multicube
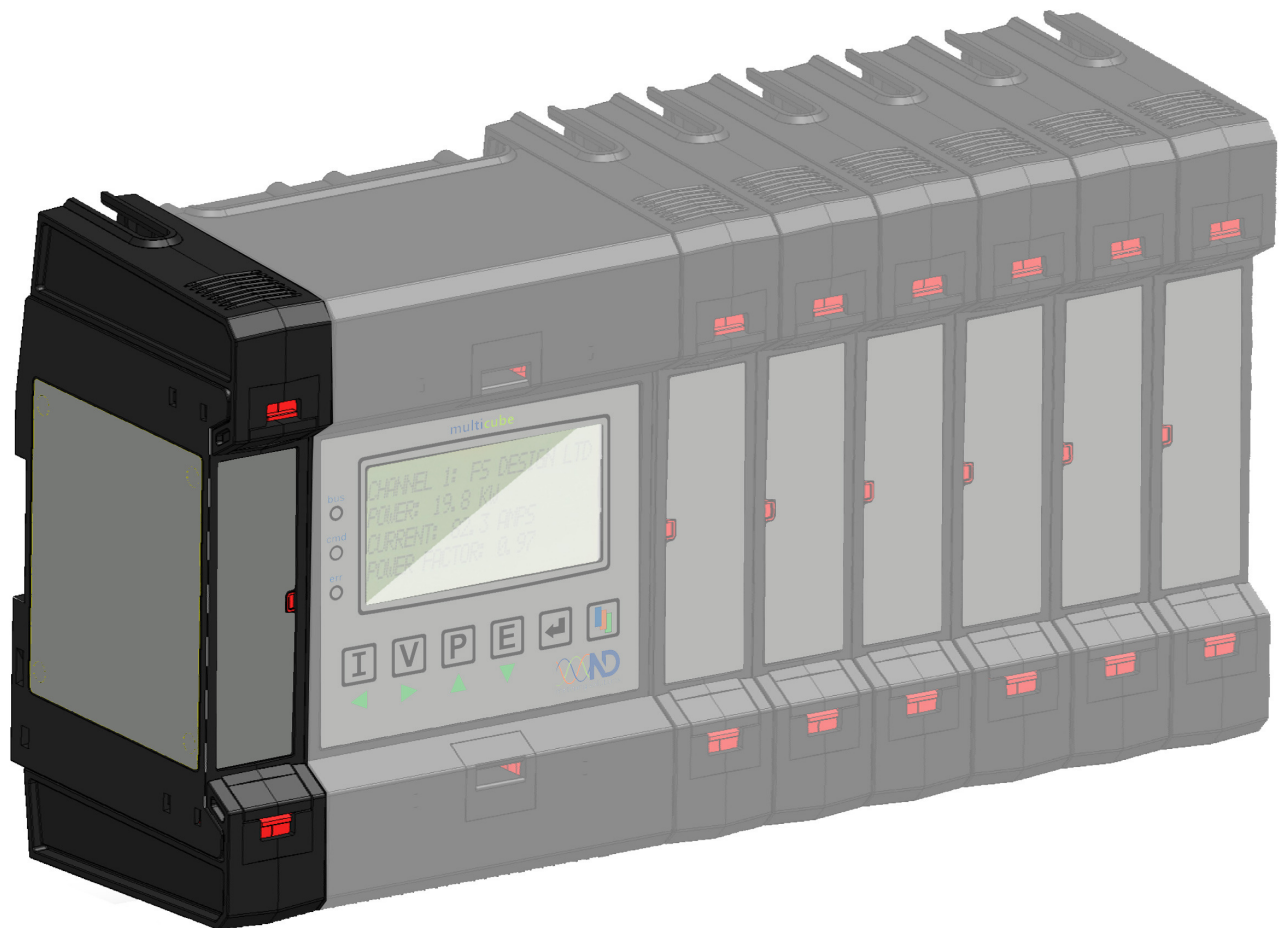
Modular Metering System
ModbusTCP Communications Manual

Revision 7

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multicube
Modular Metering System ModbusTCP

1 Description

The **multicube** modular electricity metering system simultaneously monitors up to 20 three-phase loads or 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 installations.

A Communications Module provides connection to external systems such as building energy management, billing data collection, SCADA etc.

The Communications Module provides external access, via Modbus TCP/IP, to:

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

This manual describes the operation of MODBUS TCP® and the configuration of the **multicube** TCP/IP Ethernet interface using the menus on the display of the **multicube** modular electricity metering system. Knowledge of the **multicube** Modular metering System Operating and Installation manual and the **multicube** modular meter MODBUS Communications manual are also required.

2 Safety

This instruction manual gives details of safe installation and operation of the **multicube** electricity metering system. 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.

WARNING

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

This product has been tested to the requirements of EN61010-1, 2nd Edition - including Amendment 1.

Notice

This product has been tested as class 2, IT equipment for conducted immunity and may not be suitable in extreme electrical environments.

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 contains no user serviceable parts.   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, lint-free cloth.   No solvents or cleaning agents should be used.   All inputs and supplies must be isolated before cleaning any part of the equipment.

3   ModbusTCP Protocol

The implementation of the MODBUS protocol in the **multicube** modular meter is described in the **multicube** modular meter MODBUS Comms manual.   The complete request or reply packet consists of a MODBUS address followed by a command function code and any data required by the chosen command. The RS485 MODBUS RTU implementation is concluded with a **Cyclic Redundancy Checksum** (CRC).

Address	Command	Data	CRC
(1 Byte)	(1 Byte)	(n Bytes)	(2 Bytes)

In the Ethernet MODBUS TCP implementation, MODBUS requests and replies are preceded by an **Ethernet** header, an **Internet Protocol** (IP) header and a **Transmission Control Protocol** (TCP) header. Within the TCP payload the request or reply is also preceded by a two byte transaction identifier number, a two byte protocol identifier number (always zero for MODBUS) and a two byte value indicating the length of the message. The checksum is covered in the Ethernet and the TCP/IP protocols so is no longer required.

Transaction ID	Protocol ID = 0	Message Length	Address	Command	Data
(2 Bytes)	(2 Bytes)	(2 Bytes)	(1 Byte)	(1 Byte)	(n Bytes)

A connection is made to the address allocated to the **multicube** TCP/IP Ethernet interface module using **TCP port 502**.   For each request a new transaction ID is generated and is used in the reply to identify the source of the request.   The message length includes the target MODBUS address, the command and the associated data.   These fields will generally be used to access the tables made available by the **multicube** modular meter system and the contents are described in the **multicube** modular meter MODBUS Communications manual.

4 Network Connection

4.1 Mechanical Connection

The **multicube** TCP/IP Ethernet interface is a communication module and connects to the left hand side of the **multicube** Master Display Unit. All power must be disconnected from the meter before the module is inserted into position. The Ethernet Module is identified by the Master Unit when power is re-applied to the system.

The interface module features an auto-configuring 10/100 Base-T Ethernet connection and should be connected to a suitable hub/switch/router using, at minimum, a standard CAT5 cable terminated in an RJ45 jack plug.   Direct connection may be made to a computer with consideration of the addresses of both the **multicube** system and the computer network interface as explained when testing the connection. Some computers may require a crossover CAT5 cable in order to enable direct connection.

4.2 IP Addresses

The **multicube** TCP/IP Ethernet interface supports IP version 4 (IPv4), currently the most popular protocol for internet communication.   The interface does not yet support IP version 6.   IPv4 addresses are 32 bits (four 8 bit bytes or octets) long and are usually organised in dot notation as four numbers of values between 0 and 255 and separated by periods (e.g. 192.168.4.1).

The meter will normally be provided with its address by a DHCP server, but may be configured to have a user-selected fixed IP address.   For manually setting an IP Address, see section 5.4 below

5 Communication Setup

Each **multicube** fitted with the MODBUS TCP communications option is assigned a range of unique IDs. Further information on this is available in the **multicube** modular meter MODBUS Comms manual.

- The user needs to assign a unique MODBUS ID for each **multicube master** in the MODBUS network.
- The Master Display Unit then automatically assigns a further set of consecutive IDs (2 for each sub-metering module). Each multicube can contain up to 10 dual Sub-Metering Modules of which each is a dual Sub-Metering Module containing *two 3-Phase Electricity Meters* (Subsequently each 3-Phase Meter can also be configured as 3 single phase Electricity meters).
- The user needs to select whether the IP address is to be set dynamically from a DHCP server on the network or provide a static IP address for each **multicube**.
- If the IP address is to be set manually, the user also needs to set a Subnet Mask, Default Gateway address, Name System Server address and Time Server Address.

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

Select *Communication* from the *SETUP MAIN* menu	△ ▽	SETUP MAIN Pulse Output Test Mode Reset **Communication**
Enter the Communication Setup Menu	⏎	
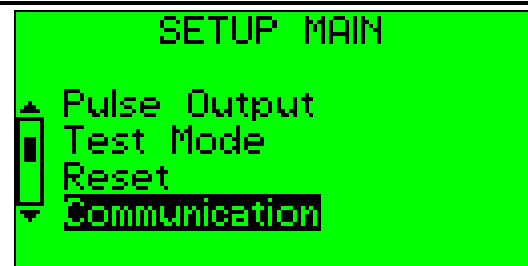
When the **multicube** has correctly identified that a TCP/IP Ethernet interface module is attached (during power up) the menu options in the Communications Menu are changed to reflect the different settings required.

5.1 Set the Modbus ID

Select Modbus ID from the menu	△ ▽	COMMUNICATION **Modbus ID 200** IP settings IP Address DHCP Back ID Range 200-219
Enter to change the value **(This will display a warning)**	⏎	

Select a *Digit*, *ESC* or *OK*	◁ ▷	ENTER MODBUS ID
Change the Digit Value. **(see note below)**	△ ▽	**201** OK ESC
OK – Accept new value *ESC*- Reject new value	⏎	
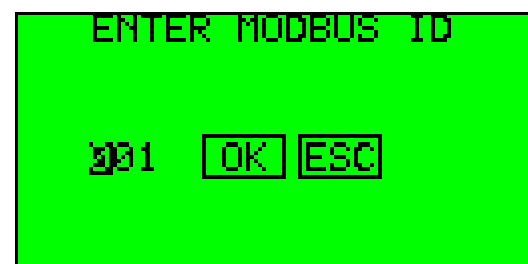
Note: Each digit is changed separately up to 9 and down to 0. Changes that result in an invalid value are not accepted.

Exiting the menu once the ID number has been changed will restart the unit and renumber all the meters.

5.2 Select DHCP or static addresses

Select *IP Address* from the menu*.*

Enter to select DHCP for dynamic addressing

```
COMMUNICATION

Modbus ID   200
IP settings
IP Address  DHCP
Back
DHCP 192:168:004:001/20
```

Enter to select STATIC for fixed IP addressing

```
COMMUNICATION

Modbus ID   200
IP settings
IP Address  Static
Back
Static 192:168:004:001/20
```

5.3 View the addresses when DHCP selected

Select *IP Settings* from the *Communication Menu*

Enter to View Addresses

```
COMMUNICATION

Modbus ID   200
IP settings
IP Address  DHCP
Back
DHCP 192:168:004:001/20
```

IP Address, Gateway & Subnet Mask cannot be edited in DHCP mode

Select *Back*

```
IP SETTINGS

IP  192:168:004:001
GWY 192:168:001:254
DNS 000:000:000:000
NTP 000:000:000:000
SUB 255:255:240:000
Back
```
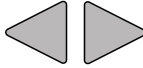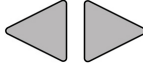
Enter to return to Communications Menu
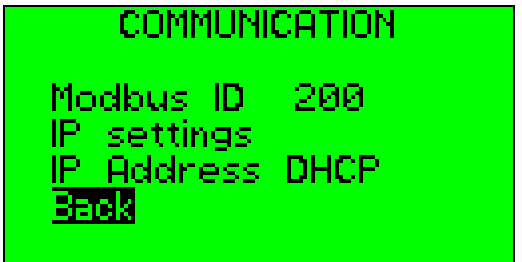
```
IP SETTINGS

IP  192:168:004:001
GWY 192:168:001:254
DNS 000:000:000:000
NTP 000:000:000:000
SUB 255:255:240:000
Back
```

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5.4 View/Set the addresses when static IP selected

Select *IP Settings* from the *Communication Menu*

Enter to View Addresses

```
        COMMUNICATION

Modbus ID    200
IP settings
IP Address  Static
Back
Static  192:168:004:001/20
```

Select Address *Digits within:*

Default Gateway (GWY)

Domain Name Server (DNS)

and Time Server (NTP)

Set the desired value

```
        IP SETTINGS
IP   192:168:004:001
GWY  192:168:001:254
DNS  000:000:000:000
NTP  000:000:000:000
SUB  255:255:240:000
Back
```

Select *Subnet Mask (SUB)*

Set the desired value

```
        IP SETTINGS
IP   192:168:004:002
GWY  000:000:000:000
DNS  000:000:000:000
NTP  000:000:000:000
SUB  255:255:240:000
Back
```

Select *Back*

Enter to accept the changes & return to Communications Menu

```
        IP SETTINGS
IP   192:168:004:002
GWY  000:000:000:000
DNS  000:000:000:000
NTP  000:000:000:000
SUB  255:255:252:000
Back
```
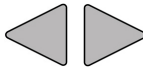
5.5 Return to the SETUP MAIN Menu

Select *Back* from the menu

Exit to *SETUP MAIN* menu

```
        COMMUNICATION

Modbus ID    200
IP settings
IP Address  DHCP
Back
```

6 Testing Communications

6.1 Standalone e.g. with laptop

In the absence of a network the meter can be connected directly to the Ethernet port of a PC or laptop. In this situation a static IP Addresses and a Subnet Mask should be chosen for the PC and the meter. Usually a Subnet Mask of 255.255.255.0 would be chosen for the PC and the meter. The two IP Addresses will have the first three bytes in common and differ in the last byte only (the Default Gateway & other settings are irrelevant and can be ignored). For example: If the meter IP address is set as 192.168.3.12, then the Pc IP address should be 192.168.3.XXX where XXX can be 1 to 255 excluding 12.

The IP Address of the meter is set as described above. The method for setting the IP Address of the PC will vary depending upon the operating system.

6.2 For MS Windows XP$^{®}$:

From the **Start** menu select **Settings** - **Control Panel**.

Double Click the Network Connections icon.

Double Click on the **Local Area Connection Icon**.
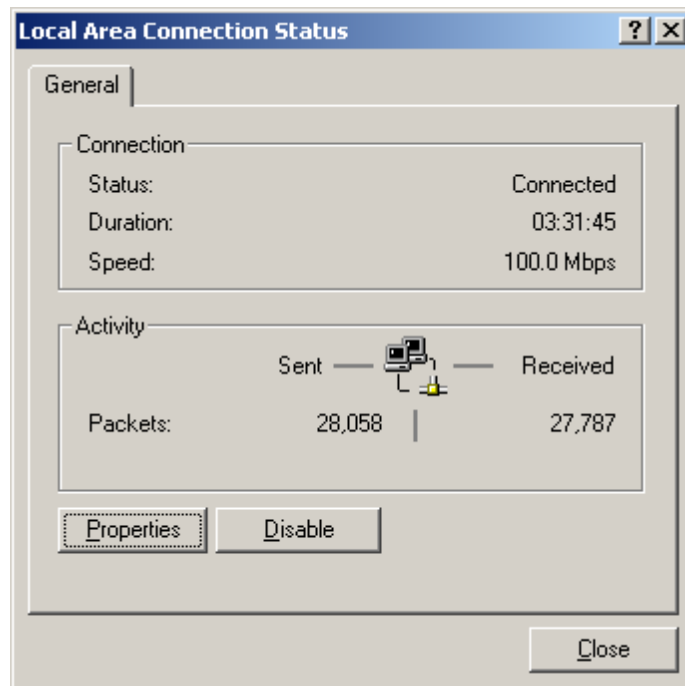
Click on the **Properties** button.
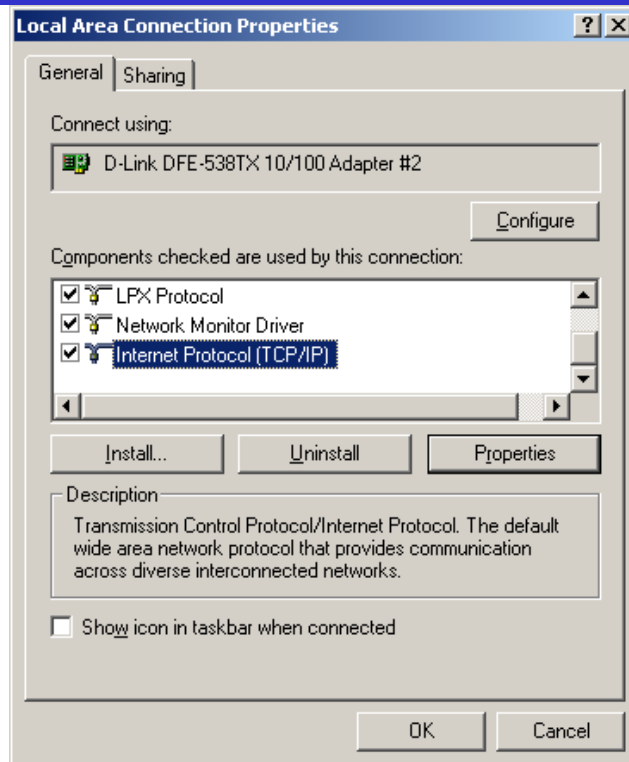
Select **Internet Protocol (TCP/IP)** from the component list as shown above.

Click on the **Properties** button.
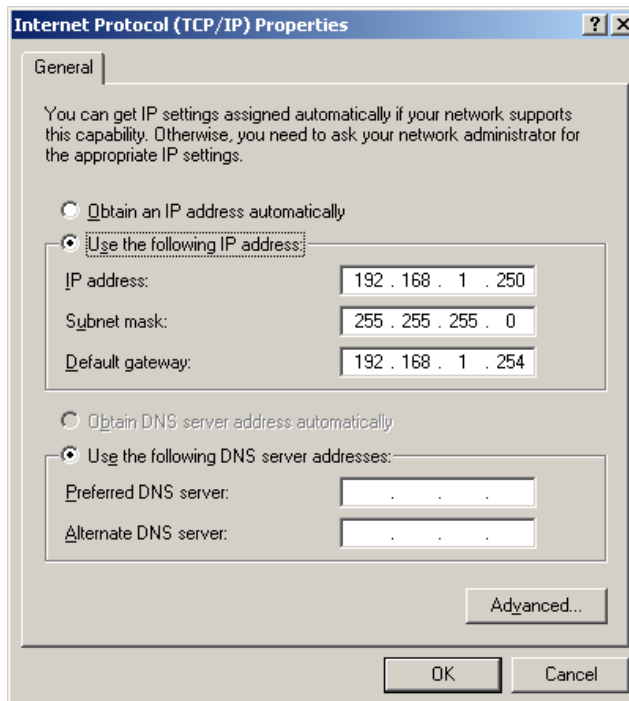
Select the **Use the following IP address** radio button.

Click on the **OK** button.

Close the **Local Area Connection Properties** dialog box.

The PC is now configured to talk only to the connected meter.

6.3 Testing Network Connection

Once the Ethernet interface of the meter is configured it can be tested using the ping utility from the command prompt of a desktop PC on the same network. Start a command prompt and type the word 'ping' followed by a space and then the IP address of the meter. For example, if the IP address is 192.168.1.121 type the command:-

```
Ping 192.168.1.121
```

If the meter is correctly configured and on the local network then there should be a response indicating that the meter replied. For example:-

```
Pinging 192.168.1.121 with 32 bytes of data:

Reply from 192.168.1.121: bytes=32 time=2ms TTL=64
Reply from 192.168.1.121: bytes=32 time=2ms TTL=64
Reply from 192.168.1.121: bytes=32 time=1ms TTL=64
Reply from 192.168.1.121: bytes=32 time=1ms TTL=64

Ping statistics for 192.168.1.121:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

If the meter is not responding then the response will indicate that the ping timed out. For example:-

```
Pinging 192.168.1.121 with 32 bytes of data:

Request timed out.
Request timed out.

Request timed out.
Request timed out.

Ping statistics for 192.168.1.121:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

If the meter fails to respond, check the network settings and all connections.

7 Modbus Data

7.1 Modbus Commands

The **multicube** supports the following standard Modbus commands:

Command	Function	Broadcast
03	Read Multiple Holding Registers	No
04	Read Multiple Input Registers	No
06	Preset a Single Register	Yes
08 (SF=00)	Sub Function 00 only (Loop Back)	No
16	Preset Multiple Registers	Yes

7.2 Exception Responses

If the **multicube** receives a Modbus command, with no errors and a valid address, it will attempt to handle the query and provide an appropriate response. If the meter cannot handle the query a standard Modbus exception response is sent (except broadcast queries). An exception response is characterised by its function byte which has 80H added to that sent in the query. The following exceptions codes are supported:

Code	Function
1	Preset data is out of range for parameter
2	Function cannot access requested register address

7.3   Data Tables

Data is stored in the **multicube** Master Display Unit in conveniently numbered data tables. Each Table is positioned at a data address, which is a multiple of 256 and so the *Table Number* forms the upper byte of the data address in the command packet. An entire table may be read with a single Modbus *Command 3* (Holding Registers). For compatibility with the Modbus standard each register contains a single data *Word* (16 bits).

Data in the multicube is stored as:

Unsigned Integer (U-INT)
16-bit data in the range 0 to 65,535. This is used for parameters such as CT Primary as this can never be negative.

Signed Integer (S-INT)
16-bit data in the range –32,767 to +32,767. This is used for parameters such as instantaneous kW, which may have a negative value indicating export power.

Long Integer (LONG)
32-bit data in the range 0 to 4,294,967,295. This is used for parameters such as kWh, which may have large values. Each LONG requires two consecutive Modbus data words. Standard software often handles long integer reads, however, a LONG may be calculated from the individual data words as:

LONG = (65536 x High Word) + Low Word

7.4   Scaling Modbus Values

7.4.1   Scaling Energy Values

All energy values are stored in Modbus tables as Long Integers in the range 0-99,999,999. This number represents the digits on the LCD with no decimal point or legend. For example if the LCD shows 1234567.8 kWh then the Modbus register for kWh will hold 12345678.

A single scaling factor *"eScale"* is used to scale all energy values and is available at several Modbus register locations for convenience.

To convert the long integer to a valid energy value scale as follows:

Long Integer	eScale	Factor	kWh
12345678	4	0.01	123456.78
12345678	5	0.1	1234567.8
12345678	6	1	12345678
12345678	7	10	123456780

Examples:

Modbus register for System kWh contains 12345678 and eScale=5:

This represents 12345678 x 0.1 = 1234567.8 kWh

Modbus register for System kvarh contains 32149 and eScale=4:

This represents 32149 x 0.01 = 321.49 kvarh

7.4.2 Scaling Instantaneous Values

Instantaneous values are stored in Modbus tables as 16 bit Integers representing the numeric value shown on the LCD with no decimal point or legend. Different scaling factors are used to convert the integer as:

Parameter	Scaling Factor
Amps	Ki
Volts (Phase)	KVp
Volts (Line)	KVl
Power	Kp

The method for converting the Modbus data to real world parameters is the same for all the Parameter Types and scaling factors as follows:

Integer	Scaling Ki, KVp, KVl or Kp	Factor	Value Amps, Volts, W, var etc
1234	1	0.01	12.34
1234	2	0.1	123.4
1234	3	1	1234
1234	4	10	12340
1234	5	100	123400
1234	6	1,000	1234000
1234	7	10,000	12340000

Examples:

Modbus register for Phase 1 Volts contains 2300 and kVp=2:

This represents $V1 = 2300 \times 0.1 = 230.0V$

Modbus register for Phase 1 Amps contains 6000 and ki=1:

This represents $I1 = 6000 \times 0.01 = 60.00A$

Modbus register for Phase 1 Watts contains 1380 and ki=4:

This represents $W1 = 1380 \times 10 = 13800W$

8 Modbus Data Tables (Main Unit)

The **Main Display Unit** acts as a data concentrator for each of the **Slave Modules** connected to it. Communication with the Main Unit allows a summary of the data from all the meters to be accessed with a single read.

