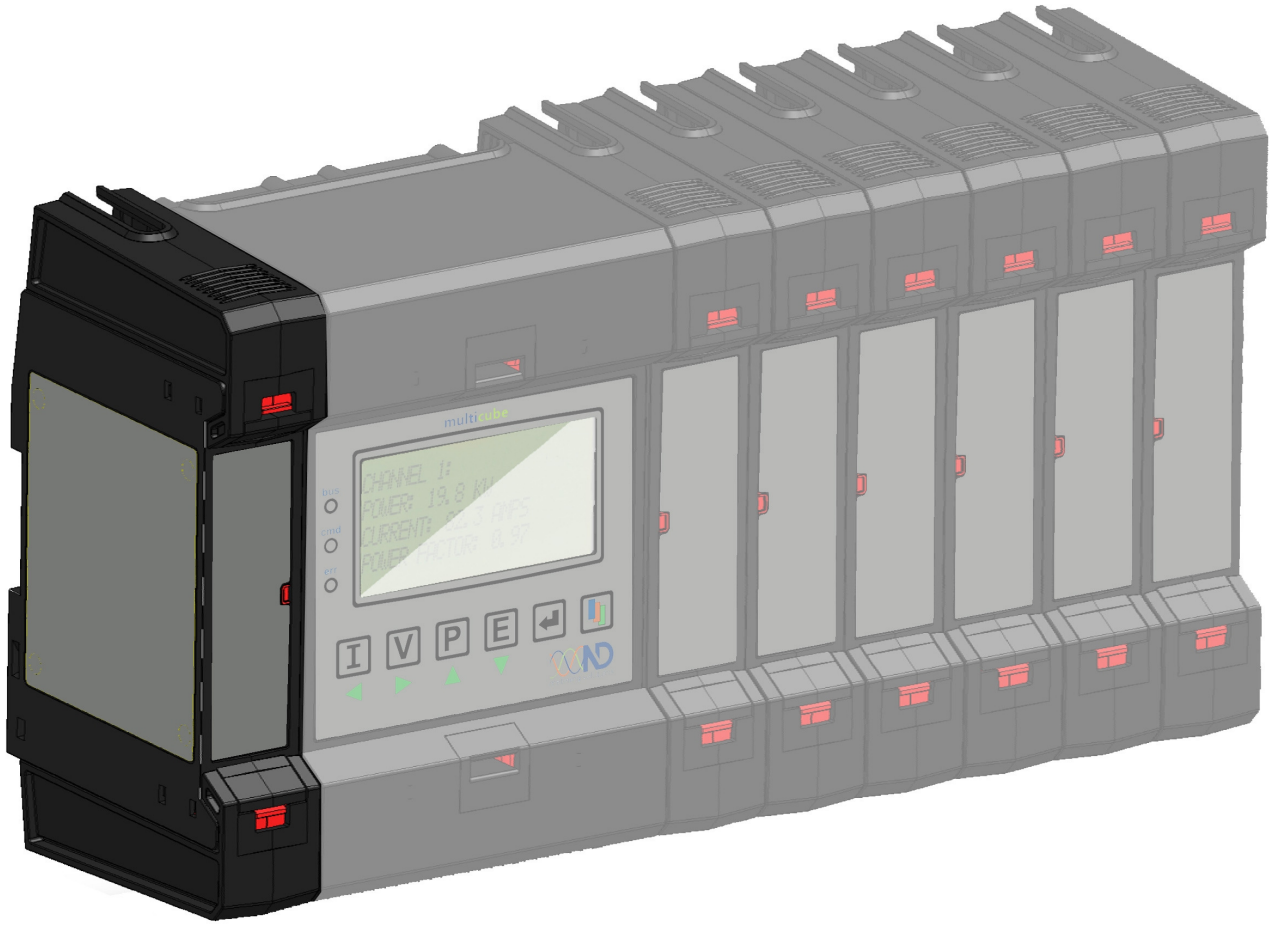
multicube

Modular Metering System

M-Bus Communications Manual



Revision 6

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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.

A ***multicube*** system is built up from a combination of the following modular components:

- **1 Master Display Unit**
- **1-10 Option Modules**
  Sub-Metering Modules (e.g. MC352*)
- **1 Communications Module (e.g. Modbus RS485, M-Bus or Modus TCP/IP)**
- *** At least 1 sub metering module must be fitted.**

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.

1.2 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 20A to 800 Amps. These specially designed transducers each have a nominal output of 0.333V, 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 M-Bus Module (MC-MBUS), to suit a range of external systems.

