Cube & Rail
IP Meter

Ethernet System Meter Installation and Operation Manual

Revision 1.07p

Published December 2013

Contents

1. Meter models covered by manual

This manual covers the following products;

- Cube 350I (V2 see note below)
- Cube 350V (V2 see note below)
- Cube 400I (V2 see note below)
- Cube 400V (V2 see note below)
- Rail 350V

Note: This manual refers to the V2 versions of the Cube IP meter, which is a replacement for the V1 meter. A V2 meter can be identified by “IP.Ver: V2” on the label on the rear of the meter.

2. Introduction

The IP meter is a standard Ethernet TCP/IP component designed for inclusion in industrial and office Ethernet networks. Depending on the hardware and settings of the network, access to the meter may be made within the local intranet or over a wider area network such as the World Wide Web.

Connection to the meter is made via the integral CAT5 socket. Standard, low-cost cabling is then used to connect the meter to the network, direct to a CAT5 socket or using a, router, a wireless access point, mains signalling access point or similar. Selection of the connection method depends on the location of the meter and the layout of the network; it may need to take into account other factors such as security and cost.

Figure 1- Meter Network Options

3. Installation

3.1. Wiring

For instructions on wiring the meter to the electrical system being measured see the installation guide for the basic meter.

3.2. Network

3.2.1. Front Panel Configuration

The network parameters IP Address, Subnet Mask and Default Gateway can all be viewed or changed via the front panel display. By default the meter will attempt to configure itself automatically using the Dynamic Host Configuration Protocol (DHCP), the same method by which a desktop computer usually configures its network settings. If the meter is unable to obtain settings using DHCP it will fall back to a static setting that the user may change.

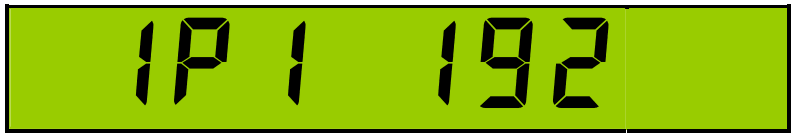
- IP Address: 192.168.1.127
- Subnet mask: 255.255.255.000
- Default gateway: 192.168.1.254

3.2.2. Dynamic Host Configuration Protocol (DHCP)

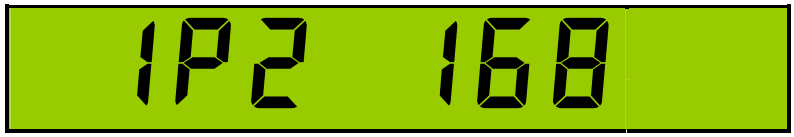
If the meter obtains its settings using DHCP then they will be displayed on the front panel. Press the V and kW keys together to display the IP Address.

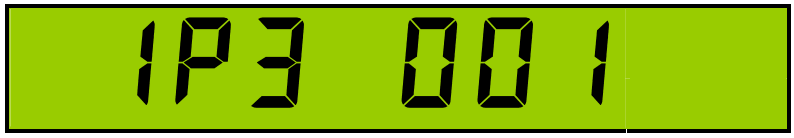
3.2.2.1. Rail and Cube 350 Instruments

The display will now show the first byte of the IP Address, for example:



Press the V and kW keys together again to scroll through the next bytes. For example if the IP Address were 192.168.1.43 then the display would show:

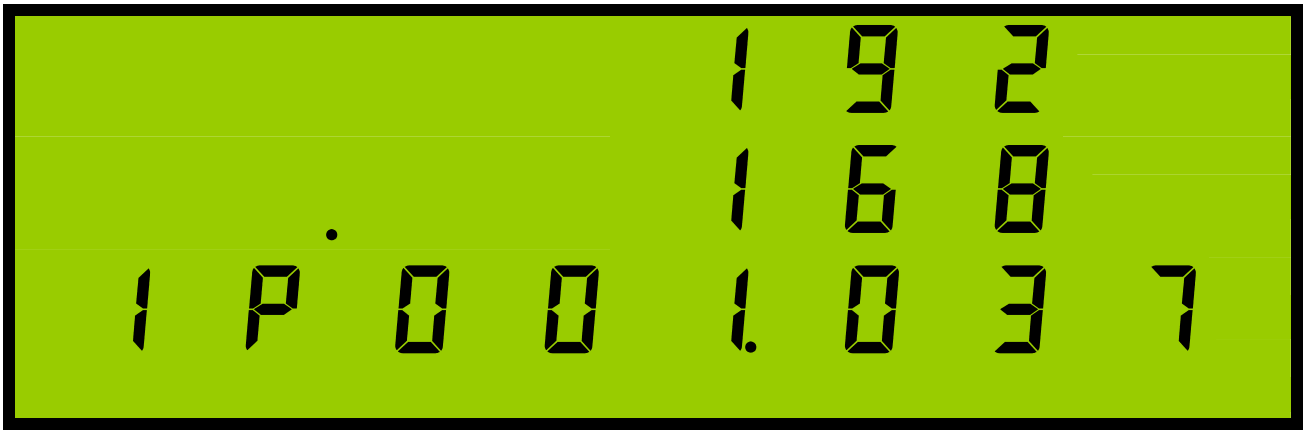




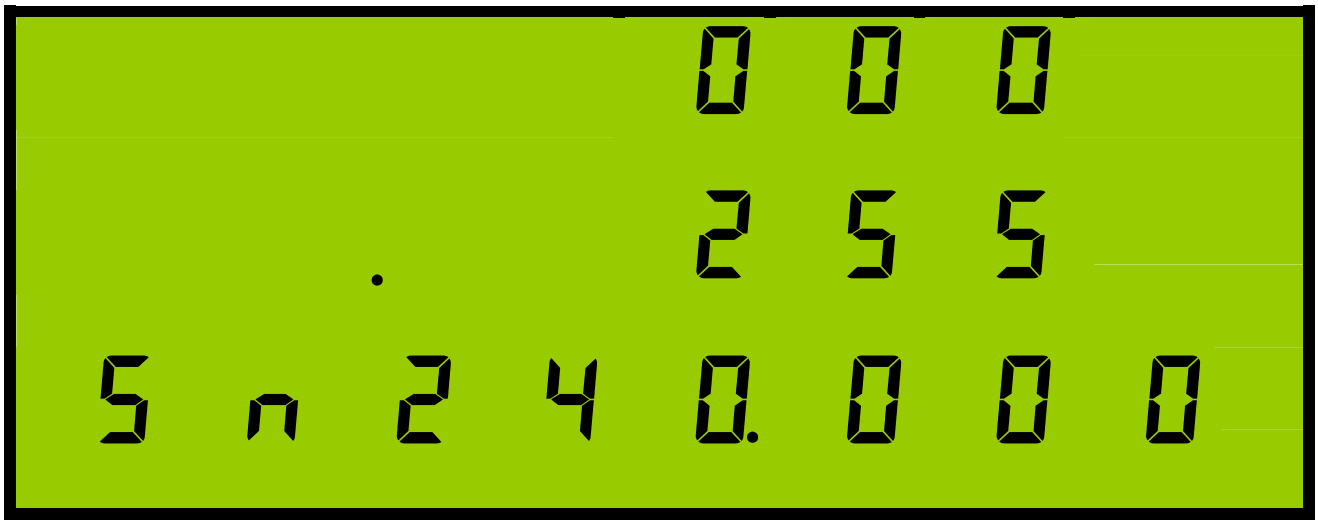
Continuing to press the V and kW ▲ keys will cause the display to scroll through the bytes of the Subnet Mask and then the Default Gateway before returning to the first byte of the IP Address. These two parameters are identified by the letters “Sn” or “dG” in the left of the display where “IP” was displayed for the IP address. The first byte of the Subnet Mask is always displayed as “000” to indicate that the settings were obtaining using DHCP.

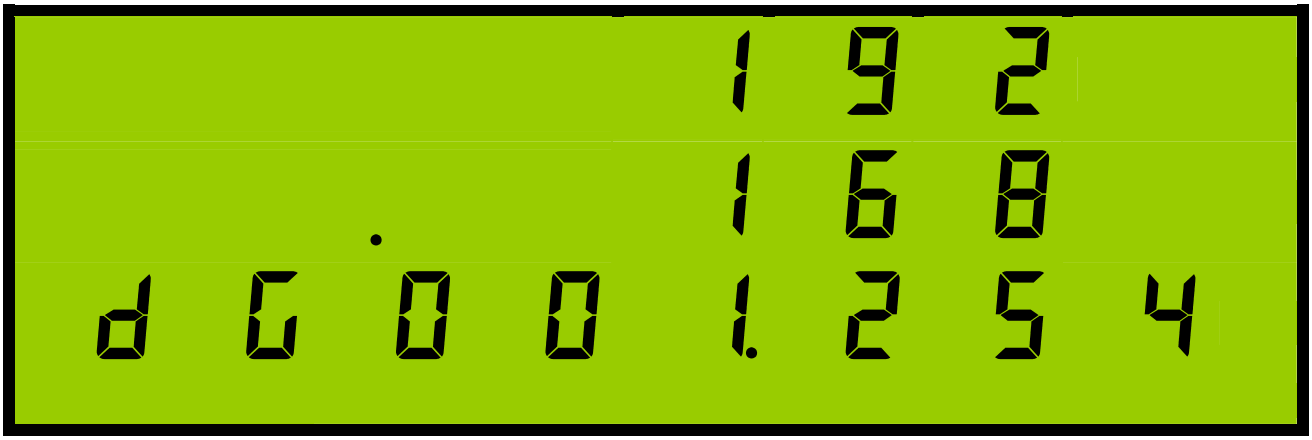
3.2.2.2. Cube 400 Instruments

The first two lines of the display show the first two bytes of the IP Address. The last line shows the last two bytes separated by a dot. For example if the IP Address were 192.168.1.37 then the display would show:



Press the V and kW ▲ keys together again to show the Subnet Mask and again to show the Default Gateway. These two parameters are identified by the letters “Sn” or “dG” in the bottom left corner of the display where “IP” was displayed for the IP address. The first byte of the Subnet Mask is always displayed as “000” to indicate that the settings were obtaining using DHCP. For example if the Subnet Mask were 000.255.240.0 and the Default Gateway 192.168.1.254 then the display would show:





3.2.3. Static IP

In a network that does not use DHCP the network settings of the meter can be set via the front panel. The IP address, Subnet Mask and Default Gateway will be chosen by the network administrator. These settings are entered into the meter as follows.

3.2.3.1. Rail and Cube 350 Instruments

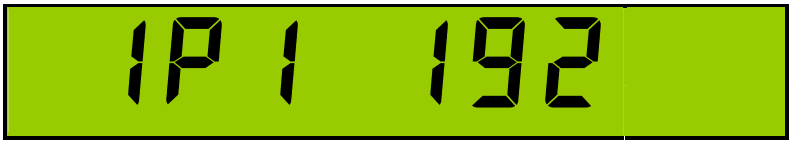
To enter programming mode press 

and 

together and hold for approximately 5 seconds. (for further information on programming mode refer to the basic meter operating manual).

Press 

to step past each programming page until the ***IP Address*** setup page appears.

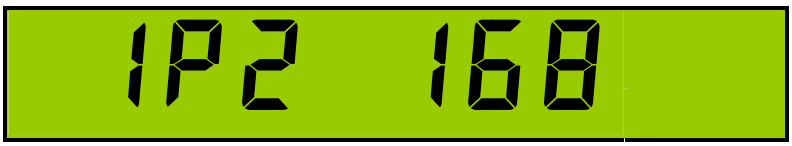


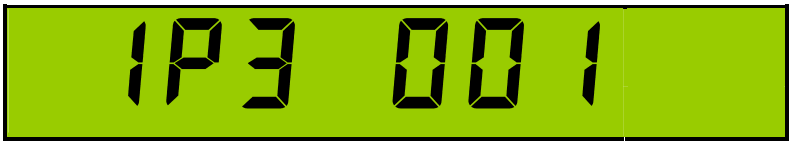
To change the IP Address, use 

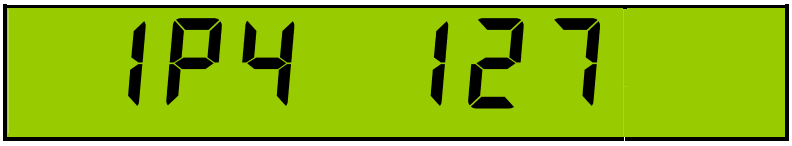
to increase it or 

to decrease it. When set correctly, press 

to move to the next part of the IP Address. Repeat until the four parts are correct.



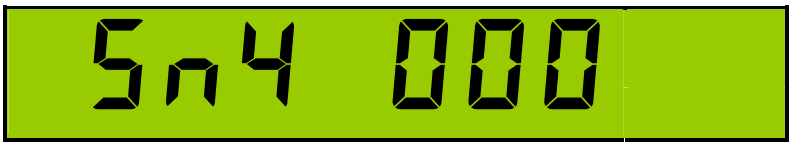




IP Address 192.168.1.127

To change the Sub Net Mask:

Press  to move to the ***Subnet Mask***.



Subnet Mask 255.255.255.0

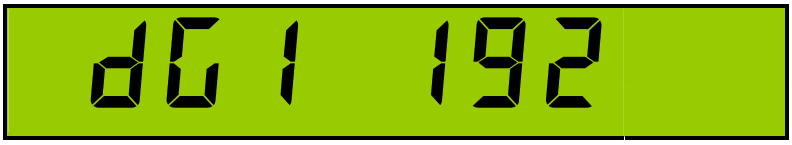
To change the Subnet Mask, use 

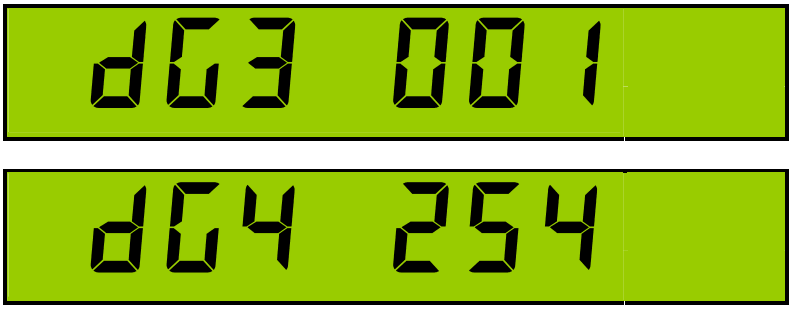
to increase it or 

to decrease it. When set correctly, press  to move to the next part of the Subnet Mask. Repeat until the four parts are correct. In most networks the first byte of the Subnet Mask will be “255”. If the first byte is changed to “000” then the meter will ignore the entered settings and attempt to obtain settings using DHCP.

To change the Default Gateway:

Press  to move to the ***Default Gateway***.

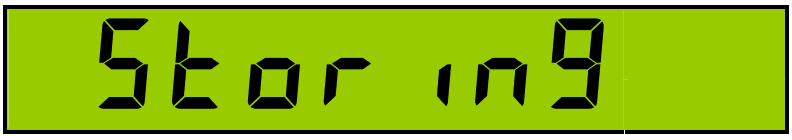




Default Gateway 192.168.1.254

Press I to step through the four parts of the Default Gateway; use kW to increase and kWh to decrease the parts of the Default Gateway until the correct numbers are displayed.

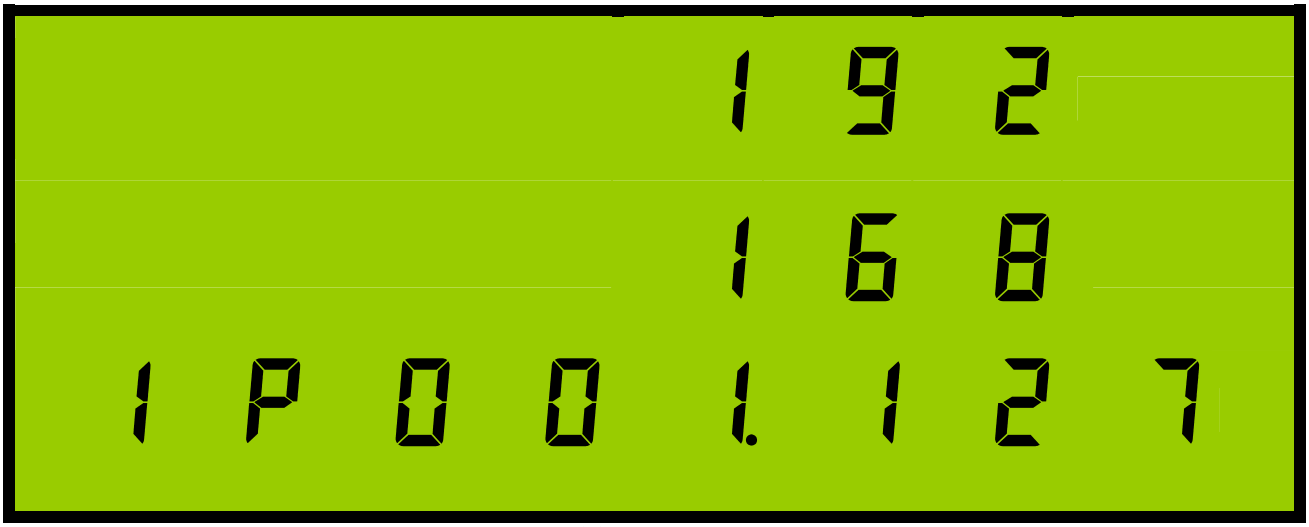
Press I to store settings and return to standard monitoring mode.



3.2.3.2. Cube 400 Instruments

Enter programming mode press I and E together and hold for approximately 5 seconds. (for further information on programming mode refer to the basic meter operating manual).

Press I to step past each programming page until the ***IP Address*** setup page appears.

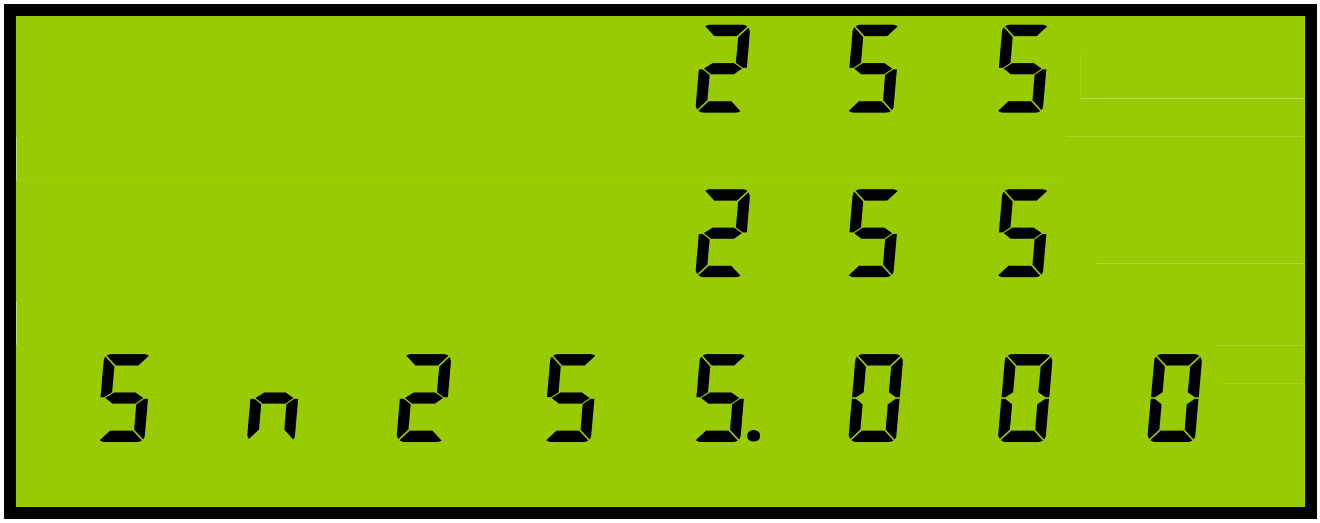


IP Address 192.168.1.127

The first part of the IP Address will flash, to change it use P ▲ to increase it or E ▼ to decrease it.

When set correctly, press V to move to the next part of the IP Address. Repeat until the four parts are correct.

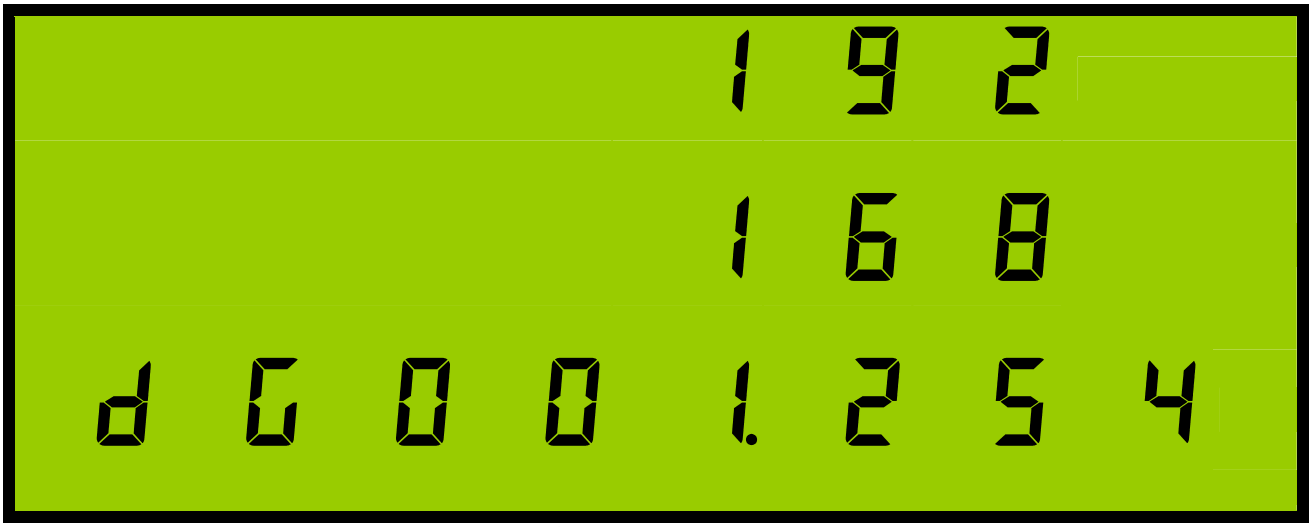
Press I ◄ to move to the ***Subnet Mask***.