8.1 Main Display Unit Table 1
3-Phase Energy Registers

Data Address	Modbus Register	Meter	Data	Access
256	40257	Meter 1	System kWh High Word	Read/Write
257	40258		System kWh Low Word	
258	40259		System kvarh High Word	Read/Write
259	40260		System kvarh Low Word	
260	40261	Meter 2	System kWh High Word	Read/Write
261	40262		System kWh Low Word	
262	40263		System kvarh High Word	Read/Write
263	40264		System kvarh Low Word	
264	40265	Meter 3	System kWh High Word	Read/Write
265	40266		System kWh Low Word	
266	40267		System kvarh High Word	Read/Write
267	40268		System kvarh Low Word	
268	40269	Meter 4	System kWh High Word	Read/Write
269	40270		System kWh Low Word	
270	40271		System kvarh High Word	Read/Write
271	40272		System kvarh Low Word	
272	40273	Meter 5	System kWh High Word	Read/Write
273	40274		System kWh Low Word	
274	40275		System kvarh High Word	Read/Write
275	40276		System kvarh Low Word	
276	40277	Meter 6	System kWh High Word	Read/Write
277	40278		System kWh Low Word	
278	40279		System kvarh High Word	Read/Write
279	40280		System kvarh Low Word	
280	40281	Meter 7	System kWh High Word	Read/Write
281	40282		System kWh Low Word	
282	40283		System kvarh High Word	Read/Write
283	40284		System kvarh Low Word	
284	40285	Meter 8	System kWh High Word	Read/Write
285	40286		System kWh Low Word	
286	40287		System kvarh High Word	Read/Write
287	40288		System kvarh Low Word	
288	40289	Meter 9	System kWh High Word	Read/Write
289	40290		System kWh Low Word	
290	40291		System kvarh High Word	Read/Write
291	40292		System kvarh Low Word	
292	40293	Meter 10	System kWh High Word	Read/Write
293	40294		System kWh Low Word	
294	40295		System kvarh High Word	Read/Write
295	40296		System kvarh Low Word	
296	40297	Meter 11	System kWh High Word	Read/Write
297	40298		System kWh Low Word	
298	40299		System kvarh High Word	Read/Write
299	40300		System kvarh Low Word	
300	40301	Meter 12	System kWh High Word	Read/Write
301	40302		System kWh Low Word	
302	40303		System kvarh High Word	Read/Write
303	40304		System kvarh Low Word	
304	40305	Meter 13	System kWh High Word	Read/Write
305	40306		System kWh Low Word	
306	40307		System kvarh High Word	Read/Write
307	40308		System kvarh Low Word	

308	40309	Meter 14	System kWh High Word	Read/Write
309	40310		System kWh Low Word	
310	40311		System kvarh High Word	Read/Write
311	40312		System kvarh Low Word	
312	40313	Meter 15	System kWh High Word	Read/Write
313	40314		System kWh Low Word	
314	40315		System kvarh High Word	Read/Write
315	40316		System kvarh Low Word	
316	40317	Meter 16	System kWh High Word	Read/Write
317	40318		System kWh Low Word	
318	40319		System kvarh High Word	Read/Write
319	40320		System kvarh Low Word	
320	40321	Meter 17	System kWh High Word	Read/Write
321	40322		System kWh Low Word	
322	40323		System kvarh High Word	Read/Write
323	40324		System kvarh Low Word	
324	40325	Meter 18	System kWh High Word	Read/Write
325	40326		System kWh Low Word	
326	40327		System kvarh High Word	Read/Write
327	40328		System kvarh Low Word	
328	40329	Meter 19	System kWh High Word	Read/Write
329	40330		System kWh Low Word	
330	40331		System kvarh High Word	Read/Write
331	40332		System kvarh Low Word	
332	40333	Meter 20	System kWh High Word	Read/Write
333	40334		System kWh Low Word	
334	40335		System kvarh High Word	Read/Write
335	40336		System kvarh Low Word	

Notes:

Table 1 provides data amalgamated from all MC352 Modules configured to measure 3-Phase electricity.
Each Slave Module can contain up to two 3-Phase Electricity Meters.
Meters configured as single phase meters will return zero for 3-Phase energy values.
Energy registers require scaling as described in Section 7.4.1

8.2 *Main Unit Table 2*
Single Phase MC352 Energy Registers

Data Address	Modbus Register	Meter	Data	Access
512	40513		Phase 1 kWh High Word	Read/Write
513	40514		Phase 1 kWh Low Word	
514	40515		Phase 2 kWh High Word	Read/Write
515	40516		Phase 2 kWh Low Word	
516	40517	Meter 1	Phase 3 kWh High Word	Read/Write
517	40518	Meter 1a	Phase 3 kWh Low Word	
518	40519	Meter 1b	Phase 1 kvarh High Word	Read/Write
519	40520		Phase 1 kvarh Low Word	
520	40521		Phase 2 kvarh High Word	Read/Write
521	40522		Phase 2 kvarh Low Word	
522	40523		Phase 3 kvarh High Word	Read/Write
523	40524		Phase 3 kvarh Low Word	
524	40525		Phase 1 kWh High Word	Read/Write
525	40526		Phase 1 kWh Low Word	
526	40527		Phase 2 kWh High Word	Read/Write
527	40528		Phase 2 kWh Low Word	
528	40529	Meter 2	Phase 3 kWh High Word	Read/Write
529	40530	Meter 2a	Phase 3 kWh Low Word	
530	40531	Meter 2b	Phase 1 kvarh High Word	Read/Write
531	40532		Phase 1 kvarh Low Word	
532	40533		Phase 2 kvarh High Word	Read/Write
533	40534		Phase 2 kvarh Low Word	
534	40535		Phase 3 kvarh High Word	Read/Write
535	40536		Phase 3 kvarh Low Word	
536	40537		Phase 1 kWh High Word	Read/Write
537	40538		Phase 1 kWh Low Word	
538	40539		Phase 2 kWh High Word	Read/Write
539	40540		Phase 2 kWh Low Word	
540	40541	Meter 3	Phase 3 kWh High Word	Read/Write
541	40542	Meter 3a	Phase 3 kWh Low Word	
542	40543	Meter 3b	Phase 1 kvarh High Word	Read/Write
543	40544		Phase 1 kvarh Low Word	
544	40545		Phase 2 kvarh High Word	Read/Write
545	40546		Phase 2 kvarh Low Word	
546	40547		Phase 3 kvarh High Word	Read/Write
547	40548		Phase 3 kvarh Low Word	
548	40549		Phase 1 kWh High Word	Read/Write
549	40550		Phase 1 kWh Low Word	
550	40551		Phase 2 kWh High Word	Read/Write
551	40552		Phase 2 kWh Low Word	
552	40553	Meter 4	Phase 3 kWh High Word	Read/Write
553	40554	Meter 4a	Phase 3 kWh Low Word	
554	40555	Meter 4b	Phase 1 kvarh High Word	Read/Write
555	40556		Phase 1 kvarh Low Word	
556	40557		Phase 2 kvarh High Word	Read/Write
557	40558		Phase 2 kvarh Low Word	
558	40559		Phase 3 kvarh High Word	Read/Write
559	40560		Phase 3 kvarh Low Word	
560	40561		Phase 1 kWh High Word	Read/Write
561	40562		Phase 1 kWh Low Word	
562	40563		Phase 2 kWh High Word	Read/Write
563	40564		Phase 2 kWh Low Word	
564	40565	Meter 5	Phase 3 kWh High Word	Read/Write
565	40566	Meter 5a	Phase 3 kWh Low Word	
566	40567	Meter 5b	Phase 1 kvarh High Word	Read/Write
567	40568		Phase 1 kvarh Low Word	
568	40569		Phase 2 kvarh High Word	Read/Write
569	40570		Phase 2 kvarh Low Word	
570	40571		Phase 3 kvarh High Word	Read/Write
571	40572		Phase 3 kvarh Low Word	

572	40573	Meter 6 Meter 6a Meter 6b	Phase 1 kWh High Word	Read/Write
573	40574		Phase 1 kWh Low Word	
574	40575		Phase 2 kWh High Word	Read/Write
575	40576		Phase 2 kWh Low Word	
576	40577		Phase 3 kWh High Word	Read/Write
577	40578		Phase 3 kWh Low Word	
578	40579		Phase 1 kvarh High Word	Read/Write
579	40580		Phase 1 kvarh Low Word	
580	40581		Phase 2 kvarh High Word	Read/Write
581	40582		Phase 2 kvarh Low Word	
582	40583		Phase 3 kvarh High Word	Read/Write
583	40584		Phase 3 kvarh Low Word	
584	40585	Meter 7 Meter 7a Meter 7b	Phase 1 kWh High Word	Read/Write
585	40586		Phase 1 kWh Low Word	
586	40587		Phase 2 kWh High Word	Read/Write
587	40588		Phase 2 kWh Low Word	
588	40589		Phase 3 kWh High Word	Read/Write
589	40590		Phase 3 kWh Low Word	
590	40591		Phase 1 kvarh High Word	Read/Write
591	40592		Phase 1 kvarh Low Word	
592	40593		Phase 2 kvarh High Word	Read/Write
593	40594		Phase 2 kvarh Low Word	
594	40595		Phase 3 kvarh High Word	Read/Write
595	40596		Phase 3 kvarh Low Word	
596	40597	Meter 8 Meter 8a Meter 8b	Phase 1 kWh High Word	Read/Write
597	40598		Phase 1 kWh Low Word	
598	40599		Phase 2 kWh High Word	Read/Write
599	40600		Phase 2 kWh Low Word	
600	40601		Phase 3 kWh High Word	Read/Write
601	40602		Phase 3 kWh Low Word	
602	40603		Phase 1 kvarh High Word	Read/Write
603	40604		Phase 1 kvarh Low Word	
604	40605		Phase 2 kvarh High Word	Read/Write
605	40606		Phase 2 kvarh Low Word	
606	40607		Phase 3 kvarh High Word	Read/Write
607	40608		Phase 3 kvarh Low Word	
608	40609	Meter 9 Meter 9a Meter 9b	Phase 1 kWh High Word	Read/Write
609	40610		Phase 1 kWh Low Word	
610	40611		Phase 2 kWh High Word	Read/Write
611	40612		Phase 2 kWh Low Word	
612	40613		Phase 3 kWh High Word	Read/Write
613	40614		Phase 3 kWh Low Word	
614	40615		Phase 1 kvarh High Word	Read/Write
615	40616		Phase 1 kvarh Low Word	
616	40617		Phase 2 kvarh High Word	Read/Write
617	40618		Phase 2 kvarh Low Word	
618	40619		Phase 3 kvarh High Word	Read/Write
619	40620		Phase 3 kvarh Low Word	
620	40621	Meter 10 Meter 10a Meter 10b	Phase 1 kWh High Word	Read/Write
621	40622		Phase 1 kWh Low Word	
622	40623		Phase 2 kWh High Word	Read/Write
623	40624		Phase 2 kWh Low Word	
624	40625		Phase 3 kWh High Word	Read/Write
625	40626		Phase 3 kWh Low Word	
626	40627		Phase 1 kvarh High Word	Read/Write
627	40628		Phase 1 kvarh Low Word	
628	40629		Phase 2 kvarh High Word	Read/Write
629	40630		Phase 2 kvarh Low Word	
630	40631		Phase 3 kvarh High Word	Read/Write
631	40632		Phase 3 kvarh Low Word	

632	40633	Meter 11 Meter 11a Meter 11b	Phase 1 kWh High Word	Read/Write
633	40634		Phase 1 kWh Low Word	
634	40635		Phase 2 kWh High Word	Read/Write
635	40636		Phase 2 kWh Low Word	
636	40637		Phase 3 kWh High Word	Read/Write
637	40638		Phase 3 kWh Low Word	
638	40639		Phase 1 kvarh High Word	Read/Write
639	40640		Phase 1 kvarh Low Word	
640	40641		Phase 2 kvarh High Word	Read/Write
641	40642		Phase 2 kvarh Low Word	
642	40643		Phase 3 kvarh High Word	Read/Write
643	40644		Phase 3 kvarh Low Word	
644	40645	Meter 12 Meter 12a Meter 12b	Phase 1 kWh High Word	Read/Write
645	40646		Phase 1 kWh Low Word	
646	40647		Phase 2 kWh High Word	Read/Write
647	40648		Phase 2 kWh Low Word	
648	40649		Phase 3 kWh High Word	Read/Write
649	40650		Phase 3 kWh Low Word	
650	40651		Phase 1 kvarh High Word	Read/Write
651	40652		Phase 1 kvarh Low Word	
652	40653		Phase 2 kvarh High Word	Read/Write
653	40654		Phase 2 kvarh Low Word	
654	40655		Phase 3 kvarh High Word	Read/Write
655	40656		Phase 3 kvarh Low Word	
656	40657	Meter 13 Meter 13a Meter 13b	Phase 1 kWh High Word	Read/Write
657	40658		Phase 1 kWh Low Word	
658	40659		Phase 2 kWh High Word	Read/Write
659	40660		Phase 2 kWh Low Word	
660	40661		Phase 3 kWh High Word	Read/Write
661	40662		Phase 3 kWh Low Word	
662	40663		Phase 1 kvarh High Word	Read/Write
663	40664		Phase 1 kvarh Low Word	
664	40665		Phase 2 kvarh High Word	Read/Write
665	40666		Phase 2 kvarh Low Word	
666	40667		Phase 3 kvarh High Word	Read/Write
667	40668		Phase 3 kvarh Low Word	
668	40669	Meter 14 Meter 14a Meter 14b	Phase 1 kWh High Word	Read/Write
669	40670		Phase 1 kWh Low Word	
670	40671		Phase 2 kWh High Word	Read/Write
671	40672		Phase 2 kWh Low Word	
672	40673		Phase 3 kWh High Word	Read/Write
673	40674		Phase 3 kWh Low Word	
674	40675		Phase 1 kvarh High Word	Read/Write
675	40676		Phase 1 kvarh Low Word	
676	40677		Phase 2 kvarh High Word	Read/Write
677	40678		Phase 2 kvarh Low Word	
678	40679		Phase 3 kvarh High Word	Read/Write
679	40680		Phase 3 kvarh Low Word	
680	40681	Meter 15 Meter 15a Meter 15b	Phase 1 kWh High Word	Read/Write
681	40682		Phase 1 kWh Low Word	
682	40683		Phase 2 kWh High Word	Read/Write
683	40684		Phase 2 kWh Low Word	
684	40685		Phase 3 kWh High Word	Read/Write
685	40686		Phase 3 kWh Low Word	
686	40687		Phase 1 kvarh High Word	Read/Write
687	40688		Phase 1 kvarh Low Word	
688	40689		Phase 2 kvarh High Word	Read/Write
689	40690		Phase 2 kvarh Low Word	
690	40691		Phase 3 kvarh High Word	Read/Write
691	40692		Phase 3 kvarh Low Word	

692	40693		Phase 1 kWh High Word	Read/Write
693	40694		Phase 1 kWh Low Word	
694	40695		Phase 2 kWh High Word	Read/Write
695	40696		Phase 2 kWh Low Word	
696	40697	Meter 16	Phase 3 kWh High Word	Read/Write
697	40698	Meter 16a	Phase 3 kWh Low Word	
698	40699	Meter 16b	Phase 1 kvarh High Word	Read/Write
699	40700		Phase 1 kvarh Low Word	
700	40701		Phase 2 kvarh High Word	Read/Write
701	40702		Phase 2 kvarh Low Word	
702	40703		Phase 3 kvarh High Word	Read/Write
703	40704		Phase 3 kvarh Low Word	
704	40705		Phase 1 kWh High Word	Read/Write
705	40706		Phase 1 kWh Low Word	
706	40707		Phase 2 kWh High Word	Read/Write
707	40708		Phase 2 kWh Low Word	
708	40709	Meter 17	Phase 3 kWh High Word	Read/Write
709	40710	Meter 17a	Phase 3 kWh Low Word	
710	40711	Meter 17b	Phase 1 kvarh High Word	Read/Write
711	40712		Phase 1 kvarh Low Word	
712	40713		Phase 2 kvarh High Word	Read/Write
713	40714		Phase 2 kvarh Low Word	
714	40715		Phase 3 kvarh High Word	Read/Write
715	40716		Phase 3 kvarh Low Word	
716	40717		Phase 1 kWh High Word	Read/Write
717	40718		Phase 1 kWh Low Word	
718	40719		Phase 2 kWh High Word	Read/Write
719	40720		Phase 2 kWh Low Word	
720	40721	Meter 18	Phase 3 kWh High Word	Read/Write
721	40722	Meter 18a	Phase 3 kWh Low Word	
722	40723	Meter 18b	Phase 1 kvarh High Word	Read/Write
723	40724		Phase 1 kvarh Low Word	
724	40725		Phase 2 kvarh High Word	Read/Write
725	40726		Phase 2 kvarh Low Word	
726	40727		Phase 3 kvarh High Word	Read/Write
727	40728		Phase 3 kvarh Low Word	
728	40729		Phase 1 kWh High Word	Read/Write
729	40730		Phase 1 kWh Low Word	
730	40731		Phase 2 kWh High Word	Read/Write
731	40732		Phase 2 kWh Low Word	
732	40733	Meter 19	Phase 3 kWh High Word	Read/Write
733	40734	Meter 19a	Phase 3 kWh Low Word	
734	40735	Meter 19b	Phase 1 kvarh High Word	Read/Write
735	40736		Phase 1 kvarh Low Word	
736	40737		Phase 2 kvarh High Word	Read/Write
737	40738		Phase 2 kvarh Low Word	
738	40739		Phase 3 kvarh High Word	Read/Write
739	40740		Phase 3 kvarh Low Word	
740	40741		Phase 1 kWh High Word	Read/Write
741	40742		Phase 1 kWh Low Word	
742	40743		Phase 2 kWh High Word	Read/Write
743	40744		Phase 2 kWh Low Word	
744	40745	Meter 20	Phase 3 kWh High Word	Read/Write
745	40746	Meter 20a	Phase 3 kWh Low Word	
746	40747	Meter 20b	Phase 1 kvarh High Word	Read/Write
747	40748		Phase 1 kvarh Low Word	
748	40749		Phase 2 kvarh High Word	Read/Write
749	40750		Phase 2 kvarh Low Word	
750	40751		Phase 3 kvarh High Word	Read/Write
751	40752		Phase 3 kvarh Low Word	

Notes:

Table 2 provides data amalgamated from all MC352 Modules configured to measure 1-Phase electricity.
Meters configured as 3-phase meters will return zero for single phase energy values.
Energy registers require scaling as described in Section 7.4.1

8.3 Main Unit Table 3
Instantaneous Readings

Data Address	Modbus Register	Meter	Data	Access
768	40769	Main Unit	Phase 1 Volts	Read Only
769	40770		Phase 2 Volts	Read Only
770	40771		Phase 3 Volts	Read Only
771	40772		Frequency	Read Only
772	40773		Phase 1 Volts THD	Read Only
773	40774		Phase 2 Volts THD	Read Only
774	40775		Phase 3 Volts THD	Read Only
775	40776	Meter 1	Phase 1 Amps	Read Only
776	40777		Phase 2 Amps	Read Only
777	40778		Phase 3 Amps	Read Only
778	40779		Phase 1 kW	Read Only
779	40780		Phase 2 kW	Read Only
780	40781		Phase 3 kW	Read Only
781	40782		Phase 1 Power Factor	Read Only
782	40783		Phase 2 Power Factor	Read Only
783	40784		Phase 3 Power Factor	Read Only
784	40785		System kW	Read Only
785	40786		System kvar	Read Only
786	40787		System PF	Read Only
787	40788	Meter 2	Phase 1 Amps	Read Only
788	40789		Phase 2 Amps	Read Only
789	40790		Phase 3 Amps	Read Only
790	40791		Phase 1 kW	Read Only
791	40792		Phase 2 kW	Read Only
792	40793		Phase 3 kW	Read Only
793	40794		Phase 1 Power Factor	Read Only
794	40795		Phase 2 Power Factor	Read Only
795	40796		Phase 3 Power Factor	Read Only
796	40797		System kW	Read Only
797	40798		System kvar	Read Only
798	40799		System PF	Read Only
799	40800	Meter 3	Phase 1 Amps	Read Only
800	40801		Phase 2 Amps	Read Only
801	40802		Phase 3 Amps	Read Only
802	40803		Phase 1 kW	Read Only
803	40804		Phase 2 kW	Read Only
804	40805		Phase 3 kW	Read Only
805	40806		Phase 1 Power Factor	Read Only
806	40807		Phase 2 Power Factor	Read Only
807	40808		Phase 3 Power Factor	Read Only
808	40809		System kW	Read Only
809	40810		System kvar	Read Only
810	40811		System PF	Read Only
811	40812	Meter 4	Phase 1 Amps	Read Only
812	40813		Phase 2 Amps	Read Only
813	40814		Phase 3 Amps	Read Only
814	40815		Phase 1 kW	Read Only
815	40816		Phase 2 kW	Read Only
816	40817		Phase 3 kW	Read Only
817	40818		Phase 1 Power Factor	Read Only
818	40819		Phase 2 Power Factor	Read Only
819	40820		Phase 3 Power Factor	Read Only
820	40821		System kW	Read Only
821	40822		System kvar	Read Only
822	40823		System PF	Read Only

823	40824	Meter 5	Phase 1 Amps	Read Only
824	40825		Phase 2 Amps	Read Only
825	40826		Phase 3 Amps	Read Only
826	40827		Phase 1 kW	Read Only
827	40828		Phase 2 kW	Read Only
828	40829		Phase 3 kW	Read Only
829	40830		Phase 1 Power Factor	Read Only
830	40831		Phase 2 Power Factor	Read Only
831	40832		Phase 3 Power Factor	Read Only
832	40833		System kW	Read Only
833	40834		System kvar	Read Only
834	40835		System PF	Read Only
835	40836	Meter 6	Phase 1 Amps	Read Only
836	40837		Phase 2 Amps	Read Only
837	40838		Phase 3 Amps	Read Only
838	40839		Phase 1 kW	Read Only
839	40840		Phase 2 kW	Read Only
840	40841		Phase 3 kW	Read Only
841	40842		Phase 1 Power Factor	Read Only
842	40843		Phase 2 Power Factor	Read Only
843	40844		Phase 3 Power Factor	Read Only
844	40845		System kW	Read Only
845	40846		System kvar	Read Only
846	40847		System PF	Read Only
847	40848	Meter 7	Phase 1 Amps	Read Only
848	40849		Phase 2 Amps	Read Only
849	40850		Phase 3 Amps	Read Only
850	40851		Phase 1 kW	Read Only
851	40852		Phase 2 kW	Read Only
852	40853		Phase 3 kW	Read Only
853	40854		Phase 1 Power Factor	Read Only
854	40855		Phase 2 Power Factor	Read Only
855	40856		Phase 3 Power Factor	Read Only
856	40857		System kW	Read Only
857	40858		System kvar	Read Only
858	40859		System PF	Read Only
859	40860	Meter 8	Phase 1 Amps	Read Only
860	40861		Phase 2 Amps	Read Only
861	40862		Phase 3 Amps	Read Only
862	40863		Phase 1 kW	Read Only
863	40864		Phase 2 kW	Read Only
864	40865		Phase 3 kW	Read Only
865	40866		Phase 1 Power Factor	Read Only
866	40867		Phase 2 Power Factor	Read Only
867	40868		Phase 3 Power Factor	Read Only
868	40869		System kW	Read Only
869	40870		System kvar	Read Only
870	40871		System PF	Read Only
871	40872	Meter 9	Phase 1 Amps	Read Only
872	40873		Phase 2 Amps	Read Only
873	40874		Phase 3 Amps	Read Only
874	40875		Phase 1 kW	Read Only
875	40876		Phase 2 kW	Read Only
876	40877		Phase 3 kW	Read Only
877	40878		Phase 1 Power Factor	Read Only
878	40879		Phase 2 Power Factor	Read Only
879	40880		Phase 3 Power Factor	Read Only
880	40881		System kW	Read Only
881	40882		System kvar	Read Only
882	40883		System PF	Read Only