The Communications Module provides external read only access to:

- **Master Display Unit Configuration**
- **Sub-Metering Module Instantaneous Meter Readings and Energy Registers**
- **Sub-Metering Module Configuration**

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

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

Contains no user serviceable parts. Field wiring and commissioning should only be carried out by qualified personnel, in compliance with applicable national regulations.

e.g. National Electrical Code (NEC) for US; Canadian Electrical Code for Canada

For further Information contact the manufacturer:

Address: Northern Design (Electronics) Ltd: 228 Bolton Road, Bradford, West Yorkshire, BD3 0QW. (UK)

Web: http://www.ndmeter.co.uk

Email: sales@ndmeter.co.uk

2.1 Maintenance

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

3 Installation

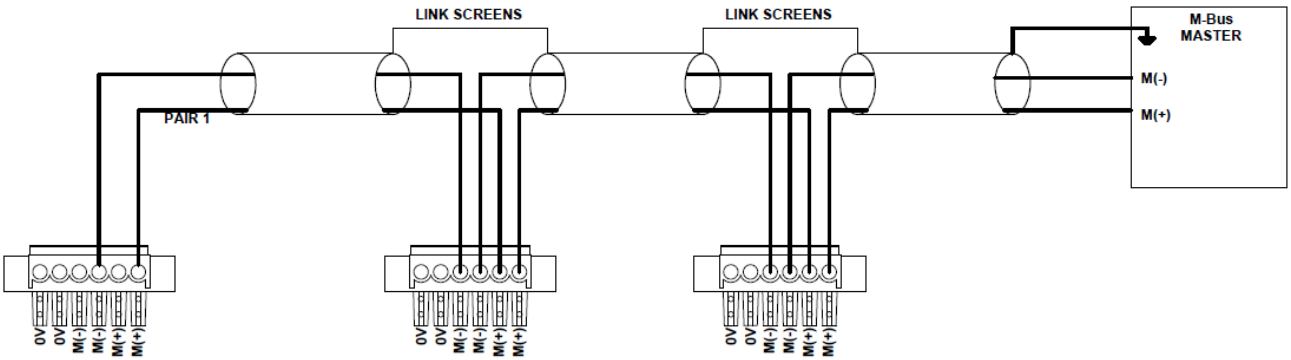
For details for attaching the Comms unit to the multicube refer to the multicube Modular Metering system Installation Guide.

3.1 Master Display Unit Power Supply

The minimum power supply required for the MC-MBUS Communications Unit is 5Vdc (unreg) at 0.5 Watts.

3.2 Schematics

Typical;



Alternatively, cabling can be connected in a ring or star configuration.

3.3 M-Bus Connections

The interface connector (M-Bus) shall only be connected to low voltage (SELV) circuits. The maximum operating voltage for an M-Bus network is 42Vdc.

M-Bus Interface Connector (supplied): 300Vac, 11A, 110 DegC; Tightening Torque < 0.25Nm.

Cables with a minimum of 1 twisted pair with an overall shield should be used. A twisted pair should be used for network lines M+ and M-. Many specialist cables are available for M-Bus but shielded CAT 5e cable (4 twisted pairs) may also be used.

Cables running within the electrical enclosure may come close to high voltages and therefore must be insulated to the following minimum specification:

Cables: UL 1015, 105 DegC , 600Vac. 30-14 AWG.

4 M-Bus Communications

4.1 M-Bus Standard

Meter Bus is a master-slave, half duplex serial, multi-drop bus based protocol defined in standard EN13757. The ***multicube*** M-Bus interface serial connection is configured for 8-bit characters with even parity and one stop bit. M-Bus, as the standard is often shortened to, uses telegrams to encapsulate information. The telegrams are framed by start and stop codes and a checksum.

M-Bus defines a single acknowledgement character, fixed length short telegrams or variable length long telegrams with length indicators in the header. Both telegrams contain a command function code (C field) and address byte (A field). Long telegrams also have a Control Information field (CI) and optional, variable length data of up to 252 bytes. Acknowledgements are only from slave to master and the source is inferred as being the slave replying to the previous command from the master.

A toggle bit in the command function byte is set every alternate telegram request and reply. When the data takes more than one telegram, and the request toggle bit is different to the last reply toggle bit then the next telegram is sent. If the request toggle bit matches the last reply toggle bit then the previous telegram is resent.

The ***multicube*** M-Bus interface acts as a slave for the ***multicube*** display and the metering elements, each with a separate network address. The primary addresses are configured using the display unit in the range 1 to 200 and the interface does not support secondary addressing.

See section 5 for instructions on configuring the address.

Baud rates of 300(default), 2400 and 9600 are set using the CI field values of B8h, BBh and BDh respectively when sent using a send user data command (SND_UD) in a long telegram as shown below. The only other CI fields supported are mode 1 data send (CI = 51h) and variable data respond (CI = 72h). Error reporting is not supported.

Note: a valid request (for example a SND_NKE packet) at the new baud rate must be sent within 20 seconds of sending a baud rate change request otherwise the baud rate will revert to the original.

The baud rate is stored in non-volatile memory. If a baud rate is successfully changed, the new baud rate will be used after a power cycle.

Byte No.	***Size (in bytes)***	***Value (Hex)***	***Comments***
1	1	68	Long Telegram Start Byte
2	1	04	L-Field
3	1	04	L-Field (repeated)
4	1	68	Start Byte (repeated)
5	1	53/73	C-Field (SND_UD)
6	1	XX	A-Field = Slave Address
7	1	B8/BB/BD	CI Field (Baud Rate Code)
8-9	2	XX	Checksum
10	1	16	Stop Byte

4.2 Data Structures

Only variable data structures are supported and all values are read only. Apart from the baud rate the only configurable setting is the table selection.

Variable data structures have a header containing manufacturer and product information followed by a number of data records. Each record contain a Data Information Block (DIB) describing data size and how the value is coded, a Value Information Block (VIB) describing what the value represents followed by the data containing the actual value.