Subnet Mask 255.255.255.0

Press V to step through the four parts of the Subnet Mask; use P ▲ to increase and E ▼ to decrease the parts of the Subnet Mask until the correct numbers are displayed. In most networks the first byte of the Subnet Mask will be "255". If the first byte is changed to "000" then the meter will ignore the entered settings and attempt to obtain settings using DHCP.

Press I ◄ to move to the ***Default Gateway***.



Default Gateway 192.168.1.254

Press V to step through the four parts of the Default Gateway; use P ▲ to increase and E ▼ to decrease the parts of the Default Gateway until the correct numbers are displayed.

Press I ◄ to store settings and return to standard monitoring mode.

It is advised not to set static IP addresses as 192.168.1.127 and 192.168.1.121 as they are used to indicate fault conditions. If meter is connected to the network and

- **(i) displays IP address 192.168.1.127, there is a connection issue between the meter and the network.**
- **(ii) Displays IP address 192.168.1.121, there is a fault with the meter.**

3.2.4. Standalone e.g. with laptop

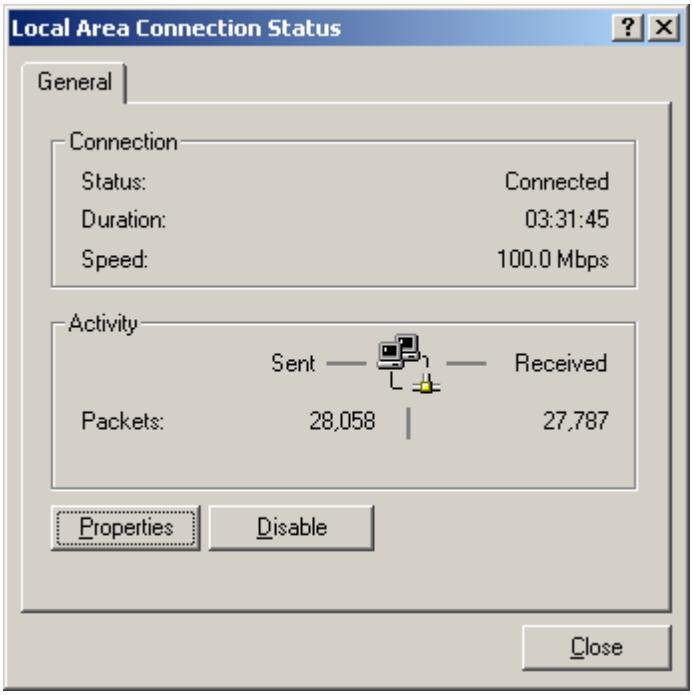
In the absence of a network the meter can be connected directly to the Ethernet port of a PC or laptop. In this situation a static IP Addresses and a Subnet Mask should be chosen for the PC and the meter. Usually a Subnet Mask of 255.255.255.0 would be chosen and the two IP Addresses will have the first three bytes in common and differ in the last byte only (the Default Gateway is irrelevant and can be ignored). 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.

3.2.4.1. For MS Windows XP®:

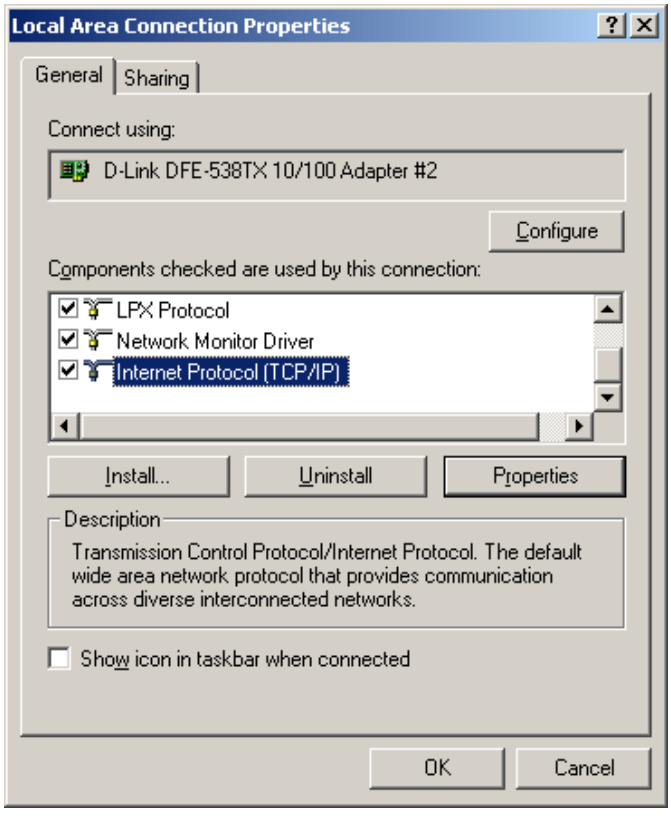
From the ***Start*** menu select ***Settings*** - ***Control Panel***.

Double Click the Network Connections icon.

Double Click on the ***Local Area Connection Icon***.

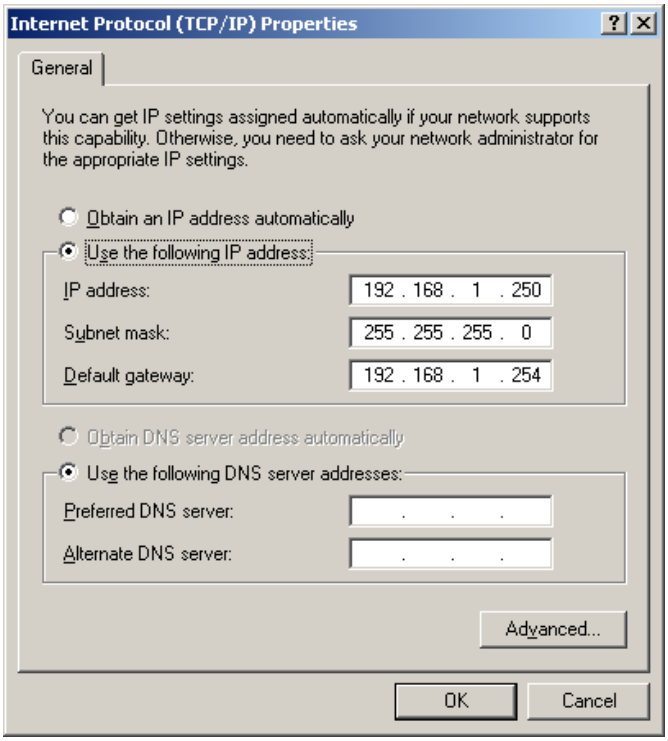


Click on the ***Properties*** button.



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 and ensure the settings are as shown above if the meter's IP address is set to default (192.168.1.127).

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.

3.2.5. 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 192.168.1.127 type the command:-

```
ping 192.168.1.127
```

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 192.168.1.127 with 32 bytes of data:

Reply from 192.168.1.127: bytes=32 time=2ms TTL=64
Reply from 192.168.1.127: bytes=32 time=2ms TTL=64
Reply from 192.168.1.127: bytes=32 time=1ms TTL=64
Reply from 192.168.1.127: bytes=32 time=1ms TTL=64

Ping statistics for 192.168.1.127:
    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 192.168.1.127 with 32 bytes of data:


Request timed out.
Request timed out.

Request timed out.
Request timed out.

Ping statistics for 192.168.1.127:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

3.2.6. Web Browser Setup

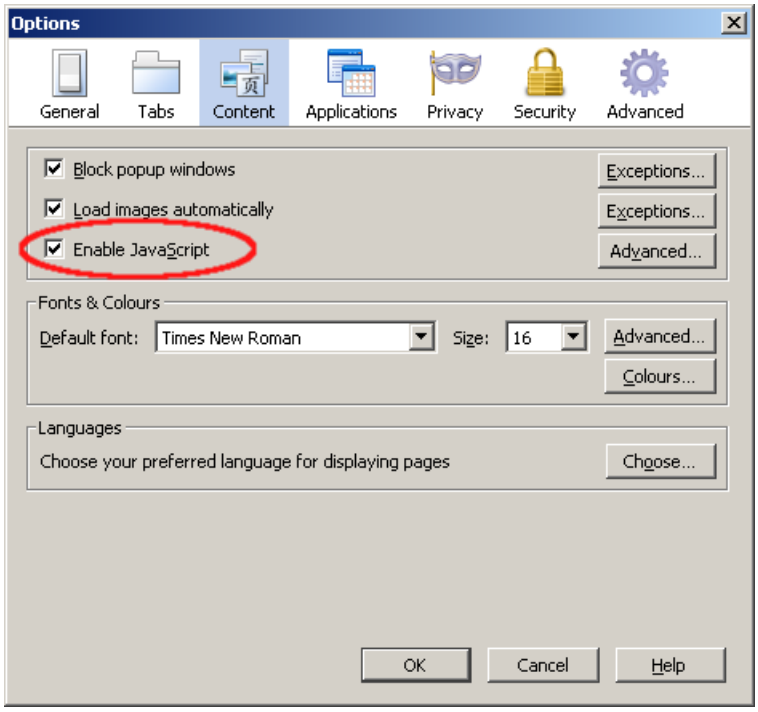
The meter contains a built-in web server that can display stored web-pages. These include views of live and recorded measurement data, forms for setting up the operation of the meter and user pages that may be added to the meter. A standard web-browser application such as Microsoft Internet Explorer or Mozilla Firefox may be used to view the meter. Enter the IP Address of the meter into the address bar of the browser.
For example:

3.2.6.1. JavaScript

No browser extensions or plug-ins are required to view the built-in web-pages but some pages require that JavaScript be enabled in the browser. Usually JavaScript is enabled by default, if not it can be enabled by the user.

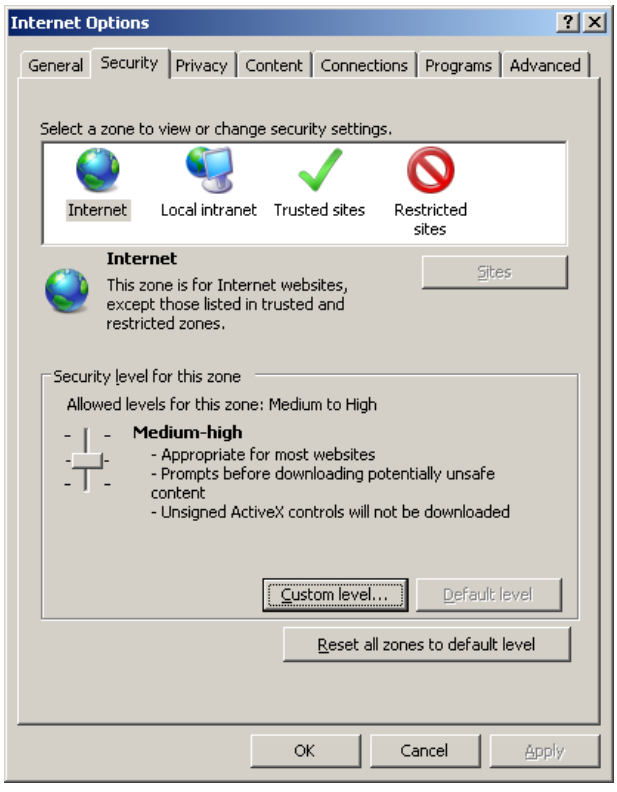
Mozilla Firefox

Select “Options…” from the “Tools” menu. When the Options dialog appears select the “Content” tab and ensure that the “Enable JavaScript” option is checked.

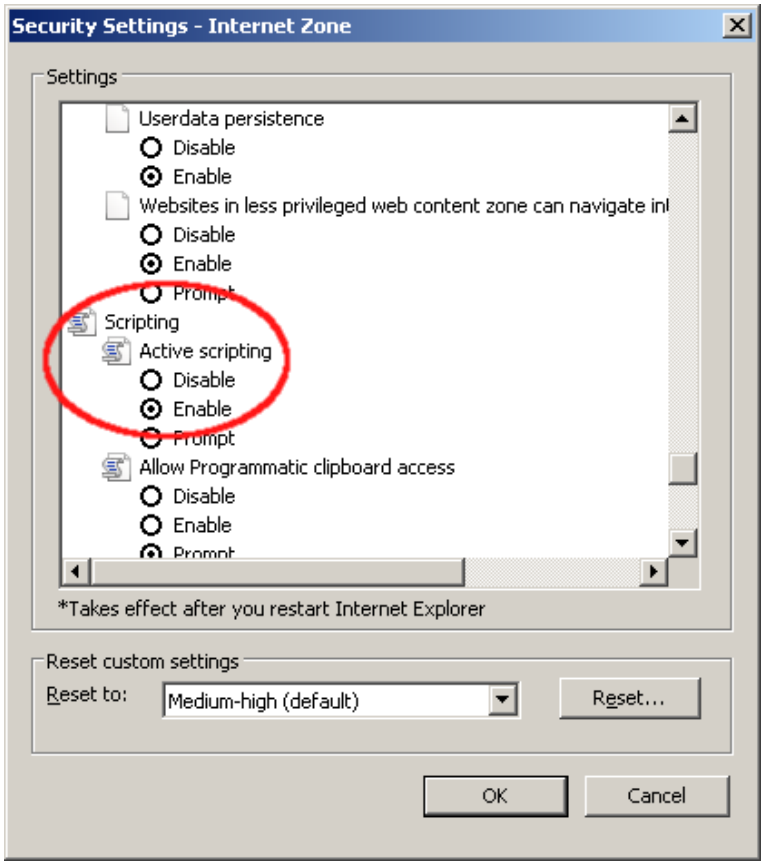


Microsoft Internet Explorer

Select “Internet Options” from the “Tools” menu. When the Internet Options tab appears select the “Web pagesSecurity” tab and chose the Internet zone.



Click on the “Custom level…” button and, in the Security Settings dialog scroll down to the Scripting section. Under “Active scripting” select the “Enable” radio button and then click “OK”.

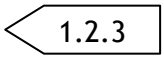


4. Web Pages – Introduction

The web pages can be accessed using a web browser, such as Internet Explorer or Mozilla Firefox, by typing the IP address of the meter into the browser.

When loaded, the Values page will appear as shown below;

Screenshot Legend

An arrow with a number inside 

alongside a screenshot indicates the section of the manual that explains that part of the screenshot.

Figure 2- Main Web Page Screen

4.1. Header

The product can be customised by changing the logo that appears here. (See the document titled "IP Meter Web Page Customisation" for details.

4.2. Top Menu

Changes between viewing the Values and the Setup menus.

4.3. Display Area

This is the main output area where either the Values or the Setup screens will be displayed.

4.4. Footer

Includes the Web Server firmware version and date.

When the “SETUP” option in the top menu is clicked, the screen changes as shown below, providing access to the various setup menu options;

4.5

Figure 3- Setup Menu

4.5. Setup Menu

Provides access to all of the setup options.

4.6. Web page details

Section 5 “Web Pages – Values” explains the values page.

Section 6 (and onwards) “Web pages – Setup” explains the setup menus.

5. Web Pages – Values

5.1.1. Live Values

The front page of the meters built in web-server displays the Live Values Page. This page gives a live view of the basic electricity measurements updated every two seconds. If the meter is powered down or the network is interrupted while viewing this page then the message “Meter Communications Interrupted” appears at the top and bottom of the page. Once the connection is restored reloading the page will remove this message and restart live updating of the data.

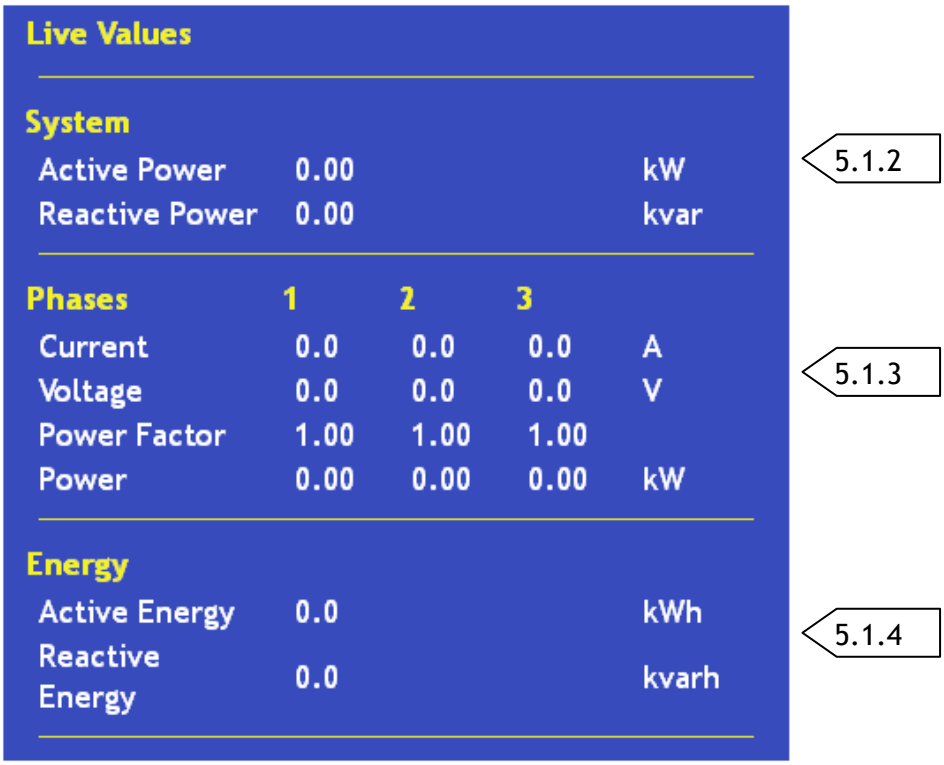


Figure 4- Values Page

5.1.2. System

Shows the Active and Reactive Power currently being measured in real time for all 3 phases of the meter.

5.1.3. Phases

Shows the individual phase values for Current, Voltage, Power Factor and Active Power.

5.1.4. Energy

Shows the accumulated Active and Reactive Energy values for all 3 phases of the meter. (Note that these values are preserved when the meter is power cycled.)

6. Web pages – Setup - General

This interface provides access to additional settings that can be used to customise the meter for specific applications.

A menu of settings pages can be accessed by clicking on the “SETUP” button that is displayed on the front page of the built-in web site.

6.1. Password

Any changes made in the Setup menus will require a username and password to be entered. By default the word “admin” is used for both username and password but the password can be changed by following a link on the System Information Page. Most web-browser applications will remember the username and password for a session (until the browser is shut down). This means that the user will only be asked for a username and password when the first settings page is updated.

6.2. Forgotten Passwords

If the password is forgotten, it can be recovered using the procedure in Section 15.4 – “Forgotten Password”.

6.3. Input Fields

All of the input fields in the setup pages are checked in the following ways;

6.3.1. Keystrokes

Only permitted keystrokes will be accepted. For example, in fields where only numerical values are permitted, only number keystrokes will be accepted. Other fields may allow other special characters such as colons (:) where applicable.

6.3.2. Checking

When Update buttons are clicked, all values will be checked to ensure they are correctly formatted (i.e. IP addresses) or within range. Any errors will result in a warning and highlighting of the field in error;

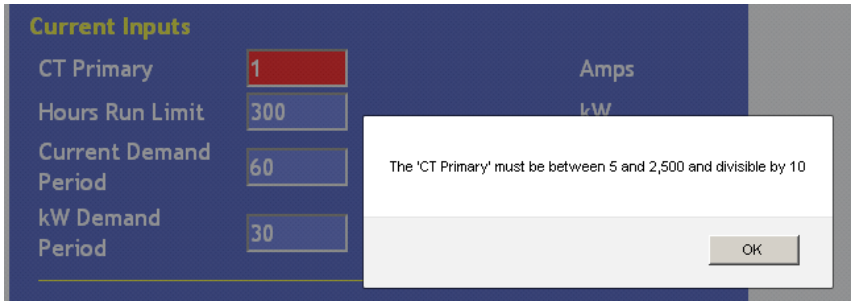


Figure 5 - Field Error Notification

6.4. Update button and Enter key

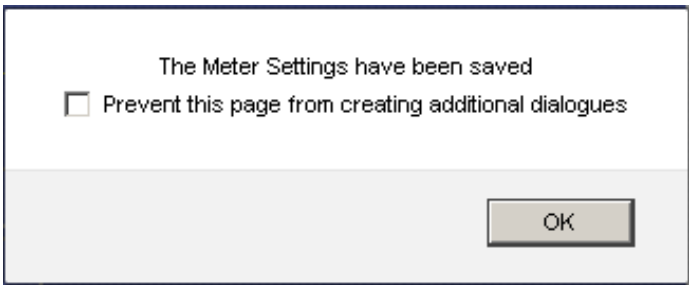
In the web pages that accept values to be entered and saved, the update button should be used to save the values. The Enter key has been disabled in web page forms.