883	40884		Phase 1 Amps	Read Only
884	40885		Phase 2 Amps	Read Only
885	40886		Phase 3 Amps	Read Only
886	40887		Phase 1 kW	Read Only
887	40888		Phase 2 kW	Read Only
888	40889	Meter 10	Phase 3 kW	Read Only
889	40890		Phase 1 Power Factor	Read Only
890	40891		Phase 2 Power Factor	Read Only
891	40892		Phase 3 Power Factor	Read Only
892	40893		System kW	Read Only
893	40894		System kvar	Read Only
894	40895		System PF	Read Only
895	40896		Phase 1 Amps	Read Only
896	40897		Phase 2 Amps	Read Only
897	40898		Phase 3 Amps	Read Only
898	40899		Phase 1 kW	Read Only
899	40900		Phase 2 kW	Read Only
900	40901	Meter 11	Phase 3 kW	Read Only
901	40902		Phase 1 Power Factor	Read Only
902	40903		Phase 2 Power Factor	Read Only
903	40904		Phase 3 Power Factor	Read Only
904	40905		System kW	Read Only
905	40906		System kvar	Read Only
906	40907		System PF	Read Only
907	40908		Phase 1 Amps	Read Only
908	40909		Phase 2 Amps	Read Only
909	40910		Phase 3 Amps	Read Only
910	40911		Phase 1 kW	Read Only
911	40912		Phase 2 kW	Read Only
912	40913	Meter 12	Phase 3 kW	Read Only
913	40914		Phase 1 Power Factor	Read Only
914	40915		Phase 2 Power Factor	Read Only
915	40916		Phase 3 Power Factor	Read Only
916	40917		System kW	Read Only
917	40918		System kvar	Read Only
918	40919		System PF	Read Only
919	40920		Phase 1 Amps	Read Only
920	40921		Phase 2 Amps	Read Only
921	40922		Phase 3 Amps	Read Only
922	40923		Phase 1 kW	Read Only
923	40924		Phase 2 kW	Read Only
924	40925	Meter 13	Phase 3 kW	Read Only
925	40926		Phase 1 Power Factor	Read Only
926	40927		Phase 2 Power Factor	Read Only
927	40928		Phase 3 Power Factor	Read Only
928	40929		System kW	Read Only
929	40930		System kvar	Read Only
930	40931		System PF	Read Only
931	40932		Phase 1 Amps	Read Only
932	40933		Phase 2 Amps	Read Only
933	40934		Phase 3 Amps	Read Only
934	40935		Phase 1 kW	Read Only
935	40936		Phase 2 kW	Read Only
936	40937	Meter 14	Phase 3 kW	Read Only
937	40938		Phase 1 Power Factor	Read Only
938	40939		Phase 2 Power Factor	Read Only
939	40940		Phase 3 Power Factor	Read Only
940	40941		System kW	Read Only
941	40942		System kvar	Read Only
942	40943		System PF	Read Only

943	40944		Phase 1 Amps	Read Only
944	40945		Phase 2 Amps	Read Only
945	40946		Phase 3 Amps	Read Only
946	40947		Phase 1 kW	Read Only
947	40948		Phase 2 kW	Read Only
948	40949	Meter 15	Phase 3 kW	Read Only
949	40950		Phase 1 Power Factor	Read Only
950	40951		Phase 2 Power Factor	Read Only
951	40952		Phase 3 Power Factor	Read Only
952	40953		System kW	Read Only
953	40954		System kvar	Read Only
954	40955		System PF	Read Only
955	40956		Phase 1 Amps	Read Only
956	40957		Phase 2 Amps	Read Only
957	40958		Phase 3 Amps	Read Only
958	40959		Phase 1 kW	Read Only
959	40960		Phase 2 kW	Read Only
960	40961	Meter 16	Phase 3 kW	Read Only
961	40962		Phase 1 Power Factor	Read Only
962	40963		Phase 2 Power Factor	Read Only
963	40964		Phase 3 Power Factor	Read Only
964	40965		System kW	Read Only
965	40966		System kvar	Read Only
966	40967		System PF	Read Only
967	40968		Phase 1 Amps	Read Only
968	40969		Phase 2 Amps	Read Only
969	40970		Phase 3 Amps	Read Only
970	40971		Phase 1 kW	Read Only
971	40972		Phase 2 kW	Read Only
972	40973	Meter 17	Phase 3 kW	Read Only
973	40974		Phase 1 Power Factor	Read Only
974	40975		Phase 2 Power Factor	Read Only
975	40976		Phase 3 Power Factor	Read Only
976	40977		System kW	Read Only
977	40978		System kvar	Read Only
978	40979		System PF	Read Only
979	40980		Phase 1 Amps	Read Only
980	40981		Phase 2 Amps	Read Only
981	40982		Phase 3 Amps	Read Only
982	40983		Phase 1 kW	Read Only
983	40984		Phase 2 kW	Read Only
984	40985	Meter 18	Phase 3 kW	Read Only
985	40986		Phase 1 Power Factor	Read Only
986	40987		Phase 2 Power Factor	Read Only
987	40988		Phase 3 Power Factor	Read Only
988	40989		System kW	Read Only
989	40990		System kvar	Read Only
990	40991		System PF	Read Only
991	40992		Phase 1 Amps	Read Only
992	40993		Phase 2 Amps	Read Only
993	40994		Phase 3 Amps	Read Only
994	40995		Phase 1 kW	Read Only
995	40996		Phase 2 kW	Read Only
996	40997	Meter 19	Phase 3 kW	Read Only
997	40998		Phase 1 Power Factor	Read Only
998	40999		Phase 2 Power Factor	Read Only
999	41000		Phase 3 Power Factor	Read Only
1000	41001		System kW	Read Only
1001	41002		System kvar	Read Only
1002	41003		System PF	Read Only

1003	41004		Phase 1 Amps	Read Only
1004	41005		Phase 2 Amps	Read Only
1005	41006		Phase 3 Amps	Read Only
1006	41007		Phase 1 kW	Read Only
1007	41008		Phase 2 kW	Read Only
1008	41009	Meter 20	Phase 3 kW	Read Only
1009	41010		Phase 1 Power Factor	Read Only
1010	41011		Phase 2 Power Factor	Read Only
1011	41012		Phase 3 Power Factor	Read Only
1012	41013		System kW	Read Only
1013	41014		System kvar	Read Only
1014	41015		System PF	Read Only

Notes:

Table 3 provides data amalgamated from all Slave Modules.

Instantaneous registers require scaling as described in Section 7.4.2

Meters configured as 3 x 1-Phase will return zero for 3-phase system parameter values.

multicube
Main Display Unit Data Tables

8.4   Main Unit Table 5
Demand (Sliding Window)

Data Address	Modbus Register	Meter	Data	Access
1280	41281		Phase 1 Volts Sliding Window Demand	Read Only
1281	41282	Master	Phase 2 Volts Sliding Window Demand	Read Only
1282	41283		Phase 3 Volts Sliding Window Demand	Read Only
1283	41284		Phase 1 Amps Demand (Sliding Window)	Read Only
1284	41285		Phase 2 Amps Demand (Sliding Window)	Read Only
1285	41286		Phase 3 Amps Demand (Sliding Window)	Read Only
1286	41287		Phase 1 kW Demand (Sliding Window)	Read Only
1287	41288	Meter 1	Phase 2 kW Demand (Sliding Window)	Read Only
1288	41289		Phase 3 kW Demand (Sliding Window)	Read Only
1289	41290		System kW Demand (Sliding Window)	Read Only
1290	41291		System kvar Demand (Sliding Window)	Read Only
1291	41292		System kVA Demand (Sliding Window)	Read Only
1292	41293		Phase 1 Amps Demand (Sliding Window)	Read Only
1293	41294		Phase 2 Amps Demand (Sliding Window)	Read Only
1294	41295		Phase 3 Amps Demand (Sliding Window)	Read Only
1295	41296		Phase 1 kW Demand (Sliding Window)	Read Only
1296	41297	Meter 2	Phase 2 kW Demand (Sliding Window)	Read Only
1297	41298		Phase 3 kW Demand (Sliding Window)	Read Only
1298	41299		System kW Demand (Sliding Window)	Read Only
1299	41300		System kvar Demand (Sliding Window)	Read Only
1300	41301		System kVA Demand (Sliding Window)	Read Only
1301	41302		Phase 1 Amps Demand (Sliding Window)	Read Only
1302	41303		Phase 2 Amps Demand (Sliding Window)	Read Only
1303	41304		Phase 3 Amps Demand (Sliding Window)	Read Only
1304	41305		Phase 1 kW Demand (Sliding Window)	Read Only
1305	41306	Meter 3	Phase 2 kW Demand (Sliding Window)	Read Only
1306	41307		Phase 3 kW Demand (Sliding Window)	Read Only
1307	41308		System kW Demand (Sliding Window)	Read Only
1308	41309		System kvar Demand (Sliding Window)	Read Only
1309	41310		System kVA Demand (Sliding Window)	Read Only
1310	41311		Phase 1 Amps Demand (Sliding Window)	Read Only
1311	41312		Phase 2 Amps Demand (Sliding Window)	Read Only
1312	41313		Phase 3 Amps Demand (Sliding Window)	Read Only
1313	41314		Phase 1 kW Demand (Sliding Window)	Read Only
1314	41315	Meter 4	Phase 2 kW Demand (Sliding Window)	Read Only
1315	41316		Phase 3 kW Demand (Sliding Window)	Read Only
1316	41317		System kW Demand (Sliding Window)	Read Only
1317	41318		System kvar Demand (Sliding Window)	Read Only
1318	41319		System kVA Demand (Sliding Window)	Read Only
1319	41320		Phase 1 Amps Demand (Sliding Window)	Read Only
1320	41321		Phase 2 Amps Demand (Sliding Window)	Read Only
1321	41322		Phase 3 Amps Demand (Sliding Window)	Read Only
1322	41323		Phase 1 kW Demand (Sliding Window)	Read Only
1323	41324	Meter 5	Phase 2 kW Demand (Sliding Window)	Read Only
1324	41325		Phase 3 kW Demand (Sliding Window)	Read Only
1325	41326		System kW Demand (Sliding Window)	Read Only
1326	41327		System kvar Demand (Sliding Window)	Read Only
1327	41328		System kVA Demand (Sliding Window)	Read Only
1328	41329		Phase 1 Amps Demand (Sliding Window)	Read Only
1329	41330		Phase 2 Amps Demand (Sliding Window)	Read Only
1330	41331		Phase 3 Amps Demand (Sliding Window)	Read Only
1331	41332		Phase 1 kW Demand (Sliding Window)	Read Only
1332	41333	Meter 6	Phase 2 kW Demand (Sliding Window)	Read Only
1333	41334		Phase 3 kW Demand (Sliding Window)	Read Only
1334	41335		System kW Demand (Sliding Window)	Read Only
1335	41336		System kvar Demand (Sliding Window)	Read Only
1336	41337		System kVA Demand (Sliding Window)	Read Only

1337	41338		Phase 1 Amps Demand (Sliding Window)	Read Only
1338	41339		Phase 2 Amps Demand (Sliding Window)	Read Only
1339	41340		Phase 3 Amps Demand (Sliding Window)	Read Only
1340	41341		Phase 1 kW Demand (Sliding Window)	Read Only
1341	41342	Meter 7	Phase 2 kW Demand (Sliding Window)	Read Only
1342	41343		Phase 3 kW Demand (Sliding Window)	Read Only
1343	41344		System kW Demand (Sliding Window)	Read Only
1344	41345		System kvar Demand (Sliding Window)	Read Only
1345	41346		System kVA Demand (Sliding Window)	Read Only
1346	41347		Phase 1 Amps Demand (Sliding Window)	Read Only
1347	41348		Phase 2 Amps Demand (Sliding Window)	Read Only
1348	41349		Phase 3 Amps Demand (Sliding Window)	Read Only
1349	41350		Phase 1 kW Demand (Sliding Window)	Read Only
1350	41351	Meter 8	Phase 2 kW Demand (Sliding Window)	Read Only
1351	41352		Phase 3 kW Demand (Sliding Window)	Read Only
1352	41353		System kW Demand (Sliding Window)	Read Only
1353	41354		System kvar Demand (Sliding Window)	Read Only
1354	41355		System kVA Demand (Sliding Window)	Read Only
1355	41356		Phase 1 Amps Demand (Sliding Window)	Read Only
1356	41357		Phase 2 Amps Demand (Sliding Window)	Read Only
1357	41358		Phase 3 Amps Demand (Sliding Window)	Read Only
1358	41359		Phase 1 kW Demand (Sliding Window)	Read Only
1359	41360	Meter 9	Phase 2 kW Demand (Sliding Window)	Read Only
1360	41361		Phase 3 kW Demand (Sliding Window)	Read Only
1361	41362		System kW Demand (Sliding Window)	Read Only
1362	41363		System kvar Demand (Sliding Window)	Read Only
1363	41364		System kVA Demand (Sliding Window)	Read Only
1364	41365		Phase 1 Amps Demand (Sliding Window)	Read Only
1365	41366		Phase 2 Amps Demand (Sliding Window)	Read Only
1366	41367		Phase 3 Amps Demand (Sliding Window)	Read Only
1367	41368		Phase 1 kW Demand (Sliding Window)	Read Only
1368	41369	Meter 10	Phase 2 kW Demand (Sliding Window)	Read Only
1369	41370		Phase 3 kW Demand (Sliding Window)	Read Only
1370	41371		System kW Demand (Sliding Window)	Read Only
1371	41372		System kvar Demand (Sliding Window)	Read Only
1372	41373		System kVA Demand (Sliding Window)	Read Only
1373	41374		Phase 1 Amps Demand (Sliding Window)	Read Only
1374	41375		Phase 2 Amps Demand (Sliding Window)	Read Only
1375	41376		Phase 3 Amps Demand (Sliding Window)	Read Only
1376	41377		Phase 1 kW Demand (Sliding Window)	Read Only
1377	41378	Meter 11	Phase 2 kW Demand (Sliding Window)	Read Only
1378	41379		Phase 3 kW Demand (Sliding Window)	Read Only
1379	41380		System kW Demand (Sliding Window)	Read Only
1380	41381		System kvar Demand (Sliding Window)	Read Only
1381	41382		System kVA Demand (Sliding Window)	Read Only
1382	41383		Phase 1 Amps Demand (Sliding Window)	Read Only
1383	41384		Phase 2 Amps Demand (Sliding Window)	Read Only
1384	41385		Phase 3 Amps Demand (Sliding Window)	Read Only
1385	41386		Phase 1 kW Demand (Sliding Window)	Read Only
1386	41387	Meter 12	Phase 2 kW Demand (Sliding Window)	Read Only
1387	41388		Phase 3 kW Demand (Sliding Window)	Read Only
1388	41389		System kW Demand (Sliding Window)	Read Only
1389	41390		System kvar Demand (Sliding Window)	Read Only
1390	41391		System kVA Demand (Sliding Window)	Read Only
1391	41392		Phase 1 Amps Demand (Sliding Window)	Read Only
1392	41393		Phase 2 Amps Demand (Sliding Window)	Read Only
1393	41394		Phase 3 Amps Demand (Sliding Window)	Read Only
1394	41395		Phase 1 kW Demand (Sliding Window)	Read Only
1395	41396	Meter 13	Phase 2 kW Demand (Sliding Window)	Read Only
1396	41397		Phase 3 kW Demand (Sliding Window)	Read Only
1397	41398		System kW Demand (Sliding Window)	Read Only
1398	41399		System kvar Demand (Sliding Window)	Read Only
1399	41400		System kVA Demand (Sliding Window)	Read Only
1400	41401	Meter 14	Phase 1 Amps Demand (Sliding Window)	Read Only
1401	41402		Phase 2 Amps Demand (Sliding Window)	Read Only
1402	41403		Phase 3 Amps Demand (Sliding Window)	Read Only
1403	41404		Phase 1 kW Demand (Sliding Window)	Read Only

1404	41405		Phase 2 kW Demand (Sliding Window)	Read Only
1405	41406		Phase 3 kW Demand (Sliding Window)	Read Only
1406	41407		System kW Demand (Sliding Window)	Read Only
1407	41408		System kvar Demand (Sliding Window)	Read Only
1408	41409		System kVA Demand (Sliding Window)	Read Only
1409	41410		Phase 1 Amps Demand (Sliding Window)	Read Only
1410	41411		Phase 2 Amps Demand (Sliding Window)	Read Only
1411	41412		Phase 3 Amps Demand (Sliding Window)	Read Only
1412	41413		Phase 1 kW Demand (Sliding Window)	Read Only
1413	41414	Meter 15	Phase 2 kW Demand (Sliding Window)	Read Only
1414	41415		Phase 3 kW Demand (Sliding Window)	Read Only
1415	41416		System kW Demand (Sliding Window)	Read Only
1416	41417		System kvar Demand (Sliding Window)	Read Only
1417	41418		System kVA Demand (Sliding Window)	Read Only
1418	41419		Phase 1 Amps Demand (Sliding Window)	Read Only
1419	41420		Phase 2 Amps Demand (Sliding Window)	Read Only
1420	41421		Phase 3 Amps Demand (Sliding Window)	Read Only
1421	41422		Phase 1 kW Demand (Sliding Window)	Read Only
1422	41423	Meter 16	Phase 2 kW Demand (Sliding Window)	Read Only
1423	41424		Phase 3 kW Demand (Sliding Window)	Read Only
1424	41425		System kW Demand (Sliding Window)	Read Only
1425	41426		System kvar Demand (Sliding Window)	Read Only
1426	41427		System kVA Demand (Sliding Window)	Read Only
1427	41428		Phase 1 Amps Demand (Sliding Window)	Read Only
1428	41429		Phase 2 Amps Demand (Sliding Window)	Read Only
1429	41430		Phase 3 Amps Demand (Sliding Window)	Read Only
1430	41431		Phase 1 kW Demand (Sliding Window)	Read Only
1431	41432	Meter 17	Phase 2 kW Demand (Sliding Window)	Read Only
1432	41433		Phase 3 kW Demand (Sliding Window)	Read Only
1433	41434		System kW Demand (Sliding Window)	Read Only
1434	41435		System kvar Demand (Sliding Window)	Read Only
1435	41436		System kVA Demand (Sliding Window)	Read Only
1436	41437		Phase 1 Amps Demand (Sliding Window)	Read Only
1437	41438		Phase 2 Amps Demand (Sliding Window)	Read Only
1438	41439		Phase 3 Amps Demand (Sliding Window)	Read Only
1439	41440		Phase 1 kW Demand (Sliding Window)	Read Only
1440	41441	Meter 18	Phase 2 kW Demand (Sliding Window)	Read Only
1441	41442		Phase 3 kW Demand (Sliding Window)	Read Only
1442	41443		System kW Demand (Sliding Window)	Read Only
1443	41444		System kvar Demand (Sliding Window)	Read Only
1444	41445		System kVA Demand (Sliding Window)	Read Only
1445	41446		Phase 1 Amps Demand (Sliding Window)	Read Only
1446	41447		Phase 2 Amps Demand (Sliding Window)	Read Only
1447	41448		Phase 3 Amps Demand (Sliding Window)	Read Only
1448	41449		Phase 1 kW Demand (Sliding Window)	Read Only
1449	41450	Meter 19	Phase 2 kW Demand (Sliding Window)	Read Only
1450	41451		Phase 3 kW Demand (Sliding Window)	Read Only
1451	41452		System kW Demand (Sliding Window)	Read Only
1452	41453		System kvar Demand (Sliding Window)	Read Only
1453	41454		System kVA Demand (Sliding Window)	Read Only
1454	41455		Phase 1 Amps Demand (Sliding Window)	Read Only
1455	41456		Phase 2 Amps Demand (Sliding Window)	Read Only
1456	41457		Phase 3 Amps Demand (Sliding Window)	Read Only
1457	41458		Phase 1 kW Demand (Sliding Window)	Read Only
1458	41459	Meter 20	Phase 2 kW Demand (Sliding Window)	Read Only
1459	41460		Phase 3 kW Demand (Sliding Window)	Read Only
1460	41461		System kW Demand (Sliding Window)	Read Only
1461	41462		System kvar Demand (Sliding Window)	Read Only
1462	41463		System kVA Demand (Sliding Window)	Read Only

Notes:

Table 5 provides data amalgamated from all Sub-Metering Modules.

Meters configured as single phase meters will return zero for 3-Phase demand values.

Demand registers require scaling as described in Section 7.4.2

8.5 Main Unit Table 6
Max/Min - Amp/Voltage Demand

Data Address	Modbus Register	Meter	Data	Access
1536	41537	Main Unit	Phase 1 Volts Maximum Demand	Read/Write
1537	41538		Phase 2 Volts Maximum Demand	Read/Write
1538	41539		Phase 3 Volts Maximum Demand	Read/Write
1539	41540		Phase 1 Volts Minimum Demand	Read/Write
1540	41541		Phase 2 Volts Minimum Demand	Read/Write
1541	41542		Phase 3 Volts Minimum Demand	Read/Write
1542	41543	Meter 1	Phase 1 Amps Maximum Demand	Read/Write
1543	41544		Phase 2 Amps Maximum Demand	Read/Write
1544	41545		Phase 3 Amps Maximum Demand	Read/Write
1545	41546		Phase 1 Amps Minimum Demand	Read/Write
1546	41547		Phase 2 Amps Minimum Demand	Read/Write
1547	41548		Phase 3 Amps Minimum Demand	Read/Write
1548	41549	Meter 2	Phase 1 Amps Maximum Demand	Read/Write
1549	41550		Phase 2 Amps Maximum Demand	Read/Write
1550	41551		Phase 3 Amps Maximum Demand	Read/Write
1551	41552		Phase 1 Amps Minimum Demand	Read/Write
1552	41553		Phase 2 Amps Minimum Demand	Read/Write
1553	41554		Phase 3 Amps Minimum Demand	Read/Write
1554	41555	Meter 3	Phase 1 Amps Maximum Demand	Read/Write
1555	41556		Phase 2 Amps Maximum Demand	Read/Write
1556	41557		Phase 3 Amps Maximum Demand	Read/Write
1557	41558		Phase 1 Amps Minimum Demand	Read/Write
1558	41559		Phase 2 Amps Minimum Demand	Read/Write
1559	41560		Phase 3 Amps Minimum Demand	Read/Write
1560	41561	Meter 4	Phase 1 Amps Maximum Demand	Read/Write
1561	41562		Phase 2 Amps Maximum Demand	Read/Write
1562	41563		Phase 3 Amps Maximum Demand	Read/Write
1563	41564		Phase 1 Amps Minimum Demand	Read/Write
1564	41565		Phase 2 Amps Minimum Demand	Read/Write
1565	41566		Phase 3 Amps Minimum Demand	Read/Write
1566	41567	Meter 5	Phase 1 Amps Maximum Demand	Read/Write
1567	41568		Phase 2 Amps Maximum Demand	Read/Write
1568	41569		Phase 3 Amps Maximum Demand	Read/Write
1569	41570		Phase 1 Amps Minimum Demand	Read/Write
1570	41571		Phase 2 Amps Minimum Demand	Read/Write
1571	41572		Phase 3 Amps Minimum Demand	Read/Write
1572	41573	Meter 6	Phase 1 Amps Maximum Demand	Read/Write
1573	41574		Phase 2 Amps Maximum Demand	Read/Write
1574	41575		Phase 3 Amps Maximum Demand	Read/Write
1575	41576		Phase 1 Amps Minimum Demand	Read/Write
1576	41577		Phase 2 Amps Minimum Demand	Read/Write
1577	41578		Phase 3 Amps Minimum Demand	Read/Write
1578	41579	Meter 7	Phase 1 Amps Maximum Demand	Read/Write
1579	41580		Phase 2 Amps Maximum Demand	Read/Write
1580	41581		Phase 3 Amps Maximum Demand	Read/Write
1581	41582		Phase 1 Amps Minimum Demand	Read/Write
1582	41583		Phase 2 Amps Minimum Demand	Read/Write
1583	41584		Phase 3 Amps Minimum Demand	Read/Write
1584	41585	Meter 8	Phase 1 Amps Maximum Demand	Read/Write
1585	41586		Phase 2 Amps Maximum Demand	Read/Write
1586	41587		Phase 3 Amps Maximum Demand	Read/Write
1587	41588		Phase 1 Amps Minimum Demand	Read/Write
1588	41589		Phase 2 Amps Minimum Demand	Read/Write
1589	41590		Phase 3 Amps Minimum Demand	Read/Write
1590	41591	Meter 9	Phase 1 Amps Maximum Demand	Read/Write
1591	41592		Phase 2 Amps Maximum Demand	Read/Write
1592	41593		Phase 3 Amps Maximum Demand	Read/Write
1593	41594		Phase 1 Amps Minimum Demand	Read/Write
1594	41595		Phase 2 Amps Minimum Demand	Read/Write
1595	41596		Phase 3 Amps Minimum Demand	Read/Write