The data has been arranged in a number of tables containing different information. The currently selected table will be sent out in one or more telegrams using the respond with user data function (RSP_UD) in reply to a class 2, request standard user data command (REQ_UD2). Class 1, request alarm user data commands (REQ_UD1), are not supported.

Tables are selected using a long telegram with a variable data structure and a single record containing the special function data field of the DIB followed by the desired table number.

If the final record in a data telegram response has a DIB of 1Fh, more records from the table are available. To obtain these records the user data request can be sent again with the toggle bit changed.

The phase of readings are indicated using the subunit number in the DIB where 3 phase system values are attributed to subunit 0 and values for phases 1-3 have corresponding subunit numbers.

4.3 Code Values

The dedicated application layer section of the M-Bus specification (EN 13757-3 2004) specifies a number of codes in tables to describe which parameter the data represents. The primary Value Information Field (VIF) code table contains all the codes that would create a VIB containing the parameter in a single VIF. This table also contains codes to redirect to other tables if the parameter is not found in the primary table, where the desired parameter can be found.

Two other tables are defined in the M-Bus standard. The main Value Information Field Extension (VIFE) code extension table (Extended Table indicated by VIF = FDh) and the alternate VIFE code extension table (Alternate Extended Table indicated by VIF = FBh).The top bit of these VIFs are set to indicate the VIB contains a VIFE.

Manufacturers wishing to export parameters not included in any of the defined tables can define a manufacturer specific table and direct to it using a VIF = FFh. The manufacturer will then publish their table of codes to enable translation of the new parameters. The VIFs or VIFES representing values indicate the desired unit and scale of the data contained in the VIB, as specified in the corresponding table.

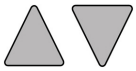
4.4 Value Ranges

A number of parameters are specified by a range of VIF or VIFE codes. These codes represent a multiplying factor to modify the integer data value in the VIB. From the VIF(E) code the number of decimal points as well as the desired unit and scale and of the actual reading can be obtained. The first number in a range of codes represents the lowest of the allowed scale of units rising to the last number representing the highest of the allowed scale of units.

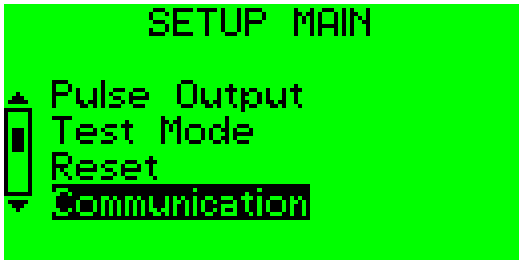
5 Setting M-Bus Address

The M-Bus Address is set via the ***multicube*** Master Display Unit.

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

Select *Communication* from the *SETUP MAIN* menu 

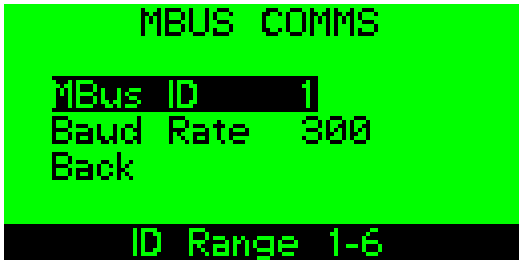
Enter the Communication Setup Menu 

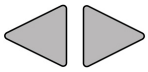


Set The M-Bus Address

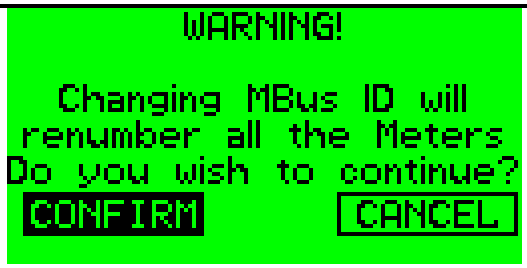
Select MBus ID from the menu 

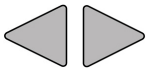
Enter to change the value 



Select *Confirm* or *Cancel* 

Enter to proceed 

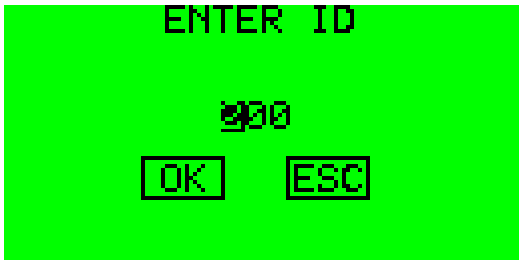


Select a *Digit*, *ESC* or *OK* 

Change the Digit Value. 