6.5. Update Messages

When screens are saved by clicking the Update button, a message will appear indicating the data has been saved, for example;

Note: If data has been saved and the above message has been displayed, refreshing the web page will cause the message to be re displayed. Avoid using the refresh function within the browser.

Some browsers may display an additional message as follows;



Clicking in the square box will prevent additional update messages from being displayed. The updates will still be performed.

7. Meter Settings Page

The meter settings page displays the settings of the measurement system. The model and type of the meter is shown at the top of the page. The remainder of the page is divided into sections that describe the current and voltage inputs and the pulse output. Once the required settings are typed into the text input boxes clicking the 'Update' button will commit the changes to the metering system. The same settings can also be accessed through the front panel display of the meter. For further details see the meter operating manual.

Note: If the Meter settings are changed via the front panel of the Meter, a message will be displayed indicating that the on screen values may differ from those of the Meter. Simply refresh the page to see the new values.

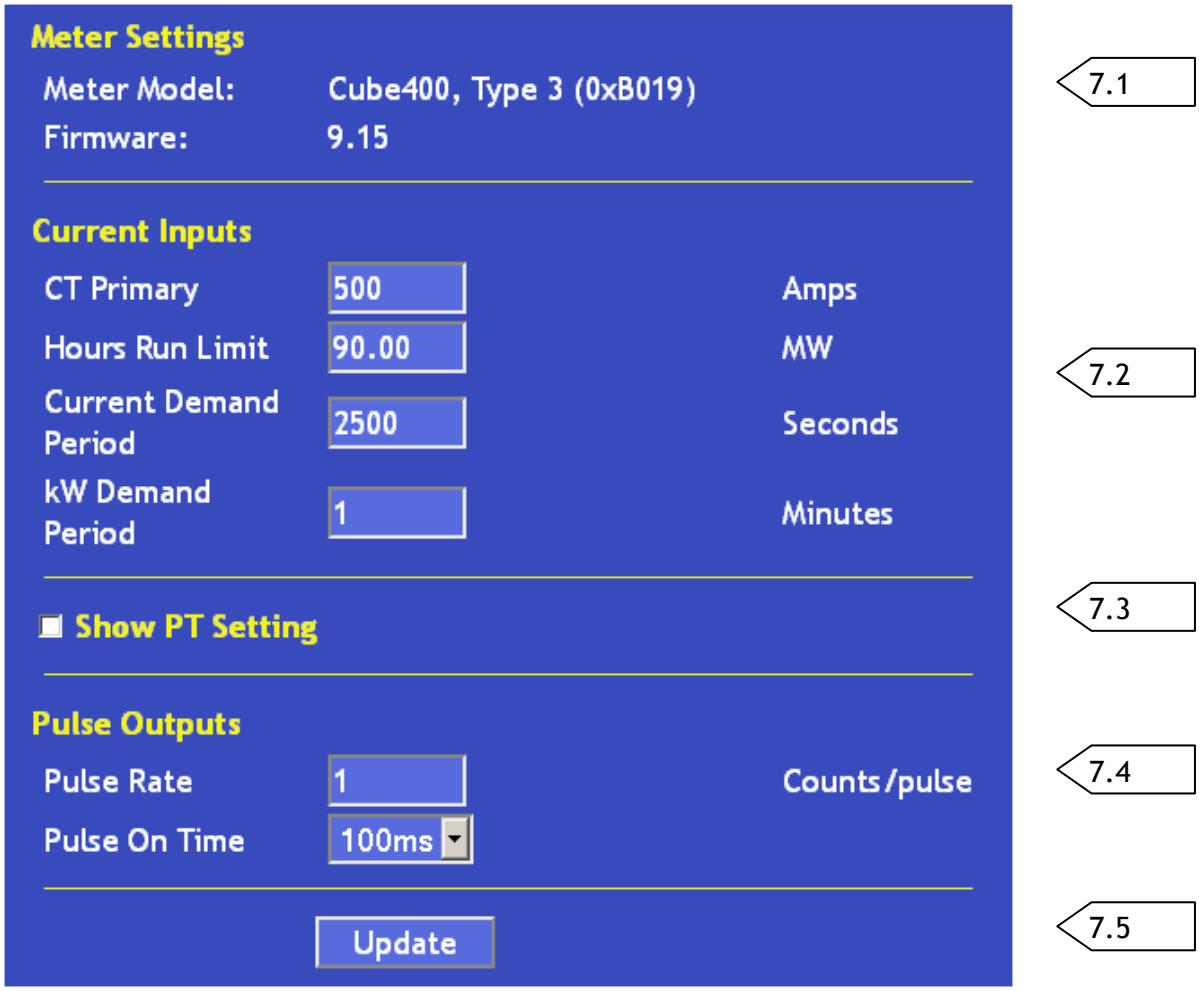


Figure 6 - Meter Setting Page

7.1. Meter Settings

This information area shows the type of meter and the Meter Firmware version installed. Note that the Meter Firmware version is different to the Web Server Firmware version included in the footer of the page.

7.2. Current Inputs

Set the Current Inputs values according to the product manual for the model you are using.

7.2.1. CT Primary

This sets the Current Transformer Primary.

7.2.2. Hours Run Limit

This sets the instantaneous (system kW on a Cube400 or percentage of Current on a Cube350) level above which the Hours Run timer will accumulate. Below this level Hours Run will remain unchanged.

Note: This value is a scaled value, and will change as the CT Primary and Nominal Voltage values are adjusted.

Note: When changing the CT Primary, it is necessary to alter the Hours Run Limit as the scaling will have been changed.

7.2.3. Current Demand Period

This sets the integration period in seconds used for the sliding time window average calculation for current and voltage.

Note: If logging is being used, and Volts Demand or Amps Demand are being logged, the Current Demand Period should be set to the same as the logging period.

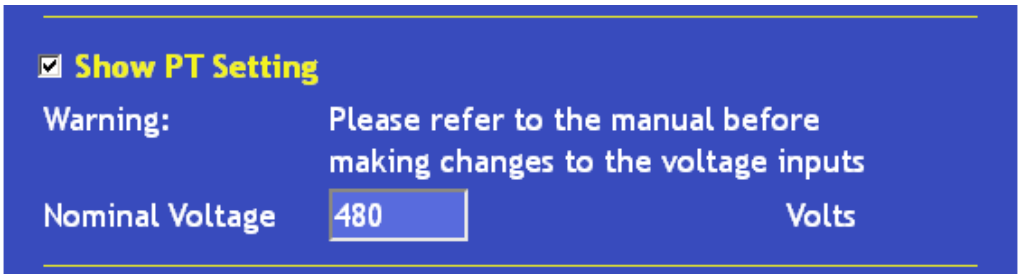
7.2.4. kW Demand Period

This sets the integration period in minutes used for the sliding time window MD calculation for power.

Note: If logging is being used, and any of the Power Demand values are being logged, the kW Demand Period should be set to the same as the logging period.

7.3. Show PT Setting

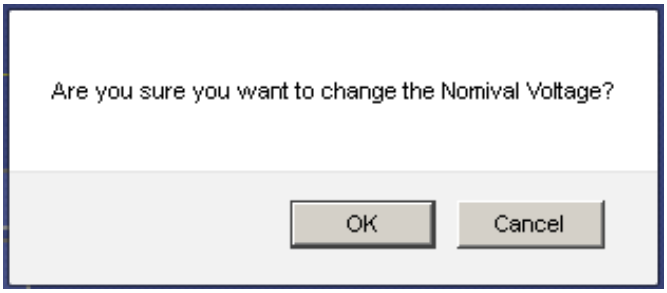
Clicking the box in this field will display the Potential Transformer Primary voltage;



If no external PT is fitted then use the rated nominal voltage input value given on the meter label.

If an external PT is fitted this must have a secondary rating which matches the rated nominal voltage input value given on the meter label. Then the Nominal voltage should be set to match the PT primary Line-Line voltage.

If a change is made to the Nominal voltage, the following message will be displayed;



Click “OK” to continue and save the new Nominal Voltage.

Click “Cancel” to cancel the Nominal Voltage change. The Nominal Voltage will be returned to its original value and the save will continue.

7.4. Pulse Outputs

Enter the pulse rate and pulse on time for the pulse outputs on pins 13 and 14 of the meter.

7.5. Update

When “Update” is clicked, the settings are written to the Meter and take immediate effect.

8. Network Settings Page

The network settings page displays and allows changes to be made to the settings of the Meter's Network interface, automatic time updating and the name of the Meter.

Note: When changing the IP address using the web pages, the browser will need to be changed with the new IP address.

Note: When changing from a static to DHCP IP address, there may be a delay of up to 1 minute for the new settings to be acquired.

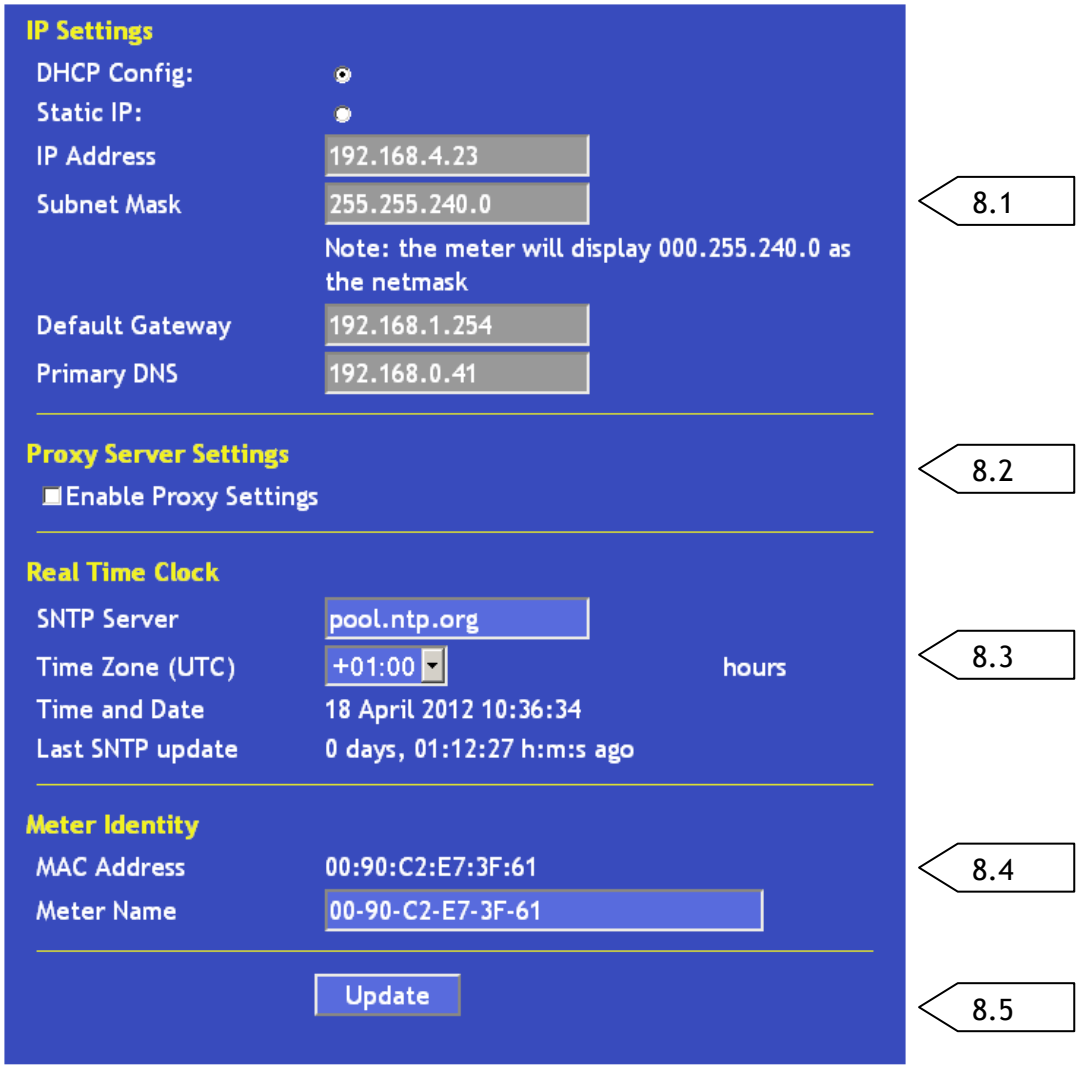


Figure 7 - Network Settings Page

8.1. IP Settings

The IP Settings section will show the current configuration of the Meter's network interface.

If the meter has been configured by DHCP then the IP Address, Subnet Mask and Default Gateway that were obtained will be displayed. If the DHCP server also gave details of Domain Name Servers (DNS) then these are displayed. If the Default Gateway or DNS Servers are not known then these boxes will display "0.0.0.0".

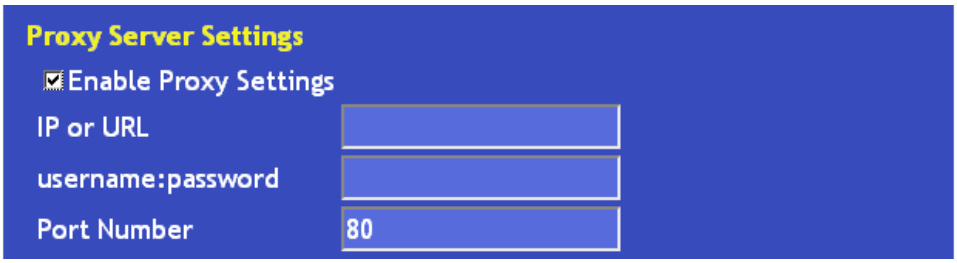
Note: When using DHCP, the Subnet Mask displayed on the Meter's front panel will differ slightly as noted in the web page.

If a static configuration has been configured then any of the IP settings can be entered or changed on this page. Note that if the IP Address is changed via this page then the browser will display an error because it will try to redisplay the page using the old IP Address. It will be necessary to type the new IP Address into the address bar of the browser.

The Meter can be reconfigured between DHCP and Static IP addresses using this page. When the "DHCP Config" option is selected, the address parameters will be greyed out and changes will not be possible.

8.2. Proxy Server Settings

The Proxy Server settings allow HTTP Posted data to be sent via a proxy server. Select "Enable Proxy Settings" to show the proxy settings;



Enter the IP address or URL of the proxy server, along with the username and password required by the Proxy server. The username and password should be entered with a colon separating them, i.e;

username:password

Additionally, the default Port Number of 80 can be changed according to the Proxy Server configuration.

8.3. Real Time Clock

This page also allows a Simple Network Time Protocol (SNTP) server to be selected. This server is used to maintain the accuracy of the built-in real time clock.

The meter contains a real time clock that it uses to timestamp records in its data-logging system. This is battery backed so it will keep time in the event of a power failure. The real time clock can be synchronised to an SNTP server or set manually via the web interface.

If the SNTP Server field is left blank, then SNTP updates will not be performed. The real time clock will still operate, but must be set and maintained manually.

By default, the SNTP Server is set to "pool.ntp.org". This can be changed to an alternative SNTP server;

8.3.1. SNTP Pool

If the meter has access to the Internet then there are a number of public NTP servers that can be used. Look at http://www.pool.ntp.org/en/ for more details. The default SNTP server address that the meter uses is "pool.ntp.org" which redirects to a public NTP server on the Internet.

8.3.2. Local Time Server

If the meter is confined to a local network that is isolated from the wider Internet then it is possible to configure a PC on the network to act as a timeserver. In order to use a PC as a timeserver open a command prompt and enter the following commands.

```
w32tm /register

net start w32time
```

The first command adds the required entry in the Registry. The second command starts the timeserver service. Once the server is started use the Network Settings page of the meter and enter the IP address of the PC as the SNTP Server. The IP address of the PC can be discovered by typing the comment 'IPCONFIG' in a command prompt.

The real time clock keeps UTC time. The Meter's time zone can be set by specifying the number of hours difference between local time and UTC. A drop down box is provided with all possible offsets from UTC.

Note: The Time Zone setting provides an offset from UTC time. The downloaded files are date stamped with the UTC time and then within the files the time zone offset if applied.

The "Time and Date" shows the UTC time and date.

The "Last SNTP update" shows the time that has elapsed since the last automatic SNTP update of the time. It is provided for information and diagnostic purposes.

Note: The time is updated via SNTP when the meter is powered on, when the Network Settings page is Updated with a valid SNTP server, and then every 24 hours thereafter.

8.4. Meter Name

The meter can be given a name to make it easily identifiable on the network. This might be used to differentiate a number of meters on the same network.

By default the name is set according to the MAC address but it can be changed to a more descriptive title.

Note: A typical MAC address might be 00:90:C2:E7:3F:61. In this case, the default name will be 00-90-C2-E7-3F-61. The colon is replaced by a dash, since the meter name is included in FTP filenames and a colon is not permitted in filenames when using some FTP servers.

The meter name may be any combination of letters and numbers up to 31 characters long. If data log files are to be sent by FTP then the filename of the log file will include the name of the meter. This means that the name must only contain characters that are allowed in filenames.

8.5. Update

Once the required settings are typed into the page clicking the 'Update' button will commit the changes to the meter.

This will have the following effects;

8.5.1. IP Settings Changes

If the "IP Settings" have been changed, this will result in the Meter's network settings being changed and the network interface will be restarted. If the IP address has changed, then the

browser will lose contact with the meter and the new IP address will have to be entered in the browser.

8.5.2. SNTP Server Valid

If the “SNTP server” is valid, the Meter’s time will be updated immediately.

8.5.3. Meter Name Changed

If the “Meter Name” has been changed, this will be used immediately in an log files sent by the meter.

Once the changes have been accepted by the meter, a message will be shown to indicate success.

9. Digital Input and Output

Note: This menu option is only available when the Meter is fitted with the Digital IO option.

The digital IO system consists of three inputs and two outputs. The two outputs are independent of each other and can be used as alarms or as MODBUS controlled outputs. The inputs share a common ground and are internally connected to 32-bit counters. The state of each input may be sampled using MODBUS.

9.1. Description

Three independent digital inputs are provided which may be used as Digital Status or Accumulating Pulse Count inputs. The inputs are safety isolated at 2.5kV from the power metering circuits.

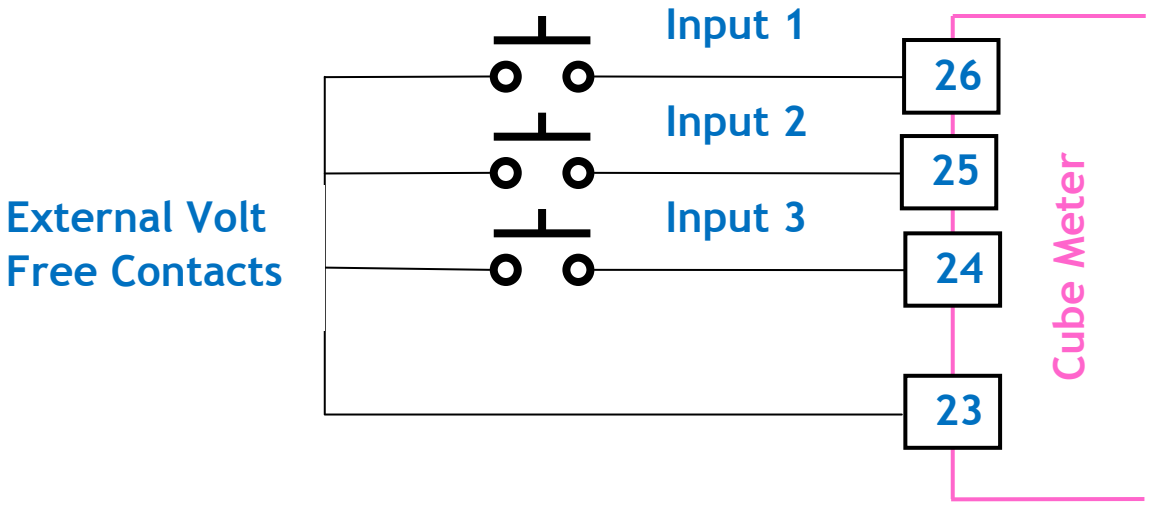
9.1.1. Use as Pulse Accumulators

Each input may be derived from a volt free, normally open contact pair such as those found on modern utility meters. Six independent 32-Bit registers (max count 4,294,967,296) are provided which accumulate input pulses and store them in non-volatile memory. Each register may be read and/or written as registers in a Modbus data table.