1596	41597	Meter 10	Phase 1 Amps Maximum Demand	Read/Write
1597	41598		Phase 2 Amps Maximum Demand	Read/Write
1598	41599		Phase 3 Amps Maximum Demand	Read/Write
1599	41600		Phase 1 Amps Minimum Demand	Read/Write
1600	41601		Phase 2 Amps Minimum Demand	Read/Write
1601	41602		Phase 3 Amps Minimum Demand	Read/Write
1602	41603	Meter 11	Phase 1 Amps Maximum Demand	Read/Write
1603	41604		Phase 2 Amps Maximum Demand	Read/Write
1604	41605		Phase 3 Amps Maximum Demand	Read/Write
1605	41606		Phase 1 Amps Minimum Demand	Read/Write
1606	41607		Phase 2 Amps Minimum Demand	Read/Write
1607	41608		Phase 3 Amps Minimum Demand	Read/Write
1608	41609	Meter 12	Phase 1 Amps Maximum Demand	Read/Write
1609	41610		Phase 2 Amps Maximum Demand	Read/Write
1610	41611		Phase 3 Amps Maximum Demand	Read/Write
1611	41612		Phase 1 Amps Minimum Demand	Read/Write
1612	41613		Phase 2 Amps Minimum Demand	Read/Write
1613	41614		Phase 3 Amps Minimum Demand	Read/Write
1614	41615	Meter 13	Phase 1 Amps Maximum Demand	Read/Write
1615	41616		Phase 2 Amps Maximum Demand	Read/Write
1616	41617		Phase 3 Amps Maximum Demand	Read/Write
1617	41618		Phase 1 Amps Minimum Demand	Read/Write
1618	41619		Phase 2 Amps Minimum Demand	Read/Write
1619	41620		Phase 3 Amps Minimum Demand	Read/Write
1620	41621	Meter 14	Phase 1 Amps Maximum Demand	Read/Write
1621	41622		Phase 2 Amps Maximum Demand	Read/Write
1622	41623		Phase 3 Amps Maximum Demand	Read/Write
1623	41624		Phase 1 Amps Minimum Demand	Read/Write
1624	41625		Phase 2 Amps Minimum Demand	Read/Write
1625	41626		Phase 3 Amps Minimum Demand	Read/Write
1626	41627	Meter 15	Phase 1 Amps Maximum Demand	Read/Write
1627	41628		Phase 2 Amps Maximum Demand	Read/Write
1628	41629		Phase 3 Amps Maximum Demand	Read/Write
1629	41630		Phase 1 Amps Minimum Demand	Read/Write
1630	41631		Phase 2 Amps Minimum Demand	Read/Write
1631	41632		Phase 3 Amps Minimum Demand	Read/Write
1632	41633	Meter 16	Phase 1 Amps Maximum Demand	Read/Write
1633	41634		Phase 2 Amps Maximum Demand	Read/Write
1634	41635		Phase 3 Amps Maximum Demand	Read/Write
1635	41636		Phase 1 Amps Minimum Demand	Read/Write
1636	41637		Phase 2 Amps Minimum Demand	Read/Write
1637	41638		Phase 3 Amps Minimum Demand	Read/Write
1638	41639	Meter 17	Phase 1 Amps Maximum Demand	Read/Write
1639	41640		Phase 2 Amps Maximum Demand	Read/Write
1640	41641		Phase 3 Amps Maximum Demand	Read/Write
1641	41642		Phase 1 Amps Minimum Demand	Read/Write
1642	41643		Phase 2 Amps Minimum Demand	Read/Write
1643	41644		Phase 3 Amps Minimum Demand	Read/Write
1644	41645	Meter 18	Phase 1 Amps Maximum Demand	Read/Write
1645	41646		Phase 2 Amps Maximum Demand	Read/Write
1646	41647		Phase 3 Amps Maximum Demand	Read/Write
1647	41648		Phase 1 Amps Minimum Demand	Read/Write
1648	41649		Phase 2 Amps Minimum Demand	Read/Write
1649	41650		Phase 3 Amps Minimum Demand	Read/Write

1650	41651		Phase 1 Amps Maximum Demand	Read/Write
1651	41652		Phase 2 Amps Maximum Demand	Read/Write
1652	41653	Meter 19	Phase 3 Amps Maximum Demand	Read/Write
1653	41654		Phase 1 Amps Minimum Demand	Read/Write
1654	41655		Phase 2 Amps Minimum Demand	Read/Write
1655	41656		Phase 3 Amps Minimum Demand	Read/Write
1656	41657		Phase 1 Amps Maximum Demand	Read/Write
1657	41658		Phase 2 Amps Maximum Demand	Read/Write
1658	41659	Meter 20	Phase 3 Amps Maximum Demand	Read/Write
1659	41660		Phase 1 Amps Minimum Demand	Read/Write
1660	41661		Phase 2 Amps Minimum Demand	Read/Write
1661	41662		Phase 3 Amps Minimum Demand	Read/Write

Notes:

Table 6 provides data amalgamated from all dual-Sub Metering Modules.

Demand registers require scaling as described in Section 7.4.2

8.6 Main Unit Table 7
Maximum/Minimum Power Demand

Data Address	Modbus Register	Meter	Data	Access
1792	41793		Phase 1 kW Demand Maximum	Read/Write
1793	41794		Phase 2 kW Demand Maximum	Read/Write
1794	41795		Phase 3 kW Demand Maximum	Read/Write
1795	41796		Phase 1 kW Demand Minimum	Read/Write
1796	41797		Phase 2 kW Demand Minimum	Read/Write
1797	41798	Meter 1	Phase 3 kW Demand Minimum	Read/Write
1798	41799		System kW Demand Maximum	Read/Write
1799	41800		System kW Demand Minimum	Read/Write
1800	41801		System kvar Demand Maximum	Read/Write
1801	41802		System kvar Demand Minimum	Read/Write
1802	41803		System kVA Demand Maximum	Read/Write
1803	41804		System kVA Demand Minimum	Read/Write
1804	41805		Phase 1 kW Demand Maximum	Read/Write
1805	41806		Phase 2 kW Demand Maximum	Read/Write
1806	41807		Phase 3 kW Demand Maximum	Read/Write
1807	41808		Phase 1 kW Demand Minimum	Read/Write
1808	41809		Phase 2 kW Demand Minimum	Read/Write
1809	41810	Meter 2	Phase 3 kW Demand Minimum	Read/Write
1810	41811		System kW Demand Maximum	Read/Write
1811	41812		System kW Demand Minimum	Read/Write
1812	41813		System kvar Demand Maximum	Read/Write
1813	41814		System kvar Demand Minimum	Read/Write
1814	41815		System kVA Demand Maximum	Read/Write
1815	41816		System kVA Demand Minimum	Read/Write
1816	41817		Phase 1 kW Demand Maximum	Read/Write
1817	41818		Phase 2 kW Demand Maximum	Read/Write
1818	41819		Phase 3 kW Demand Maximum	Read/Write
1819	41820		Phase 1 kW Demand Minimum	Read/Write
1820	41821		Phase 2 kW Demand Minimum	Read/Write
1821	41822	Meter 3	Phase 3 kW Demand Minimum	Read/Write
1822	41823		System kW Demand Maximum	Read/Write
1823	41824		System kW Demand Minimum	Read/Write
1824	41825		System kvar Demand Maximum	Read/Write
1825	41826		System kvar Demand Minimum	Read/Write
1826	41827		System kVA Demand Maximum	Read/Write
1827	41828		System kVA Demand Minimum	Read/Write
1828	41829		Phase 1 kW Demand Maximum	Read/Write
1829	41830		Phase 2 kW Demand Maximum	Read/Write
1830	41831		Phase 3 kW Demand Maximum	Read/Write
1831	41832		Phase 1 kW Demand Minimum	Read/Write
1832	41833		Phase 2 kW Demand Minimum	Read/Write
1833	41834		Phase 3 kW Demand Minimum	Read/Write
1834	41835	Meter 4	System kW Demand Maximum	Read/Write
1835	41836		System kW Demand Minimum	Read/Write
1836	41837		System kvar Demand Maximum	Read/Write
1837	41838		System kvar Demand Minimum	Read/Write
1838	41839		System kVA Demand Maximum	Read/Write
1839	41840		System kVA Demand Minimum	Read/Write
1840	41841		Phase 1 kW Demand Maximum	Read/Write
1841	41842		Phase 2 kW Demand Maximum	Read/Write
1842	41843		Phase 3 kW Demand Maximum	Read/Write
1843	41844		Phase 1 kW Demand Minimum	Read/Write
1844	41845		Phase 2 kW Demand Minimum	Read/Write
1845	41846		Phase 3 kW Demand Minimum	Read/Write
1846	41847	Meter 5	System kW Demand Maximum	Read/Write
1847	41848		System kW Demand Minimum	Read/Write
1848	41849		System kvar Demand Maximum	Read/Write
1849	41850		System kvar Demand Tinimum	Read/Write
1850	41851		System kVA Demand Maximum	Read/Write
1851	41852		System kVA Demand Minimum	Read/Write

1852	41853		Phase 1 kW Demand Maximum	Read/Write
1853	41854		Phase 2 kW Demand Maximum	Read/Write
1854	41855		Phase 3 kW Demand Maximum	Read/Write
1855	41856		Phase 1 kW Demand Minimum	Read/Write
1856	41857		Phase 2 kW Demand Minimum	Read/Write
1857	41858		Phase 3 kW Demand Minimum	Read/Write
1858	41859	Meter 6	System kW Demand Maximum	Read/Write
1859	41860		System kW Demand Minimum	Read/Write
1860	41861		System kvar Demand Maximum	Read/Write
1861	41862		System kvar Demand Minimum	Read/Write
1862	41863		System kVA Demand Maximum	Read/Write
1863	41864		System kVA Demand Minimum	Read/Write
1864	41865		Phase 1 kW Demand Maximum	Read/Write
1865	41866		Phase 2 kW Demand Maximum	Read/Write
1866	41867		Phase 3 kW Demand Maximum	Read/Write
1867	41868		Phase 1 kW Demand Minimum	Read/Write
1868	41869		Phase 2 kW Demand Minimum	Read/Write
1869	41870		Phase 3 kW Demand Minimum	Read/Write
1870	41871	Meter 7	System kW Demand Maximum	Read/Write
1871	41872		System kW Demand Minimum	Read/Write
1872	41873		System kvar Demand Maximum	Read/Write
1873	41874		System kvar Demand Minimum	Read/Write
1874	41875		System kVA Demand Maximum	Read/Write
1875	41876		System kVA Demand Minimum	Read/Write
1876	41877		Phase 1 kW Demand Maximum	Read/Write
1877	41878		Phase 2 kW Demand Maximum	Read/Write
1878	41879		Phase 3 kW Demand Maximum	Read/Write
1879	41880		Phase 1 kW Demand Minimum	Read/Write
1880	41881		Phase 2 kW Demand Minimum	Read/Write
1881	41882		Phase 3 kW Demand Minimum	Read/Write
1882	41883	Meter 8	System kW Demand Maximum	Read/Write
1883	41884		System kW Demand Minimum	Read/Write
1884	41885		System kvar Demand Maximum	Read/Write
1885	41886		System kvar Demand Minimum	Read/Write
1886	41887		System kVA Demand Maximum	Read/Write
1887	41888		System kVA Demand Minimum	Read/Write
1888	41889		Phase 1 kW Demand Maximum	Read/Write
1889	41890		Phase 2 kW Demand Maximum	Read/Write
1890	41891		Phase 3 kW Demand Maximum	Read/Write
1891	41892		Phase 1 kW Demand Minimum	Read/Write
1892	41893		Phase 2 kW Demand Minimum	Read/Write
1893	41894		Phase 3 kW Demand Minimum	Read/Write
1894	41895	Meter 9	System kW Demand Maximum	Read/Write
1895	41896		System kW Demand Minimum	Read/Write
1896	41897		System kvar Demand Maximum	Read/Write
1897	41898		System kvar Demand Minimum	Read/Write
1898	41899		System kVA Demand Maximum	Read/Write
1899	41900		System kVA Demand Minimum	Read/Write
1900	41901		Phase 1 kW Demand Maximum	Read/Write
1901	41902		Phase 2 kW Demand Maximum	Read/Write
1902	41903		Phase 3 kW Demand Maximum	Read/Write
1903	41904		Phase 1 kW Demand Minimum	Read/Write
1904	41905		Phase 2 kW Demand Minimum	Read/Write
1905	41906		Phase 3 kW Demand Minimum	Read/Write
1906	41907	Meter 10	System kW Demand Maximum	Read/Write
1907	41908		System kW Demand Minimum	Read/Write
1908	41909		System kvar Demand Maximum	Read/Write
1909	41910		System kvar Demand Minimum	Read/Write
1910	41911		System kVA Demand Maximum	Read/Write
1911	41912		System kVA Demand Minimum	Read/Write

1912	41913	Meter 11	Phase 1 kW Demand Maximum	Read/Write
1913	41914		Phase 2 kW Demand Maximum	Read/Write
1914	41915		Phase 3 kW Demand Maximum	Read/Write
1915	41916		Phase 1 kW Demand Minimum	Read/Write
1916	41917		Phase 2 kW Demand Minimum	Read/Write
1917	41918		Phase 3 kW Demand Minimum	Read/Write
1918	41919		System kW Demand Maximum	Read/Write
1919	41920		System kW Demand Minimum	Read/Write
1920	41921		System kvar Demand Maximum	Read/Write
1921	41922		System kvar Demand Minimum	Read/Write
1922	41923		System kVA Demand Maximum	Read/Write
1923	41924		System kVA Demand Minimum	Read/Write
1924	41925	Meter 12	Phase 1 kW Demand Maximum	Read/Write
1925	41926		Phase 2 kW Demand Maximum	Read/Write
1926	41927		Phase 3 kW Demand Maximum	Read/Write
1927	41928		Phase 1 kW Demand Minimum	Read/Write
1928	41929		Phase 2 kW Demand Minimum	Read/Write
1929	41930		Phase 3 kW Demand Minimum	Read/Write
1930	41931		System kW Demand Maximum	Read/Write
1931	41932		System kW Demand Minimum	Read/Write
1932	41933		System kvar Demand Maximum	Read/Write
1933	41934		System kvar Demand Minimum	Read/Write
1934	41935		System kVA Demand Maximum	Read/Write
1935	41936		System kVA Demand Minimum	Read/Write
1936	41937	Meter 13	Phase 1 kW Demand Maximum	Read/Write
1937	41938		Phase 2 kW Demand Maximum	Read/Write
1938	41939		Phase 3 kW Demand Maximum	Read/Write
1939	41940		Phase 1 kW Demand Minimum	Read/Write
1940	41941		Phase 2 kW Demand Minimum	Read/Write
1941	41942		Phase 3 kW Demand Minimum	Read/Write
1942	41943		System kW Demand Maximum	Read/Write
1943	41944		System kW Demand Minimum	Read/Write
1944	41945		System kvar Demand Maximum	Read/Write
1945	41946		System kvar Demand Minimum	Read/Write
1946	41947		System kVA Demand Maximum	Read/Write
1947	41948		System kVA Demand Minimum	Read/Write
1948	41949	Meter 14	Phase 1 kW Demand Maximum	Read/Write
1949	41950		Phase 2 kW Demand Maximum	Read/Write
1950	41951		Phase 3 kW Demand Maximum	Read/Write
1951	41952		Phase 1 kW Demand Minimum	Read/Write
1952	41953		Phase 2 kW Demand Minimum	Read/Write
1953	41954		Phase 3 kW Demand Minimum	Read/Write
1954	41955		System kW Demand Maximum	Read/Write
1955	41956		System kW Demand Minimum	Read/Write
1956	41957		System kvar Demand Maximum	Read/Write
1957	41958		System kvar Demand Minimum	Read/Write
1958	41959		System kVA Demand Maximum	Read/Write
1959	41960		System kVA Demand Minimum	Read/Write
1960	41961	Meter 15	Phase 1 kW Demand Maximum	Read/Write
1961	41962		Phase 2 kW Demand Maximum	Read/Write
1962	41963		Phase 3 kW Demand Maximum	Read/Write
1963	41964		Phase 1 kW Demand Minimum	Read/Write
1964	41965		Phase 2 kW Demand Minimum	Read/Write
1965	41966		Phase 3 kW Demand Minimum	Read/Write
1966	41967		System kW Demand Maximum	Read/Write
1967	41968		System kW Demand Minimum	Read/Write
1968	41969		System kvar Demand Maximum	Read/Write
1969	41970		System kvar Demand Minimum	Read/Write
1970	41971		System kVA Demand Maximum	Read/Write
1971	41972		System kVA Demand Minimum	Read/Write

1972	41973	Meter 16	Phase 1 kW Demand Maximum	Read/Write
1973	41974		Phase 2 kW Demand Maximum	Read/Write
1974	41975		Phase 3 kW Demand Maximum	Read/Write
1975	41976		Phase 1 kW Demand Minimum	Read/Write
1976	41977		Phase 2 kW Demand Minimum	Read/Write
1977	41978		Phase 3 kW Demand Minimum	Read/Write
1978	41979		System kW Demand Maximum	Read/Write
1979	41980		System kW Demand Minimum	Read/Write
1980	41981		System kvar Demand Maximum	Read/Write
1981	41982		System kvar Demand Minimum	Read/Write
1982	41983		System kVA Demand Maximum	Read/Write
1983	41984		System kVA Demand Minimum	Read/Write
1984	41985	Meter 17	Phase 1 kW Demand Maximum	Read/Write
1985	41986		Phase 2 kW Demand Maximum	Read/Write
1986	41987		Phase 3 kW Demand Maximum	Read/Write
1987	41988		Phase 1 kW Demand Minimum	Read/Write
1988	41989		Phase 2 kW Demand Minimum	Read/Write
1989	41990		Phase 3 kW Demand Minimum	Read/Write
1990	41991		System kW Demand Maximum	Read/Write
1991	41992		System kW Demand Minimum	Read/Write
1992	41993		System kvar Demand Maximum	Read/Write
1993	41994		System kvar Demand Minimum	Read/Write
1994	41995		System kVA Demand Maximum	Read/Write
1995	41996		System kVA Demand Minimum	Read/Write
1996	41997	Meter 18	Phase 1 kW Demand Maximum	Read/Write
1997	41998		Phase 2 kW Demand Maximum	Read/Write
1998	41999		Phase 3 kW Demand Maximum	Read/Write
1999	42000		Phase 1 kW Demand Minimum	Read/Write
2000	42001		Phase 2 kW Demand Minimum	Read/Write
2001	42002		Phase 3 kW Demand Minimum	Read/Write
2002	42003		System kW Demand Maximum	Read/Write
2003	42004		System kW Demand Minimum	Read/Write
2004	42005		System kvar Demand Maximum	Read/Write
2005	42006		System kvar Demand Minimum	Read/Write
2006	42007		System kVA Demand Maximum	Read/Write
2007	42008		System kVA Demand Minimum	Read/Write
2008	42009	Meter 19	Phase 1 kW Demand Maximum	Read/Write
2009	42010		Phase 2 kW Demand Maximum	Read/Write
2010	42011		Phase 3 kW Demand Maximum	Read/Write
2011	42012		Phase 1 kW Demand Minimum	Read/Write
2012	42013		Phase 2 kW Demand Minimum	Read/Write
2013	42014		Phase 3 kW Demand Minimum	Read/Write
2014	42015		System kW Demand Maximum	Read/Write
2015	42016		System kW Demand Minimum	Read/Write
2016	42017		System kvar Demand Maximum	Read/Write
2017	42018		System kvar Demand Minimum	Read/Write
2018	42019		System kVA Demand Maximum	Read/Write
2019	42020		System kVA Demand Minimum	Read/Write
2020	42021	Meter 20	Phase 1 kW Demand Maximum	Read/Write
2021	42022		Phase 2 kW Demand Maximum	Read/Write
2022	42023		Phase 3 kW Demand Maximum	Read/Write
2023	42024		Phase 1 kW Demand Minimum	Read/Write
2024	42025		Phase 2 kW Demand Minimum	Read/Write
2025	42026		Phase 3 kW Demand Minimum	Read/Write
2026	42027		System kW Demand Maximum	Read/Write
2027	42028		System kW Demand Minimum	Read/Write
2028	42029		System kvar Demand Maximum	Read/Write
2029	42030		System kvar Demand Minimum	Read/Write
2030	42031		System kVA Demand Maximum	Read/Write
2031	42032		System kVA Demand Minimum	Read/Write

Notes:

Table 7 provides data amalgamated from all Sub-Metering Modules.

Meters configured as single phase meters will return zero for 3-Phase demand values.

Demand registers require scaling as described in Section 7.4.2

8.7   Main Unit Table 9
Dual Source Energy (kWh) Registers

It is possible to separate kWh consumed into two registers for each load, dependant on a Modbus switch setting. This allows kWh energy fed from two sources (eg from the power utility and from local generation) to be accumulated and logged independently. This feature is enabled/disabled and setup in the following Modbus data table.

Data Address	Modbus Register	Data	Access
2304	42305	Enable Dual Source kWh Registers Feature (1=Enable , 0=Disable)	Read/Write
2305	42306	Power Source 0 = Source 1 (Eg utility power) 1 = Source 2 (eg Generator power) 2 = Use Conditional Control Result (2306) to select Source 1/Source 2 accumulation	Read/Write
2306	42307	Conditional Control Result (0 or 1)	Read Only
2307	42308	Conditional Control Module ID	Read/Write
2308	42309	Conditional Control Register Address	Read/Write
2309	42310	Conditional Control Current Register Value	Read Only
2310	42311	Conditional Control Limit Type. 0=Over Limit, 1=Under Limit	Read/Write
2311	42312	Conditional Control Upper Limit Register Value	Read/Write
2312	42313	Conditional Control Lower Limit Register Value	Read/Write
2313	42314	Dual Source Logging Enabled Year	Read Only
2314	42315	Dual Source Logging Enabled Month	Read Only
2315	42316	Dual Source Logging Enabled Day	Read Only
2316	42317	Dual Source Logging Enabled Hour	Read Only
2317	42318	Dual Source Logging Enabled Minute	Read Only
2318	42319	Dual Source Logging Enabled Second	Read Only
2319	42320	Seconds Generator Power Logged High	Read Only
2320	42321	Seconds Generator Power Logged Low	Read Only

WARNING !

Enabling/Disabling the Generated Load feature causes the accumulated energy registers to reset to zero.

Notes:

i.   Enable Generated Load Feature

This setting turns the Dual Source kWh feature ON/OFF for all the measured loads.
When this feature is ON it is not possible to measure export kWh/kvarh.
When this feature is enabled 3 Parameters are logged for each load (Ref Section 8.11).

ii.   Power Source

By setting this value over Modbus, the user informs the **multicube** which source is currently being used for power supply.

0 = Power from source 1 (eg utility).
1 = Power from source 2 (eg local generation).

If a setting of 2 is used in this register then the source is determined by the value held in register 2306 which is, in-turn, derived from the conditional control data (below).

iii.   Conditional Control Data

Registers 2306 to 2312 may be used to switch kWh energy accumulation source registers dependant on any measured or input parameter in any slave module.

For example this feature may be used to trigger measurement of generated load when the current measured in Phase 1 of Slave ID 3 rises above 120.0Amps and then to return to measurement of utility load when the current falls below 110.0A:

iv.   *Date & Time Dual Source Enabled*

Registers 2313 to 2318 store the date and time that the dual source logging was last enabled. At this time all energy registers and the generator second counter were all set to zero.

v.   *Number of Seconds Power From Generator Logged*

Registers 2319 and 2320 show the number of seconds the power read from the meters has been assigned to the generator logs since dual source logging was last enabled.