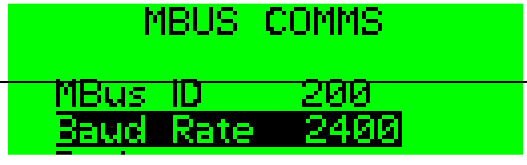
***OK* – Accept new value**

***ESC*- Reject new value** 



Set The Baud Rate

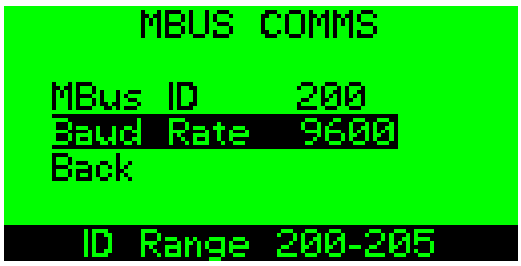
Select *Baud Rate* from the *Communication Menu* 



Enter to Change the Value

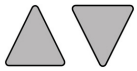
Select the desired baud rate

Enter to accept the selection

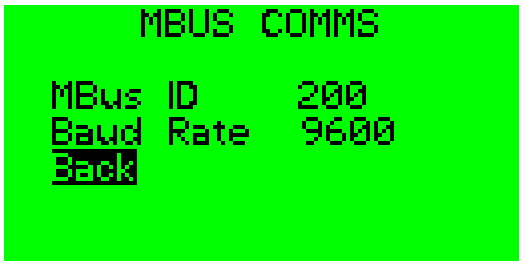


Return To the *SETUP MAIN* Menu

Select *Back* from the menu



Exit to *SETUP MAIN* menu



6 Reading Standard Data from a *Slave*

The ***multicube*** supports only Class 2 (normal priority) M-Bus data. It is recommended to reset the telegram toggle counter by sending the initialisation code (SND_NKE).

Byte No.	*Size (in bytes)*	*Value (Hex)*	*Comments*
1	1	10	Short Telegram Start Byte
2	1	40	C-Field (SND_NKE)
3	1	XX	A-Field = Slave Address
4	1	XX	Checksum
5	1	16	Stop Byte

The standard readings can be obtained using the request user data command (REQ_UD2).

Byte No.	*Size (in bytes)*	*Value (Hex)*	*Comments*
1	1	10	Short Telegram Start Byte
2	1	5B/7B	C-Field (REQ_UD2)
3	1	XX	A-Field = Slave Address
4	1	XX	Checksum
5	1	16	Stop Byte

The following parameters are available, from each slave, for communication on the M-Bus network:

6.1 Read 3-Phase Energy Registers

This table of data is normally transmitted, in a single telegram, from a 3-Phase slave in response to a REQ_UD2 command from the M-Bus system master.

Parameter	*Description*	*Unit*	*VIB Table*	*Code*
Import kWh	3-Phase system cumulative active imported energy	0	Primary	00h – 07h
Import kvarh	3-Phase system cumulative reactive imported energy	0	Manufacturer (FFh)	48h – 4Fh
Import kVAh	3-Phase system cumulative apparent imported energy	0	Manufacturer (FFh)	08h – 0Fh
Export kWh[1]	3-Phase system cumulative active exported energy	0	Manufacturer (FFh)	10h – 17h
Export kvarh[1]	3-Phase system cumulative reactive exported energy	0	Manufacturer (FFh)	18h – 1Fh

Note 1: Export energies are not accumulated (remain at zero) if Auto CT Rotation feature is enabled. Refer to the multicube operating instructions for more information on the CT Auto rotation feature.

6.2 Read 1-Phase Energy Registers

This table of data is normally transmitted, in a single telegram, from a metering slave, set to measure 3 x single phase loads, in response to a REQ_UD2 command from the M-Bus system master.

Parameter	*Description*	*Unit*	*VIB Table*	*Code*
Import kWh Load 1	Load 1 cumulative active imported energy	1	Primary	00h – 07h
Import kWh Load 2	Load 2 cumulative active imported energy	2	Primary	00h – 07h
Import kWh Load 3	Load 3 cumulative active imported energy	3	Primary	00h – 07h
Import kvarh Load 1	Load 1 cumulative reactive imported energy	1	Manufacturer (FFh)	48h – 4Fh
Import kvarh Load 2	Load 2 cumulative reactive imported energy	2	Manufacturer (FFh)	48h – 4Fh
Import kvarh Load 3	Load 3 cumulative reactive imported energy	3	Manufacturer (FFh)	48h – 4Fh

7 Reading Alternate Data Tables from a *Slave*

Before reading an Alternate Parameter Table the user must first select the table via the Master using a SND_UD (Send User Data) command. The SND_UD command used for this function is formatted as follows:

Byte No.	*Size (in bytes)*	*Value (Hex)*	*Comments*
1	1	68	Long Telegram Start Byte
2	1	05	L-Field
3	1	05	L-Field (repeated)
4	1	68	Start Byte (repeated)
5	1	53/73	C-Field (SND_UD)
6	1	XX	A-Field = Slave Address
7	1	51	CI Field
8	1	0F	Special DIF
9	1	APT_ID	Alternate Parameter Table ID[1]
10	1	XX	Checksum
11	1	16	Stop Byte

NOTE 1: The Alternate Parameter Table APT_ID value depends on the table of data required as described in below.

This command is always sent before a read of any data table other than the standard table normally read with a REQ_UD2 command. To read any Alternate Parameter Table:

Direction	*CMD*	*Comments*
Master → Slave	SND_NKE	Initialise the meter communications (Recommended)
Slave → Master	E5H	Acknowledge
Master → Slave	SND_UD	UD Telegram sets the Alternate Parameter Table type
Slave → Master	E5H	Acknowledge
Master → Slave	REQ_UD2	Request Alternate Parameter Table from the Slave
Master → Slave	RSP_UD	Slave sends its Alternate Parameter Table in 1 or more Telegrams.