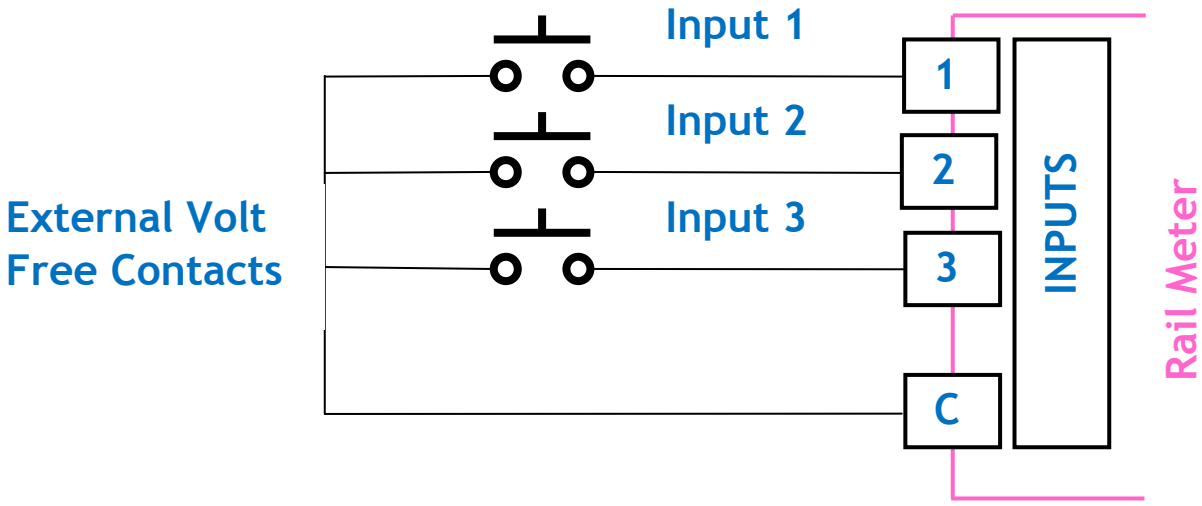
9.1.2. Use as Digital Inputs

Each input may be used as a Modbus discrete digital input. Standard Modbus commands may be used to read the digital status of each channel.

9.2. Inputs Connection



Input Connections – Cube 350 and Cube 400



Input Connections – Rail 350

9.3. Outputs Connection

Two independent digital outputs are provided which may be used as control inputs or alarms to external switching devices. Each output takes the form of an isolated normally open volt free contact pair.

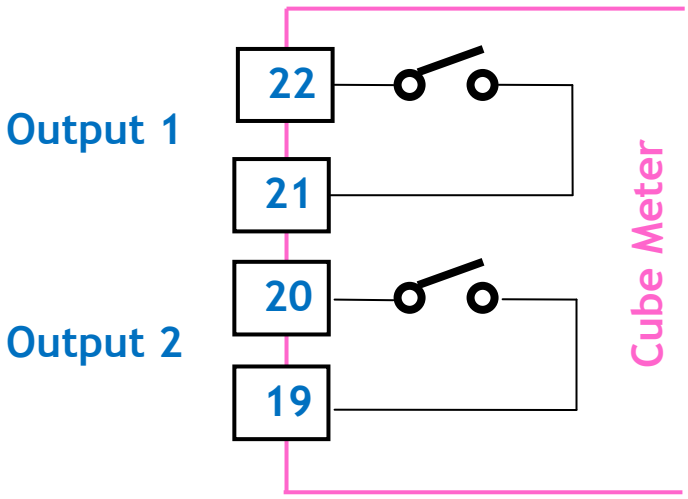


Figure Output Connections – Cube 350 and Cube 400

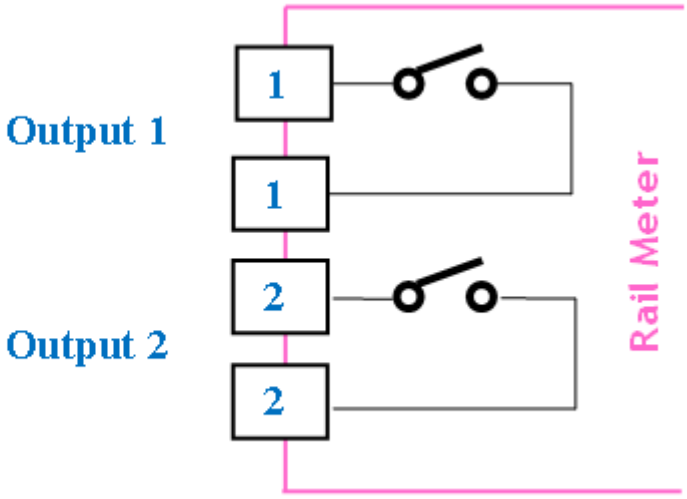


Figure Output Connections – Rail 350

9.3.1. Use as Modbus Controlled Outputs

Each output may be configured individually as a control output with On/Off status set using normal Modbus commands.

Note: The outputs are of a NON-HOLDING type and will be released to the OFF state in the event of a loss of auxiliary power to the meter.

9.3.2. Use as Alarm Outputs

Each output may be configured individually as an Alarm status output. In this mode a parameter is associated with the Alarm using its Modbus Data Address. Any instantaneous Modbus parameter may be chosen to control the alarm.

Each Alarm features High and/or Low settings with hysteresis. A time delay may optionally be associated with the setting to delay a trip condition, until a valid set period of time.

9.4. Digital IO Setup Web Page

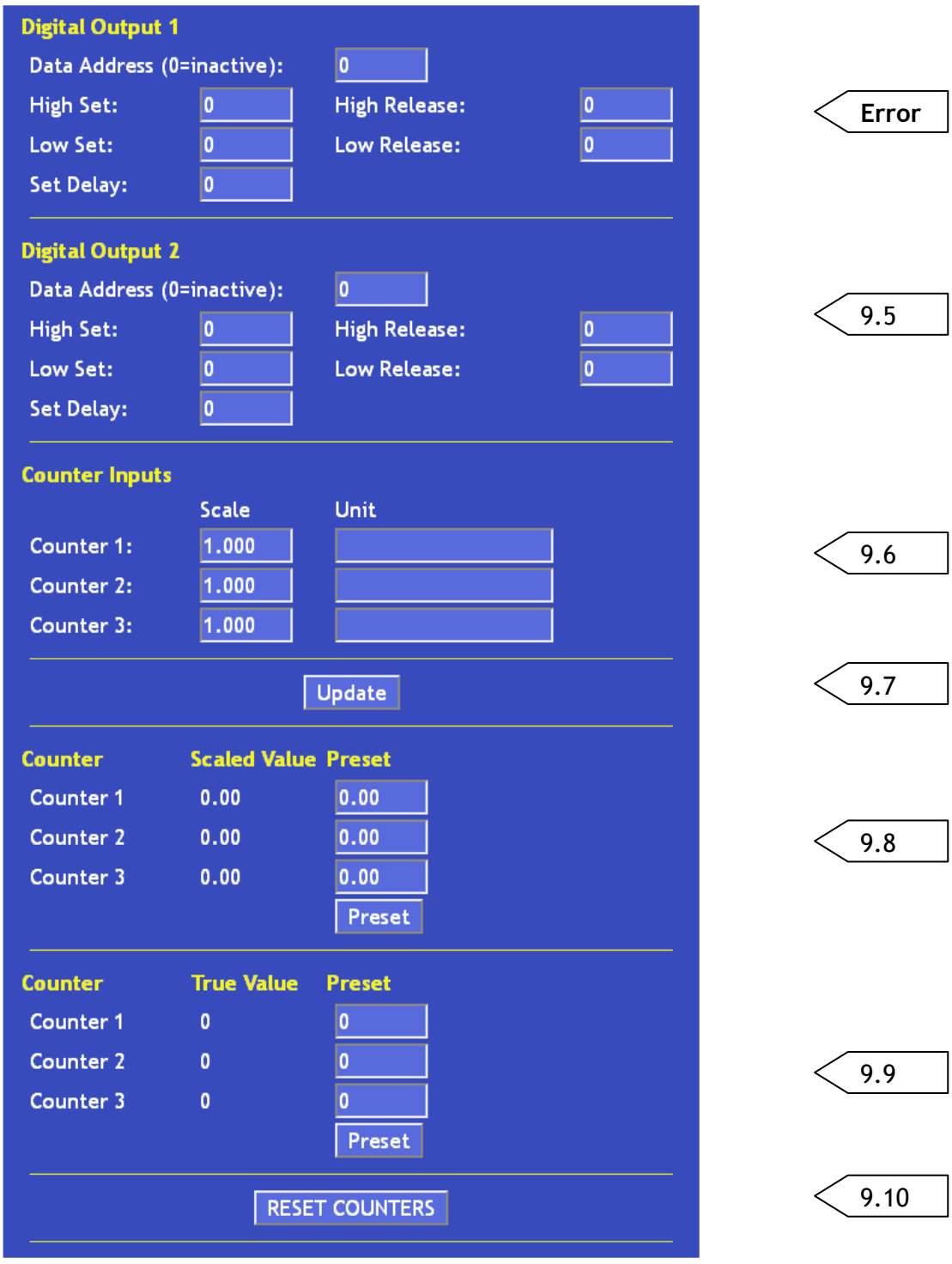


Figure 8 - Digital Input / Output Page

9.5. Digital Output 1 and 2

The Digital Output sections allow the two outputs to be configured as alarms on any measurement parameter.

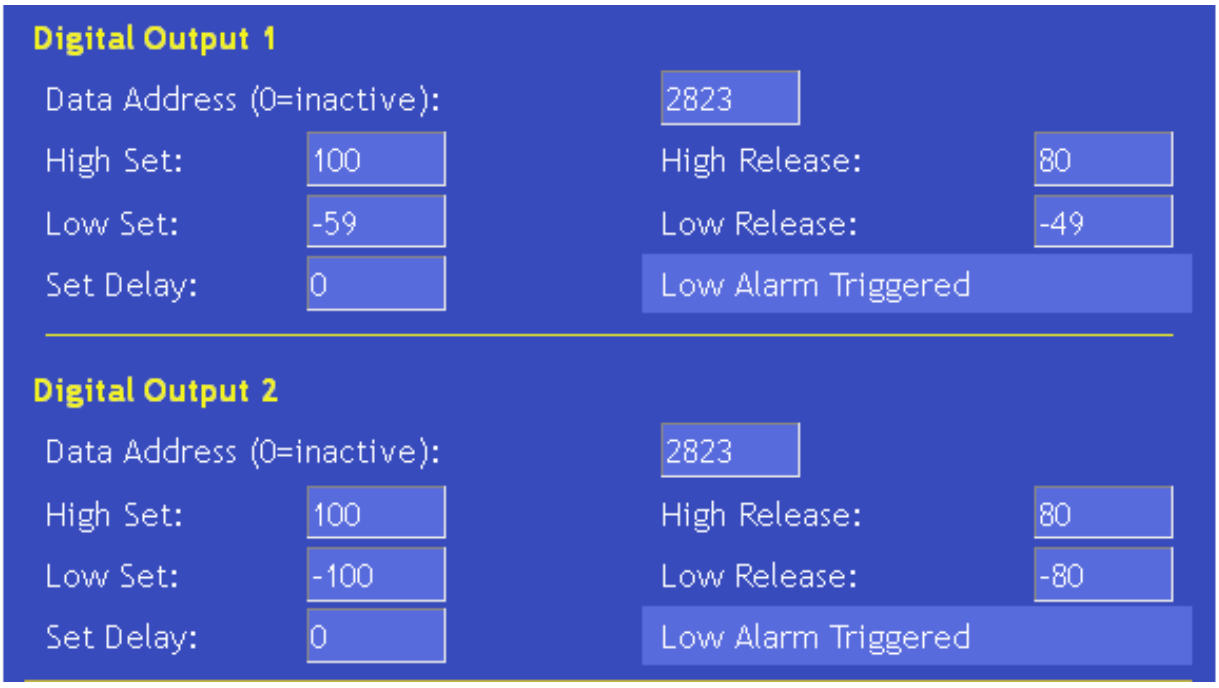
The data addresses for each measurement is detailed in the MODBUS tables for the meter. The most common measurements are included in the appendix, Amalgamated Data Table.

If the data address is set to zero then the output does not function as an alarm. It is set inactive but can be controlled through the MODBUS interface.

The high and low set points of each alarm can be configured along with the hysteresis and a set delay. The high and low set and release points are specified as the un-scaled value of the measurement and a set delay is specified in seconds. If the measurement exceeds either of the set points for the number of seconds given as the set delay then the alarm becomes active. The alarm remains active until the measurement passes the release point.

The High/Low Set/Release points can be negative values as well as positive values.

When an alarm has been triggered, the web page will display a message along stating whether the High or Low set point has been exceeded;



9.6. Counter Inputs

The three digital input counters may each be assigned a scaling factor and a unit of measurement. The scaling factor is multiplied by the True Value count to produce a scaled value.

Below the 'Update' button the Digital IO Settings page contains two further forms that show the raw and scaled values of the three counters. Buttons in these forms allow the counters to be reset to zero or preset to any value. The preset controls alongside the un-scaled values preset the counters to a specified raw count. The preset controls alongside the scaled values will apply the scaling factors to the preset values and set the counters, as near as possible, to the given scaled value.

9.7. Update

Clicking the 'Update' button commits changes to the alarm outputs or counter inputs to be committed to the meter.

9.8. Preset Scaled

The Preset Scaled fields can be used to provide a starting point for scaled counter values, or to correct them during operation.

Clicking the "Preset" button will only apply the changes in this section.

9.9. Preset True Value

The Preset True Value fields can be used to provide a starting point for the unscaled counter values, or to correct them during operation.

Clicking the "Preset" button will only apply the changes in this section.

9.10. Reset Counters

Clicking the "Reset Counters" button will result in the 3 Counter Inputs being set to zero.

9.11. Table 26 External Pulse Input Count Registers

Offset	Address	Modbus Address	Contents	Format	Bytes	Words	Access
0	6656	46657	Count 1 Hi	Unsigned Long	4	2	Read/Write
1	6657	46658	Count 1 Lo				
2	6658	46659	Count 2 Hi	Unsigned Long	4	2	Read/Write
3	6659	46660	Count 2 Lo				
4	6660	46661	Count 3 Hi	Unsigned Long	4	2	Read/Write
5	6661	46662	Count 3 Lo				

9.11.1. External Pulse Input Count Registers

Pulse Input Count registers accumulate pulses from external sources via the Input/Output & Modbus option. These registers may be used to record pulses from other pulsing devices such as gas, water steam meters etc. The two resultant 4-byte registers are stored in Modbus Table 26 as unsigned long integers.

9.11.2. Reading Input Count Registers

Function 3 may be used to read the input count registers in Table 26. These Modbus commands are covered in full in "***Cube400 Modbus Comms Manual***".

9.11.3. Writing to Input Count Registers

Function 6 may be used to write to the Input Count registers in Table 26. These Modbus commands are covered in full in "***Cube400 Modbus Comms Manual***".

Function 6 allows access to the upper and lower integers of the 4-byte long individually. Function 16 is not supported. The counter registers must be written individually.

9.12. Table 27 External Status Registers

Offset	Address	Modbus Address	Contents	Format	Bytes	Words	Access
0	6912	46913	Combined Contact Status	Integer	2	1	Read
1	6913	46914	Input 1 Status	Integer	2	1	Read
2	6914	46915	Input 2 Status	Integer	2	1	Read
3	6915	46916	Output 1 Status	Integer	2	1	Read
4	6916	46917	Output 2 Status	Integer	2	1	Read
5	6917	46918	Input 3 Status	Integer	2	1	Read

9.12.1. Combined Contact Status Register

This 16-Bit register provides a single location to read the status of the 3 Digital Inputs and the 2 Coil outputs. The register is formatted as follows:

BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	OUT2	OUT1	0	0	0	0	0	IN3	IN2	IN1

9.12.2. External Pulse Input Status Registers

The IP Meter Status registers may be read using Modbus commands 03 or 04.

Table 27 stores a 16-bit register for each Status Input as:

Input Open Circuit — Input Status register = 0

Input Short Circuit — Input Status register = 65535 (-1)

9.12.3. External Pulse Coil Output Status Registers

The IP Meter Status registers may be read using Modbus commands 03 or 04.

Table 27 stores a 16-bit register for each Output Coil Status as:

Output Open Circuit — Output Coil Status register = 0

Output Short Circuit — Output Coil Status register = 65535 (-1)

9.13. Table 28 Digital Alarm Outputs

Offset	Address	Modbus Address	Contents	Format	Access
0	7168	47169	Alarm 1 Data Address	Unsigned Integer	Read/Write
1	7169	47170	Alarm 1 High Set Point	Signed Integer	Read/Write
2	7170	47171	Alarm 1 High Release Point	Signed Integer	Read/Write
3	7171	47172	Alarm 1 Low Release Point	Signed Integer	Read/Write
4	7172	47173	Alarm 1 Low Set Point	Signed Integer	Read/Write
5	7173	47174	Alarm 1 Set Delay (Seconds)	Signed Integer	Read/Write
6	7174	47175	Alarm 1 Status	Signed Integer	Read/Write
7	7175	47176	Alarm 1 Parameter Value	Signed Integer	Read Only
8	7176	47177	Alarm 2 Data Address	Unsigned Integer	Read/Write
9	7177	47178	Alarm 2 High Set Point	Signed Integer	Read/Write
10	7178	47179	Alarm 2 High Release Point	Signed Integer	Read/Write
11	7179	47180	Alarm 2 Low Release Point	Signed Integer	Read/Write
12	7180	47181	Alarm 2 Low Set Point	Signed Integer	Read/Write
13	7181	47182	Alarm 2 Set Delay (Seconds)	Signed Integer	Read/Write
14	7182	47183	Alarm 2 Status	Signed Integer	Read/Write
15	7183	47184	Alarm 2 Parameter Value	Signed Integer	Read Only

9.13.1. Using Outputs as Alarms

Each output may be individually setup to provide an over/under alarm function. Configuration is carried out using the Modbus interface as shown in **Table 28**.

9.13.1.1. Enabling the Alarm Function

To switch between Modbus Control Output and Alarm functionality write to the "***Alarm n Data Address***" register in Table 28. Output 1 is set by writing to register 47169 and Output 2 at register 47177.

0 = Modbus Controlled Output

>0 = Alarm Output

9.13.1.2. Enabling Modbus Controlled Outputs

To enable Modbus Controlled Outputs, write 0 to either 47169 (Output 1) or 47177 (Output 2). Writing to the Alarm Status registers will then activate or deactivate the relevant output.

Function	Output 1 Write to 47175	Output 2 Write to 47183
Disable output	0	0
Enable output	1	1

9.13.2. Alarm Operation

9.13.2.1. Alarm Parameters

Each Alarm is associated with a single Modbus register, which in turn is linked to a measured parameter in the meter.

To associate a measured parameter with an alarm output write it's ***Data Address*** to ***Table 28***.

A complete list of Modbus register ***Data Addresses*** is given in the ***Cube400 Modbus Communications Manual***.

For example: Writing 2821 to ***Table 28*** register 47169 will associate Alarm Output 1 with Phase 1 Voltage Input. The instantaneous phase voltage will then be copied to Modbus register 47176.

Note: The scaling of the input value is the same as that provided over the Modbus link. A phase voltage display of 240.0, for example would provide a Modbus register value of 2400.

The ***Cube400*** instantaneous parameters are updated once a second. Each new measurement value provides a true rms reading, which takes account of all short-term fluctuations and transient behaviour during that second. Alarm inputs reflect these values and therefore outputs react at the end of each second to the rms values and not to transients.

9.13.2.2. Set Points

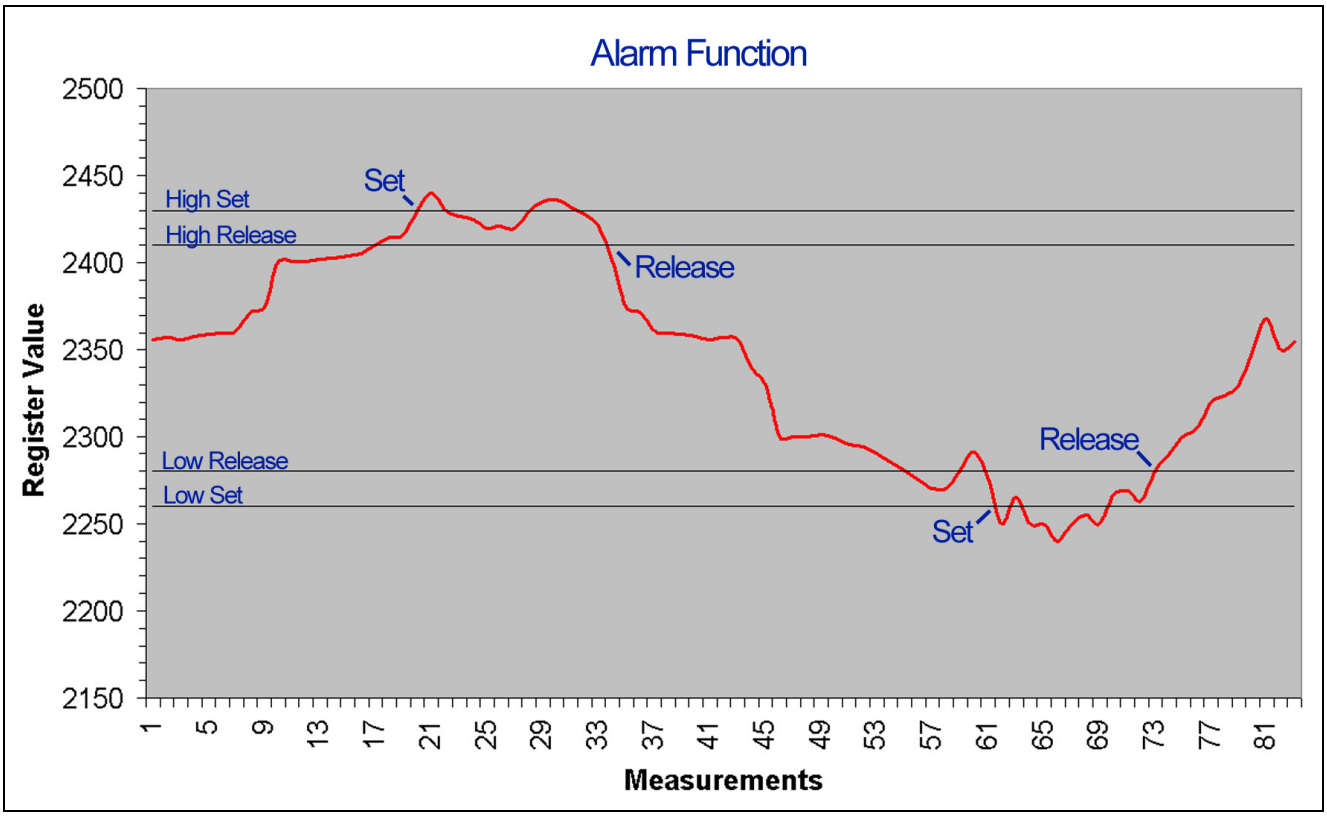


Figure 1 Alarm Set Points

Set Delay - The consecutive period of time a ***High Set*** or ***Low Set*** point must be exceeded before an alarm output is set. Alarms are released on detecting a release condition with no delay.