Example:

Data Address	Modbus Register	Data	Value
2304	42305	Enable Dual Source kWh Registers Feature (1=Enabled)	1
2305	42306	Power Source (2 = Use 42307 Control Result Value to select power source)	2
2306	42307	Conditional Control Result (0 or 1 dependant on current measured and control settings)	0 or 1
2307	42308	Conditional Control Module ID (Slave ID = 3)	3
2308	42309	Conditional Control Register Address(Register Address of Phase 1 Amps)	2822
2309	42310	Conditional Control Current Register Value (0-9999 = 0.0-999.9Amps)	0-9999
2310	42311	Conditional Control Limit Type. 0=Trigger when over preset level	1
2311	42312	Conditional Control Upper Limit Register Value (Trigger generated load measurement when current rises above 120.0A)	1200
2312	42313	Conditional Control Lower Limit Register Value (Trigger utility load measurement when current falls below 110.0A)	1100

8.8   Main Display Unit Table 10
3-Phase Dual Source Energy Registers

Data Address	Modbus Register	Meter	Data	Access
2560	42561	Meter 1	System kWh Source 1 High Word	Read/Write
2561	42562		System kWh Source 1 Low Word	
2562	42563		System kWh Source 2 High Word	Read/Write
2563	42564		System kWh Source 2 Low Word	
2564	42565	Meter 2	System kWh Source 1 High Word	Read/Write
2565	42566		System kWh Source 1 Low Word	
2566	42567		System kWh Source 2 High Word	Read/Write
2567	42568		System kWh Source 2 Low Word	
2568	42569	Meter 3	System kWh Source 1 High Word	Read/Write
2569	42570		System kWh Source 1 Low Word	
2570	42571		System kWh Source 2 High Word	Read/Write
2571	42572		System kWh Source 2 Low Word	
2572	42573	Meter 4	System kWh Source 1 High Word	Read/Write
2573	42574		System kWh Source 1 Low Word	
2574	42575		System kWh Source 2 High Word	Read/Write
2575	42576		System kWh Source 2 Low Word	
2576	42577	Meter 5	System kWh Source 1 High Word	Read/Write
2577	42578		System kWh Source 1 Low Word	
2578	42579		System kWh Source 2 High Word	Read/Write
2579	42580		System kWh Source 2 Low Word	
2580	42581	Meter 6	System kWh Source 1 High Word	Read/Write
2581	42582		System kWh Source 1 Low Word	
2582	42583		System kWh Source 2 High Word	Read/Write
2583	42584		System kWh Source 2 Low Word	
2584	42585	Meter 7	System kWh Source 1 High Word	Read/Write
2585	42586		System kWh Source 1 Low Word	
2586	42587		System kWh Source 2 High Word	Read/Write
2587	42588		System kWh Source 2 Low Word	
2588	42589	Meter 8	System kWh Source 1 High Word	Read/Write
2589	42590		System kWh Source 1 Low Word	
2590	42591		System kWh Source 2 High Word	Read/Write
2591	42592		System kWh Source 2 Low Word	
2592	42593	Meter 9	System kWh Source 1 High Word	Read/Write
2593	42594		System kWh Source 1 Low Word	
2594	42595		System kWh Source 2 High Word	Read/Write
2595	42596		System kWh Source 2 Low Word	
2596	42597	Meter 10	System kWh Source 1 High Word	Read/Write
2597	42598		System kWh Source 1 Low Word	
2598	42599		System kWh Source 2 High Word	Read/Write
2599	42600		System kWh Source 2 Low Word	
2600	42601	Meter 11	System kWh Source 1 High Word	Read/Write
2601	42602		System kWh Source 1 Low Word	
2602	42603		System kWh Source 2 High Word	Read/Write
2603	42604		System kWh Source 2 Low Word	
2604	42605	Meter 12	System kWh Source 1 High Word	Read/Write
2605	42606		System kWh Source 1 Low Word	
2606	42607		System kWh Source 2 High Word	Read/Write
2607	42608		System kWh Source 2 Low Word	

2608	42609	Meter 13	System kWh Source 1 High Word	Read/Write
2609	42610		System kWh Source 1 Low Word	
2610	42611		System kWh Source 2 High Word	Read/Write
2611	42612		System kWh Source 2 Low Word	
2612	42613	Meter 14	System kWh Source 1 High Word	Read/Write
2613	42614		System kWh Source 1 Low Word	
2614	42615		System kWh Source 2 High Word	Read/Write
2615	42616		System kWh Source 2 Low Word	
2616	42617	Meter 15	System kWh Source 1 High Word	Read/Write
2617	42618		System kWh Source 1 Low Word	
2618	42619		System kWh Source 2 High Word	Read/Write
2619	42620		System kWh Source 2 Low Word	
2620	42621	Meter 16	System kWh Source 1 High Word	Read/Write
2621	42622		System kWh Source 1 Low Word	
2622	42623		System kWh Source 2 High Word	Read/Write
2623	42624		System kWh Source 2 Low Word	
2624	42625	Meter 17	System kWh Source 1 High Word	Read/Write
2625	42626		System kWh Source 1 Low Word	
2626	42627		System kWh Source 2 High Word	Read/Write
2627	42628		System kWh Source 2 Low Word	
2628	42629	Meter 18	System kWh Source 1 High Word	Read/Write
2629	42630		System kWh Source 1 Low Word	
2630	42631		System kWh Source 2 High Word	Read/Write
2631	42632		System kWh Source 2 Low Word	
2632	42633	Meter 19	System kWh Source 1 High Word	Read/Write
2633	42634		System kWh Source 1 Low Word	
2634	42635		System kWh Source 2 High Word	Read/Write
2635	42636		System kWh Source 2 Low Word	
2636	42637	Meter 20	System kWh Source 1 High Word	Read/Write
2637	42638		System kWh Source 1 Low Word	
2638	42639		System kWh Source 2 High Word	Read/Write
2639	42640		System kWh Source 2 Low Word	

Notes:

Table 1 provides data amalgamated from all Dual-Sub Metering Modules configured to measure 3-Phase electricity.
Meters configured as single phase meters will return zero for 3-Phase energy values.
Energy registers require scaling as described in Section 7.4.1

8.9 Main Unit Table 11
Single Phase Dual Energy Registers

Data Address	Modbus Register	Meter	Data	Access
2816	42817		Source 1 - Phase 1 kWh High Word	Read/Write
2817	42818		Source 1 - Phase 1 kWh Low Word	
2818	42819		Source 1 - Phase 2 kWh High Word	Read/Write
2819	42820		Source 1 - Phase 2 kWh Low Word	
2820	42821	Meter 1	Source 1 - Phase 3 kWh High Word	Read/Write
2821	42822	Meter 1a	Source 1 - Phase 3 kWh Low Word	
2822	42823	Meter 1b	Source 2 - Phase 1 kWh High Word	Read/Write
2823	42824		Source 2 - Phase 1 kWh Low Word	
2824	42825		Source 2 - Phase 2 kWh High Word	Read/Write
2825	42826		Source 2 - Phase 2 kWh Low Word	
2826	42827		Source 2 - Phase 3 kWh High Word	Read/Write
2827	42828		Source 2 - Phase 3 kWh Low Word	
2828	42829		Source 1 - Phase 1 kWh High Word	Read/Write
2829	42830		Source 1 - Phase 1 kWh Low Word	
2830	42831		Source 1 - Phase 2 kWh High Word	Read/Write
2831	42832		Source 1 - Phase 2 kWh Low Word	
2832	42833	Meter 2	Source 1 - Phase 3 kWh High Word	Read/Write
2833	42834	Meter 2a	Source 1 - Phase 3 kWh Low Word	
2834	42835	Meter 2b	Source 2 - Phase 1 kWh High Word	Read/Write
2835	42836		Source 2 - Phase 1 kWh Low Word	
2836	42837		Source 2 - Phase 2 kWh High Word	Read/Write
2837	42838		Source 2 - Phase 2 kWh Low Word	
2838	42839		Source 2 - Phase 3 kWh High Word	Read/Write
2839	42840		Source 2 - Phase 3 kWh Low Word	
2840	42841		Source 1 - Phase 1 kWh High Word	Read/Write
2841	42842		Source 1 - Phase 1 kWh Low Word	
2842	42843		Source 1 - Phase 2 kWh High Word	Read/Write
2843	42844		Source 1 - Phase 2 kWh Low Word	
2844	42845	Meter 3	Source 1 - Phase 3 kWh High Word	Read/Write
2845	42846	Meter 3a	Source 1 - Phase 3 kWh Low Word	
2846	42847	Meter 3b	Source 2 - Phase 1 kWh High Word	Read/Write
2847	42848		Source 2 - Phase 1 kWh Low Word	
2848	42849		Source 2 - Phase 2 kWh High Word	Read/Write
2849	42850		Source 2 - Phase 2 kWh Low Word	
2850	42851		Source 2 - Phase 3 kWh High Word	Read/Write
2851	42852		Source 2 - Phase 3 kWh Low Word	
2852	42853		Source 1 - Phase 1 kWh High Word	Read/Write
2853	42854		Source 1 - Phase 1 kWh Low Word	
2854	42855		Source 1 - Phase 2 kWh High Word	Read/Write
2855	42856		Source 1 - Phase 2 kWh Low Word	
2856	42857	Meter 4	Source 1 - Phase 3 kWh High Word	Read/Write
2857	42858	Meter 4a	Source 1 - Phase 3 kWh Low Word	
2858	42859	Meter 4b	Source 2 - Phase 1 kWh High Word	Read/Write
2859	42860		Source 2 - Phase 1 kWh Low Word	
2860	42861		Source 2 - Phase 2 kWh High Word	Read/Write
2861	42862		Source 2 - Phase 2 kWh Low Word	
2862	42863		Source 2 - Phase 3 kWh High Word	Read/Write
2863	42864		Source 2 - Phase 3 kWh Low Word	
2864	42865		Source 1 - Phase 1 kWh High Word	Read/Write
2865	42866		Source 1 - Phase 1 kWh Low Word	
2866	42867		Source 1 - Phase 2 kWh High Word	Read/Write
2867	42868		Source 1 - Phase 2 kWh Low Word	
2868	42869	Meter 5	Source 1 - Phase 3 kWh High Word	Read/Write
2869	42870	Meter 5a	Source 1 - Phase 3 kWh Low Word	
2870	42871	Meter 5b	Source 2 - Phase 1 kWh High Word	Read/Write
2871	42872		Source 2 - Phase 1 kWh Low Word	
2872	42873		Source 2 - Phase 2 kWh High Word	Read/Write
2873	42874		Source 2 - Phase 2 kWh Low Word	
2874	42875		Source 2 - Phase 3 kWh High Word	Read/Write
2875	42876		Source 2 - Phase 3 kWh Low Word	

2876	42877		Source 1 - Phase 1 kWh High Word	Read/Write
2877	42878		Source 1 - Phase 1 kWh Low Word	
2878	42879		Source 1 - Phase 2 kWh High Word	Read/Write
2879	42880		Source 1 - Phase 2 kWh Low Word	
2880	42881	Meter 6	Source 1 - Phase 3 kWh High Word	Read/Write
2881	42882	Meter 6a	Source 1 - Phase 3 kWh Low Word	
2882	42883	Meter 6b	Source 2 - Phase 1 kWh High Word	Read/Write
2883	42884		Source 2 - Phase 1 kWh Low Word	
2884	42885		Source 2 - Phase 2 kWh High Word	Read/Write
2885	42886		Source 2 - Phase 2 kWh Low Word	
2886	42887		Source 2 - Phase 3 kWh High Word	Read/Write
2887	42888		Source 2 - Phase 3 kWh Low Word	
2888	42889		Source 1 - Phase 1 kWh High Word	Read/Write
2889	42890		Source 1 - Phase 1 kWh Low Word	
2890	42891		Source 1 - Phase 2 kWh High Word	Read/Write
2891	42892		Source 1 - Phase 2 kWh Low Word	
2892	42893	Meter 7	Source 1 - Phase 3 kWh High Word	Read/Write
2893	42894	Meter 7a	Source 1 - Phase 3 kWh Low Word	
2894	42895	Meter 7b	Source 2 - Phase 1 kWh High Word	Read/Write
2895	42896		Source 2 - Phase 1 kWh Low Word	
2896	42897		Source 2 - Phase 2 kWh High Word	Read/Write
2897	42898		Source 2 - Phase 2 kWh Low Word	
2898	42899		Source 2 - Phase 3 kWh High Word	Read/Write
2899	42900		Source 2 - Phase 3 kWh Low Word	
2900	42901		Source 1 - Phase 1 kWh High Word	Read/Write
2901	42902		Source 1 - Phase 1 kWh Low Word	
2902	42903		Source 1 - Phase 2 kWh High Word	Read/Write
2903	42904		Source 1 - Phase 2 kWh Low Word	
2904	42905	Meter 8	Source 1 - Phase 3 kWh High Word	Read/Write
2905	42906	Meter 8a	Source 1 - Phase 3 kWh Low Word	
2906	42907	Meter 8b	Source 2 - Phase 1 kWh High Word	Read/Write
2907	42908		Source 2 - Phase 1 kWh Low Word	
2908	42909		Source 2 - Phase 2 kWh High Word	Read/Write
2909	42910		Source 2 - Phase 2 kWh Low Word	
2910	42911		Source 2 - Phase 3 kWh High Word	Read/Write
2911	42912		Source 2 - Phase 3 kWh Low Word	
2912	42913		Source 1 - Phase 1 kWh High Word	Read/Write
2913	42914		Source 1 - Phase 1 kWh Low Word	
2914	42915		Source 1 - Phase 2 kWh High Word	Read/Write
2915	42916		Source 1 - Phase 2 kWh Low Word	
2916	42917	Meter 9	Source 1 - Phase 3 kWh High Word	Read/Write
2917	42918	Meter 9a	Source 1 - Phase 3 kWh Low Word	
2918	42919	Meter 9b	Source 2 - Phase 1 kWh High Word	Read/Write
2919	42920		Source 2 - Phase 1 kWh Low Word	
2920	42921		Source 2 - Phase 2 kWh High Word	Read/Write
2921	42922		Source 2 - Phase 2 kWh Low Word	
2922	42923		Source 2 - Phase 3 kWh High Word	Read/Write
2923	42924		Source 2 - Phase 3 kWh Low Word	
2924	42925		Source 1 - Phase 1 kWh High Word	Read/Write
2925	42926		Source 1 - Phase 1 kWh Low Word	
2926	42927		Source 1 - Phase 2 kWh High Word	Read/Write
2927	42928		Source 1 - Phase 2 kWh Low Word	
2928	42929	Meter 10	Source 1 - Phase 3 kWh High Word	Read/Write
2929	42930	Meter 10a	Source 1 - Phase 3 kWh Low Word	
2930	42931	Meter 10b	Source 2 - Phase 1 kWh High Word	Read/Write
2931	42932		Source 2 - Phase 1 kWh Low Word	
2932	42933		Source 2 - Phase 2 kWh High Word	Read/Write
2933	42934		Source 2 - Phase 2 kWh Low Word	
2934	42935		Source 2 - Phase 3 kWh High Word	Read/Write
2935	42936		Source 2 - Phase 3 kWh Low Word	

2936	42937		Source 1 - Phase 1 kWh High Word	Read/Write
2937	42938		Source 1 - Phase 1 kWh Low Word	
2938	42939		Source 1 - Phase 2 kWh High Word	Read/Write
2939	42940		Source 1 - Phase 2 kWh Low Word	
2940	42941		Source 1 - Phase 3 kWh High Word	Read/Write
2941	42942	Meter 11	Source 1 - Phase 3 kWh Low Word	
2942	42943	Meter 11a	Source 2 - Phase 1 kWh High Word	Read/Write
2943	42944	Meter 11b	Source 2 - Phase 1 kWh Low Word	
2944	42945		Source 2 - Phase 2 kWh High Word	Read/Write
2945	42946		Source 2 - Phase 2 kWh Low Word	
2946	42947		Source 2 - Phase 3 kWh High Word	Read/Write
2947	42948		Source 2 - Phase 3 kWh Low Word	
2948	42949		Source 1 - Phase 1 kWh High Word	Read/Write
2949	42950		Source 1 - Phase 1 kWh Low Word	
2950	42951		Source 1 - Phase 2 kWh High Word	Read/Write
2951	42952		Source 1 - Phase 2 kWh Low Word	
2952	42953		Source 1 - Phase 3 kWh High Word	Read/Write
2953	42954	Meter 12	Source 1 - Phase 3 kWh Low Word	
2954	42955	Meter 12a	Source 2 - Phase 1 kWh High Word	Read/Write
2955	42956	Meter 12b	Source 2 - Phase 1 kWh Low Word	
2956	42957		Source 2 - Phase 2 kWh High Word	Read/Write
2957	42958		Source 2 - Phase 2 kWh Low Word	
2958	42959		Source 2 - Phase 3 kWh High Word	Read/Write
2959	42960		Source 2 - Phase 3 kWh Low Word	
2960	42961		Source 1 - Phase 1 kWh High Word	Read/Write
2961	42962		Source 1 - Phase 1 kWh Low Word	
2962	42963		Source 1 - Phase 2 kWh High Word	Read/Write
2963	42964		Source 1 - Phase 2 kWh Low Word	
2964	42965		Source 1 - Phase 3 kWh High Word	Read/Write
2965	42966	Meter 13	Source 1 - Phase 3 kWh Low Word	
2966	42967	Meter 13a	Source 2 - Phase 1 kWh High Word	Read/Write
2967	42968	Meter 13b	Source 2 - Phase 1 kWh Low Word	
2968	42969		Source 2 - Phase 2 kWh High Word	Read/Write
2969	42970		Source 2 - Phase 2 kWh Low Word	
2970	42971		Source 2 - Phase 3 kWh High Word	Read/Write
2971	42972		Source 2 - Phase 3 kWh Low Word	
2972	42973		Source 1 - Phase 1 kWh High Word	Read/Write
2973	42974		Source 1 - Phase 1 kWh Low Word	
2974	42975		Source 1 - Phase 2 kWh High Word	Read/Write
2975	42976		Source 1 - Phase 2 kWh Low Word	
2976	42977		Source 1 - Phase 3 kWh High Word	Read/Write
2977	42978	Meter 14	Source 1 - Phase 3 kWh Low Word	
2978	42979	Meter 14a	Source 2 - Phase 1 kWh High Word	Read/Write
2979	42980	Meter 14b	Source 2 - Phase 1 kWh Low Word	
2980	42981		Source 2 - Phase 2 kWh High Word	Read/Write
2981	42982		Source 2 - Phase 2 kWh Low Word	
2982	42983		Source 2 - Phase 3 kWh High Word	Read/Write
2983	42984		Source 2 - Phase 3 kWh Low Word	
2984	42985		Source 1 - Phase 1 kWh High Word	Read/Write
2985	42986		Source 1 - Phase 1 kWh Low Word	
2986	42987		Source 1 - Phase 2 kWh High Word	Read/Write
2987	42988		Source 1 - Phase 2 kWh Low Word	
2988	42989		Source 1 - Phase 3 kWh High Word	Read/Write
2989	42990	Meter 15	Source 1 - Phase 3 kWh Low Word	
2990	42991	Meter 15a	Source 2 - Phase 1 kWh High Word	Read/Write
2991	42992	Meter 15b	Source 2 - Phase 1 kWh Low Word	
2992	42993		Source 2 - Phase 2 kWh High Word	Read/Write
2993	42994		Source 2 - Phase 2 kWh Low Word	
2994	42995		Source 2 - Phase 3 kWh High Word	Read/Write
2995	42996		Source 2 - Phase 3 kWh Low Word	

Main Display Unit Data Tables

2996	42997		Source 1 - Phase 1 kWh High Word	Read/Write
2997	42998		Source 1 - Phase 1 kWh Low Word	
2998	42999		Source 1 - Phase 2 kWh High Word	Read/Write
2999	43000		Source 1 - Phase 2 kWh Low Word	
3000	43001	Meter 16	Source 1 - Phase 3 kWh High Word	Read/Write
3001	43002	Meter 16a	Source 1 - Phase 3 kWh Low Word	
3002	43003	Meter 16b	Source 2 - Phase 1 kWh High Word	Read/Write
3003	43004		Source 2 - Phase 1 kWh Low Word	
3004	43005		Source 2 - Phase 2 kWh High Word	Read/Write
3005	43006		Source 2 - Phase 2 kWh Low Word	
3006	43007		Source 2 - Phase 3 kWh High Word	Read/Write
3007	43008		Source 2 - Phase 3 kWh Low Word	
3008	43009		Source 1 - Phase 1 kWh High Word	Read/Write
3009	43010		Source 1 - Phase 1 kWh Low Word	
3010	43011		Source 1 - Phase 2 kWh High Word	Read/Write
3011	43012		Source 1 - Phase 2 kWh Low Word	
3012	43013	Meter 17	Source 1 - Phase 3 kWh High Word	Read/Write
3013	43014	Meter 17a	Source 1 - Phase 3 kWh Low Word	
3014	43015	Meter 17b	Source 2 - Phase 1 kWh High Word	Read/Write
3015	43016		Source 2 - Phase 1 kWh Low Word	
3016	43017		Source 2 - Phase 2 kWh High Word	Read/Write
3017	43018		Source 2 - Phase 2 kWh Low Word	
3018	43019		Source 2 - Phase 3 kWh High Word	Read/Write
3019	43020		Source 2 - Phase 3 kWh Low Word	
3020	43021		Source 1 - Phase 1 kWh High Word	Read/Write
3021	43022		Source 1 - Phase 1 kWh Low Word	
3022	43023		Source 1 - Phase 2 kWh High Word	Read/Write
3023	43024		Source 1 - Phase 2 kWh Low Word	
3024	43025	Meter 18	Source 1 - Phase 3 kWh High Word	Read/Write
3025	43026	Meter 18a	Source 1 - Phase 3 kWh Low Word	
3026	43027	Meter 18b	Source 2 - Phase 1 kWh High Word	Read/Write
3027	43028		Source 2 - Phase 1 kWh Low Word	
3028	43029		Source 2 - Phase 2 kWh High Word	Read/Write
3029	43030		Source 2 - Phase 2 kWh Low Word	
3030	43031		Source 2 - Phase 3 kWh High Word	Read/Write
3031	43032		Source 2 - Phase 3 kWh Low Word	
3032	43033		Source 1 - Phase 1 kWh High Word	Read/Write
3033	43034		Source 1 - Phase 1 kWh Low Word	
3034	43035		Source 1 - Phase 2 kWh High Word	Read/Write
3035	43036		Source 1 - Phase 2 kWh Low Word	
3036	43037	Meter 19	Source 1 - Phase 3 kWh High Word	Read/Write
3037	43038	Meter 19a	Source 1 - Phase 3 kWh Low Word	
3038	43039	Meter 19b	Source 2 - Phase 1 kWh High Word	Read/Write
3039	43040		Source 2 - Phase 1 kWh Low Word	
3040	43041		Source 2 - Phase 2 kWh High Word	Read/Write
3041	43042		Source 2 - Phase 2 kWh Low Word	
3042	43043		Source 2 - Phase 3 kWh High Word	Read/Write
3043	43044		Source 2 - Phase 3 kWh Low Word	
3044	43045		Source 1 - Phase 1 kWh High Word	Read/Write
3045	43046		Source 1 - Phase 1 kWh Low Word	
3046	43047		Source 1 - Phase 2 kWh High Word	Read/Write
3047	43048		Source 1 - Phase 2 kWh Low Word	
3048	43049	Meter 20	Source 1 - Phase 3 kWh High Word	Read/Write
3049	43050	Meter 20a	Source 1 - Phase 3 kWh Low Word	
3050	43051	Meter 20b	Source 2 - Phase 1 kWh High Word	Read/Write
3051	43052		Source 2 - Phase 1 kWh Low Word	
3052	43053		Source 2 - Phase 2 kWh High Word	Read/Write
3053	43054		Source 2 - Phase 2 kWh Low Word	
3054	43055		Source 2 - Phase 3 kWh High Word	Read/Write
3055	43056		Source 2 - Phase 3 kWh Low Word	

Notes:

Table 11 provides data amalgamated from all Dual Sub-Metering Modules configured to measure 1-Phase electricity.

Meters configured as 3-phase meters will return zero for single phase energy values.

Energy registers require scaling as described in Section 7.4.1

8.10 Main Unit Table 30
Main Unit Configuration

Data Address	Modbus Register	Data	Access
7680	47681	Main Unit Name ASCII Characters 1-2	Read/Write
7681	47682	Main Unit Name ASCII Characters 3-4	Read/Write
7682	47683	Main Unit Name ASCII Characters 5-6	Read/Write
7683	47684	Main Unit Name ASCII Characters 7-8	Read/Write
7684	47685	Main Unit Name ASCII Characters 9-10	Read/Write
7685	47686	Main Unit Name ASCII Characters 11-12	Read/Write
7686	47687	Main Unit Name ASCII Characters 13-14	Read/Write
7687	47688	Real Time Clock Year (eg 10 = 2010)	Read/Write
7688	47689	Real Time Clock Month (1= January)	Read/Write
7689	47690	Real Time Clock Day (1 -> 31)	Read/Write
7690	47691	Real Time Clock Hour	Read/Write
7691	47692	Real Time Clock Minute	Read/Write
7692	47693	Real Time Clock Second	Read/Write
7693	47694	Real Time Clock Date Format (0=dd/mm/yy, 1=mm/dd/yy)	Read/Write
7694	47695	Real Time Clock Week Start Day (Default =1) (1=Mon, 2=Tue etc) (Note 1)	Read/Write
7695	47696	Real Time Clock Day of week (1=Mon, 2=Tue etc)	Read Only
7696	47697	Modbus Address (Main Unit) Range 1-200	Read Only
7697	47698	Modbus Baud Rate / 100 (e.g. 96 = 9600): 96, 144, 192, 384, 560, 576 or 1152.	Read/Write
7698	47699	Modbus Parity Setting. 0 = no parity, 1 = odd, 2 = even,	Read/Write
7699	47700	Nominal Voltage (Range 60 – 600)	Read Only
7700	47701	System Voltage (PT primary) Range 10 to 55,000	Read/Write
7701	47702	Voltage Demand Period Phase 1 (x10 i.e. 1=10 Seconds, 2=20 seconds etc) Range 1-360	Read/Write
7702	47703	Voltage Demand Period Phase 2 (x10 i.e. 1=10 Seconds, 2=20 seconds etc) Range 1-360	Read/Write
7703	47704	Voltage Demand Period Phase 3 (x10 i.e. 1=10 Seconds, 2=20 seconds etc) Range 1-360	Read/Write
7704	47705	Number of Slave Modules (Range 1-20)	Read Only
7705	47706	Slave Types, each bit set to make corresponding meter single phase (High word)	Read/Write
7706	47707	Slave Types each bit set to make corresponding meter single phase (Low Word)	Read/Write
7707	47708	Password 1 (Range 0 to 9999)	Read/Write
7708	47709	Password 2 (Range 0 to 9999)	Read/Write
7709	47710	Backlight OFF Delay in seconds (0-3600)	Read/Write
7710	47711	Serial No. High word	Read Only
7711	47712	Serial No. Low word	Read Only
7712	47713	Custom CT Primary 5 - 25,000 Amps	Read/Write
7713	47714	Custom CT Phase correction ±10 = ±1.0 degrees (Range -30 to 30)	Read/Write
7714	47715	Custom CT Secondary 33,333 = 0.33333V (Range 30,000 to 36,666)	Read/Write
7715	47716	Custom CT Multiplier 1-100 (Range 1 to 20)	Read/Write

Notes:
Week Start Day: Determines which day of the week (Monday to Friday) is considered as the first day.