7.1 Read 3-Phase Standard Instantaneous Parameters

This table of parameter data is available (updated every second) from each slave meter which is setup to measure 3-Phase loads

APT_ID = 01				
Parameter	**Description**	**Unit**	**VIB Table**	**Code**
System kW	3-Phase instantaneous active power	0	Primary	28h – 2Fh
System kVA	3-Phase instantaneous apparent power	0	Manufacturer (FFh)	28h – 2Fh
System kvar	3-Phase instantaneous reactive power	0	Manufacturer (FFh)	20h – 27h
System PF	3-Phase instantaneous power factor	0	Manufacturer (FFh)	03h
Frequency	Frequency derived from phase 1 voltage	0	Manufacturer (FFh)	04h
Phase 1 Amps	True RMS current measured on phase 1	1	Extended (FDh)	50h – 5Fh
Phase 2 Amps	True RMS current measured on phase 2	2	Extended (FDh)	50h – 5Fh
Phase 3 Amps	True RMS current measured on phase 3	3	Extended (FDh)	50h – 5Fh
Reserved	Reserved for future use	0	Manufacturer (FFh)	60h – 6Fh
Phase 1 Volts	True RMS voltage measured between phase 1 and neutral.	1	Extended (FDh)	40h – 4Fh
Phase 2 Volts	True RMS voltage measured between phase 2 and neutral.	2	Extended (FDh)	40h – 4Fh
Phase 3 Volts	True RMS voltage measured between phase 3 and neutral.	3	Extended (FDh)	40h – 4Fh
Phase1-2 Volts	True RMS voltage measured between phase 1 and phase 2	1	Manufacturer (FFh)	50h – 5Fh
Phase2-3 Volts	True RMS voltage measured between phase 2 and phase 3	2	Manufacturer (FFh)	50h – 5Fh
Phase3-1 Volts	True RMS voltage measured between phase 3 and phase 1	3	Manufacturer (FFh)	50h – 5Fh
Phase 1 PF	Phase 1 instantaneous power factor	1	Manufacturer (FFh)	03h
Phase 2 PF	Phase 2 instantaneous power factor	2	Manufacturer (FFh)	03h
Phase 3 PF	Phase 3 instantaneous power factor	3	Manufacturer (FFh)	03h
kW1	Phase 1 instantaneous active power	1	Primary	28h – 2Fh
kW2	Phase 2 instantaneous active power	2	Primary	28h – 2Fh
kW3	Phase 3 instantaneous active power	3	Primary	28h – 2Fh
kvar1	Phase 1 instantaneous reactive power	1	Manufacturer (FFh)	20h – 27h
kvar2	Phase 2 instantaneous reactive power	2	Manufacturer (FFh)	20h – 27h
kvar3	Phase 3 instantaneous reactive power	3	Manufacturer (FFh)	20h – 27h
Phase 1 Voltage %THD	Total harmonic distortion for phase 1 voltage as a percentage	1	Manufacturer (FFh)	05h
Phase 2 Voltage %THD	Total harmonic distortion for phase 2 voltage as a percentage	2	Manufacturer (FFh)	05h
Phase 3 Voltage %THD	Total harmonic distortion for phase 3 voltage as a percentage	3	Manufacturer (FFh)	05h
Phase 1 Amps %THD	Total harmonic distortion for phase 1 Amps as a percentage	1	Manufacturer (FFh)	06h
Phase 2 Amps %THD	Total harmonic distortion for phase 2 Amps as a percentage	2	Manufacturer (FFh)	06h
Phase 3 Amps %THD	Total harmonic distortion for phase 3 Amps as a percentage	3	Manufacturer (FFh)	06h
Phase 1 Quadrant	Reserved **(note 1)**	1	Manufacturer (FFh)	07h
Phase 2 Quadrant	Reserved **(note 1)**	2	Manufacturer (FFh)	07h
Phase 3 Quadrant	Reserved **(note 1)**	3	Manufacturer (FFh)	07h

note 1: Data at this address is reserved for future expansion

7.2 Read 1-Phase Standard Instantaneous Parameters

This table of parameter data is available (updated every second) from each slave meter which is setup to measure 3 x single Phase loads.