High Set Point - If the value in the selected Modbus register exceeds this value for a time period greater than the ***Set Delay*** the alarm is set (**Set High**).

High Release Point - If the alarm is **Set High** and the value in the selected Modbus register is lower than this value, for a single measurement period (1 second) the alarm is released.

Low Set Point - If the value in the selected Modbus register is lower than this value for a time period greater than the ***Set Delay*** the alarm is set (**Set Low**).

Low Release Point - If the alarm is **Set Low** and the value in the selected Modbus register exceeds this value, for a single measurement period (1 second) the alarm is released.

Alarm Status – Each Alarm status is available at a Modbus register as:

0 = Alarm Released

1 = Alarm Set High

2 = Alarm Set Low

The status of each Alarm may be set using Modbus command 03 and 04. This allows a great level of flexibility with the Cube400 Alarm functions.

9.13.3. Example 1 – Over-Alarm

Alarm if Phase 1 Amps > 150A. (CT Primary = 200A).

Data Address	*Modbus Address*	*Description*	*Value*
7168	*47169*	*Alarm 1 Data Address*	*2822*
7169	*47170*	*Alarm 1 High Set Point*	*1500*
7170	*47171*	*Alarm 1 High Release Point*	*1400*
7171	*47172*	*Alarm 1 Low Release Point*	*0*
7172	*47173*	*Alarm 1 Low Set Point*	*0*
7173	*47174*	*Alarm 1 Set Delay (Seconds)*	*0*

Note: The Low Set/Release points are set to zero. Phase 1 Amps can never be less than zero, so they become inactive.

9.13.4. Example 2 – Under-Alarm

Alarm if Phase 3 Volts < 220V. (PT Primary = 480V$_{L-L}$).

Data Address	*Modbus Address*	*Description*	*Value*
7168	*47169*	*Alarm 1 Data Address*	*2827*
7169	*47170*	*Alarm 1 High Set Point*	*10000*
7170	*47171*	*Alarm 1 High Release Point*	*10000*
7171	*47172*	*Alarm 1 Low Release Point*	*2250*
7172	*47173*	*Alarm 1 Low Set Point*	*2200*
7173	*47174*	*Alarm 1 Set Delay (Seconds)*	*0*

Note: The High Set/Release points are set to 10000 (1000.0V). Phase Volts can never exceed these values so they become inactive.

9.13.5. Example 3 – Over/Under-Alarm

Alarm if Phase 3 Volts < 211.6V. (PT Primary = 480V$_{L-L}$).

Alarm if Phase 3 Volts > 248.4V

Data Address	*Modbus Address*	*Description*	*Value*
7168	*47169*	*Alarm 1 Data Address*	*2827*
7169	*47170*	*Alarm 1 High Set Point*	*2484*
7170	*47171*	*Alarm 1 High Release Point*	*2450*
7171	*47172*	*Alarm 1 Low Release Point*	*2150*
7172	*47173*	*Alarm 1 Low Set Point*	*2116*
7173	*47174*	*Alarm 1 Set Delay (Seconds)*	*0*

Note: This setting detects if phase voltage is out of the normal 230V ±8% band.

9.13.6. Example 4 – Latching Over Alarm

Alarm if Phase 1 Amps > 180A. (CT Primary = 200A).

Data Address	*Modbus Address*	*Description*	*Value*
7168	*47169*	*Alarm 1 Data Address*	*2822*
7169	*47170*	*Alarm 1 High Set Point*	*1800*
7170	*47171*	*Alarm 1 High Release Point*	*0*
7171	*47172*	*Alarm 1 Low Release Point*	*0*
7172	*47173*	*Alarm 1 Low Set Point*	*0*
7173	*47174*	*Alarm 1 Set Delay (Seconds)*	*5*
7174	*47175*	*Alarm 1 Status*	*0 to RESET*

Note: This Alarm will Set if the current exceeds 180.0A for a consecutive period of 5 seconds or more. The High Release point is set to zero so an Alarm will remain set until reset by the user. Reset is performed by writing a zero to Modbus address 47175.

10. Filesystem

The IP Meter has a built in filesystem that can be used to store user defined content such as company logos to brand the web pages, customised web pages or documentation. The uploaded pages will be served by the built in web server.

10.1. The Filesystem page provides an easy method of maintaining the content of the filesystem. Alternatively, Trivial File Transfer Protocol (TFTP) can be used from the command line as detailed in 15.2 "TFTP log download

Trivial File Transfer Protocol (TFTP)

The logs can be downloaded using a TFTP client such as the one that is included in the Windows command prompt.

To use the Windows TFTP client open a Command Prompt by either selecting "Command Prompt" from the start menu under All Programs -> Accessories or by selecting "Run…" from the start menu and issuing the command "cmd". In the Command Prompt, type the following command, for a brief description of the operation of the tool.

The Fast Data Log can be downloaded using the following command;

```
TFTP –i 192.168.1.127 get log.csv {alternate_name}
```

Note: The IP address must be changed to that of the meter.

Note: The optional {alternate_name} can be used to store the file locally by a different name.

The Energy Log can be downloaded using the following command;

```
TFTP –i 192.168.1.127 get energy.csv {alternate_name}
```

Note: The IP address must be changed to that of the meter.

Note: The optional {alternate_name} can be used to store the file locally by a different name.

TFTP file transfer".

Figure 9 - Filesystem Page

10.1.1. Upload File

To upload a file into the filesystem, click the "Browse" button, select the required file and click "Upload".

Any files that have the same name as built-in files will override the built-in files. This allows users to replace the logo, the style-sheet or pages of the built-in web site with their own. If two or more files are uploaded with the same name then the web server will always serve the last file to be added.

File names may have a maximum length of 30 characters including any extension.

There is no means of deleting individual files but the entire file store can be reformatted.

10.1.2. Read File & Directory List

Files can be read by typing the filename into the text box next to the "Read" button and then clicking the button. Files can also be read by typing their name into the address bar of the web-browser after the IP address of the meter. For example; if the IP address of the meter is 192.168.1.121 and the uploaded file is named "uploaded.html" then the file can be viewed by typing "192.168.1.121/uploaded.html" into the address bar.

A list of uploaded files can be displayed by clicking the 'DIR' button.

Files that are uploaded to the meter using TFTP will appear in the directory list.

If the filename "dir" is entered into the text box then the clicking the "Read" button will cause a directory listing of the contents of the file-system to be displayed.

10.1.3. Format Filesystem

The format button deletes any user files that have been uploaded but does not affect the built-in website. If a user-uploaded file over-rides a built-in file of the same name then re-formatting the file-system will delete the uploaded file and cause the built-in file to become available to the web-server. The data-logging system is separate from the uploaded files and is not affected by re-formatting the file-system.

Note: When the Format button is pressed, the system will give a warning and will ask for confirmation - click OK will permanently erase all uploaded files. Click Cancel to abort.

10.1.4. Customisation of web pages

Please contact Northern Design for information on customising the built in web pages.

11. Introduction to logging

11.1. 2 Logging Systems

The meter includes two independent data-logging systems.

The Energy Data Log system is used to track recorded energy and pulse inputs over the course of several months or years.

The Fast Data Log system is used to track instantaneous measurements over the course a smaller time period, such as days or a few months.

Both logs can be configured to send data to a remote server using the file transfer protocol (FTP).

The Energy Data Log sends a file to a remote FTP server every time it logs data. The Fast Data Log system can accumulate and send several readings at once.

Additionally, both logs can post data in an XML format to a remote web application, which is referred to as “HTTP Posting”. Each log has a separate settings page, once the required settings for logging and export of data are entered clicking the ‘Update’ button will configure that log, erase old data and start logging from that moment.

Both the logs are implemented as circular buffers, once full they will begin writing over the oldest records.

11.2. Methods of getting the logs

The following methods can be used to get logging information;

11.2.1. Web pages.

Via the System Information screen, either log can be viewed in a web browser. By default, the entire log will be output, but different date ranges can be chosen.

Additionally, the Fast Data Log can be saved in CSV format for loading into a spreadsheet application, for example.

11.2.2. FTP

Either log can be configured to send data to an FTP (File Transfer Protocol) server at regular intervals. At each interval, logged data since the last FTP transfer is sent.

11.2.3. TFTP

Using TFTP (Trivial File Transfer Protocol), logs can be manually downloaded. TFTP is a standard application within Windows and also available for other platforms. The entire log is downloaded.

See 15.2 for more information.

11.2.4. HTTP Posting

Either log can be configured to send data to a remote web application (typically a Cloud Server) at regular intervals. At each interval, logged data since the last HTTP posting is sent.

11.3. Drop in communications

If a transfer of data to the remote FTP server should fail then both logging systems will accumulate readings and send them along with the next successful transfer.

In the case of FTP, this will result in large files (up to 1MB) being sent until all data has been sent.

In the case of HTTP posting, individual posts are sent for each log entry that is outstanding.

In both cases, this will continue until all outstanding data has been sent, then the system will return to normal FTP or HTTP transfers.

11.4. Logging System Capacity

The two logging systems each have a 1 Mbyte circular buffer. The energy and counter values each take up four bytes in every record. The instantaneous parameters saved in the fast data log take up two bytes each, the fast data log may also record the energy and counter values at four bytes each. In addition, the timestamp of each record also takes up four bytes. The length of time that each log will run before overwriting the oldest values depends upon how many parameters are logged and how often.

Examples:-

Energy Log records 3 energy values and 3 counters every 30 minutes:

Timestamp = 4 bytes

3 x energy values (4 bytes each) = 12 bytes

3 x counters (4 bytes each) = 12 bytes

TOTAL = 28 bytes/record

1 Mbyte is 1000000 bytes / 28 bytes/record = 35714 records

35714 records / 48 records/day = 744 days or 2 years

Data Log records 16 instantaneous parameters every 60 seconds

Timestamp = 4 bytes

16 x instantaneous values (2 bytes each) = 32 bytes

TOTAL = 36 bytes/record

1 Mbyte is 1000000 bytes / 36 bytes/record = 27777 records

27777 records / 24 x 60 records/day = 19 days

12. Fast Data Log

WARNING: ANY CHANGES MADE IN THIS PAGE WILL RESULT IN THE FAST DATA LOG BEING RESTARTED, LOOSING ANY DATA ALREADY LOGGED.

The configurations page for the Fast data Log shows a list of the parameters that are available to be logged, the logging period and configuration options for FTP and HTTP posting of the data.

Figure 10 - Fast Data Log Setup Page

12.1.1. Log Parameters

Parameters shown in the “Selected Parameters” column will be logged in the Fast Data Log. When the page is loaded, any parameters currently being logged will be displayed in this column.

Parameters in the “Available Parameters” column are not currently logged, but can be by dragging and dropping them into the “Selected Parameters” column”.

Likewise, parameters can be removed from the logging system by dragging them out of the “Selected Parameters” column and dropping them into the “Available Parameters” column.

Note: The Digital Input counters will be only be available for logging if the Digital IO option its fitted to the Meter.

As far as the logging system is concerned, the order in which the parameters appear in the “Selected Parameters” column is not important. Also, for parameters where there is a high and low word, only one of those needs to appear in the “Selected Parameters” column for it to be logged.

However, the screen order of the parameters determines the parameter order in the FTP and CSV files. See 12.1.5– “Fast Data Log File Formats” for more details.

12.1.2. Fast Data Logging Period

The Fast Data Logging Period determines the interval at which data is logged. It can be set as low as 1 second.

For example, if set to 60s, a new log entry will be created containing all the “Selected Parameters” every 60s.

Note: If posting via HTTP is enabled, a value less than 60s will be overridden to 60s.

Note: Logging is always running, regardless of whether any of the data sending options detailed below are in operation.

Note: If any Demand values are being logged, the Demand Period in the meter should be set to the same value for more accurate results. See section 7.2 - Current Inputs for more information.

12.1.3. Send Fast Data Log to FTP

The Fast Data Log data can be periodically sent to an FTP server for backup or data analysis purposes. When the “Send datalog to FTP” option is selected, or FTP is already enabled, the screen expands showing the following additional fields.

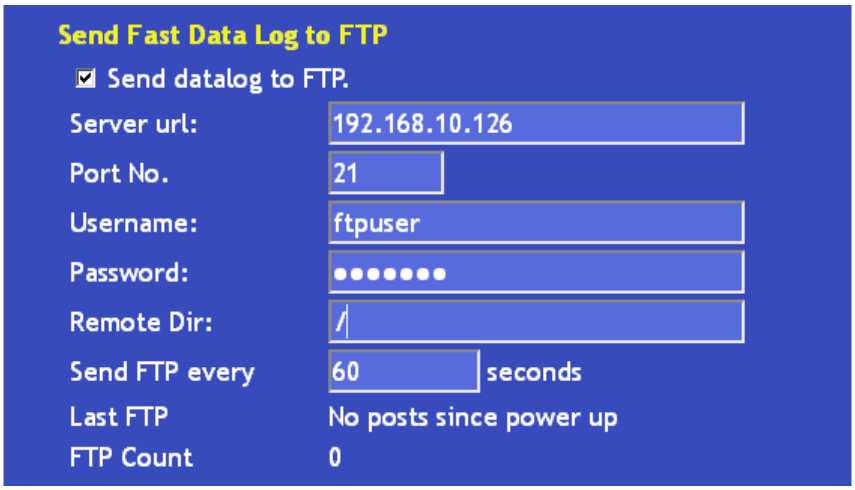


Figure 11 - Fast Data Log FTP Settings

Note: The Fast Data Log FTP settings are unique to the Fast Data Log and are distinct to the Energy Data Log FTP settings.

The fields are completed as follows;

12.1.3.1. "Server URL" – This is the IP address or URL of the FTP server to which the logging data is to be sent. If a URL is specified, the ftp:// should be omitted.

12.1.3.2. "Port Number" – This is the port number used for the FTP transfers. The default port for FTP is 21.

12.1.3.3. "Username" – Specify the username required by the FTP server.

12.1.3.4. "Password" – Specify the password required by the FTP server.

12.1.3.5. "Remote Dir" – Specify the directory into which the files will be written. This should be a URL relative to the root directory of the FTP server. For example;

[blank]	save the file in the FTP server root directory
/	save the file in the FTP server root directory
/data	Save the file in the "data" directory on the FTP server

12.1.3.6. "Send FTP every" – Enter the number of seconds between each FTP transfer. If this is set the same as the "Fast Data Logging Period", then one FTP transfer will occur for each log entry written. If this is set to 10 times the "Fast Data Logging Period", then an FTP transfer will occur for each 10 log entries written.

The "Last FTP" and "FTP Count" fields will display the time that a successful FTP transfer last occurred along with the number of successful FTP transfers since the meter was powered up;

Figure 12 - FTP Statistics

Note: When the pages "Update" button is pressed, an FTP transfer will be attempted immediately. If successful, the "Last FTP" and "FTP Count" fields will be updated immediately.

12.1.4. Post Fast Data Log via HTTP

The Fast Data Log can be sent to a web server. The advantage of HTTP posting is that it usually requires no extra configuration of the local network or firewall. The meter posts data to the web application in the same way that a web-browser running on a desktop PC posts data typed into a form on a web-page. The data is sent in an XML format as detailed in "Appendix A3 – XML Data Format".

The "Shortname", "Company Username" and "Company Password" are required to setup the Meter. The other screen and e-mail information is used to login to the web based Cloud system to view the data.

When the "Post Fast Data Log via HTTP" option is selected, or HTTP posting is already enabled, the screen expands showing the following additional fields.

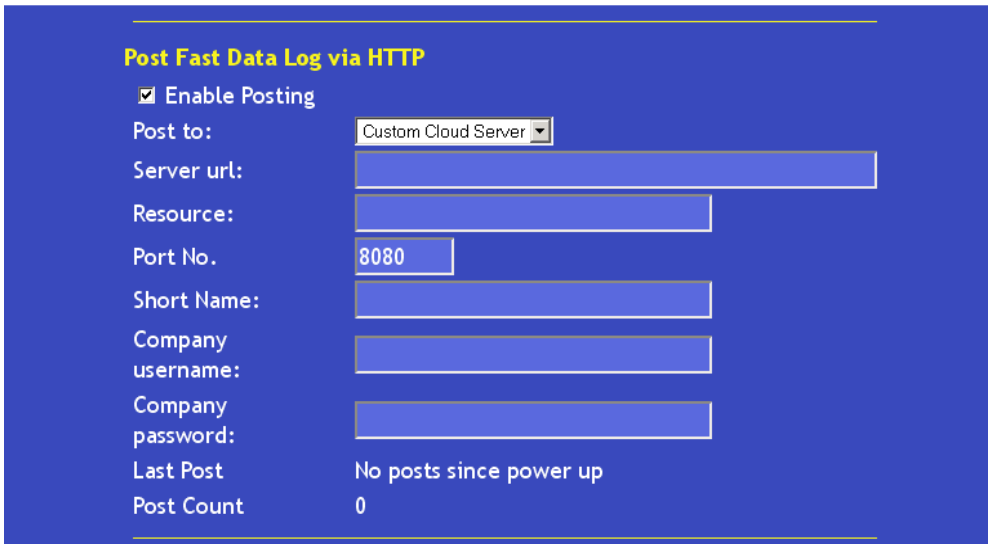


Figure 13 - Fast Data Log HTTP Posting Settings

Note: The Fast Data Log HTTP Posting settings are shared with the Energy Data Log HTTP Posting. They can be individually enabled, and have different posting periods, but the data must be sent to the same destination.

The fields are completed as follows;

"Post to" - This can be set to Custom Cloud Server;

Custom Cloud Server	The "Server URL", "Resource" and "Port No" are editable.

12.1.4.1. "Server URL" – This is the IP address or URL of the HPTP server to which the logging data is to be sent. If a URL is specified, the http:// should be omitted.

12.1.4.2. "Resource" – This is the file on the web server that will receive and process the data.

12.1.4.3. "Port No" – "Port Number" – This is the port number used for the HTTP transfers. The default port for HTTP is 8080.

12.1.4.4. "Short Name" – Enter the "Short Name". This is a required field entry.

12.1.4.5. "Company username" – Enter the "Company username". This is a required field entry.

12.1.4.6. "Company password" – Enter the "Company password". This is a required field entry.

The "Last Post" and "Post Count" fields will display the time that a successful HTTP transfer last occurred along with the number of successful HTTP transfers since the meter was powered up;

Figure 14 - HTTP Post Statistics

Note: When the pages "Update" button is pressed, an HTTP transfer will be attempted immediately. If successful, the "Last Post" and "Post Count" fields will be updated immediately.

12.1.5. Fast Data Log File Formats

The logs in the Meter are always in the same format. However, both the CSV file that is sent by FTP and the screen dumps of the logs can each be configured in one of 2 formats using the 2 tick boxes at the bottom of the page;

Figure 15 - Fast Data Log File Formats

When a tick box is unticked, the corresponding output (either CSV or Screen) contains parameter values such as “kWh”.

When a tick box is ticked, the corresponding output (either CSV or Screen) contains Modbus register values. This option provides a file format that is compatible with the v1 Meter.

12.1.6. Update

When the “Update” button is clicked, the following occur;

12.1.6.1. The logging system is restarted.

WARNING – THIS DELETES EXISTING LOGGING DATA. ANY DATA REQUIRED SHOULD BE DOWNLOADED BEFORE THIS OPERATION IS PERFORMED.

12.1.6.2. The parameters to be logged are stored.

12.1.6.3. If the FTP section is completed, an FTP transfer is attempted immediately, and will continue to be made each time interval set.

12.1.6.4. If the HTTP posting section is completed, an HTTP transfer is attempted immediately, and will continue to be made each logging interval.

13. Energy Data Log

WARNING: ANY CHANGES MADE IN THIS PAGE WILL RESULT IN THE FAST DATA LOG BEING RESTARTED, LOOSING ANY DATA ALREADY LOGGED.

The configurations page for the Energy Data Log shows a list of the parameters that are available to be logged, the logging period and configuration options for FTP and HTTP posting of the data.