8.11 Main Display Unit - Table 34
Logger Setup/Status

Data Address	Modbus Register	Data	Access
8704	48705	Log Period (minutes) = 15, 20 or 30 (note 1)	Read/Write
8705	48706	Daylight Saving OPERATION 0=OFF, 1=ON	Read/Write
8706	48707	Daylight Saving FORCE 0=NO, 1=YES, 2=AUTO (Use DS Dates)	Read/Write
8707	48708	Daylight Saving STATE 0=NO SAVING TODAY , 1=SAVING TODAY	Read Only
8708	48709	Daylight Saving Start on Day of Week after Date (1=Monday, 7=Sunday)	Read/Write
8709	48710	Daylight Saving Start Date Day (Day of Month 1-31)	Read/Write
8710	48711	Daylight Saving Start Date Month (1=January)	Read/Write
8711	48712	Not Used (Returns 0)	Read/Write
8712	48713	Daylight Saving End on Day of Week after Date (1=Monday, 7=Sunday)	Read/Write
8713	48714	Daylight Saving End Date Day (Day of Month 1-31)	Read/Write
8714	48715	Daylight Saving End Date Month (1=January)	Read/Write
8715	48716	Not Used (Returns 0)	Read/Write
8716	48717	Number of Parameters to Log (2 for MC352) (note 1) (note 2)	Read/Write
8717	48718	Parameter 1 Code = 1 for standard **multicube** (kWh logged) (note 1)	Read/Write
8718	48719	Parameter 2 Code = 2 for standard **multicube** (kvarh logged) (note 1)	Read/Write
8719	48720	Parameter 3 Code = 0 for standard **multicube** (Not Logged) (note 1) (note 2)	Read/Write
8720	48721	Parameter 4 Code = 0 for standard **multicube** (Not Logged) (note 1)	Read/Write
8721	48722	Parameter 5 Code = 0 for standard **multicube** (Not Logged) (note 1)	Read/Write
8722	48723	Parameter 6 Code = 0 for standard **multicube** (Not Logged) (note 1)	Read/Write
8723	48724	Parameter 7 Code = 0 for standard **multicube** (Not Logged) (note 1)	Read/Write
8724	48725	Parameter 8 Code = 0 for standard **multicube** (Not Logged) (note 1)	Read/Write
8725	48726	Not Used Returns 0	Read Only
8726	48727		
8727	48728		
8728	48729		
8729	48730		
8730	48731		
8731	48732		
8732	48733		
8733	48734		
8734	48735		
8735	48736		
8736	48737	Maximum Number of Logger Days (Depends on number of loads)	Read Only
8737	48738	Number of loads being logged	Read Only
8738	48739	Number of metering modules being logged	Read Only
8739	48740	Number of parameters being logged per load (=2 for standard **multicube**)	Read Only
8740	48741	Memory Status (0=Not Full, 1=Overwriting Old Data)	Read Only
8741	48742	Days Since Log Start (0-65536 complete days stored)	Read Only
8742	48743	Lowest Logger Index	Read Only
8743	48744	Highest Logger Index	Read Only
8744	48745	Earliest Date Stored DAY(Day of Month 1-31)	Read Only
8745	48746	Earliest Date Stored MONTH (1=January)	Read Only
8746	48747	Earliest Date Stored YEAR (10 =2010)	Read Only
8747	48748	Latest Date Stored DAY(Day of Month 1-31)	Read Only
8748	48749	Latest Date Stored MONTH (1=January)	Read Only
8749	48750	Latest Date Stored YEAR (10 =2010)	Read Only
8750	48751	Logger Status (0=Running, 1=Stopped)	Read Only
8751	48752	Logger Start/Stop Enable (0=Default, 176=Enable)	Read/Write
8752	48753	Logger Start/Stop Command (Must be enabled in 48752)	Read/Write

Notes:

1. Some parameters cannot be written when the logger is running and a Modbus exception response is used to indicate this.

2. If the Dual Source Energy feature is enabled then 3 parameters are logged per load
   Parameter 1=Source 1 kWh;   Parameter2=kvarh;   Parameter3=Source2 kWh.

8.11.1 Daylight Saving

In some countries the local time is advanced by 1 hour for part of the year, decided by local government, to extend useful daylight hours.

The Daylight Saving System in the data logger does not affect the raw data stored but provides a method of recording whether daylight saving was applicable for each day. A Flag is recorded with the energy data to indicate days when Daylight Saving was applicable.

If the Daylight Saving system is used this allows historic data from the logger to be time-stamped with/without daylight saving applied.

- *Daylight Saving OPERATION (Register 48706)*
  - *OFF (0) The Daylight Saving Flag is recorded as 0 on all days*
  - *ON (1)   The Daylight Saving System Is Enabled (see below for flag settings)*
- *Daylight Saving FORCE (Register 48707)*
  - *NO (0)   Daylight Saving Flag will be recorded as 0 with today's logged data*
  - *YES (1) The Daylight Saving Flag will be recorded as 1 with today's logged data*
  - *AUTO (2)   The Daylight Saving Flag will be recorded as 1 during the PRESET DATES and as zero on all other days.*
- *Daylight Saving STATE (Read Register 48708)*
  - *NO SAVE (0)   Daylight saving is not APPLICABLE TODAY*
  - *SAVE (1)   Daylight Saving is APPLICABLE TODAY*

NOTES:

If OPERATION is set to OFF (0) then Daylight Saving STATE will always be read as 0.

If Daylight Saving FORCE is set to AUTO (and OPERATION is set to ON (1)) then Daylight Saving STATE will be read as 1 during the time of year including the Dates set in registers 48709-48716.

If Daylight saving Day of Week >0 then this delays setting/resetting the daylight Saving Flag until the next Day of Week specified after the Start/End Date. For example if Day of Week is set to 7 = Sunday and the date is set to 25th March then daylight saving flag will always be set from the Last Sunday in March (Next Sunday after 25th May).

8.11.2 Logger Start/Stop

A command sequence via Modbus may be sent to Start/Stop the logger.

To Start the Logger:

i.   Ensure the logger is Stopped by reading the Logger Status (48751) and check the value is 1.

ii.   Enable the Logger Start Command by sending 176 (0xB0) to 48752

iii. Start the logger by sending the Start Command 85 (0x55) to 48753
      The Enable Register is reset to 0 after the Start Command is received.
      If the logger is already running, the Start command does not make any changes and logging is not restarted. To restart the logging, send a Stop command first, then a new Start command.

To Stop the Logger:

i.   Ensure the logger is Running by reading the Logger Status (48751) and check the value is 0.

ii.   Enable the Logger Stop Command by sending 176 (0xB0) to 48752

iii. Stop the logger by sending the Stop Command 86 (0x56) to 48753
      The Enable Register is reset to 0 after the Stop Command is received.
      If the logger is already stopped the Stop command does not make any changes.

8.12 Main Display Unit - Tables 35/36
Reading Logged Data

Logged Data is stored in '**Day Files'** which each contain a single Day worth of data for a single Parameter from a Single Measured Load. For example a **Day File** may contain the 30 Minute kWh Profile for the Office Lighting (connected to Phase 2 of Module 3) on 20th January 2010.

Each **Day File** contains some summary data for the day recorded and up to 96 Period Energy Values (15 minute periods).

In order to access a **Day File** for a particular Load it is necessary to first load a **Day File Request** data into Modbus Table 35 as follows:

8.12.1 Day File Request

Data Address	Modbus Register	Data	Access
8960	48961	Logged Date DAY (1-31)	Read/Write
8961	48962	Logged Date MONTH (1-12. 1=January, 12=December)	Read/Write
8962	48963	Logged Date YEAR (10 = 2010 etc)	Read/Write
8963	48964	Logged Day File Index (1-65535)	Read/Write
8964	48965	Meter Number (1-20)	Read/Write
8965	48966	Load Number (0=3 Phase, 1=Ph1, 2=Ph2, 3=Ph3)	Read/Write
8966	48967	Parameter Number (1=kWh, 2=kvarh, 3=Source 2 kWh ref Section 8.7)	Read/Write
8967	48968	Apply Daylight Saving (0=DO NOT APPLY SAVING, 1=APPLY SAVING)	Read/Write
8968	48969	Search Type (0=By Date, 1=By Index)	Read/Write
8969	48970	Auto Increment	Read/Write
8970	48971	Requested Data Valid	Read Only

Notes:

i. Logged Day File Index

Every Day File has an index number starting at 1 for the 1st complete logged day and incrementing for each stored day. The index number is not incremented on missing days.

ii. Search Type (48969)

0: Use **Logged Date (48961-48963)** in Day File Request to search for Day Data Table

1: Use **Logged Day Index (48964)** in Day File Request to search for Day Data Table

iii. Auto Increment (48970)

0: No Auto Increment

1: After each successful read of the Day File Data Table, automatically increment the **Logged Date (48961-48963)** by 1 day and the **Logged Day Index (48964)** by 1.

2: After each successful read of the Day File Data Table, automatically decrement the **Logged Date (48961-48963)** by 1 day and the **Logged Day Index (48964)** by 1.

Auto Increment provides a means of reading sequential **Day File** data from the logger by entering a start date or index and performing repeated reads of the **Day File** data table.

When searching by date the automatically incrementing by calendar day may point to missing data resulting in invalid data being requested. This may result in an exception response (see below).

When searching by Logged **Day File Index**, auto increment will point to the next/previous stored day, skipping over missing days with no exception response (except where Index = 0). All successfully logged days are thus sequentially returned.

iv. *Manual Checking of Day Request Data (Register 48971)*

When the *Requested Data Valid Register (48971)* is read the data in the request Table is checked for errors and the Logger is checked to see if valid data is available for the selected date. This register may be used to manually check for errors in the request Table before attempting to read the *Day Data File* Table thus avoiding Exception responses. If the data being requested is valid the Modbus *Day Data Table* is loaded ready to read.

Requested Data Valid Register (48971)	
Value	**Meaning**
0	Data in the requested table has changed (used internally for automatic checking)
1	Data is Valid
2	The date format is incorrect
3	The Meter number is unavailable
4	The Load number is not available for this meter
5	The Parameter type is not available for this meter
6	No data is available for the requested Date.

v. *Automatic Checking of Day Request Data*

When any register in the *Day Data File* Table is read using Modbus, the *Requested Data Valid Register (48971)* is first checked.

Requested Data Valid Register (48971)	
Value	**Result**
0	Validate the Day Request Data and update register 48971. If new Valid Status = 1 Then Load Day Data into Modbus Table Then reply to Modbus data request Else If new valid status > 1 Send exception response as below.
1	Reply to Modbus data request
2	exception code: Illegal data address (2)
3	exception code: Illegal data address (2)
4	exception code: Illegal data address (2)
5	exception code: Illegal data address (2)
6	exception code: Illegal data address (2)

Note: When searching by Date the Day Page Index is not checked.
When searching by Day page Index the Logged Dates are not checked.

8.12.2 Day Data File

First set the values in the *Day File Request Table.* Then read the *Day Data File* which will return the actual profile energy data for the requested load as follows:

Data Address	Modbus Register	Data	Access
9216	49217	Number of Days After Logger Start Date	Read Only
9217	49218	Logged Date DAY (1-31)	Read Only
9218	49219	Logged Date MONTH (1-12. 1=January, 12=December)	Read Only
9219	49220	Logged Date YEAR (10 = 2010 etc)	Read Only
9220	49221	Logged Day File Index (0-65535)	Read Only
9221	49222	Meter Number (1-20)	Read Only
9222	49223	Load Number (0=3 Phase, 1=Ph1, 2=Ph2, 3=Ph3)	Read Only
9223	49224	Energy Scaling Factor	Read Only
9224	49225	Parameter Number (1=kWh, 2=kvarh, 3=Source 2 kWh ref Section 8.7)	Read Only
9225	49226	Number of Logs Per Day	Read Only
9226	49227	Module Type	Read Only
9227	49228	Daylight Saving Flag (Ref 8.11.1)	Read Only
9228	49229	Total Register Value at Day Start	Read Only
9229	49230		
9230	49231	Accumulated Energy During Period -4	Read Only
9231	49232	Accumulated Energy During Period -3	Read Only
9232	49233	Accumulated Energy During Period -2	Read Only
9233	49234	Accumulated Energy During Period -1	Read Only
9234	49235	Accumulated Energy During Period 1	Read Only
9235	49236	Accumulated Energy During Period 2	Read Only
9236	49237	Accumulated Energy During Period 3	Read Only
9237	49238	Accumulated Energy During Period 4	Read Only
⋮	⋮	⋮	⋮
9328	49329	Accumulated Energy During Period 95	Read Only
9329	49330	Accumulated Energy During Period 96	Read Only
9330	49331	Tariff Period 1 End Time (0-96)	
9331	49332	Tariff Period 2 End Time (0-96)	
9332	49333	Tariff Period 3 End Time (0-96)	
9333	49334	Tariff Period 4 End Time (0-96)	
9334	49335	Tariff Period 5 End Time (0-96)	
9335	49336	Tariff Period 6 End Time (0-96)	
9336	49337	Tariff Period 7 End Time (0-96)	
9337	49338	Tariff Period 8 End Time (0-96)	
9338	49339	Period 1 Tariff Number (0-8)	
9339	49340	Period 2 Tariff Number (0-8)	
9340	49341	Period 3 Tariff Number (0-8)	
9341	49342	Period 4 Tariff Number (0-8)	
9342	49343	Period 5 Tariff Number (0-8)	
9343	49344	Period 6 Tariff Number (0-8)	
9344	49345	Period 7 Tariff Number (0-8)	
9345	49346	Period 8 Tariff Number (0-8)	
9346	49347	Tariff 1 Value	
9347	49348	Tariff 2 Value	
9348	49349	Tariff 3 Value	
9349	49350	Tariff 4 Value	
9350	49351	Tariff 5 Value	
9351	49352	Tariff 6 Value	
9352	49353	Tariff 7 Value	
9353	49354	Tariff 8 Value	

9354	49355	Tariff 1 Register Value at Day Start	Read Only
9355	49356		
9356	49357	Tariff 2 Register Value at Day Start	Read Only
9357	49358		
9358	49359	Tariff 3 Register Value at Day Start	Read Only
9359	49360		
9360	49361	Tariff 4 Register Value at Day Start	Read Only
9361	49362		
9362	49363	Tariff 5 Register Value at Day Start	Read Only
9363	49364		
9364	49365	Tariff 6 Register Value at Day Start	Read Only
9365	49366		
9366	49367	Tariff 7 Register Value at Day Start	Read Only
9367	49368		
9368	49369	Tariff 8 Register Value at Day Start	Read Only
9369	49370		

Notes:

i. *Day Information*

   a. **Number of Days after Logger Start Date**
   This can be used to check that recorded data is continuous with no missing days.

   b. **Logged Day File Index**
   A sequential Index number is associated with each Day File which provides consecutive numbering from the first logged day (1,2….65000) regardless of the date the data was recorded.

ii. *Load Information*

   a. **Meter Number**
   Each Modular Meter is numbered depending on it's installed position. An MC352 contains two Modular Meters as described in Section **Error! Reference source not found.**.

   b. **Load Number**
   Modular Meter configured as 1x3-Phase Meter: Load Number = 0
   Modular Meter configured as 3x Single Phase meters: Load Number = 1-3.

iii. *Daylight Saving*

   If the Day File Request Table has *Apply Daylight Saving (48968) = 1,* then the Day Data File registers are shifted automatically by 1hr to match local clocks adjusted to take daylight saving into account. This only occurs on days when the Daylight Saving Flag was recorded as 1 (Ref 8.11.1).

   If the Day File Request Table has *Apply Daylight Saving (48968) = 1,* then Accumulated energy Periods -1 to -4 will Return 0.

   Note: With daylight saving applied, 1hr of data will be lost on the day the local clocks are moved back to normal time.

iv. *Period Register Values*

   When the logger is setup the user selects either 15, 20 or 30 minute time periods for each energy log. The energy accumulated during each of these time periods is provided in the Modbus Data Table as a single unsigned 16 bit number.

   Period 1 is the first period of the day starting at 00:00.

   Period 2 starts 1 time period later etc.

   When the File Request Table has *Apply Daylight Saving (48968) = 0* then Period -1 is the last period of the previous day, Period -2 is the period before this etc. Thus 25 hours are stored each day allowing user external software to retrospectively apply daylight saving to the data. Accumulated data requested earlier than 1 hour before Period 1 is returned as 0.

8.13 Energy Tariffs

The kWh and kvarh energy measured during preset tariff periods is accumulated in up to 8 separate sets of "**Energy Tariff Registers**".

8.13.1 Tariff Values

Up to 8 Tariffs may be programmed. Each Tariff is 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.

8.13.2 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

Tariff 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

8.13.3 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

8.13.4 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 Two 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.

8.13.5 Table 37 Tariff Structures

Table 37 details the current Tariff settings being used in the meter.

Data Address	Modbus Register	Data	Access
9472	49473	Day Type 1 End Period 1 (0-96)	Read Only
9473	49474	Day Type 1 End Period 2 (0-96)	Read Only
9474	49475	Day Type 1 End Period 3 (0-96)	Read Only
9475	49476	Day Type 1 End Period 4 (0-96)	Read Only
9476	49477	Day Type 1 End Period 5 (0-96)	Read Only
9477	49478	Day Type 1 End Period 6 (0-96)	Read Only
9478	49479	Day Type 1 End Period 7 (0-96)	Read Only
9479	49480	Day Type 1 End Period 8 (0-96)	Read Only
9480	49481	Day Type 1 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9481	49482	Day Type 1 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9482	49483	Day Type 1 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9483	49484	Day Type 1 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9484	49485	Day Type 1 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9485	49486	Day Type 1 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9486	49487	Day Type 1 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9487	49488	Day Type 1 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9488	49489	Day Type 2 End Period 1 (0-96)	Read Only
9489	49490	Day Type 2 End Period 2 (0-96)	Read Only
9490	49491	Day Type 2 End Period 3 (0-96)	Read Only
9491	49492	Day Type 2 End Period 4 (0-96)	Read Only
9492	49493	Day Type 2 End Period 5 (0-96)	Read Only
9493	49494	Day Type 2 End Period 6 (0-96)	Read Only
9494	49495	Day Type 2 End Period 7 (0-96)	Read Only
9495	49496	Day Type 2 End Period 8 (0-96)	Read Only
9496	49497	Day Type 2 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9497	49498	Day Type 2 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9498	49499	Day Type 2 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9499	49500	Day Type 2 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9500	49501	Day Type 2 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9501	49502	Day Type 2 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9502	49503	Day Type 2 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9503	49504	Day Type 2 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9504	49505	Day Type 3 End Period 1 (0-96)	Read Only
9505	49506	Day Type 3 End Period 2 (0-96)	Read Only
9506	49507	Day Type 3 End Period 3 (0-96)	Read Only
9507	49508	Day Type 3 End Period 4 (0-96)	Read Only
9508	49509	Day Type 3 End Period 5 (0-96)	Read Only
9509	49510	Day Type 3 End Period 6 (0-96)	Read Only
9510	49511	Day Type 3 End Period 7 (0-96)	Read Only
9511	49512	Day Type 3 End Period 8 (0-96)	Read Only
9512	49513	Day Type 3 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9513	49514	Day Type 3 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9514	49515	Day Type 3 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9515	49516	Day Type 3 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9516	49517	Day Type 3 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9517	49518	Day Type 3 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9518	49519	Day Type 3 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9519	49520	Day Type 3 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9520	49521	Day Type 4 End Period 1 (0-96)	Read Only
9521	49522	Day Type 4 End Period 2 (0-96)	Read Only
9522	49523	Day Type 4 End Period 3 (0-96)	Read Only
9523	49524	Day Type 4 End Period 4 (0-96)	Read Only
9524	49525	Day Type 4 End Period 5 (0-96)	Read Only
9525	49526	Day Type 4 End Period 6 (0-96)	Read Only
9526	49527	Day Type 4 End Period 7 (0-96)	Read Only
9527	49528	Day Type 4 End Period 8 (0-96)	Read Only
9528	49529	Day Type 4 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9529	49530	Day Type 4 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9530	49531	Day Type 4 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9531	49532	Day Type 4 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9532	49533	Day Type 4 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9533	49534	Day Type 4 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9534	49535	Day Type 4 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9535	49536	Day Type 4 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only

9536	49537	Day Type 5 End Period 1 (0-96)	Read Only
9537	49538	Day Type 5 End Period 2 (0-96)	Read Only
9538	49539	Day Type 5 End Period 3 (0-96)	Read Only
9539	49540	Day Type 5 End Period 4 (0-96)	Read Only
9540	49541	Day Type 5 End Period 5 (0-96)	Read Only
9541	49542	Day Type 5 End Period 6 (0-96)	Read Only
9542	49543	Day Type 5 End Period 7 (0-96)	Read Only
9543	49544	Day Type 5 End Period 8 (0-96)	Read Only
9544	49545	Day Type 5 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9545	49546	Day Type 5 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9546	49547	Day Type 5 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9547	49548	Day Type 5 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9548	49549	Day Type 5 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9549	49550	Day Type 5 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9550	49551	Day Type 5 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9551	49552	Day Type 5 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9552	49553	Day Type 6 End Period 1 (0-96)	Read Only
9553	49554	Day Type 6 End Period 2 (0-96)	Read Only
9554	49555	Day Type 6 End Period 3 (0-96)	Read Only
9555	49556	Day Type 6 End Period 4 (0-96)	Read Only
9556	49557	Day Type 6 End Period 5 (0-96)	Read Only
9557	49558	Day Type 6 End Period 6 (0-96)	Read Only
9558	49559	Day Type 6 End Period 7 (0-96)	Read Only
9559	49560	Day Type 6 End Period 8 (0-96)	Read Only
9560	49561	Day Type 6 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9561	49562	Day Type 6 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9562	49563	Day Type 6 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9563	49564	Day Type 6 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9564	49565	Day Type 6 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9565	49566	Day Type 6 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9566	49567	Day Type 6 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9567	49568	Day Type 6 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9568	49569	Day Type 7 End Period 1 (0-96)	Read Only
9569	49570	Day Type 7 End Period 2 (0-96)	Read Only
9570	49571	Day Type 7 End Period 3 (0-96)	Read Only
9571	49572	Day Type 7 End Period 4 (0-96)	Read Only
9572	49573	Day Type 7 End Period 5 (0-96)	Read Only
9573	49574	Day Type 7 End Period 6 (0-96)	Read Only
9574	49575	Day Type 7 End Period 7 (0-96)	Read Only
9575	49576	Day Type 7 End Period 8 (0-96)	Read Only
9576	49577	Day Type 7 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9577	49578	Day Type 7 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9578	49579	Day Type 7 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9579	49580	Day Type 7 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9580	49581	Day Type 7 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9581	49582	Day Type 7 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9582	49583	Day Type 7 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9583	49584	Day Type 7 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9584	49585	Day Type 8 End Period 1 (0-96)	Read Only
9585	49586	Day Type 8 End Period 2 (0-96)	Read Only
9586	49587	Day Type 8 End Period 3 (0-96)	Read Only
9587	49588	Day Type 8 End Period 4 (0-96)	Read Only
9588	49589	Day Type 8 End Period 5 (0-96)	Read Only
9589	49590	Day Type 8 End Period 6 (0-96)	Read Only
9590	49591	Day Type 8 End Period 7 (0-96)	Read Only
9591	49592	Day Type 8 End Period 8 (0-96)	Read Only
9592	49593	Day Type 8 End Period 1 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9593	49594	Day Type 8 End Period 2 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9594	49595	Day Type 8 End Period 3 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9595	49596	Day Type 8 End Period 4 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9596	49597	Day Type 8 End Period 5 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9597	49598	Day Type 8 End Period 6 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9598	49599	Day Type 8 End Period 7 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9599	49600	Day Type 8 End Period 8 Tariff, 0=Unassigned, 1-8=T1-T8	Read Only
9600	49601	Week Type 1 Monday Day Type (0-8) (0=Unassigned)	Read Only
9601	49602	Week Type 1 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9602	49603	Week Type 1 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9603	49604	Week Type 1 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9604	49605	Week Type 1 Friday Day Type (0-8) (0=Unassigned)	Read Only
9605	49606	Week Type 1 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9606	49607	Week Type 1 Sunday Day Type (0-8) (0=Unassigned)	Read Only