APT_ID = 01				
Parameter	**Description**	**Unit**	**VIB Table**	**Code**
Frequency	Frequency derived from Load 1 voltage	0	Manufacturer (FFh)	04h
Load 1 Amps	Load 1 True RMS current	1	Extended (FDh)	50h – 5Fh
Load 2 Amps	Load 2 True RMS current	2	Extended (FDh)	50h – 5Fh
Load 3 Amps	Load 3 True RMS current	3	Extended (FDh)	50h – 5Fh
Load 1 Volts	Load 1 True RMS phase voltage	1	Extended (FDh)	40h – 4Fh
Load 2 Volts	Load 2 True RMS phase voltage	2	Extended (FDh)	40h – 4Fh
Load 3 Volts	Load 3 True RMS phase voltage	3	Extended (FDh)	40h – 4Fh
Load 1 PF	Load 1 instantaneous power factor	1	Manufacturer (FFh)	03
Load 2 PF	Load 2 instantaneous power factor	2	Manufacturer (FFh)	03
Load 3 PF	Load 3 instantaneous power factor	3	Manufacturer (FFh)	03
Load 1 kW	Load 1 instantaneous active power	1	Primary	28h – 2Fh
Load 2 kW	Load 2 instantaneous active power	2	Primary	28h – 2Fh
Load 3 kW	Load 3 instantaneous active power	3	Primary	28h – 2Fh
Load 1 kvar	Load 1 instantaneous reactive power	1	Manufacturer (FFh)	20h – 27h
Load 2 kvar	Load 2 instantaneous reactive power	2	Manufacturer (FFh)	20h – 27h
Load 3 kvar	Load 3 instantaneous reactive power	3	Manufacturer (FFh)	20h – 27h
Load 1 Voltage %THD	Total harmonic distortion for load 1 voltage as a percentage	1	Manufacturer (FFh)	05h
Load 2 Voltage %THD	Total harmonic distortion for load 2 voltage as a percentage	2	Manufacturer (FFh)	05h
Load 3 Voltage %THD	Total harmonic distortion for load 3 voltage as a percentage	3	Manufacturer (FFh)	05h
Load 1 Amps %THD	Total harmonic distortion for load 1 Amps as a percentage	1	Manufacturer (FFh)	06h
Load 2 Amps %THD	Total harmonic distortion for load 2 Amps as a percentage	2	Manufacturer (FFh)	06h
Load 3 Amps %THD	Total harmonic distortion for load 3 Amps as a percentage	3	Manufacturer (FFh)	06h
Load 1 Quadrant	Reserved **(note 1)**	1	Manufacturer (FFh)	07h
Load 2 Quadrant	Reserved **(note 1)**	2	Manufacturer (FFh)	07h
Load 3 Quadrant	Reserved **(note 1)**	3	Manufacturer (FFh)	07h

note 1: Data at this address is reserved for future expansion

7.3 Read Peak Hold Parameters

This table of parameter data is available (updated every second) from each slave meter which is setup to measure 3-Phase or 3x1-Phase loads.

APT_ID = 02				
Parameter	**Description**	**Unit**	**VIB Table**	**Code**
Phase/Load 1 Peak Amps	Peak hold amps on phase 1 (3-Phase) or Load 1 (1-Phase)	1	Extended (FDh)	50h – 5Fh
Phase/Load 2 Peak Amps	Peak hold amps on phase 2 (3-Phase) or Load 2 (1-Phase)	2	Extended (FDh)	50h – 5Fh
Phase/Load 3 Peak Amps	Peak hold amps on phase 3 (3-Phase) or Load 3 (1-Phase)	3	Extended (FDh)	50h – 5Fh
Phase/Load 1 Peak Volts	Peak hold volts on phase 1 (3-Phase) or Load 1 (1-Phase)	1	Extended (FDh)	40h – 4Fh
Phase/Load 1 Peak Volts	Peak hold volts on phase 2 (3-Phase) or Load 1 (1-Phase)	2	Extended (FDh)	40h – 4Fh
Phase/Load 1 Peak Volts	Peak hold volts on phase 3 (3-Phase) or Load 1 (1-Phase)	3	Extended (FDh)	40h – 4Fh

7.4 Read 3-Phase Demand Parameters

This table of parameter data is available (updated every second) from each slave meter which is setup to measure 3-Phase loads.

APT_ID = 03				
Parameter	**Description**	**Unit**	**VIB Table**	**Code**
Phase 1 Amps Demand	Sliding window demand – Phase 1 Amps	1	Manufacturer (FFh)	38h – 3Fh
Phase 2 Amps Demand	Sliding window demand – Phase 2 Amps	2	Manufacturer (FFh)	38h – 3Fh
Phase 3 Amps Demand	Sliding window demand – Phase 3 Amps	3	Manufacturer (FFh)	38h – 3Fh
Phase 1 Peak Amps Demand	Peak hold - Sliding window demand – Phase 1 Amps	1	Manufacturer (FFh)	38h – 3Fh
Phase 2 Peak Amps Demand	Peak hold - Sliding window demand – Phase 2 Amps	2	Manufacturer (FFh)	38h – 3Fh
Phase 3 Peak Amps Demand	Peak hold - Sliding window demand – Phase 3 Amps	3	Manufacturer (FFh)	38h – 3Fh
Phase 1 Volts Demand	Sliding window demand – Phase 1 Volts	1	Manufacturer (FFh)	30h – 37h
Phase 2 Volts Demand	Sliding window demand – Phase 2 Volts	2	Manufacturer (FFh)	30h – 37h
Phase 3 Volts Demand	Sliding window demand – Phase 3 Volts	3	Manufacturer (FFh)	30h – 37h
Phase 1 Peak Volts Demand	Peak hold - Sliding window demand – Phase 1 Volts	1	Manufacturer (FFh)	30h – 37h
Phase 2 Peak Volts Demand	Peak hold - Sliding window demand – Phase 2 Volts	2	Manufacturer (FFh)	30h – 37h
Phase 3 Peak Volts Demand	Peak hold - Sliding window demand – Phase 3 Volts	3	Manufacturer (FFh)	30h – 37h
3-Phase kW Demand	Sliding window demand – 3- Phase active power	0	Manufacturer (FFh)	40h – 47h
3-Phase Peak kW Demand	Peak Hold - Sliding window demand – 3- Phase active power	0	Manufacturer (FFh)	40h – 47h

7.5 Read 1-Phase Demand Parameters

This table of parameter data is available (updated every second) from each slave meter which is setup to measure 3 x 1-Phase loads.