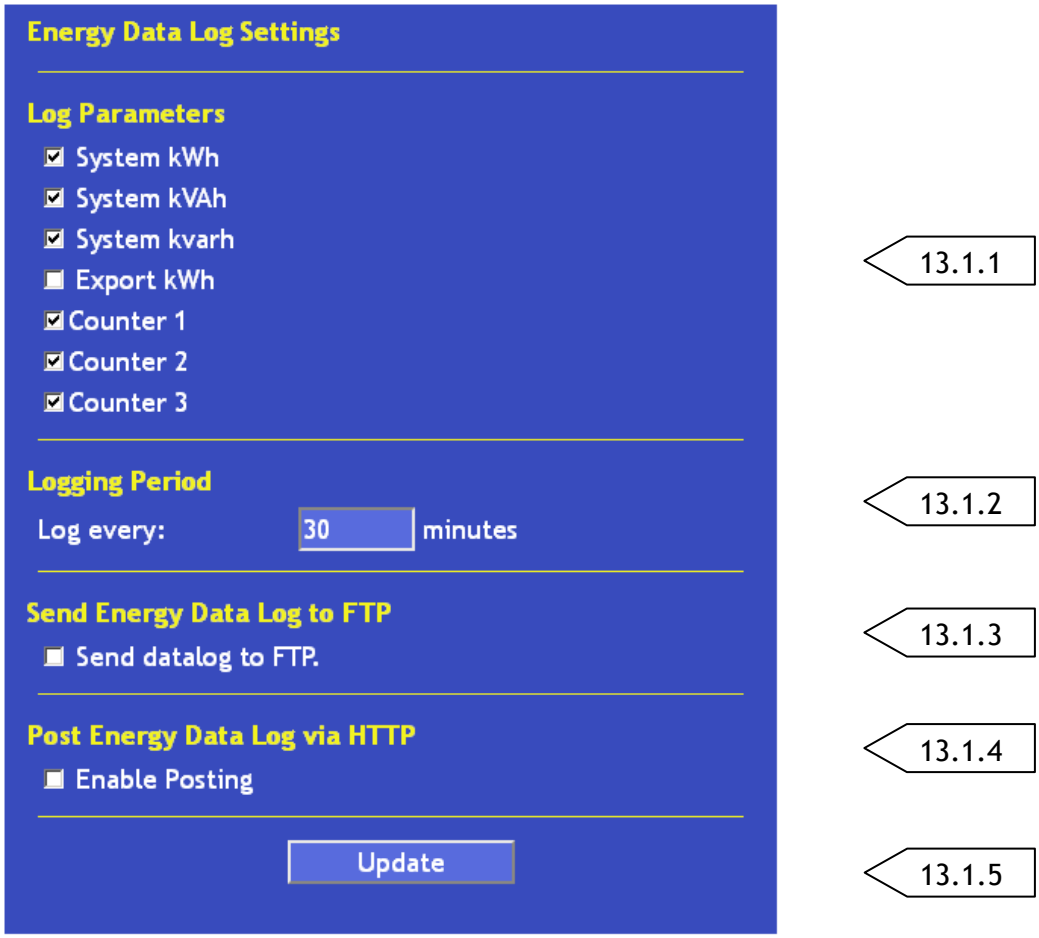


Figure 16 - Energy Data Log Setup Page

13.1.1. Log Parameters

Parameters that are ticked will be logged in the Energy Data Log. When the page is loaded, any parameters currently being logged will be show as ticked.

To include a parameter in the Energy Data Log, simply tick the box next to it. To exclude it from the Energy Data Log, remove the tick.

Note: The Digital Input counters will be only be available for logging if the Digital IO option its fitted to the Meter.

13.1.2. Logging Period

The Fast Data Logging Period determines the interval at which data is logged. It can be set as low as 1 minute.

For example, if set to 1 minute, a new log entry will be created containing all the ticked parameters every 1 minute.

Note: Logging is always running, regardless of whether any of the data sending options detailed below are in operation.

13.1.3. Send Energy Data Log to FTP

The Energy Data Log data can be periodically sent to an FTP server for backup or data analysis purposes. When the "Send datalog to FTP" option is selected, or FTP is already enabled, the screen expands showing the following additional fields.

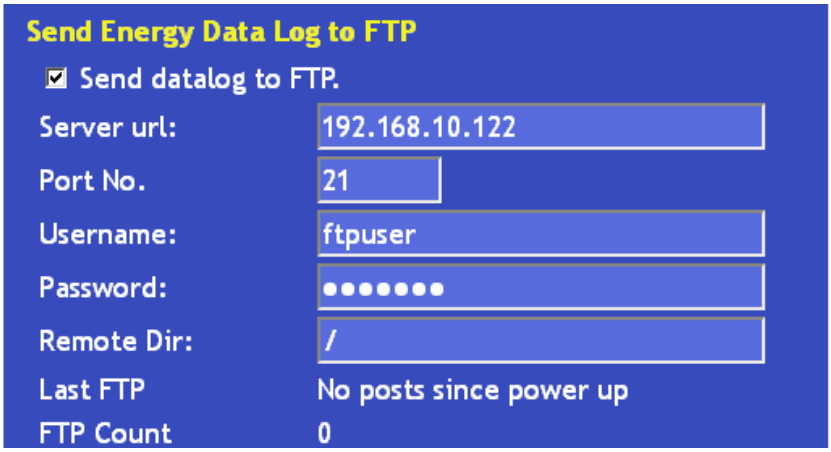


Figure 17 - Fast Data Log FTP Settings

Note: The Fast Data Log FTP settings are unique to the Fast Data Log and are distinct to the Energy Data Log FTP settings.

The fields are completed as follows;

13.1.3.1. "Server URL" – This is the IP address or URL of the FTP server to which the logging data is to be sent. If a URL is specified, the ftp:// should be omitted.

13.1.3.2. "Port Number" – This is the port number used for the FTP transfers. The default port for FTP is 21.

13.1.3.3. "Username" – Specify the username required by the FTP server.

13.1.3.4. "Password" – Specify the password required by the FTP server.

13.1.3.5. "Remote Dir" – Specify the directory into which the files will be written. This should be a URL relative to the root directory of the FTP server. For example;

[blank]	save the file in the FTP server root directory
/	save the file in the FTP server root directory
/data	Save the file in the "data" directory on the FTP server

The “Last FTP” and “FTP Count” fields will display the time that a successful FTP transfer last occurred along with the number of successful FTP transfers since the meter was powered up;

Figure 18 - FTP Statistics

Note: When the pages “Update” button is pressed, an FTP transfer will be attempted immediately. If successful, the “Last FTP” and “FTP Count” fields will be updated immediately.

13.1.4. Post Energy Data Log via HTTP

The Energy Data Log can be sent to a web server. The advantage of HTTP posting is that it usually requires no extra configuration of the local network or firewall. The meter posts data to the web application in the same way that a web-browser running on a desktop PC posts data typed into a form on a web-page. The data is sent in an XML format as detailed in “Appendix A3 – XML Data Format”.

The “Shortname”, “Company Username” and “Company Password” are required to setup the Meter. The other screen and e-mail information is used to login to the web based Cloud system to view the data.

When the “Post Energy Data Log via HTTP” option is selected, or HTTP posting is already enabled, the screen expands showing the following additional fields.

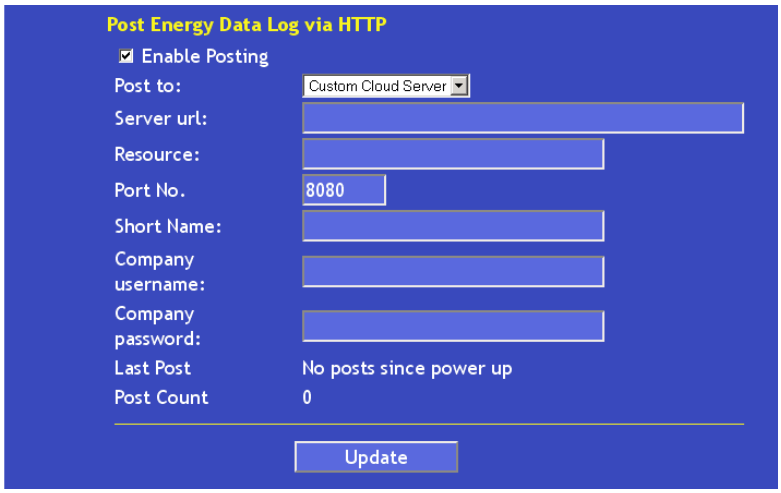


Figure 19 - Fast Data Log HTTP Posting Settings

Note: The Energy Data Log HTTP Posting settings are shared with the Fast Data Log HTTP Posting. They can be individually enabled, and have different posting periods, but the data must be sent to the same destination.

The fields are completed as follows;

“Post to” – This can be set Custom Cloud Server;

Custom Cloud Server	The “Server URL”, “Resource” and “Port No” are editable.

13.1.4.1. "Server URL" – This is the IP address or URL of the HPTP server to which the logging data is to be sent. If a URL is specified, the http:// should be omitted.

13.1.4.2. "Resource" – This is the file on the web server that will receive and process the data.

13.1.4.3. "Port No" – "Port Number" – This is the port number used for the HTTP transfers. The default port for HTTP is 8080.

13.1.4.4. "Short Name" – Enter the "Short Name". This is a required field entry.

13.1.4.5. "Company username" – Enter the "Company username". This is a required field entry.

13.1.4.6. "Company password" – Enter the "Company password". This is a required field entry.

The "Last Post" and "Post Count" fields will display the time that a successful HTTP transfer last occurred along with the number of successful HTTP transfers since the meter was powered up;

Figure 20 - HTTP Post Statistics

Note: When the pages "Update" button is pressed, an HTTP transfer will be attempted immediately. If successful, the "Last Post" and "Post Count" fields will be updated immediately.

13.1.5. Update

When the "Update" button is clicked, the following occur;

13.1.5.1. The logging system is restarted. WARNING – THIS DELETES EXISTING LOGGING DATA. ANY DATA REQUIRED SHOULD BE DOWNLOADED BEFORE THIS OPERATION IS PERFORMED.

13.1.5.2. The parameters to be logged are stored.

13.1.5.3. If the FTP section is completed, an FTP transfer is attempted immediately, and will continue to be made each time interval set.

13.1.5.4. If the HTTP posting section is completed, an HTTP transfer is attempted immediately, and will continue to be made each logging interval.

14. System Information

The system information page provides details of the IP meter and provides a means to set the real time clock or change the system password. At the top of the page is the product name and copyright notice. The next section gives the name given in the Network Settings Page and the MAC address of the meter. The 'Last Power Down' element gives the time and date of the last time that the meter was switched off or the mains power failed.

Links are provided to pages that allow the user to set the meters clock (see the section on Real Time Clock) and change the admin password. Some IP meter products feature an auto discovery feature that allows them to discover other Northern Design IP meters on the local network. If this feature is included then links from the System Information page allow other meters to be listed and viewed.

Figure 21 - System Information Page

14.1.1. System Information

This section shows the model, type, IP firmware running on the Meter and the serial number. The number in brackets after the model and type may be requested if you telephone for support.

14.1.2. Meter Details

The current Meter name is displayed here, along with the MAC address and the last UTC time the unit was power cycled.

14.1.3. Tools Menu

The Tools section provides links through to additional configuration screens;

14.1.3.1. Set Clock – displays a screen providing a method of manually setting the time.
See 14.1.6– “Set Clock”.

14.1.3.2. Change Password – provides a screen to change the password.
See 14.1.7– “Change Password”.

14.1.3.3. List Meter on LAN – provides a screen listing all the Meters found on the same LAN.
See 14.1.8– “List Meters on LAN”.

14.1.3.4. View Meters on LAN – provides a screen showing the current energy values from all the Meters found on the LAN.
See 14.1.9– “View Meters on LAN”.

14.1.3.5. Energy Log – displays the entire Energy Log, or part of the log between 2 date/time values.
See 14.1.10 - Energy Log.

14.1.3.6. Data Log – displays the entire Data Log, or part of the log between 2 date/time values, in text or CSV format.
See 14.1.11 - Data Log.

14.1.4. SNMP

The SNMP section provides 2 additional screens to get the Meter’s MIB file and to set the community string;

14.1.5. SNMP MIB – retrieve the MIB file.
See 14.1.12– SNMP MIB.

14.1.5.1. Community String – set the community string.
See 14.1.13– “Community String”.

14.1.6. Set Clock

WARNING: PLEASE READ THE FOLLOWING CAREFULLY WHEN MANUALLY CHANGING THE TIME

Changing the time by a significant amount (i.e. greater than the Fast or the Energy logging period) will alter the behaviour of the logging system in particular the output of the logs via HTTP posting, FTP, TFTP or the web pages.

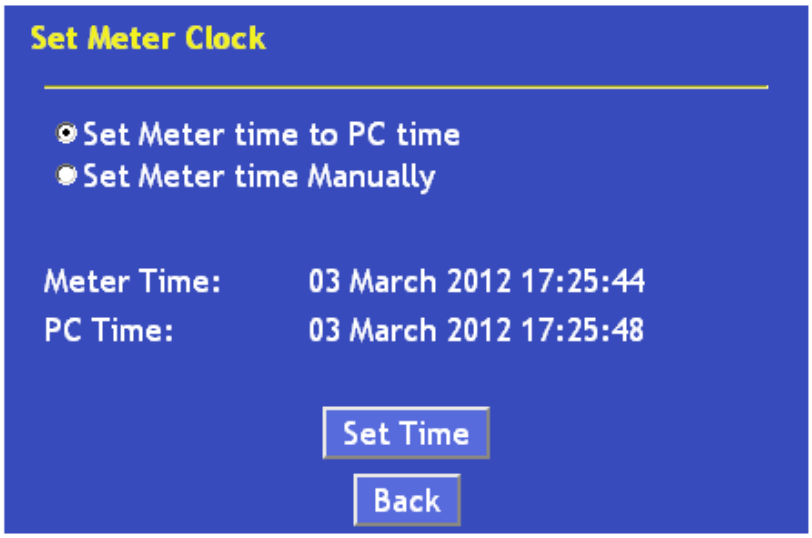
Moving the time forwards will simply result in the log entries jumping forwards in time at the point the change is made. As long as this is acceptable, the time may be changed forwards. If it is not acceptable, then the logging system should be restarted (see below).

Moving the time backwards could result in partial or incomplete reading of the log files. It is recommended that the logging system is restarted should the time be changed backwards. If the logging system is not restarted, then meter will continue to operate and log data, but the outputs of the logs may be incomplete.

To restart the logging systems, simply click the “Update” button on the “Fast Data Log” and “Energy Data Log” configuration screens.

END OF WARNING

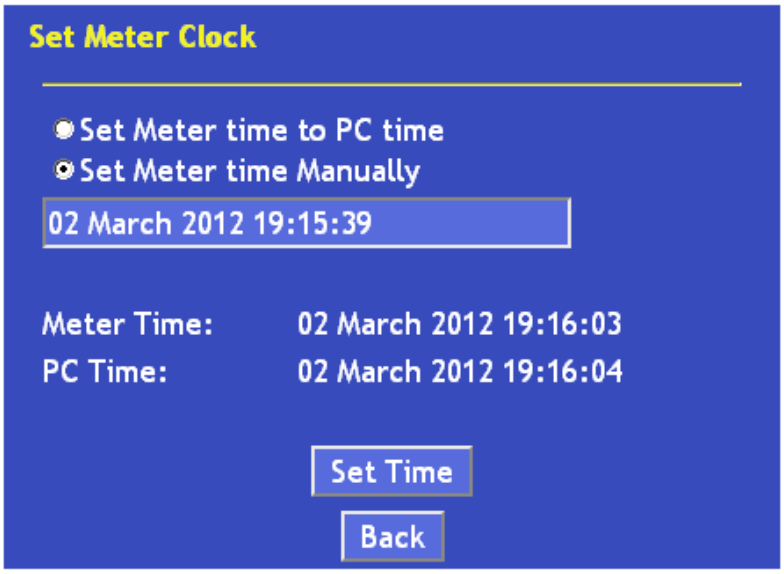
Rather than using a timeserver, it is possible to set the real time clock using the web interface;



The Set Clock page displays the time in the Meter’s Real Time Clock (RTC) and the time of the system on which the browser is running.

When “Set Meter time to PC time” is selected and the “Set Time” button is pressed, the local PC time is written to the Meter.

When “Set Meter time Manually” is selected, an input box appears (as shown below) in which the date and time can be manually entered. When the “Set Time” button is pressed, the manually entered time is written to the Meter.



14.1.7. Change Password

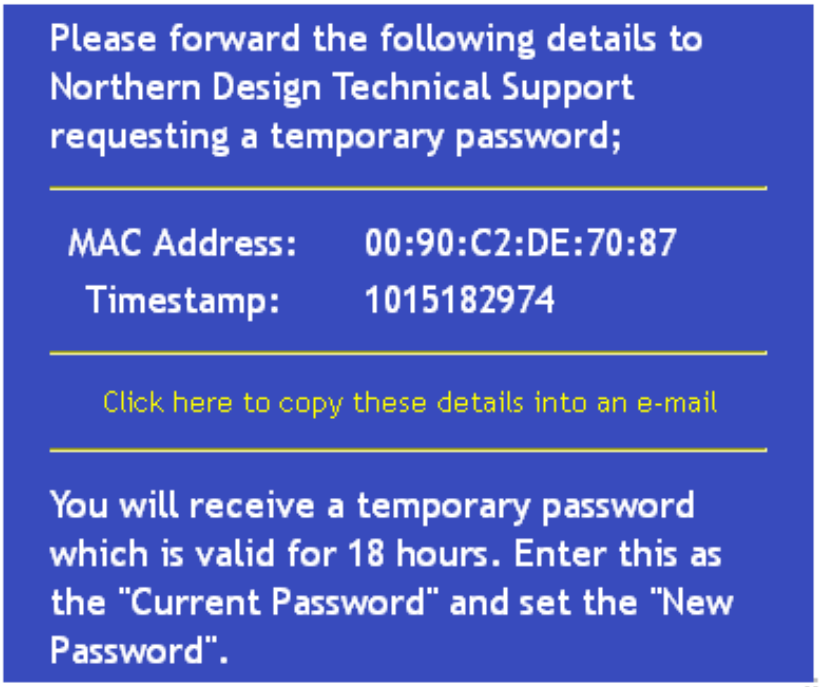
This screen provides a mechanism for setting the password used in some of the Web Page screens.

Enter the current password, and the New Password in the fields provided;

If the “New Password” and “Confirm New Password” entries do not match, a warning will be displayed and the password will not be written.

If the “Current Password” is entered incorrectly, the password will not be set and a warning will be displayed.

If the Current Password has been forgotten, click the on screen message “Click here if you have forgotten your password” and the following window will be displayed;



You can either copy the “MAC Address” and “Timestamp” values into an e-mail, or click the yellow link to put the values into an e-mail using your default mail client. Send this e-mail to ND Technical support at support@ndmeter.co.uk and a temporary password will be sent to you.

The temporary password is valid for 18 hours, after which the process will need to be repeated.

Enter the temporary password as the “Current Password” in the change password screen, along with the new password.

14.1.8. List Meters on LAN

This menu option will display a list of Northern Design IP Meters found on the LAN. It is provided for diagnostic purposes when configuring multiple meters.

The list shows the IP addresses of the Meters.

14.1.9. View Meters on LAN

This menu option displays a list of the Northern Design IP Meters on the LAN. It includes the name of the Meter and various energy values as shown below.

The values will update every 2 seconds.

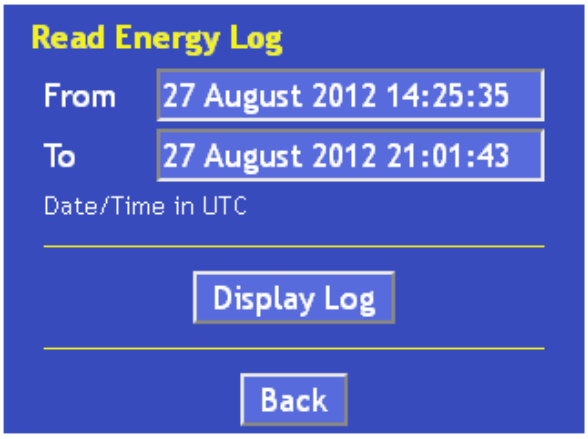
Note: If a Meter goes offline or it becomes unavailable when in the list, “Problem retrieving XML data” will be displayed. Once the Meter is back online, the data will reappear.

Meter	Active Energy kWh	Reactive Energy kvarh	Active Power kW	Reactive Power kvar
00-90-C2-DE-70-87	0.00	0.00	0.00	0.00
00-90-C2-E7-3E-C8	0.00	1.70	0.00	0.00
00-90-C2-E7-3F-58	0.00	0.00	0.00	0.00
00-90-C2-E7-3F-55	0.00	0.00	0.00	0.00
00:90:C2:E2:D2:69	0.00	0.00	0.00	0.00
00-90-C2-E7-3F-64	0.00	0.00	0.00	0.00
00-90-C2-E7-3E-C4	0.00	0.30	0.00	0.00
00-90-C2-E7-3E-D9	0.00	0.00	0.00	0.00
00-90-C2-E7-3E-C3	0.00	0.00	0.00	0.00

14.1.10. Energy Log

The Energy Log can be shown in the browser by setting the From and To date/time and clicking “Display Log”.