9607	49608	Week Type 2 Monday Day Type (0-8) (0=Unassigned)	Read Only
9608	49609	Week Type 2 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9609	49610	Week Type 2 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9610	49611	Week Type 2 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9611	49612	Week Type 2 Friday Day Type (0-8) (0=Unassigned)	Read Only
9612	49613	Week Type 2 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9613	49614	Week Type 2 Sunday Day Type (0-8) (0=Unassigned)	Read Only
9614	49615	Week Type 3 Monday Day Type (0-8) (0=Unassigned)	Read Only
9615	49616	Week Type 3 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9616	49617	Week Type 3 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9617	49618	Week Type 3 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9618	49619	Week Type 3 Friday Day Type (0-8) (0=Unassigned)	Read Only
9619	49620	Week Type 3 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9620	49621	Week Type 3 Sunday Day Type (0-8) (0=Unassigned)	Read Only
9621	49622	Week Type 4 Monday Day Type (0-8) (0=Unassigned)	Read Only
9622	49623	Week Type 4 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9623	49624	Week Type 4 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9624	49625	Week Type 4 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9625	49626	Week Type 4 Friday Day Type (0-8) (0=Unassigned)	Read Only
9626	49627	Week Type 4 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9627	49628	Week Type 4 Sunday Day Type (0-8) (0=Unassigned)	Read Only
9628	49629	Week Type 5 Monday Day Type (0-8) (0=Unassigned)	Read Only
9629	49630	Week Type 5 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9630	49631	Week Type 5 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9631	49632	Week Type 5 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9632	49633	Week Type 5 Friday Day Type (0-8) (0=Unassigned)	Read Only
9633	49634	Week Type 5 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9634	49635	Week Type 5 Sunday Day Type (0-8) (0=Unassigned)	Read Only
9635	49636	Week Type 6 Monday Day Type (0-8) (0=Unassigned)	Read Only
9636	49637	Week Type 6 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9637	49638	Week Type 6 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9638	49639	Week Type 6 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9639	49640	Week Type 6 Friday Day Type (0-8) (0=Unassigned)	Read Only
9640	49641	Week Type 6 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9641	49642	Week Type 6 Sunday Day Type (0-8) (0=Unassigned)	Read Only
9642	49643	Week Type 7 Monday Day Type (0-8) (0=Unassigned)	Read Only
9643	49644	Week Type 7 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9644	49645	Week Type 7 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9645	49646	Week Type 7 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9646	49647	Week Type 7 Friday Day Type (0-8) (0=Unassigned)	Read Only
9647	49648	Week Type 7 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9648	49649	Week Type 7 Sunday Day Type (0-8) (0=Unassigned)	Read Only
9649	49650	Week Type 8 Monday Day Type (0-8) (0=Unassigned)	Read Only
9650	49651	Week Type 8 Tuesday Day Type (0-8) (0=Unassigned)	Read Only
9651	49652	Week Type 8 Wednesday Day Type (0-8) (0=Unassigned)	Read Only
9652	49653	Week Type 8 Thursday Day Type (0-8) (0=Unassigned)	Read Only
9653	49654	Week Type 8 Friday Day Type (0-8) (0=Unassigned)	Read Only
9654	49655	Week Type 8 Saturday Day Type (0-8) (0=Unassigned)	Read Only
9655	49656	Week Type 8 Sunday Day Type (0-8) (0=Unassigned)	Read Only
9656	49657	Season Type 1 – Start Date Day (1 - 31)	Read Only
9657	49658	Season Type 1 – Start Date Month (1 - 12, 1=January)	Read Only
9658	49659	Season Type 1 – End Day (1 - 31)	Read Only
9659	49660	Season Type 1 – End Month (1 - 12, 1=January)	Read Only
9660	49661	Season Type 1 – Associated Week Type (0-8) 0=Unassigned	Read Only
9661	49662	Season Type 2 – Start Date Day (1 - 31)	Read Only
9662	49663	Season Type 2 – Start Date Month (1 - 12, 1=January)	Read Only
9663	49664	Season Type 2 – End Day (1 - 31)	Read Only
9664	49665	Season Type 2 – End Month (1 - 12, 1=January)	Read Only
9665	49666	Season Type 2 – Associated Week Type (0-8) 0=Unassigned	Read Only
9666	49667	Season Type 3 – Start Date Day (1 - 31)	Read Only
9667	49668	Season Type 3 – Start Date Month (1 - 12, 1=January)	Read Only
9668	49669	Season Type 3 – End Day (1 - 31)	Read Only
9669	49670	Season Type 3 – End Month (1 - 12, 1=January)	Read Only
9670	49671	Season Type 3 – Associated Week Type (0-8) 0=Unassigned	Read Only
9671	49672	Season Type 4 – Start Date Day (1 - 31)	Read Only
9672	49673	Season Type 4 – Start Date Month (1 - 12, 1=January)	Read Only
9673	49674	Season Type 4 – End Day (1 - 31)	Read Only
9674	49675	Season Type 4 – End Month (1 - 12, 1=January)	Read Only
9675	49676	Season Type 4 – Associated Week Type (0-8) 0=Unassigned	Read Only

9676	49677	Season Type 5 – Start Date Day (1 - 31)	Read Only
9677	49678	Season Type 5 – Start Date Month (1 - 12, 1=January)	Read Only
9678	49679	Season Type 5 – End Day (1 - 31)	Read Only
9679	49680	Season Type 5 – End Month (1 - 12, 1=January)	Read Only
9680	49681	Season Type 5 – Associated Week Type (0-8) 0=Unassigned	Read Only
9681	49682	Season Type 6 – Start Date Day (1 - 31)	Read Only
9682	49683	Season Type 6 – Start Date Month (1 - 12, 1=January)	Read Only
9683	49684	Season Type 6 – End Day (1 - 31)	Read Only
9684	49685	Season Type 6 – End Month (1 - 12, 1=January)	Read Only
9685	49686	Season Type 6 – Associated Week Type (0-8) 0=Unassigned	Read Only
9686	49687	Season Type 7 – Start Date Day (1 - 31)	Read Only
9687	49688	Season Type 7 – Start Date Month (1 - 12, 1=January)	Read Only
9688	49689	Season Type 7 – End Day (1 - 31)	Read Only
9689	49690	Season Type 7 – End Month (1 - 12, 1=January)	Read Only
9690	49691	Season Type 7 – Associated Week Type (0-8) 0=Unassigned	Read Only
9691	49692	Season Type 8 – Start Date Day (1 - 31)	Read Only
9692	49693	Season Type 8 – Start Date Month (1 - 12, 1=January)	Read Only
9693	49694	Season Type 8 – End Day (1 - 31)	Read Only
9694	49695	Season Type 8 – End Month (1 - 12, 1=January)	Read Only
9695	49696	Season Type 8 – Associated Week Type (0-8) 0=Unassigned	Read Only

Notes:

Tariff values are written to the Day Data File at the end of the current day.

8.13.6   Setting Energy Tariffs

To avoid errors in programming Tariff structures, new settings are inserted into Modbus "Forms" which may be checked and verified by the **multicube** before copying the values to the tariff structure in the logger configuration database.

8.13.7 Day Types (Day1 – Day 8)
Table 37 (Offset 224)

Day Types are entered in the following Modbus Form:

Data Address	Modbus Register	Data	Access
9696	49697	End of Day Type Period 1 (Number log of periods past 00:00)	Read/Write
9697	49698	End of Day Type Period 2 (Number log of periods past 00:00)	Read/Write
9698	49699	End of Day Type Period 3 (Number log of periods past 00:00)	Read/Write
9699	49700	End of Day Type Period 4 (Number log of periods past 00:00)	Read/Write
9700	49701	End of Day Type Period 5 (Number log of periods past 00:00)	Read/Write
9701	49702	End of Day Type Period 6 (Number log of periods past 00:00)	Read/Write
9702	49703	End of Day Type Period 7 (Number log of periods past 00:00)	Read/Write
9703	49704	End of Day Type Period 8 (Number log of periods past 00:00)	Read/Write
9704	49705	Tariff Number for Day Type Period 1, 0=Unassigned, 1-8=T1-T8	Read/Write
9705	49706	Tariff Number for Day Type Period 2, 0=Unassigned, 1-8=T1-T8	Read/Write
9706	49707	Tariff Number for Day Type Period 3, 0=Unassigned, 1-8=T1-T8	Read/Write
9707	49708	Tariff Number for Day Type Period 4, 0=Unassigned, 1-8=T1-T8	Read/Write
9708	49709	Tariff Number for Day Type Period 5, 0=Unassigned, 1-8=T1-T8	Read/Write
9709	49710	Tariff Number for Day Type Period 6, 0=Unassigned, 1-8=T1-T8	Read/Write
9710	49711	Tariff Number for Day Type Period 7, 0=Unassigned, 1-8=T1-T8	Read/Write
9711	49712	Tariff Number for Day Type Period 8, 0=Unassigned, 1-8=T1-T8	Read/Write
9712	49713	Copy Data to Day Type Number (1-8)	Read/Write
9713	49714	Day Type Data Valid (0=Incorrect data, 1=Valid Data)	Read Only

End of Day Type Periods

Up to 8 periods are defined by setting the Log Period number that corresponds to the end of the time period. The period number corresponding to a certain time of day is calculated from the number of periods per hour as :

Day Type End Period Number = Hours Past 00:00 x Log Periods Per hour

Time	Day Type End Period Number		Time	Day Type End Period Number	
	Log Period=15 min	Log Period=30min		Log Period=15 min	Log Period=30min
00:00h	0	0	12:30h	50	25
00:30h	2	1	13:00h	52	26
01:00h	4	2	13:30h	54	27
01:30h	6	3	14:00h	56	28
02:00h	8	4	14:30h	58	29
02:30h	10	5	15:00h	60	30
03:00h	12	6	15:30h	62	31
03:30h	14	7	16:00h	64	32
04:00h	16	8	16:30h	66	33
04:30h	18	9	17:00h	68	34
05:00h	20	10	17:30h	70	35
05:30h	22	11	18:00h	72	36
06:00h	24	12	18:30h	74	37
06:30h	26	13	19:00h	76	38
07:00h	28	14	19:30h	78	39
07:30h	30	15	20:00h	80	40
08:00h	32	16	20:30h	82	41
08:30h	34	17	21:00h	84	42
09:00h	36	18	21:30h	86	43
09:30h	38	19	22:00h	88	44
10:00h	40	20	22:30h	90	45
10:30h	42	21	23:00h	92	46
11:00h	44	22	23:30h	94	47
11:30h	46	23	24:00h	96	48
12:00h	48	24			

Notes:

For unassigned Day Type Periods the user must enter the maximum log period value
(eg Enter 48 in End of Day Type Period 6,7 and 8 for 30 minute logging, if only 5 periods are assigned)

Example: Day Type 1 with 4 Tariff Periods and a Logging Period of 30 Minutes

Tariff Day Type 1		
Tariff Period 1	00:00 – 07:00	Day Type End Period 1 = 14
Tariff Period 2	07:00 – 15:30	Day Type End Period 2 = 31
Tariff Period 3	15:30 – 19:00	Day Type End Period 3 = 38
Tariff Period 4	19:00 – 24:00	Day Type End Period 4 = 48

Day Type Data Rules

Data values entered in the Day Type Data Form must follow certain rules to be considered valid.

- Day Type End Period must be less than the number of logged periods in a 24 Hour Day which depends on the number of periods per hour as:

Log Period	Log Periods/Hour	Log Periods/Day
15 min	4	96
20 min	3	72
30 min	2	48

- Each Day Type End Period must be later than the end period of the previous one (ie Period 2 must be later than Period 1 etc).

- Tariff Numbers must be less than or equal to 8 (0 is unassigned)

Checking Form Values

After completing the Modbus Form it is possible to check if the data is valid by reading the Day Type Valid register (49714).

Saving a Day Type

If the data is valid it may be copied to a one of the Day Types in the meter for future use by writing the Day Type number (1-8) to the **Copy Data to Day Type Number** register 49713. When this register is written the form is first validated then, either it is copied to the selected Day Type, or an Exception Response is returned.

8.13.8   Week Types (Week Type 1 – Week Type 8)
Table 37 (Offset 242)

Week Types are entered in the following Modbus Form:

Data Address	Modbus Register	Data	Access
9714	49715	Week Type Monday Day Type (0-8) (0=Unassigned)	Read/Write
9715	49716	Week Type Tuesday Day Type (0-8) (0=Unassigned)	Read/Write
9716	49717	Week Type Wednesday Day Type (0-8) (0=Unassigned)	Read/Write
9717	49718	Week Type Thursday Day Type (0-8) (0=Unassigned)	Read/Write
9718	49719	Week Type Friday Day Type (0-8) (0=Unassigned)	Read/Write
9719	49720	Week Type Saturday Day Type (0-8) (0=Unassigned)	Read/Write
9720	49721	Week Type Sunday Day Type (0-8) (0=Unassigned)	Read/Write
9721	49722	Copy Data to Week Type Number (1-8)	Read/Write
9722	49723	Week Type Data Valid (0=Incorrect data, 1=Valid Data)	Read Only

Week Type Data Rules

Data values entered in the Week Type Data Form must follow certain rules to be considered valid.

- Week Type Numbers must be less than or equal to 8 (0 is unassigned)

Checking Form Values

After completing the Modbus Form it is possible to check if the data is valid by reading the Week Type Valid register (49723).

Saving a Week Type

If the data is valid it may be copied to a one of the Week Types in the meter for future use by writing the Week Type number (1-8) to the *Copy Data to Week Type Number* register 49722. When this register is written the form is first validated then, either it is copied to the selected Week Type, or an Exception Response is returned.

8.13.9 Season Types (Season Type 1 –Season Type 8)
Table 37 (Offset 251) – Table 38

Season Types are entered in the following Modbus Form:

Data Address	Modbus Register	Data	Access
9723	49724	Season Type – Start Date Day (1 - 31)	Read/Write
9724	49725	Season Type – Start Date Month (1 - 12, 1=January)	Read/Write
9725	49726	Season Type – End Day (1 - 31)	Read/Write
9726	49727	Season Type – End Month (1 - 12, 1=January)	Read/Write
9727	49728	Season Type – Associated Week Type (0-8) 0=Unassigned	Read/Write
9728	49729	Copy Data to Season Type Number (1-8)	Read/Write
9729	49730	Season Type Data Valid (0=Incorrect data, 1=Valid Data)	Read Only

Season Type Data Rules

Data values entered in the Week Type Data Form must follow certain rules to be considered valid.

- Season Start Date must be before Season End Date

- The number of days must not be zero greater than the maximum for each calendar month.

- Week Type must be less than or equal to 8 (0 is unassigned)

Checking Form Values

After completing the Modbus Form it is possible to check if the data is valid by reading the Season Type Valid register (49730).

Saving a Season Type

If the data is valid it may be copied to a one of the Season Types in the meter for future use by writing the Season Type number (1-8) to the *Copy Data to Season Type Number* register 49729. When this register is written the form is first validated then, either it is copied to the selected Season Type, or an Exception Response is returned.

9 Modbus Data Tables (Dual Sub-Metering Unit)

Each *Slave* Module connected in a **multicube** system may be treated as a stand alone Modbus RTU meter making it compatible with other more conventional metering products. Each *Slave* contains two 3-Phase electricity meters which are accessed by a Modbus master using their individual Modbus IDs as described in Section 3.

Each *Dual Sub-Metering Unit* contains Modbus Data which is arranged into data tables for convenience. An entire data Table may be read with a single Modbus read command.

Modbus Tables in each sub-Meter are arranged as follows:

9.1 Sub-Metering Metering Unit Table 2
Energy Registers (System)

Data Address	Modbus Register	Data	Access
512	40513	eScale High Word	Read Only
513	40514	eScale Low Word	
514	40515	kWh High Word	Read/Write
515	40516	kWh Low Word	
516	40517	kVAh High Word	Read/Write
517	40518	kVAh Low Word	
518	40519	kvarh Import High Word	Read/Write
519	40520	kvarh Import Low Word	

Notes:

This table is only available for *Slave Modules* setup to monitor 3-Phase Loads

9.2 Sub-Metering Unit Table 3
Energy Registers (Per Phase)

Data Address	Modbus Register	Data	Access
768	40769	eScale High Word	Read Only
769	40770	eScale Low Word	
770	40771	Load 1 kWh High Word	Read/Write
771	40772	Load 1 kWh Low Word	
772	40773	Load 2 kWh High Word	Read/Write
773	40774	Load 2 kWh Low Word	
774	40775	Load 3 kWh High Word	Read/Write
775	40776	Load 3 kWh Low Word	
776	40777	Load 1 Import kvarh High Word	Read/Write
777	40778	Load 1 Import kvarh Low Word	
778	40779	Load 2 Import kvarh High Word	Read/Write
779	40780	Load 2 Import kvarh Low Word	
780	40781	Load 3 Import kvarh High Word	Read/Write
781	40782	Load 3 Import kvarh Low Word	

Notes:

This table is only available for *Slave Modules* setup to monitor 1-Phase Loads

9.3 Sub-Metering Unit Table 11
Instantaneous Meter Values

Data Address	Modbus Register	Data	Scaling
2816	42817	System kW	Kp
2817	42818	System kVA	Kp
2818	42819	System kvar	Kp
2819	42820	System PF	1000 = 1.000
2820	42821	Frequency	500 = 50.00
2821	42822	Phase 1 Volts	Kvp
2822	42823	Phase 1 Amps	Ki
2823	42824	Phase 1 kW	Kp
2824	42825	Phase 2 Volts	Kvp
2825	42826	Phase 2 Amps	Ki
2826	42827	Phase 2 kW	Kp
2827	42828	Phase 3 Volts	Kvp
2828	42829	Phase 3 Amps	Ki
2829	42830	Phase 3 kW	Kp
2830	42831	Phase 1 PF	1000 = 1.000
2831	42832	Phase 2 PF	1000 = 1.000
2832	42833	Phase 3 PF	1000 = 1.000
2833	42834	Ph1-Ph2 Volts	Kvl
2834	42835	Ph2-Ph3 Volts	Kvl
2835	42836	Ph3-Ph1 Volts	Kvl
2836	42837	Neutral Current	Ki
2837	42838	Amps Scale Ki	-
2838	42839	Phase Volts Scale Kvp	-
2839	42840	Line Volts Scale Kvl	-
2840	42841	Power Scale Kp	-

Notes:

Meters configured as single phase meters will return zero for 3-Phase parameters values.

9.4 Sub-Metering Unit Table 12
Additional Instantaneous Values

Data Address	Modbus Register	Data	Scaling
3072	43073	Phase 1 kVA	Kp
3073	43074	Phase 2 kVA	Kp
3074	43075	Phase 3 kVA	Kp
3075	43076	Phase 1 kvar	Kp
3076	43077	Phase 2 kvar	Kp
3077	43078	Phase 3 kvar	Kp
3078	43079	Peak Hold Ph1 Amps	Ki
3079	43080	Peak Hold Ph2 Amps	Ki
3080	43081	Peak Hold Ph3 Amps	Ki
3081	43082	I1 % THD	1000 = 100%
3082	43083	I2 % THD	1000 = 100%
3083	43084	I3 % THD	1000 = 100%

9.5 Dual Sub-Metering Unit Table 14
Meter Setup

Data Address	Modbus Register	Data	Scaling	Data Type	Access
3584	43585	Meter Model	352 = MC352	Unsigned Integer	R
3585	43586	Meter Type	0=1 x 3-Ph 1=3x1Ph	Unsigned Integer	R
3586	43587	Firmware Version	Eg. 0x14 = 1.04	Unsigned Integer	R
3587	43588	CT Primary	5 - 25,000 Amps	Unsigned Integer	R/W
3588	43589	CT Secondary	33,333 = 0.33333V	Unsigned Integer	R/W
3589	43590	CT Phase Angle	±10 = ±1.0 degrees	Signed Integer	R/W
3590	43591	CT Multiplier	1-20	Unsigned Integer	R/W
3591	43592	CT Auto Rotate	0=No Rotate, 1=Rotate	Unsigned Integer	R/W
3592	43593	PT Primary/System Volts	5 - 50,000V	Unsigned Integer	R
3593	43594	Meter Nominal Voltage	10 - 600V	Unsigned Integer	R
3594	43595	Current Demand Period 1		Unsigned Integer	R/W
3595	43596	Current Demand Period 2		Unsigned Integer	R/W
3596	43597	Current Demand Period 3		Unsigned Integer	R/W
3597	43598	Sys Power Demand Period	1=10S, 20=200S etc	Unsigned Integer	R/W
3598	43599	Power Demand Period 1		Unsigned Integer	R/W
3599	43600	Power Demand Period 2		Unsigned Integer	R/W
3600	43601	Power Demand Period 3		Unsigned Integer	R/W
3601	43602	Modbus ID	2 – 220	Unsigned Integer	R
3602	43603	Baud	96 = 9600 etc	Unsigned Integer	R
3603	43604	Parity	0=NO, 1=Even 2=Odd	Unsigned Integer	R

9.6 Dual-Sub metering Metering Unit Table 28
Slave Module ASCII Names

Data Address	Modbus Register	Unit	Data	Access
7168	47169	MC352	Slave Module Serial Number High Word	Read Only
7169	47170		Slave Module Serial Number Low Word	
7170	47171	Load 1	Slave Module Name ASCII Characters 1-2	Read/Write
7171	47172		Slave Module Name ASCII Characters 3-4	
7172	47173	or	Slave Module Name ASCII Characters 5-6	
7173	47174		Slave Module Name ASCII Characters 7-8	
7174	47175	3 Phase Load	Slave Module Name ASCII Characters 9-10	
7175	47176		Slave Module Name ASCII Characters 11-12	
7176	47177		Slave Module Name ASCII Characters 13-14	
7177	47178	Load 2	Slave Module Name ASCII Characters 1-2	Read/Write
7178	47179		Slave Module Name ASCII Characters 3-4	
7179	47180		Slave Module Name ASCII Characters 5-6	
7180	47181		Slave Module Name ASCII Characters 7-8	
7181	47182		Slave Module Name ASCII Characters 9-10	
7182	47183		Slave Module Name ASCII Characters 11-12	
7183	47184		Slave Module Name ASCII Characters 13-14	
7184	47185	Load 3	Slave Module Name ASCII Characters 1-2	Read/Write
7185	47186		Slave Module Name ASCII Characters 3-4	
7186	47187		Slave Module Name ASCII Characters 5-6	
7187	47188		Slave Module Name ASCII Characters 7-8	
7188	47189		Slave Module Name ASCII Characters 9-10	
7189	47190		Slave Module Name ASCII Characters 11-12	
7190	47191		Slave Module Name ASCII Characters 13-14	

Notes:

Each Load in each half of an slave module can be named with up to 14 printable ASCII characters. Each Modbus data register holds two 8-bit printable ASCII coded characters.

The Load Names can be programmed using the keyboard on the main Unit (Refer to the **multicube** Modular Metering System Installation Manual) or via the Modbus interface by writing to Table 28.