APT_ID = 03				
Parameter	**Description**	**Unit**	**VIB Table**	**Code**
Load 1 Amps Demand	Sliding window demand – Load 1 Amps	1	Manufacturer (FFh)	38h – 3Fh
Load 2 Amps Demand	Sliding window demand – Load 2 Amps	2	Manufacturer (FFh)	38h – 3Fh
Load 3 Amps Demand	Sliding window demand – Load 3 Amps	3	Manufacturer (FFh)	38h – 3Fh
Load 1 Peak Amps Demand	Peak hold - Sliding window demand – Load 1 Amps	1	Manufacturer (FFh)	38h – 3Fh
Load 2 Peak Amps Demand	Peak hold - Sliding window demand – Load 2 Amps	2	Manufacturer (FFh)	38h – 3Fh
Load 3 Peak Amps Demand	Peak hold - Sliding window demand – Load 3 Amps	3	Manufacturer (FFh)	38h – 3Fh
Load 1 Volts Demand	Sliding window demand – Load 1 Volts	1	Manufacturer (FFh)	30h – 37h
Load 2 Volts Demand	Sliding window demand – Load 2 Volts	2	Manufacturer (FFh)	30h – 37h
Load 3 Volts Demand	Sliding window demand – Load 3 Volts	3	Manufacturer (FFh)	30h – 37h
Load 1 Peak Volts Demand	Peak hold - Sliding window demand – Load 1 Volts	1	Manufacturer (FFh)	30h – 37h
Load 2 Peak Volts Demand	Peak hold - Sliding window demand – Load 2 Volts	2	Manufacturer (FFh)	30h – 37h
Load 3 Peak Volts Demand	Peak hold - Sliding window demand – Load 3 Volts	3	Manufacturer (FFh)	30h – 37h
Load 1 kW Demand	Sliding window demand – Load 1 Active Power	1	Manufacturer (FFh)	40h – 47h
Load 2 kW Demand	Sliding window demand – Load 2 Active Power	2	Manufacturer (FFh)	40h – 47h
Load 3 kW Demand	Sliding window demand – Load 3 Active Power	3	Manufacturer (FFh)	40h – 47h
Load 1 Peak kW Demand	Peak Hold - Sliding window demand – Load 1 Active Power	1	Manufacturer (FFh)	40h – 47h
Load 2 Peak kW Demand	Peak Hold - Sliding window demand – Load 2 Active Power	2	Manufacturer (FFh)	40h – 47h
Load 3 Peak kW Demand	Peak Hold - Sliding window demand – Load 3 Active Power	3	Manufacturer (FFh)	40h – 47h

7.6 Read Setup Parameters

This table of parameter data is available from each slave meter which is setup to measure 3-Phase or 3x1-Phase loads.

APT_ID = 04				
Parameter	**Description**	**Unit**	**VIB Table**	**Code**
Meter Model	Metering Slave Model (eg 352 = MC352)	0	Extended (FDh)	0Ch
Load Type (1-Ph or 3-Ph)	0=3-Phase, 1=3 x 1-Phase	0	Manufacturer (FFh)	72h
Firmware Version	Firmware version of metering module	0	Extended (FDh)	0Eh
CT Primary	CT Primary setting in the metering module (1-25,000A)	0	Manufacturer (FFh)	73h
CT Secondary	CT Secondary (0.3333 ± 10%)	0	Manufacturer (FFh)	74h
CT Phase Angle	Phase Compensation for selected CTs	0	Manufacturer (FFh)	75h
CT Multiplier	Number of CTs fitted per phase (normally 1)	0	Manufacturer (FFh)	76h
CT Auto Rotate	0=No Rotate, 1=Rotate	0	Manufacturer (FFh)	77h
PT Primary Voltage	Nominal Voltage at PT primary (1-50,000)	0	Manufacturer (FFh)	78h
System Volts	System Nominal Voltage (1-50,000)	0	Manufacturer (FFh)	79h
Phase/Load 1 Current Demand Period	Sliding window period for Phase/Load 1 Current Demand	1	Manufacturer (FFh)	7Ah
Phase/Load 2 Current Demand Period	Sliding window period for Phase/Load 2 Current Demand	2	Manufacturer (FFh)	7Ah
Phase/Load 3 Current Demand Period	Sliding window period for Phase/Load 3 Current Demand	3	Manufacturer (FFh)	7Ah
Phase/Load 1 Voltage Demand Period	Sliding window period for Phase/Load 1 Voltage Demand	1	Manufacturer (FFh)	7Bh
Phase/Load 2 Voltage Demand Period	Sliding window period for Phase/Load 2 Voltage Demand	2	Manufacturer (FFh)	7Bh
Phase/Load 3 Voltage Demand Period	Sliding window period for Phase/Load 3 Voltage Demand	3	Manufacturer (FFh)	7Bh
3-Phase Power Demand Period	Sliding window period for 3-Phase Power Demand	0	Manufacturer (FFh)	7Ch
Phase/Load 1 Power Demand Period	Sliding window period for Phase/Load 1 Power Demand	1	Manufacturer (FFh)	7Ch
Phase/Load 2 Power Demand Period	Sliding window period for Phase/Load 2 Power Demand	2	Manufacturer (FFh)	7Ch
Phase/Load 3 Power Demand Period	Sliding window period for Phase/Load 3 Power Demand	3	Manufacturer (FFh)	7Ch
Time and Date	Day, month, year, hour, min	0	Primary	6Dh

8 Standard M-Bus codes available

There a number of standard M-Bus parameters available from the multicube meters.