When the page is loaded, the earliest and most recent log times are shown.



Either leave the date/time fields as they are set, or change according to the required data range.

Note: The dates and times are in UTC format

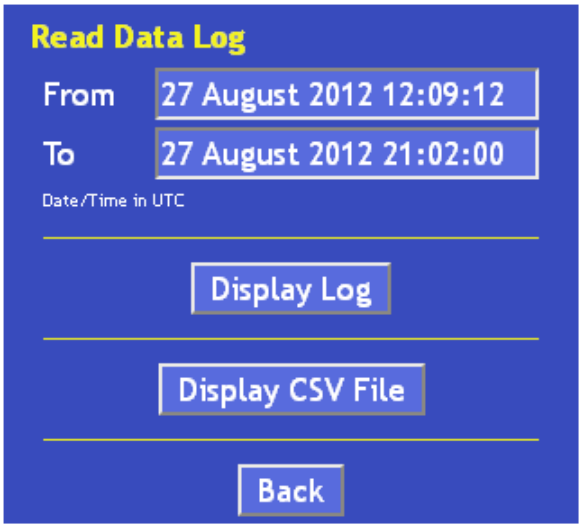
Click “Display log” to view the selected range on the web page.

14.1.11. Data Log

The Fast Data Log can be shown in the browser by setting the From and To date/time and clicking “Display Log”.

Additionally, the Log can be output as a CSV file by clicking “Display CSV File”. This can then be copied and pasted into a third party application.

When the page is loaded, the earliest and most recent log times are shown.



Either leave the date/time fields as they are set, or change according to the required data range.

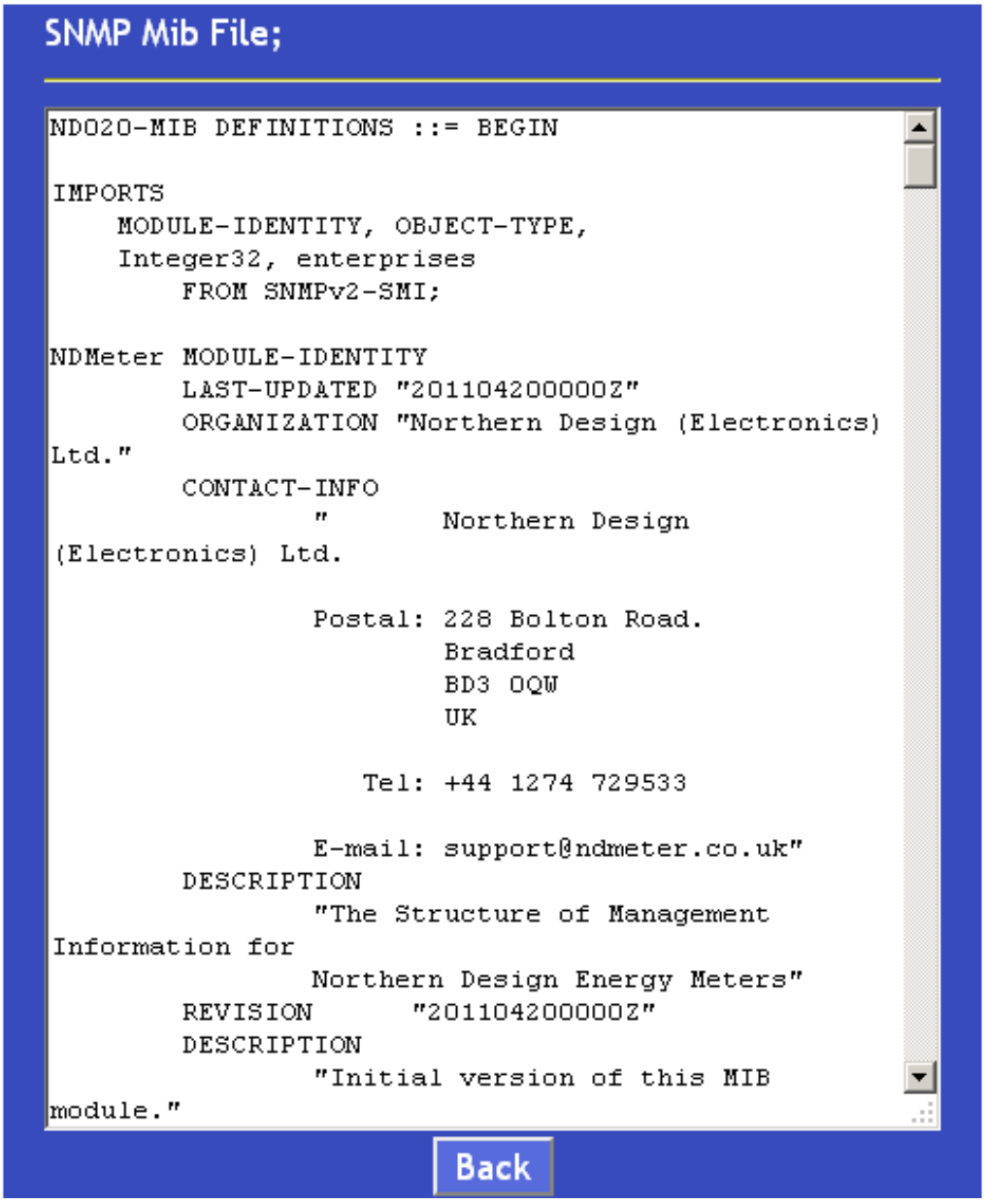
Note: The dates and times are in UTC format

Click “Display log” to view the selected range on the web page.

Click “Display CSV File” to view the selected range on the web page in CSV format.

14.1.12. SNMP MIB

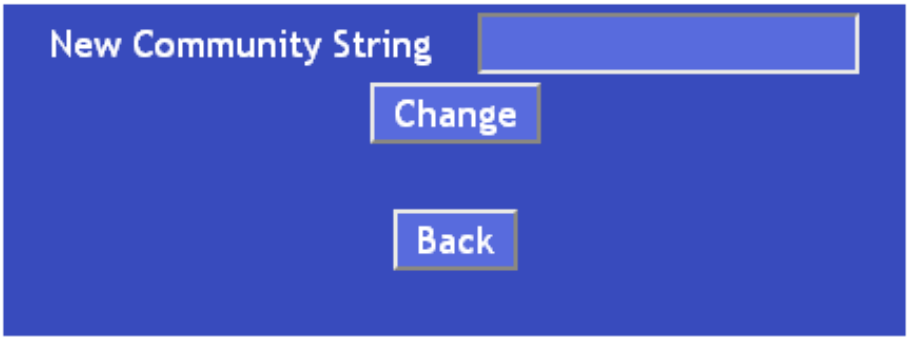
When using SNMP a MIB is required for the Meter. This can be displayed from the SNMP MIB screen as shown below;



Simply highlight the text in the white text area, copy it and paste into a file which can then be saved as “ND.MIB”, for example, and loaded into the SNMP Management software.

14.1.13. Community String

The default community string of “public” can be changed using this screen. Simply enter the required string and click the “Change” button to save the new string.


New Community String
Change
Back

15. Common tasks

15.1. FTP posting

Each of the data logs can send files to a remote FTP server. The energy log sends one file every time a record is logged. The data log allows the period between files to be specified. This means that files sent by the energy log will usually contain just one record while files from the data log may contain several records. If an FTP transfer is unsuccessful then whatever records were due to be sent will be saved and added to the next successful transfer.

The name of each file transferred begins with the word “Energy” or the word “Data” depending on which log it is sent from. The log name is followed by the date in the form “YYYY-MM-DD”, then an underscore character, the time in 24-hour format, then another underscore followed by the name of the meter. All files are in comma-separated value format and have the extension “.csv”. For example; a file sent by the data logging system at 12:34 on the 31st of March 2011 from a meter named “Workshop” will have the file name: “Data_2011-3-31_1234_Workshop.csv”.

In the case of the Fast Data Log, if “CSV Format = MODBUS Addresses” is ticked, the FTP filename format changes. Each file name is made up of the meter MAC address, date and time separated by the underline character. For example, the filename “001BE5101010_110817_073000” indicates a log from the meter with MAC address 00:1B:E5:10:10:10, sent at 07:30:00 on 17th August 2011.

If a file contains more than one record then each record will be on a separate line. Each line contains the date of the record in the form “DD-MM-YYYY”, a comma, the time of the record in the form “hh:mm:ss”, another comma and then the values of the recorded parameters separated by commas. Any parameters that are selected will be included in the file in the order shown below. Since the energy log only contains energy and counter measurements only the first 9 columns may be present. Any of the columns may be present in the data log.

Column No.	Measurement Parameter
1	Date
2	Time
3	System kWh
4	System kVAh
5	System kvarh
6	Export kWh
7	Counter 1
8	Counter 2
9	Counter 3
10	Phase 1 Peak Amps
11	Phase 2 Peak Amps
12	Phase 3 Peak Amps
13	Phase 1 Peak Volts
14	Phase 2 Peak Volts
15	Phase 3 Peak Volts
16	System kW Demand
17	System kVA Demand
18	System kvar Demand
19	Peak Hold kW Demand
20	Peak Hold kVA Demand
21	Peak Hold kvar Demand
22	Neutral Current

23	Phase 3 Volts Demand
24	Phase 1 Amps
25	Phase 2 Amps
26	Phase 3 Amps
27	Phase 1 Volts
28	Phase 2 Volts
29	Phase 3 Volts
30	Phase 1-2 Volts
31	Phase 2-3 Volts
32	Phase 3-1 Volts
33	System Frequency
34	Phase 1 Power Factor
35	Phase 2 Power Factor
36	Phase 3 Power Factor
37	System Power Factor
38	Phase 1 kW
39	Phase 2 kW
40	Phase 3 kW
41	System kW
42	Phase 1 kVA
43	Phase 2 kVA
44	Phase 3 kVA
45	System kVA
46	Phase 1 kvar
47	Phase 2 kvar
48	Phase 3 kvar
49	System kvar
50	Phase 1 Amps Demand
51	Phase 2 Amps Demand
52	Phase 3 Amps Demand
53	Phase 1 Volts Demand
54	Phase 2 Volts Demand
55	Phase 3 Volts Demand
56	Line Volts Scale
57	Phase Volts Scale
58	Amps Scale
59	Power Scale
60	Energy Scale

Log File Column Order

The files can be opened directly in a spreadsheet application. It is possible to concatenate all the files in a directory into one single file using the command:-

```
type * > new_file.csv
```

This command can be entered at the Windows Command prompt or put into a text file with the extension ".bat" in order to run it by double-clicking in Windows Explorer. This will produce a single file named "new_file.csv" containing all the records of all the files in the directory. The "*" is a wildcard that selects all the files regardless of their names. It is possible to be more selective. For example; to concatenate all the energy files, replace "*" with "Energy*". To select only data files from the meter named "Workshop", replace the "*" with "Data*Workshop.csv".

15.2. TFTP log download

Trivial File Transfer Protocol (TFTP)

The logs can be downloaded using a TFTP client such as the one that is included in the Windows command prompt.

To use the Windows TFTP client open a Command Prompt by either selecting “Command Prompt” from the start menu under All Programs -> Accessories or by selecting “Run…” from the start menu and issuing the command “cmd”. In the Command Prompt, type the following command, for a brief description of the operation of the tool.

The Fast Data Log can be downloaded using the following command;

```
TFTP –i 192.168.1.127 get log.csv {alternate_name}
```

Note: The IP address must be changed to that of the meter.

Note: The optional {alternate_name} can be used to store the file locally by a different name.

The Energy Log can be downloaded using the following command;

```
TFTP –i 192.168.1.127 get energy.csv {alternate_name}
```

Note: The IP address must be changed to that of the meter.

Note: The optional {alternate_name} can be used to store the file locally by a different name.

15.3. TFTP file transfer

Trivial File Transfer Protocol (TFTP)

The file-system can be accessed using a TFTP client such as the one that is included in the Windows command prompt. The TFTP client has two commands; PUT to upload files to the meter and GET to download files from the meter. This basic functionality is augmented by the existence of certain special file names that the TFTP server in the meter recognises and handles differently.

To use the Windows TFTP client open a Command Prompt by either selecting “Command Prompt” from the start menu under All Programs -> Accessories or by selecting “Run…” from the start menu and issuing the command “cmd”. In the Command Prompt, type the following command, for a brief description of the operation of the tool.

```
TFTP –?
```

Note that the option “-i” is required for any file that is not an ASCII text file. For example, if the IP address of the meter is 192.168.1.121 and the file to be uploaded is named “uploaded.jpg” then it can be uploaded by the command,

```
TFTP –i 192.168.1.121 PUT uploaded.jpg
```

Once uploaded the file can be retrieved by the corresponding GET command,

```
TFTP –i 192.168.1.121 GET uploaded.jpg
```

The TFTP protocol does not provide any means of listing a directory but the TFTP server in the meter overcomes this by maintaining a special file named “dir.txt”. When this file is retrieved

using the GET command it will contain a list of all the files uploaded to the file-system. This file only contains details of uploaded files, the built-in files are not included.

The entire file-system can be uploaded or retrieved in a single command by means of the special file name “webpages.fat”. When this file is retrieved using the GET command it contains an image of the entire file-system including the directory listing in a binary format. This file can then be uploaded using the PUT command to restore the file-system on the meter at some later date or it can be uploaded to another meter in order to duplicate the file-system of the first meter. Note that the format of the webpages.fat file is different to that of older IP meters so images can not be shared between them and the new IPv2 meters. Since the file is in a binary format it is essential to use the “-i" option after the tftp command. The “webpages.fat” file can not be read by any external programs since its format is specific to the IPv” meters internal filesystem.

15.4. Forgotten Password

If you forget the password set in the meter, firstly try the default username and password of “admin” (without the quotes).

Should that fail, please follow the recovery procedure in 14.1.7 – “Change Password”.

15.5. SNMP

The Simple Network Messaging Protocol (SNMP) is an internet-standard for managing devices on IP networks. The meter acts as an SNMP agent exposing variables that can be inspected by network management systems. The whole of the amalgamated data table 1, described in “Appendix A4 - Amalgamated Data Table 1 (Table 30)”, can be inspected via SNMP.

The available variables are organised in a tree structure that is represented as a series of integer numbers separated by dots. The series of numbers leading to a particular variable is called the object identifier (OID). Each number identifies a branch from the preceding node. Branches and variables are described in a management information base (MIB). The MIB gives a name and description to each branch and gives information about the type of each variable. For example the KWh High Word register at data address 7680 in the amalgamated data table is represented to a network management system by the OID:

1.3.6.1.4.1.37778.7680.0

The branches contained in this OID are named:

iso.org.dod.internet.private.enterprises.NDmeter.meterkWhH.0

The first six numbers conform to the structure described in Internet Engineering Taskforce document RFC1155. The seventh number, 37778, is assigned by the Internet Assigned Numbers Authority (IANA) to represent the company Northern Design. The eighth number is the data address of the variable in the amalgamated data table. The last number represents an instance of this variable; this will always be zero as there is only one instance of each variable.

Any variable in the amalgamated table can be accessed by a network management system using the OID:

1.3.6.1.4.1.37778.[Data Address].0

Replace [Data Address] with the data address number given in “Appendix A4 - Amalgamated Data Table 1 (Table 30)”.

A management information base describing these variables is given in “Appendix A6 - Management Information Base (MIB)”. It is also available from the system information page of the meters built-in website. Highlight all the text in the white text box (for example by clicking inside the box and

typing Ctrl C) and paste it into a text file. This file can then be imported into you network management system.

Note: The default PUBLIC community string (password) is "public". This can be changed from the "Community String" link on the "System Info" screen.

15.5.1. Timeouts and retries

It is recommended to setup your SNMP software to retry reads at least once, and set the timeout to greater than 10 seconds.

16. MODBUS TCP Interface

The measurement system of the meter can be accessed using the MODBUS TCP protocol. The MODBUS TCP server in the meter provides access to all the measured parameters. A MODBUS master application is required running either on a PC or PLC. The application will need to connect to the IP address of the meter on port number 502. The TCP server implements MODBUS commands 3, 4 and 6 (Read Holding Register, Read Input register and Write Holding Register).

Although any of the tables listed in the MODBUS operations manual for the meter, it is recommended that the 2 amalgamated tables are used to increase system performance. The amalgamated tables are updated once per second, and are documented in the following appendices;

Appendix A4 - Amalgamated Data Table 1 (Table 30)

Appendix A5 - Amalgamated Data Table 2 (Table 22)

16.1. Amalgamated table scaling

Values in the 2 amalgamated tables are provided as integer values which need to be scaled.

Amalgamated table 1 provides 5 scaling factors (1 for energy, and 4 for instantaneous values).

The amalgamated tables in the appendices show what scaling factor to apply to a particular value.

The following details the calculations for Energy and Instantaneous value scaling.

16.1.1. Energy scaling (Ke)

Energy registers are stored as long integer representations of the number displayed on the meter without decimal point or scaling. For example if the meter displays 123456.78kWh, the Holding Registers 40515-40516 will contain the long integer 12345678. This number may be scaled in Wh or kWh, using Ke as:

$$\mathbf{Wh = Holding\ Reg[40516] \times 10^{(Ke-3)}}$$

$$\mathbf{kWh = Holding\ Reg[40516] \times 10^{(Ke-6)}}$$

The Ke constant is set, along with the kWh register resolution and scaling, by the CT primary and nominal voltage programmed settings. The display scaling and Ke therefore remain constant once a meter is installed and commissioned. A read of Ke High Word always returns zero.

Example:

If the meter displays 1234567.8 kWh then Ke would be 5 and the Holding Register 40515 – 40516 would contain 12345678.

The host would calculate the scaled energy reading as:

$12345678 \times 10^{(5-3)} = 12345678 \times 100 = 1,234,567,800$ Wh

or $12345678 \times 10^{(5-6)} = 12345678 \times 0.1 = 1,234,567.8$ kWh

The host programmer could take two approaches to interpreting the data from the meter:

- Enter a fixed scaling factor (x100 for Wh or x0.1 for kWh in above example). This would be set for each meter in the system based on its display after commissioning.

- Use the transmitted eScale constant, as shown above, to automatically position the decimal point in the interpreted result.

16.1.2. Instantaneous scaling (Ki, Kvp, Kvl, Kp)

The following details how to scale an integer instantaneous value to get a real number.

Instantaneous readings are provided as signed integer values with no decimal point or legend (e.g. kW or MW). Scaling factors are provided to enable conversion of the raw data to real numbers in basic unit form (amps, volts, watts, VA, or var). These scaling factors are constant values calculated as a function of CT and PT Primary programming.

To convert raw data to real numbers:

$$R = I \times 10^{(K-3)}$$

Where: I = Integer number

K = Relevant Scaling Factor

R = Real number result

Example:

If the meter is programmed with CT Primary=50Amps and PT Primary=415V:

LCD values would be scaled as: 50.00A, 240.0V, 415.7VLL and 36.00kW.

Scaling factors would be: Ki=1, Kvp=2, Kvl=2, Kp=4.

Integer Values would be transmitted as: 5000, 2400, 4157 and 3600.

Amps would be calculated as $5000 \times 10^{(1-3)} = 5000/100 = 50.00A$.

Phase Volts would be calculated as $2400 \times 10^{(2-3)} = 2400/10 = 240.0V$

Line Volts would be calculated as $4157 \times 10^{(2-3)} = 4157/10 = 415.7V$

3-Ph Power would be calculated as $3600 \times 10^{(4-3)} = 3600x10 = 36000W$

16.2. Energy registers

The energy registers can be written using Table 2. The energy registers are each 32 bits long and consequently take up two 16-bit MODBUS registers. The following table gives the MODBUS addresses of the energy registers in Table 2.

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 Inductive High Word	Read/Write

519	40520	kvarh Inductive Low Word	
520	40521	kvarh Capacitive High Word	Read/Write
521	40522	kvarh Capacitive Low Word	
522	40523	Import kvarh High Word	Read/Write
523	40524	Import kvarh Low Word	
524	40525	Export kWh High Word	Read/Write
525	40526	Export kWh Low Word	
526	40527	Export kvarh High Word	Read/Write
527	40528	Export kvarh Low Word	
528	40529	Hours Run High Word	Read/Write
529	40530	Hours Run Low Word	

MODBUS Addresses of Energy Registers.

17. Troubleshooting

17.1. FTP

If sending data by FTP is enabled then an FTP file containing a single record is sent as soon the logging system is configured. There are a number of potential problems that may prevent a file from getting to a remote server. In order to aid troubleshooting it is possible to view the last error encountered by the meters FTP system. Type the IP address of the meter into the address box of a web browser followed by "/error.shtml". For example; if the meters IP address is 192.168.1.121 then type "192.168.1.121/error.shtml". This will display a simple page that gives the time and date when the FTP system last encountered an error and a code that identifies that error. The possible error codes are as follows:-

Code = 421	The remote FTP server is offline or unreachable. Try pinging the server from a PC on the same network as the meter to check that it can be reached. Check that FTP is running on the remote server.
Code = 7	The FTP server is reachable but a firewall is preventing connection to the FTP port (port 21).
Code = 425	The firewall allows connections to port 21 but additional ports must be opened for passive mode FTP.
Code = 530	The meter is not allowed to login to the remote FTP server. Check the username and password.
Code = 550	The meter logged into the server but could not write the file. Check that the remote directory exists and that the username has write access to it.