Example: The required name for Load Number 3 is "Freezer Num A1"

Character		ASCII Code		Data	
Number	Letter	Decimal	Hex	Address	Hex Value
1	F	70	0x46	47183	0x4672
2	r	114	0x72		
3	e	101	0x65	47184	0x6565
4	e	101	0x65		
5	z	122	0x7A	47185	0x7A65
6	e	101	0x65		
7	r	114	0x72	47186	0x7220
8	Space	32	0x20		
9	N	78	0x4E	47187	0x4E75
10	u	117	0x75		
11	m	109	0x6D	47188	0x6D20
12	Space	32	0x20		
13	A	65	0x41	47189	0x4131
14	1	49	0x31		

Figure 9-1 – Module Name Example

9.7 Sub-Metering Unit Table 30
Amalgamated Data Table (3-Phase)

Data Address	Modbus Register	Data	Scaling
7680	47681	KWh High Word	eScale
7681	47682	KWh Low Word	
7682	47683	KVAh High Word	eScale
7683	47684	KVAh Low Word	
7684	47685	Import Kvarh High Word	eScale
7685	47686	Import Kvarh Low Word	
7686	47687	Export kWh High Word	eScale
7687	47688	Export kWh Low Word	
7688	47689	Phase 1 Amps	Ki
7689	47690	Phase 2 Amps	
7690	47691	Phase 3 Amps	
7691	47692	Phase 1 Volts	Kvp
7692	47693	Phase 2 Volts	
7693	47694	Phase 3 Volts	
7694	47695	Ph1-Ph2 Volts	Kvl
7695	47696	Ph2-Ph3 Volts	
7696	47697	Ph3-Ph1 Volts	
7697	47698	Frequency	500 = 50.00
7698	47699	Phase 1 PF	1000 = 1.000
7699	47700	Phase 2 PF	
7700	47701	Phase 3 PF	
7701	47702	System PF	
7702	47703	Phase 1 kW	Kp
7703	47704	Phase 2 kW	
7704	47705	Phase 3 kW	
7705	47706	System kW	
7706	47707	Phase 1 kVA	Kp
7707	47708	Phase 2 kVA	
7708	47709	Phase 3 kVA	
7709	47710	System kVA	
7710	47711	Phase 1 kvar	Kp
7711	47712	Phase 2 kvar	
7712	47713	Phase 3 kvar	
7713	47714	System kvar	
7714	47715	Ph1 Amps Demand	Ki
7715	47716	Ph2 Amps Demand	
7716	47717	Ph3 Amps Demand	
7717	47718	Ph1 Volts Demand	Kvp
7718	47719	Ph2 Volts Demand	
7719	47720	Ph3 Volts Demand	
7720	47721	Peak Ph1 Amps	Ki
7721	47722	Peak Ph2 Amps	
7722	47723	Peak Ph3 Amps	
7723	47724	Peak Ph1 Volts	Kvp
7724	47725	Peak Ph2 Volts	
7725	47726	Peak Ph3 Volts	
7726	47727	System kW Demand (Sliding Window)	Kp
7727	47728	System kVA Demand (Sliding Window)	
7728	47729	System kvar Demand (Sliding Window)	
7729	47730	Peak Hold kW Demand (Sliding Window)	Kp
7730	47731	Peak Hold kVA Demand (Sliding Window)	
7731	47732	Peak Hold kvar Demand (Sliding Window)	
7732	47733	Neutral Current	Ki
7733	47734	Amps Scale Ki	-
7734	47735	Phase Volts Scale Kvp	-
7735	47736	Line Volts Scale Kvl	-
7736	47737	Power Scale Kp	-
7737	47738	Energy Scale eScale	-

Notes:

This table is only available for **Sub-Metering** Units setup to monitor 3-Phase Loads

All values in this table have read only access.

The amalgamated data table provides a copy of key variables in a single table, which may be read with a single Modbus command. The format and scaling of each parameter is identical to that found in the main tables.

9.8 Sub-Metering Unit Table 31
Amalgamated Data Table (Single Phase)

Data Address	Modbus Register	Data	Scaling
7936	47937	Load 1 KWh High Word	eScale
7937	47938	Load 1 KWh Low Word	
7938	47939	Load 2 KWh High Word	
7939	47940	Load 2 KWh Low Word	
7940	47941	Load 3 KWh High Word	
7941	47942	Load 3 KWh Low Word	
7942	47943	Load 1 Kvarh High Word	
7943	47944	Load 1 Kvarh Low Word	
7944	47945	Load 2 Kvarh High Word	
7945	47946	Load 2 Kvarh Low Word	
7946	47947	Load 3 Kvarh High Word	
7947	47948	Load 3 Kvarh Low Word	
7948	47949	Load 1 Pk kW Demand	Kp
7949	47950	Load 2 Pk kW Demand	
7950	47951	Load 3 Pk kW Demand	
7951	47952	Load 1 kW Demand	
7952	47953	Load 2 kW Demand	
7953	47954	Load 3 kW Demand	
7954	47955	Load 1 kW	
7955	47956	Load 2 kW	
7956	47957	Load 3 kW	
7957	47958	Load 1 kvar	
7958	47959	Load 2 kvar	
7959	47960	Load 3 kvar	
7960	47961	Load 1 kVA	
7961	47962	Load 2 kVA	
7962	47963	Load 3 kVA	
7963	47964	Load 1 Amps	Ki
7964	47965	Load 2 Amps	
7965	47966	Load 3 Amps	
7966	47967	Load 1 Volts	Kvp
7967	47968	Load 2 Volts	
7968	47969	Load 3 Volts	
7969	47970	Energy Scale (eScale)	-
7970	47971	Power Scale Kp	
7971	47972	Amps Scale Ki	
7972	47973	Phase Volts Scale Kv	
7973	47974	Load 1 PF	1000 = 1.000
7974	47975	Load 2 PF	
7975	47976	Load 3 PF	
7976	47977	Frequency	500 = 50.0

Notes:

This table is only available for **Sub-Metering** Units setup to monitor 1-Phase Loads.

All values in this table have read only access.

The amalgamated data table provides a copy of key variables in a single table, which may be read with a single Modbus command. The format and scaling of each parameter is identical to that found in the main tables.

9.9 Sub-Metering Unit Table 16
Individual Tariff Energy Registers (Single Phase)

Data Address	Modbus Register	Data	Access
4096	44097	Tariff 1 - Phase 1 kWh High Word	Read Only
4097	44098	Tariff 1 - Phase 1 kWh Low Word	Read Only
4098	44099	Tariff 1 - Phase 2 kWh High Word	Read Only
4099	44100	Tariff 1 - Phase 2 kWh Low Word	Read Only
4100	44101	Tariff 1 - Phase 3 kWh High Word	Read Only
4101	44102	Tariff 1 - Phase 3 kWh Low Word	Read Only
4102	44103	Tariff 1 - Phase 1 kvarh High Word	Read Only
4103	44104	Tariff 1 - Phase 1 kvarh Low Word	Read Only
4104	44105	Tariff 1 - Phase 2 kvarh High Word	Read Only
4105	44106	Tariff 1 - Phase 2 kvarh Low Word	Read Only
4106	44107	Tariff 1 - Phase 3 kvarh High Word	Read Only
4107	44108	Tariff 1 - Phase 3 kvarh Low Word	Read Only
4108	44109	Tariff 2 - Phase 1 kWh High Word	Read Only
4109	44110	Tariff 2 - Phase 1 kWh Low Word	Read Only
4110	44111	Tariff 2 - Phase 2 kWh High Word	Read Only
4111	44112	Tariff 2 - Phase 2 kWh Low Word	Read Only
4112	44113	Tariff 2 - Phase 3 kWh High Word	Read Only
4113	44114	Tariff 2 - Phase 3 kWh Low Word	Read Only
4114	44115	Tariff 2 - Phase 1 kvarh High Word	Read Only
4115	44116	Tariff 2 - Phase 1 kvarh Low Word	Read Only
4116	44117	Tariff 2 - Phase 2 kvarh High Word	Read Only
4117	44118	Tariff 2 - Phase 2 kvarh Low Word	Read Only
4118	44119	Tariff 2 - Phase 3 kvarh High Word	Read Only
4119	44120	Tariff 2 - Phase 3 kvarh Low Word	Read Only
4120	44121	Tariff 3 - Phase 1 kWh High Word	Read Only
4121	44122	Tariff 3 - Phase 1 kWh Low Word	Read Only
4122	44123	Tariff 3 - Phase 2 kWh High Word	Read Only
4123	44124	Tariff 3 - Phase 2 kWh Low Word	Read Only
4124	44125	Tariff 3 - Phase 3 kWh High Word	Read Only
4125	44126	Tariff 3 - Phase 3 kWh Low Word	Read Only
4126	44127	Tariff 3 - Phase 1 kvarh High Word	Read Only
4127	44128	Tariff 3 - Phase 1 kvarh Low Word	Read Only
4128	44129	Tariff 3 - Phase 2 kvarh High Word	Read Only
4129	44130	Tariff 3 - Phase 2 kvarh Low Word	Read Only
4130	44131	Tariff 3 - Phase 3 kvarh High Word	Read Only
4131	44132	Tariff 3 - Phase 3 kvarh Low Word	Read Only
4132	44133	Tariff 4 - Phase 1 kWh High Word	Read Only
4133	44134	Tariff 4 - Phase 1 kWh Low Word	Read Only
4134	44135	Tariff 4 - Phase 2 kWh High Word	Read Only
4135	44136	Tariff 4 - Phase 2 kWh Low Word	Read Only
4136	44137	Tariff 4 - Phase 3 kWh High Word	Read Only
4137	44138	Tariff 4 - Phase 3 kWh Low Word	Read Only
4138	44139	Tariff 4 - Phase 1 kvarh High Word	Read Only
4139	44140	Tariff 4 - Phase 1 kvarh Low Word	Read Only
4140	44141	Tariff 4 - Phase 2 kvarh High Word	Read Only
4141	44142	Tariff 4 - Phase 2 kvarh Low Word	Read Only
4142	44143	Tariff 4 - Phase 3 kvarh High Word	Read Only
4143	44144	Tariff 4 - Phase 3 kvarh Low Word	Read Only
4144	44145	Tariff 5 - Phase 1 kWh High Word	Read Only
4145	44146	Tariff 5 - Phase 1 kWh Low Word	Read Only
4146	44147	Tariff 5 - Phase 2 kWh High Word	Read Only
4147	44148	Tariff 5 - Phase 2 kWh Low Word	Read Only
4148	44149	Tariff 5 - Phase 3 kWh High Word	Read Only
4149	44150	Tariff 5 - Phase 3 kWh Low Word	Read Only
4150	44151	Tariff 5 - Phase 1 kvarh High Word	Read Only
4151	44152	Tariff 5 - Phase 1 kvarh Low Word	Read Only
4152	44153	Tariff 5 - Phase 2 kvarh High Word	Read Only
4153	44154	Tariff 5 - Phase 2 kvarh Low Word	Read Only
4154	44155	Tariff 5 - Phase 3 kvarh High Word	Read Only
4155	44156	Tariff 5 - Phase 3 kvarh Low Word	Read Only

4156	44157	Tariff 6 - Phase 1 kWh High Word	Read Only
4157	44158	Tariff 6- Phase 1 kWh Low Word	Read Only
4158	44159	Tariff 6 - Phase 2 kWh High Word	Read Only
4159	44160	Tariff 6 - Phase 2 kWh Low Word	Read Only
4160	44161	Tariff 6 - Phase 3 kWh High Word	Read Only
4161	44162	Tariff 6 - Phase 3 kWh Low Word	Read Only
4162	44163	Tariff 6 - Phase 1 kvarh High Word	Read Only
4163	44164	Tariff 6 - Phase 1 kvarh Low Word	Read Only
4164	44165	Tariff 6 - Phase 2 kvarh High Word	Read Only
4165	44166	Tariff 6 - Phase 2 kvarh Low Word	Read Only
4166	44167	Tariff 6 - Phase 3 kvarh High Word	Read Only
4167	44168	Tariff 6 - Phase 3 kvarh Low Word	Read Only
4168	44169	Tariff 7 - Phase 1 kWh High Word	Read Only
4169	44170	Tariff 7 - Phase 1 kWh Low Word	Read Only
4170	44171	Tariff 7 - Phase 2 kWh High Word	Read Only
4171	44172	Tariff 7 - Phase 2 kWh Low Word	Read Only
4172	44173	Tariff 7 - Phase 3 kWh High Word	Read Only
4173	44174	Tariff 7 - Phase 3 kWh Low Word	Read Only
4174	44175	Tariff 7 - Phase 1 kvarh High Word	Read Only
4175	44176	Tariff 7 - Phase 1 kvarh Low Word	Read Only
4176	44177	Tariff 7 - Phase 2 kvarh High Word	Read Only
4177	44178	Tariff 7 - Phase 2 kvarh Low Word	Read Only
4178	44179	Tariff 7 - Phase 3 kvarh High Word	Read Only
4179	44180	Tariff 7 - Phase 3 kvarh Low Word	Read Only
4180	44181	Tariff 8 - Phase 1 kWh High Word	Read Only
4181	44182	Tariff 8 - Phase 1 kWh Low Word	Read Only
4182	44183	Tariff 8 - Phase 2 kWh High Word	Read Only
4183	44184	Tariff 8 - Phase 2 kWh Low Word	Read Only
4184	44185	Tariff 8 - Phase 3 kWh High Word	Read Only
4185	44186	Tariff 8 - Phase 3 kWh Low Word	Read Only
4186	44187	Tariff 8 - Phase 1 kvarh High Word	Read Only
4187	44188	Tariff 8 - Phase 1 kvarh Low Word	Read Only
4188	44189	Tariff 8 - Phase 2 kvarh High Word	Read Only
4189	44190	Tariff 8 - Phase 2 kvarh Low Word	Read Only
4190	44191	Tariff 8 - Phase 3 kvarh High Word	Read Only
4191	44192	Tariff 8 - Phase 3 kvarh Low Word	Read Only

Notes:

All values in this table have read only access.

Sub-Metering Modules configured as 3-Phase Meters will give 'Exception response' for single phase values.

Tariff Energy registers require scaling as described in Section 7.4.

9.10 Sub-Metering Unit Table 17
Individual Tariff Energy Registers (Three Phase)

Data Address	Modbus Register	Data	Access
4352	44353	Tariff 1 System kWh High Word	Read Only
4353	44354	Tariff 1 System kWh Low Word	Read Only
4354	44355	Tariff 1 System kvarh High Word	Read Only
4355	44356	Tariff 1 System kvarh Low Word	Read Only
4356	44357	Tariff 2 System kWh High Word	Read Only
4357	44358	Tariff 2 System kWh Low Word	Read Only
4358	44359	Tariff 2 System kvarh High Word	Read Only
4359	44360	Tariff 2 System kvarh Low Word	Read Only
4360	44361	Tariff 3 System kWh High Word	Read Only
4361	44362	Tariff 3 System kWh Low Word	Read Only
4362	44363	Tariff 3 System kvarh High Word	Read Only
4363	44364	Tariff 3 System kvarh Low Word	Read Only
4364	44365	Tariff 4 System kWh High Word	Read Only
4365	44366	Tariff 4 System kWh Low Word	Read Only
4366	44367	Tariff 4 System kvarh High Word	Read Only
4367	44368	Tariff 4 System kvarh Low Word	Read Only
4368	44369	Tariff 5 System kWh High Word	Read Only
4369	44370	Tariff 5 System kWh Low Word	Read Only
4370	44371	Tariff 5 System kvarh High Word	Read Only
4371	44372	Tariff 5 System kvarh Low Word	Read Only
4372	44373	Tariff 6 System kWh High Word	Read Only
4373	44374	Tariff 6 System kWh Low Word	Read Only
4374	44375	Tariff 6 System kvarh High Word	Read Only
4375	44376	Tariff 6 System kvarh Low Word	Read Only
4376	44377	Tariff 7 System kWh High Word	Read Only
4377	44378	Tariff 7 System kWh Low Word	Read Only
4378	44379	Tariff 7 System kvarh High Word	Read Only
4379	44380	Tariff 7 System kvarh Low Word	Read Only
4380	44381	Tariff 8 System kWh High Word	Read Only
4381	44382	Tariff 8 System kWh Low Word	Read Only
4382	44383	Tariff 8 System kvarh High Word	Read Only
4383	44384	Tariff 8 System kvarh Low Word	Read Only

Notes:

All values in this table have read only access.
Sub-Metering Modules configured as Single Phase Meters will give 'Exception response' for 3-Phase values.
Tariff Energy registers require scaling as described in Section 7.4.

10 Specification

10.1 Modbus TCP Module

GENERAL		
Dimensions	Height :	164mm
	Depth: (Off Wall)	96mm
	Width:	29mm
ModbusTCP Ethernet Interface	Ethernet:	10/100 Base-T
	Cable:	Minimum Cat5 RJ45 termination
	Protocol:	Modbus TCP
	ID:	1-200 (for Main display unit) user programmable
Isolation (Ethernet Output)	2.5kV (1 minute) Ethernet Port from all other circuits	
Conducted Immunity	Class 2: IT Equipment	
Performance		
Reply Time	Network Dependant	
Repeat Commands	Repeat command may start 10mS after last command is complete	
Buffer (Data Packet Size)	Data Read:	Max 125 Registers in a single Read Command (Modbus compatibility)
	Data Write:	Max 125 Registers in a single Write Command (Modbus compatibility)
POWER SUPPLY		
DC Power From Master Display	DC Power Supply:	5.0V DC
	Maximum Load:	1.2 W

Annexe A - Network Information

A.1   Network Addressing

Internet addresses are allocated by regional registries managed by the **Internet Assigned Numbers Authority** (IANA) and must be unique in order to identify the intended recipient of a message.   **Private Local Area Networks** (LAN) can be separated from the internet using **Network Address Translation** (NAT) in the gateway or router connecting the LAN to the rest of the internet.   A NAT allows a number of private IP addresses to be seen externally to the LAN as a single allocated IP address.

A number of ranges of addresses have been reserved to be used for private networks and packets with these addresses will not be allowed through a router out of LAN where they will not be guaranteed to be globally unique.   Addresses selected from these ranges for a private network should be unique on the LAN and require translation by a NAT server if connection to the internet is required.

A private IP address are managed by the local network administrator and for each IP enabled device (such as a **MultiCube** with a TCP/IP Ethernet interface module or computer) can be fixed by entering a static address into the device's settings or requested by the device from a **Dynamic Host Configuration Protocol** (DHCP) server.   The ranges of addresses allocated for private networks are as follows:

10.0.0.0 to 10.255.255.255
172.16.0.0 to 172.31.255.255
192.168.0.0 to 192.168.255.255

When a device first requests an address from a DHCP server the server selects one of its list of available addresses that has not yet been allocated and presents it as a candidate to the device.   If accepted, the DHCP server will lease the address to the device for a set period of time (commonly a week).   A device can request an address from the server at any time but only in the lease period will the server reserve a previously allocated address for the device to which it was leased (barring server problems).   Outside this period, the address may have been allocated elsewhere and the request is rejected; the device will have to ask for another address.   If a device requests an address outside the range allowed for the DHCP server the request will be immediately rejected.

A network will usually be separated by the administrator into a range of addresses to be allocated by DHCP and a number of static addresses reserved for equipment on the network such as servers and the Gateway.   This separate range ensures uniqueness on the LAN.   To contact a server with an address allocated by DHCP some method of address discovery must be performed.

Another range of addresses allocated to private networks are reserved for automatic address configuration by IP enabled devices on a network without a DHCP server.   If a device cannot find an address when set to use DHCP, that device can allocate itself an address from the following range:

169.254.0.0 to 169.254.255.255

When the DHCP request procedure has failed a computer running a Windows operating system will select one of these addresses and check if it is unique on the network.   The **multicube** TCP/IP Ethernet interface will not use these addresses but will try to obtain the last address it was allocated from the DHCP server.   This process may take a few minutes.   If the address type is set to static or no address is available from DHCP the interface will initially default to an address of **192.168.1.121**.

A.2 Subnet Masks

The internet consists of a number of links between separate networks with the end of each link terminated by a router.   A router connects a number of links and determines the best path an IP packet (of information) that reaches it should take in order to reach the desired destination.   In order to do this the router must keep a list of the links by which each address can be reached.

To prevent the need for huge lists of separate addresses in each router, it was decided to allocate similar address ranges to geographically close areas of the world that would be served by a small number of routers. A more compact address format was devised to describe complete networks as ranges of addresses and this required the use of subnet masks.

A subnet mask is a 32 bit number, the same size as the IP address, with a bit set to 1 for each corresponding bit of the address that is a fixed part of the network address and a 0 for each corresponding bit of the address that can be a variable part of the network address. The subnet can be described in the same dot notation as an IP address. For example, a subnet mask of **255.255.0.0** applied to any address in the range **192.168.x.x** (where x stands for any 8 bit number) and indicates that addresses **192.168.0.0** to **192.168.255.255** all belong to the same network.

The rule for subnet masks is that the bits in a subnet must not follow a 0 value bit with a 1 value bit. Thus valid values of an octet in the subnet mask are therefore 0, 128, 192, 224, 240, 248, 252, 254 and 255. If the octet value is non-zero then all previous octets to the left must be 255 and if the octet value is less than 255 then all following octets to the right must be zero. For example the subnet mask **255.255.0.0** is valid, while the subnet mask **255.255.0.1** is not. Generally the most significant bit of a subnet mask should be a 1 to avoid describing the whole internet and the least significant bit should be zero to avoid restricting a network to a single IP address.

An alternative description of the subnet mask uses the number of bits set to 1 before the first 0 value bit. The previous valid example, the subnet mask of **255.255.0.0** would be shown as **/16** to show the first sixteen bits of the subnet mask are set to 1 the rest to 0.

The compact format of network address description uses the first address of a range of network addresses followed by the subnet mask description. For example, the complete set of consecutive addresses from **192.168.0.0** to **192.168.255.255** can all be described using the compact form **192.168.0.0/16**.

Smaller LANs can utilise the subnet mask to separate a single block of addresses into a number of logical sub-networks (subnets). This could be done to segregate different departments in a company and improve the switching of packets in the network infrastructure to reduce traffic. Devices do not accept broadcasts from other devices outside or their subnet or respond to an **Address Resolution Protocol** (ARP) request, which is a method to find the Ethernet **Media Access Control** (or MAC) address for a device with a corresponding IP address.

The only exception to ARP requests from outside the subnet is the Gateway, which is a special static address that is manually input into the device or given by the DHCP server when the IP address is configured. The device at this address can issue ARP requests on behalf of and reply to ARP requests for other devices with IP addresses outside your subnet. If the desired address is outside the complete network range, such as an external internet address, the Gateway should respond to the ARP request with the MAC address of the NAT server.

For a static IP address or no DHCP server being found, the gateway on the **MultiCube** with a TCP/IP Ethernet interface module will initially not be set, while the subnet mask will default to **255.255.240.0**. Once an address has been set it will be retained until changed by the user or by accepting the settings from a DHCP server.

A member of a network can use the subnet mask to indicate the network to which it belongs. The network address **192.168.4.23/28** can be found to belong to the sub-network **192.168.4.16/28** and **192.168.4.35/28** can be found to belong to the sub-network **192.168.4.32/28** by performing a Boolean addition of each of the IP addresses with the long form of the subnet mask. The IP addresses available in a network to allocate to devices usually exclude the first address of the subnet that describes the network and the last address of the subnet which is used as a broadcast address for the whole subnet.

A.3 Domain Name Server

The **Domain Name Service** (DNS) is a method for an internet enabled device to access another device on the internet without knowledge of the device's actual IP address. Instead the device uses part of a **Universal Resource Indicator** (URI), which is the name of a desired IP Address in human readable text such as is entered into a web browser (e.g. ndmeter.co.uk)

The last part of the URI describes the resource or the name of the page or file to obtain from a remote device. The first part of the URI describes the device from which to obtain the resource and is called a **Fully Qualified Domain Name** (FQDN). The FQDN is used to find the IP address of a device on the internet in order to contact it using the domain name system.

The ability to enter a suitable IP address for a domain name server has been included in the menus of the **multicube** modular meter for future use, but the functionality to use this address has not yet been implemented.

A.4 Simple Network Time Protocol

The **Simple Network Time Protocol** (SNTP) is a service that exists for internet enabled devices to automatically obtain the time from one of a number of IP addresses on the internet. The time received is **Universal Coordinated Time** (UTC), which is equivalent to **Greenwich Mean Time** (GMT), the standard time for the UK. This time was chosen to avoid problems with internet connected devices synchronising across the world using different local time.

 The ability to enter a suitable IP address for a network time server has been included in the menus of the **multicube** modular meter for future use, but the functionality to use this address has not yet been implemented.

E. & O. E.
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