **MECHANICAL** | | |
| **Enclosure** | Material: Black ABS UL 94-V0 | |
| **Dimensions** | Height :<br>Depth: (Off Wall)<br><br>Length:<br>Master Display Unit:<br>Communication Module:<br>Dual Metering Slave: | 164mm<br>96mm<br><br><br>100mm<br>29mm<br>29mm |
| **SAFETY** | | |
| **Conforms to** | EN 61010-1 Installation Category III, Pollution Degree 2 | |

## *8.2. Master Display Module*

| | | |
|---|---|---|
| **GENERAL** | | |
| **Dimensions** | Height :<br>Depth: (Off Wall)<br>Length: | 164mm<br>96mm<br>100mm |
| **System** | 1-Phase 2 Wire Unbalanced Loads<br>3-Phase 3 or 4 Wire Unbalanced Loads<br>2 Phase 3 wire Unbalanced Loads | |
| **Modules (Capacty)** | Maximum = 10 Modules<br>e.g. 10x Metering Modules MC352 | |
| **Voltage Un** | Nominal: | 480V Phase to Phase<br>277Vac Phase to Neutral |
| | Terminals Rising Cage. 2.5mm2 (12 AWG) cable max. | |
| **Current In** | Nominal: | 0.33V from Externally Isolated Custom Current Transducers. |
| **Measurement Range** | Voltage<br>Current | 40% to 120% of Nominal<br>0.2% to 120% of Nominal |
| **Frequency Range** | Fundamental<br>Harmonics | 45 to 65Hz<br>Up to 30th harmonic at 50Hz<br>Individual to the 15th |
| **Burden** | Voltage<br>Current | <0.1VA per phase<br>Not applicable (Burden fitted in transducer) |
| **Overload** | Voltage<br>Current | x4 for 1 hour<br>x2 permanently |
| **DISPLAY** | | |
| **Type** | LCD 128x64 Dot Graphic | |
| **AUXILIARY SUPPLY** | | |
| **Input Range** | 100-240Vac ±10% 45-65Hz | |
| **Load** | Master Only :<br>Master + 10 MC352 Modules: | 3 W max<br>5 W max. |

## *8.3. Dual Metering Module MC352*

| | | |
|---|---|---|
| **GENERAL** | | |
| **Dimensions** | Height :<br>Depth: (Off Wall)<br>Length: | 164mm<br>96mm<br>29mm |
| **Current Inputs: (1/2 Module)** | Use only Northern Design Current Transducers with the following specification:<br>Nominal CT Primary: 20A;40A;60A;100A; 150A; 200A, 300A, 400A; 600A, 800A, 1000A or 1200A<br>Nominal CT Secondary: 0.333Vac<br>Insulation Class 600Vac | |
| **Voltage Input** | From Master Display Unit:<br>maximum 0V - 3.3V ac Peak | |
| **ACCURACY All errors ± 1 digit** | | |
| **kWh** | Better than Class 1 per EN 62053-21 & BS 8431 | |
| **kvarh** | Better than Class 2 per EN 62053-23 & 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) | |
| **PF** | ±0.2° (0.05In – 1.2In and 0.2Un – 1.2Un) | |
| **Neutral Current** | Class 0.5 IEC 60688 (0.05In – 1.2In) | |
| **POWER SUPPLY** | | |
| **DC Power From Master Display** | DC Power Supply:<br>Maximum Load Per Module (2 Meters) : | 3.3V DC<br>0.15W |

E. & O. E.