18. Appendix A1 - IP Interface Applications

18.1. Web Browsers

The Cube IPv2 system meter has been tested with the following web browser applications:
Mozilla Firefox 13.0 and later.
Internet Explorer 8 and later.
Apple Safari 5.0 and later.
Google Chrome V10.0 and later.
Opera 11.00 and later.

18.2. MODBUS TCP

The MODBUS TCP interface has been tested using Win Tech Software ModScan32, version 7.B01-03.

18.3. File Transfer Program

The data logging system has been tested sending files to FileZilla Server, version 0.9.34 beta.

19. Appendix A2 - AJAX File Formats

The following tables are provided by the meters built-in web server and may be used in creating custom AJAX web pages.

Values_live.shtml

This table gives live measurement values. The values are all un-scaled, they are just as they are stored in the MODBUS registers in the meter element. The document "ND Cube350 MODBUS Comms Manual" describes how to scale the values.

Table	Data
<HTML>	
<table>	
<td>Data:-</td>	
<td id='ap'></td>	System kW
<td id='rp'></td>	System kvar
<td id='v1'></td>	Phase 1 Voltage
<td id='i1'></td>	Phase 1 Current
<td id='pf1'></td>	Phase 1 Power Factor
<td id='p1'></td>	Phase 1 kW
<td id='v2'></td>	Phase 2 Voltage
<td id='i2'></td>	Phase 2 Current
<td id='pf2'></td>	Phase 2 Power Factor
<td id='p2'></td>	Phase 2 kW
<td id='v3'></td>	Phase 3 Voltage
<td id='i3'></td>	Phase 3 Current
<td id='pf3'></td>	Phase 3 Power Factor
<td id='p3'></td>	Phase 3 kW
<td id='ae'></td>	System kWh
<td id='re'></td>	System kvarh
<td id='ascale'></td>	Current Scale
<td id='vscale'></td>	Volts Scale
<td id='pscale'></td>	Power Scale
<td id='escale'></td>	Energy Scale
<td>-----</td>	
</table>	
</HTML>	

Nd2_liv.html

This table gives the same measurement values as Valuies_live.shtml but in a more compact format.

Table	*Data*
name="x000" value="Values"	
name="X1E08" value="0"	Phase 1 Current
name="X1E09" value="0"	Phase 2 Current
name="X1E0A" value="0"	Phase 3 Current
name="X1E0B" value="0"	Phase 1 Voltage
name="X1E0C" value="0"	Phase 2 Voltage
name="X1E0D" value="0"	Phase 3 Voltage
name="X1E12" value="1000"	Phase 1 Power Factor
name="X1E13" value="1000"	Phase 2 Power Factor
name="X1E14" value="1000"	Phase 3 Power Factor
name="X1E21" value="0"	System kvar
name="X1E19" value="0"	System kW
name="X1E00" value="0"	System kWh High Word
name="X1E01" value="1230"	System kWh Low Word
name="X1E04" value="0"	System kvarh High Word
name="X1E05" value="450"	System kvarh Low Word
name="X1E16" value="0"	Phase 1 kW
name="X1E17" value="0"	Phase 2 kW
name="X1E18" value="0"	Phase 3 kW

20. Appendix A3 – XML Data Format

XML File Format	
<PostedData>	
<Login>	
<Shortname>	A short name that identifies the meter to the remote server.
<Username>	A username for access to the remote server.
<Password>	A password associated with the username.
<MAC>	The MAC address of the meters Ethernet interface.
<Settings>	The current configuration of the meter.
<Date>	The current date of the meters real time clock.
<Time>	The current time of the meters real time clock.
<Name>	The name of the meter.
<DeviceType>	Always set to "IPM".
<Version>	The firmware version of the metering element.
<DHCP>	Set to 1 if the network interface is using DHCP or 0 if using static IP settings.
<IP>	The IP address of the meter on its local network.
<Netmask>	The network mask of the meter.
<Gateway>	The default gateway used bhy the meter.
<DNS1>	The meters primary DNS server.
<DNS2>	The secondary DNS server.
<SNTP>	The timeserver used to update the meters real time clock.
<CT>	The meters CT primary setting.
<NV>	The nominal voltage.
<P1>	Pulse rate.
<MM>	Meter model.
<MT>	Meter type.
<FV>	Firmware version.
<CD>	Current demand period.

<PO>	Pulse on time.
<HR>	Hours run setting.
<PS>	PT scaling factor.
<ASCALE>	The current scaling factor.
<VSCALE>	The voltage scaling factor.
<PSCALE>	The power scaling factor.
<ESCALE>	The energy scaling factor.
<Lastpowerdown>	The time the meter last powered down or was switched off.
<Reading>	A single record in the data log.
<Header>	The timestamp of the record.
<Date>	The date portion of the timestamp. Format is "DD-MM-YYYY"
<Time>	The time portion of the timestamp. Format is "HH:MM"
<Parameter>	One or more measurement parameters recorded in the data log.
<PN>	The parameter number identifying the parameter.
<PV>	The value of the parameter at the time of the record.

21. Appendix A4 - Amalgamated Data Table 1 (Table 30)

Refer to section “Amalgamated table scaling” on page 72 for details on scaling.

Data Address	MODBUS Register	Data	Scaling
7680	47681	KWh High Word	Energy Scale (Ke)
7681	47682	KWh Low Word	
7682	47683	KVAh High Word	Energy Scale (Ke)
7683	47684	KVAh Low Word	
7684	47685	Kvarh High Word	Energy Scale (Ke)
7685	47686	Kvarh Low Word	
7686	47687	Export kWh High Word	Energy Scale (Ke)
7687	47688	Export kWh Low Word	
7688	47689	Phase 1 Amps	Amps Scale (Ki)
7689	47690	Phase 2 Amps	
7690	47691	Phase 3 Amps	
7691	47692	Phase 1 Volts	Phase Volts (Kvp)
7692	47693	Phase 2 Volts	
7693	47694	Phase 3 Volts	
7694	47695	Ph1-Ph2 Volts	Line 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	Power Scale (Kp)
7703	47704	Phase 2 kW	
7704	47705	Phase 3 kW	
7705	47706	System kW	
7706	47707	Phase 1 kVA	Power Scale (Kp)
7707	47708	Phase 2 kVA	
7708	47709	Phase 3 kVA	
7709	47710	System kVA	
7710	47711	Phase 1 kvar	Power Scale (Kp)
7711	47712	Phase 2 kvar	
7712	47713	Phase 3 kvar	
7713	47714	System kvar	
7714	47715	Ph1 Amps Demand	Amps Scale (Ki)

7715	47716	Ph2 Amps Demand	
7716	47717	Ph3 Amps Demand	
7717	47718	Ph1 Volts Demand	Phase Volts (Kvp)
7718	47719	Ph2 Volts Demand	
7719	47720	Ph3 Volts Demand	
7720	47721	Peak Ph1 Amps	Amps Scale (Ki)
7721	47722	Peak Ph2 Amps	
7722	47723	Peak Ph3 Amps	
7723	47724	Peak Ph1 Volts	Phase Volts (Kvp)
7724	47725	Peak Ph2 Volts	
7725	47726	Peak Ph3 Volts	
7726	47727	kW Demand	Power Scale (Kp) + 1
7727	47728	kVA Demand	
7728	47729	kvar Demand	
7729	47730	Peak Hold kW Demand	Power Scale (Kp) + 1
7730	47731	Peak Hold kVA Demand	
7731	47732	Peak Hold kvar Demand	
7732	47733	Neutral Current	Amps Scale (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 Ke	-

Note: All registers in the amalgamated data table are read only.

22. Appendix A5 - Amalgamated Data Table 2 (Table 22)

Refer to section “Amalgamated table scaling” on page 72 for details on scaling.

Data Address	MODBUS Register	Data	Scaling
5632	45633	kvarh Inductive High Word	Energy Scale (Ke)
5633	45634	kvarh Inductive Low Word Read/Write	Energy Scale (Ke)
5634	45635	kvarh Capacitive High Word	Energy Scale (Ke)
5635	45636	kvarh Capacitive Low Word Read/Write	Energy Scale (Ke)
5636	45637	Export kvarh High Word	Energy Scale (Ke)
5637	45638	Export kvarh Low Word Read/Write	Energy Scale (Ke)
5638	45639	Hours Run High WordRead/Write	-
5639	45640	Hours Run Low Word Read/Write	-
5640	45641	Peak Hold Ph1 Amps	Amps Scale (Ki)
5641	45642	Peak Hold Ph2 Amps	Amps Scale (Ki)
5642	45643	Peak Hold Ph3 Amps	Amps Scale (Ki)
5643	45644	Peak Hold Ph1 Volts	Phase Volts (Kvp)
5644	45645	Peak Hold Ph2 Volts	Phase Volts (Kvp)
5645	45646	Peak Hold Ph3 Volts	Phase Volts (Kvp)
5646	45647	KW Demand Period 1-60 Minutes	-
5647	45648	CT Primary 5 - 25,000 Amps	-
5648	45649	Nominal Volts 10 - 55,000 Volts	-
5649	45650	Pulse 1 Rate 1-1000 Counts/Pulse	-
5650	45651	Pulse 2 Rate (= Pulse 1 Rate) 1-1000 Counts/Pulse	-
5651	45652	Baud 96 = 9600baud etc	-
5652	45653	Modbus ID 0 – 247	-
5653	45654	Meter Model Cube350 = 350	-
5654	45655	Meter Type Basic Cube350 = 1	-
5655	45656	Firmware Version Eg. 0x14 = 1.04	-
5656	45657	Current Demand Period 1 = 10Sec, 2=20Sec etc	-
5657	45658	Pulse ON Time 1 = 100ms, 2=200ms etc	-
5658	45659	Security Pin 0 - 9999	-

5659	45660	Hours Run Limit 1-100% of (I1+I2+I3)/3	-
5660	45661	PT Scaling Factor 1 – 10	-
5661	45662	Peak Ph1 Amps Demand	Amps Scale (Ki)
5662	45663	Peak Ph2 Amps Demand	Amps Scale (Ki)
5663	45664	Peak Ph3 Amps Demand	Amps Scale (Ki)
5664	45665	Peak Ph1 Volts Demand	Phase Volts (Kvp)
5665	45666	Peak Ph2 Volts Demand	Phase Volts (Kvp)
5666	45667	Peak Ph3 Volts Demand	Phase Volts (Kvp)
5667	45668	V1 % THD 1000 = 100%	-
5668	45669	V2 % THD 1000 = 100%	-
5669	45670	V3 % THD 1000 = 100%	-
5670	45671	I1 % THD 1000 = 100%	-
5671	45672	I2 % THD 1000 = 100%	-
5672	45673	I3 % THD 1000 = 100%	-

Note: All registers in the amalgamated data table 2 are read only.

23. Appendix A6 - Management Information Base (MIB)

The following is the management information base (MIB) for the variables provided by the simple network messaging protocol agent in the meter.

Note: The MIB text can be obtained from t he Meter's web interface. See 14.1.10– "SNMP MIB".

```
ND020-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY, OBJECT-TYPE,
   Integer32, enterprises
      FROM SNMPv2-SMI;

NDMeter MODULE-IDENTITY
  LAST-UPDATED "201104200000Z"
  ORGANIZATION "Northern Design (Electronics) Ltd."
  CONTACT-INFO
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          Postal: 228 Bolton Road.
                  Bradford
                  BD3 0QW
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            Tel: +44 1274 729533

          E-mail: support@ndmeter.co.uk"
  DESCRIPTION
          "The Structure of Management Information for
          Northern Design Energy Meters"
  REVISION      "201104200000Z"
  DESCRIPTION
          "Initial version of this MIB module."
  ::= { enterprises 37778 }    -- assigned by IANA
```

```
meterkWhH OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kWh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "kWh High."
   ::= { NDMeter 7680 }

meterkWhL OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kWh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "kWh Low."
   ::= { NDMeter 7681 }

meterkVAhH OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kVAh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "kVAh High."
   ::= { NDMeter 7682 }

meterkVAhL OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kVAh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "kVAh Low."
   ::= { NDMeter 7683 }

meterkvarhH OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kvarh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "kvarh High."
   ::= { NDMeter 7684 }

meterkvarhL OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kvarh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "kvarh Low."
   ::= { NDMeter 7685 }

meterEkWhH OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kWh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Export kWh High."
   ::= { NDMeter 7686 }

meterEkWhL OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kWh"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Export kWh Low."
   ::= { NDMeter 7687 }

meterP1Amps OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "Amps"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 1 current scaled
by Ki."
   ::= { NDMeter 7688 }

meterP2Amps OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "Amps"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 2 current scaled
by Ki."
   ::= { NDMeter 7689 }

meterP3Amps OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "Amps"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 3 current scaled
by Ki."
   ::= { NDMeter 7690 }

meterP1Volts OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "Voltsx10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 1 voltage scaled
by Kvp."
   ::= { NDMeter 7691 }
```

meterP2Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 2 voltage scaled by Kvp."
::= { NDMeter 7692 }

meterP3Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 3 voltage scaled by Kvp."
::= { NDMeter 7693 }

meterP1P2Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase1 Phase2 voltage scaled by Kvl."
::= { NDMeter 7694 }

meterP2P3Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase2 Phase3 voltage scaled by Kvl."
::= { NDMeter 7695 }

meterP3P1Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase3 Phase1 voltage scaled by Kvl."
::= { NDMeter 7696 }

meterFreq OBJECT-TYPE
SYNTAX UInteger32
UNITS "Hz x 10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Frequency x 10."
::= { NDMeter 7697 }

meterPh1PF OBJECT-TYPE
SYNTAX Integer32
UNITS "PF x 100"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase1 PF x 100."
::= { NDMeter 7698 }

meterPh2PF OBJECT-TYPE
SYNTAX Integer32
UNITS "PF x 100"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase2 PF x 100."
::= { NDMeter 7699 }

meterPh3PF OBJECT-TYPE
SYNTAX Integer32
UNITS "PF x 100"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase3 PF x 100."
::= { NDMeter 7700 }

meterSysPh1PF OBJECT-TYPE
SYNTAX Integer32
UNITS "PF x 100"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"System PF x 100."
::= { NDMeter 7701 }

meterP1kW OBJECT-TYPE
SYNTAX Integer32
UNITS "kW"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 1 kW scaled by Kp."
::= { NDMeter 7702 }

meterP2kW OBJECT-TYPE
SYNTAX Integer32
UNITS "kW"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 2 kW scaled by Kp."
::= { NDMeter 7703 }

```
meterP3kW OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kW"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 3 kW scaled by
Kp."
   ::= { NDMeter 7704 }

meterSyskW OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kW"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "System kW scaled by
Kp."
   ::= { NDMeter 7705 }

meterP1kVA OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kVA"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 1 kVA scaled by
Kp."
   ::= { NDMeter 7706 }

meterP2kVA OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kVA"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 2 kVA scaled by
Kp."
   ::= { NDMeter 7707 }

meterP3kVA OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kVA"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 3 kVA scaled by
Kp."
   ::= { NDMeter 7708 }

meterSyskVA OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "kVA"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "System kVA scaled by
Kp."
   ::= { NDMeter 7709 }

meterP1kvar OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kvar"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 1 kvar scaled by
Kp."
   ::= { NDMeter 7710 }

meterP2kvar OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kvar"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 2 kvar scaled by
Kp."
   ::= { NDMeter 7711 }

meterP3kvar OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kvar"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 3 kvar scaled by
Kp."
   ::= { NDMeter 7712 }

meterSyskvar OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kvar"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "System kvar scaled by
Kp."
   ::= { NDMeter 7713 }

meterP1AmpsDem OBJECT-
TYPE
    SYNTAX UInteger32
    UNITS      "Amps"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 1 current
demand scaled by Ki."
   ::= { NDMeter 7714 }

meterP2AmpsDem OBJECT-
TYPE
    SYNTAX UInteger32
    UNITS      "Amps"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase 2 current
demand scaled by Ki."
   ::= { NDMeter 7715 }
```

meterP3AmpsDem OBJECT-TYPE
SYNTAX UInteger32
UNITS "Amps"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 3 current demand scaled by Ki."
::= { NDMeter 7716 }

meterP1VoltsDem OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 1 voltage demand scaled by Kvp."
::= { NDMeter 7717 }

meterP2VoltsDem OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 2 voltage demand scaled by Kvp."
::= { NDMeter 7718 }

meterP3VoltsDem OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Phase 3 voltage demand scaled by Kvp."
::= { NDMeter 7719 }

meterPkP1Amps OBJECT-TYPE
SYNTAX UInteger32
UNITS "Amps"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Peak Phase 1 current scaled by Ki."
::= { NDMeter 7720 }

meterPkP2Amps OBJECT-TYPE
SYNTAX UInteger32
UNITS "Amps"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Peak Phase 2 current scaled by Ki."
::= { NDMeter 7721 }

meterPkP3Amps OBJECT-TYPE
SYNTAX UInteger32
UNITS "Amps"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Peak Phase 3 current scaled by Ki."
::= { NDMeter 7722 }

meterPkP1Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Peak Phase 1 voltage scaled by Kvp."
::= { NDMeter 7723 }

meterPkP2Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Peak Phase 2 voltage scaled by Kvp."
::= { NDMeter 7724 }

meterPkP3Volts OBJECT-TYPE
SYNTAX UInteger32
UNITS "Voltsx10"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Peak Phase 3 voltage scaled by Kvp."
::= { NDMeter 7725 }

meterkWDem OBJECT-TYPE
SYNTAX Integer32
UNITS "kW"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"kW Demand scaled with Kp."
::= { NDMeter 7726 }

meterkVADem OBJECT-TYPE
SYNTAX UInteger32
UNITS "kVA"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"kVA Demand scaled with Kp."
::= { NDMeter 7727 }

```
meterkvarDem OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kvar"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "kvar Demand scaled
with Kp."
   ::= { NDMeter 7728 }

meterPkkWDem OBJECT-TYPE
    SYNTAX Integer32
    UNITS      "kW"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Peak kW Demand
scaled with Kp."
   ::= { NDMeter 7729 }
meterPkkVADem OBJECT-
TYPE
    SYNTAX UInteger32
    UNITS      "kVA"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Peak kVA Demand
scaled with Kp."
   ::= { NDMeter 7730 }

meterPkkvarDem OBJECT-
TYPE
    SYNTAX Integer32
    UNITS      "kvar"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Peak kvar Demand
scaled with Kp."
   ::= { NDMeter 7731 }

meterNeuAmps OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "Amps"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Neutral current x 10."
   ::= { NDMeter 7732 }

meterAmpsScal OBJECT-TYPE
    SYNTAX UInteger32
    UNITS      "Ki"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Amps scale."
   ::= { NDMeter 7733 }
meterPhVoltScal OBJECT-
TYPE
    SYNTAX UInteger32
    UNITS      "Kvp"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Phase Volts scale."
   ::= { NDMeter 7734 }

meterLLVoltScal OBJECT-
TYPE
    SYNTAX UInteger32
    UNITS      "Kvl"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Line Volts scale."
   ::= { NDMeter 7735 }

meterPowerScal OBJECT-
TYPE
    SYNTAX UInteger32
    UNITS      "Kp"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Power scale."
   ::= { NDMeter 7736 }

meterEnergyScal OBJECT-
TYPE
    SYNTAX UInteger32
    UNITS      "Ke"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Energy scale."
   ::= { NDMeter 7737 }

END
```

24. Appendix A7 - Fast Data Log output formats

This appendix shows the different output formats configurable using the “Fast Data Log” screen.

“CSV File Format = MODBUS Addresses” = Un-ticked	
CSV	Date, Time, kWh, kVAh, kvarh, P3 V Dmd, P1 PF, P2 PF, P3 PF, Sys PF, P1 kW, P2 kW, P3 kW, Sys kW 09-08-2011, 11:50:03, 123.00, 123.00, 45.00, 0.00, 1.00, 1.00, 1.00, 1.00, 0.00, 0.00, 0.00, 0.00
TFTP & FTP	09-08-2011, 13:20:55, 0.00, 1.00, 1.00, 1.00, 1.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00
FTP Filename	"Data 2011-8-9_1320_00-90-C2-DA-B5-71.csv"

“CSV File Format = MODBUS Addresses” = Ticked	
CSV	Date & Time, 7680, 7681, 7682, 7683, 7684, 7685, 7714, 7715, 7716, 7717, 7718, 7719, 7698, 7699 110809_104406, 0, 1230, 0, 1230, 0, 450, 0, 0, 0, 0, 0, 0, 1000, 1000
TFTP & FTP	00-90-C2-DA-B5-71,7714,7715,7681,7716,6661,6660,7682,7717,6659,7683,7718 110811_092100,0,0,1230,0,0,0,0,0,0,1230,0
FTP Filename	"0090C2DAB571_110811_093000"

“Screen Format = MODBUS Addresses” = Un-ticked									
Screen	Date & Time	kWh	kVAh	kvarh	P3 V	P1 PF	P2 PF	P3 PF	Sys PF
	09-08-2011, 11:50:03	123.00	123.00	45.00	0.00	1.00	1.00	1.00	1.00

“Screen Format = MODBUS Addresses” = Ticked										
Screen	Date & Time	7680	7681	7682	7683	7684	7685	7714	7715	7716 7717
	110809_104406	0	1230	0	1230	0	450	0	0	0 0