8.1 Primary table values

Primary Table Codes			
Parameter	**Description**	**Code**	**Range**
kWh	cumulative active imported energy	00h – 07h	0.001Wh – 10000Wh
kW	instantaneous active power	28h – 2Fh	0.001W – 10000W
Time Point-	day, month, year, (hour, min)	6Ch – 6Dh	Date – Date & Time

8.2 Extended table values

Extended Table Codes			
Parameter	**Description**	**Code**	**Range**
Meter Model	Metering Slave Model (eg 352 = MC352)	0Ch	-
Firmware Version	Firmware version of metering module	0Eh	-
Volts	True RMS voltage	40h – 4Fh	10^{-9}V – 10^{6}V
Amps	True RMS current	50h – 5Fh	10^{-12}A – 10^{3}A

9 Manufacturer specific codes

Any parameters from the multicube meters not defined in the standard M-Bus tables are defined as manufacturer specific codes.

Manufacturer Specific Codes			
Parameter	***Description***	***Code***	***Range***
Current Table	Parameter to set current table to view for unit	00h	-
Serial Number	Serial number associated with metering unit	01h	-
Meter Types	Bit fields of all meter types 0=3-Phase, 1=3 x 1-Phase	02h	-
PF	instantaneous power factor	03h	0.001
Frequency	Frequency derived from phase 1 voltage	04h	0.1Hz
Voltage %THD	Total harmonic distortion for voltage as a percentage	05h	0.1%
Current %THD	Total harmonic distortion for current as a percentage	06h	0.1%
Quadrant	Reserved **(note 1)**	07h	-
kVAh	cumulative apparent imported energy	08h – 0Fh	0.001VAh – 10000VAh
Export kWh	cumulative active exported energy	10h – 17h	0.001Wh – 10000Wh
Export kvarh	cumulative reactive exported energy	18h – 1Fh	0.001varh – 10000varh
kvar	instantaneous reactive power	20h – 27h	0.001var – 10000var
kVA	instantaneous apparent power	28h – 2Fh	0.001VA – 10000VA
Voltage Demands	Sliding window Volts demand	30h – 37h	10^{-3}V – 10^{4}V
Current Demands	Sliding window Amps demand	38h – 3Fh	10^{-3}A – 10^{4}A
Power Demands	Sliding window kW demand	40h – 47h	0.001W – 10000W
kvarh	Cumulative reactive imported energy	48h – 4Fh	0.001varh – 10000varh
L-L Voltage	True RMS voltage measured between phases	50h – 5Fh	10^{-9}V – 10^{6}V
Reserved	Reserved for future use	60h – 6Fh	10^{-12}A – 10^{3}A
Main Unit Text	Name associated with main unit	70h	-
Meter Text	Name associated with metering unit	71h	-
Meter Type	0=3-Phase, 1=3 x 1-Phase	72h	-
CT Primary	CT Primary setting in the metering module (1-25,000A)	73h	-
CT Secondary	CT Secondary (0.3333 ± 10%)	74h	10^{-5}
CT Phase Angle	Phase Compensation for selected CTs	75h	-
CT Multiplier	Number of CTs fitted per phase (normally 1)	76h	-
CT Auto Rotate	0=No Rotate, 1=Rotate	77h	-
PT Primary Voltage	Nominal Voltage at PT primary (1-50,000)	78h	-
System Volts	System Nominal Voltage (1-50,000)	79h	-
Current Demand Period	Sliding window period for Current Demand	7Ah	-
Voltage Demand Period	Sliding window period for Voltage Demand	7Bh	-
Power Demand Period	Sliding window period for Power Demand	7Ch	-
Reserved	unused	7Dh – 7Fh	-

note 1: Data at this address is reserved for future expansion

10 Specification

10.1 M-Bus Module

GENERAL		
Dimensions	Height : Depth: (Off Wall) Length:	164mm 96mm 29mm
M-Bus Interface	Cable: Cable length: Connection: Load: Protocol: Baud: Address:	Half duplex, 2 Wires + optional 0V Up to 250m (refer to M-Bus specifications) Bus, star and ring topologies 3 Unit loads per interface M-Bus 300 (default), 2400, 9600 user programmable 1-200(for master display unit) user programmable
Isolation (M-Bus Output)	2.5kV (1 minute) M-Bus Port from all other circuits	
Performance		
Reply Time	Maximum 250mS	
Repeat Commands	Repeat command may start 10mS after last command is complete	
Buffer (Data Packet Size)	Data Read/Write:	Max 261 Total 8 bit Characters in a single Telegram Max 252 Record Bytes in a single Telegram
POWER SUPPLY		
DC Power From Master Display	DC Power Supply: Maximum Load:	5.0V DC 0.5 W

E. & O. E.