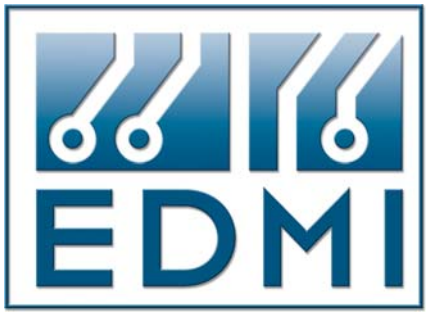


Atlas Series Energy Meters

Mk10 / Mk7

Software Reference Manual

Revision M

Release Date: 3rd September 2009

1910-E-07

EDMI Pty Ltd
162 South Pine Rd
Brendale, Qld, 4500
Australia

EDMI Limited
Level 3
No.47 Yishun Industrial Park A
Singapore 768724

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter

1

Introduction

This reference manual is for the EDMI Atlas series of Energy Meters.

- Mk10 Three Phase Energy Meter (includes Mk10A)
- Mk10D Three Phase Energy Meter with Disconnect
- Mk7A Single Phase Energy Meter
- Mk7C Compact Single phase Energy Meter
- Mk10E High Performance Three Phase Energy Meter

It covers the usage and configuration of the meter from a software perspective. Examples are used to demonstrate application of the meter features.

The meter is fundamentally an energy meter, measuring the basic quantities of Wh, varh and VAh. Consumption data may be recorded in a load survey, and as time of use data. The meter can also measure a wide variety of instantaneous quantities. The configuration is extremely flexible.

This edition of the manual is based on version 4.21 of EziView, and version 1.40 of the Atlas firmware. For hardware information on the meters see the Atlas Hardware Reference Manual, 1910-E-02. The contents of this manual were previously published as part of that document.

Using this Manual

The Chapter 2 "EziView Basics" describes the basics of getting the meter up and running, installation, basic operation and meter reading. The Chapter 3 "Configuration Basics" covers basic configuration and how to transfer setup information to the meter.

These two chapters should be read first, and then the remaining chapters may be read in any order as required.

Before you setup a large number of meters, you should decide how you will use the features of the meter consistently within your organisation. This is particularly important in deciding security groupings, and basic setting such as TOU channels.

Conventions Used in this Manual

All dates are in DD/MM/YY format.

References to settings or controls are printed in *Italics*.

The path to a specific menu option is written as:

Menu Level 1 → *Menu Level 2* → *Menu Level 3*

Information with special note (such as safety information) is marked with a  .

Additional noteworthy information is marked with a  .

Mk10 Specific information will be marked with a  . The name Mk10 refers to either the Mk10, Mk10D, MK10A, or the Mk10E

Mk7 Specific information will be marked with a  . The name Mk7 refers to either the Mk7A or the Mk7C.

"Clicking" on a button or field means using the left mouse button.

Note that due to variations between computers and improvements in software, the screenshots shown in this manual may vary slightly from the appearance of the software on your system.

For more information

The best source of information should generally be this manual. The table of contents has been organised to make finding information as easy as possible. If you are still having problems though, EDMI support may be contacted via email at support@edmi-meters.com The EDMI web site is located at http://www.edmi-meters.com/.

The online help of EziView also has a wealth of information, and contains more information on advanced functions of EziView such as the scheduler, script files, and reading files.

When contacting EDMI for support you may be asked for the meter serial number, firmware version and EziView version. The serial number is printed on the label, and is the serial number used in EziView to identify the meter. The EziView version is available under *Help* → *About* in EziView.

All this information will help us help you.

Chapter

2

EziView Basics

EziView is a 32 bit Windows application written by EDMI. EziView is used to configure and retrieve data in a user-friendly manner from EDMI energy meters. It can keep track of multiple meters spread across multiple sites.

This chapter covers the installation of EziView and configuring EziView to connect to your meters. The online help in EziView is also a valuable source of information.

Installation

EziView version 3.32 or later is required to access the meter. EziView version 4 or later is required for Mk7 meters. EziView 4.21 is needed to fully support Mk10E and Mk10A meters. It is strongly recommended to use EziView 4.21 or later, to ensure all meter features are supported by EziView.

System Requirements

- 486, Pentium, or above based personal computer
- Microsoft Windows™ 98/ME or Windows™ NT4/2000/XP. (Win3.1 is not supported).
- Vista is supported, although help does not work in 4.08. Install EziView as an Administrator, and run the first time as Administrator. After that it will operate properly as a standard user. Help operates correctly in 4.20.
- At least 50 MB of HDD space, plus space for retrieved meter data.

To install EziView

1. Close all active applications.
2. Insert the EziView software CD in the CD ROM drive, or download EziView from the EDMI web site.
3. Run the setup.exe program from the install package. (In Vista run as Administrator)

4. The *EziView Installer* dialog box appears. Follow the instructions on the screen to progress through the installation.

EziView Tutorial

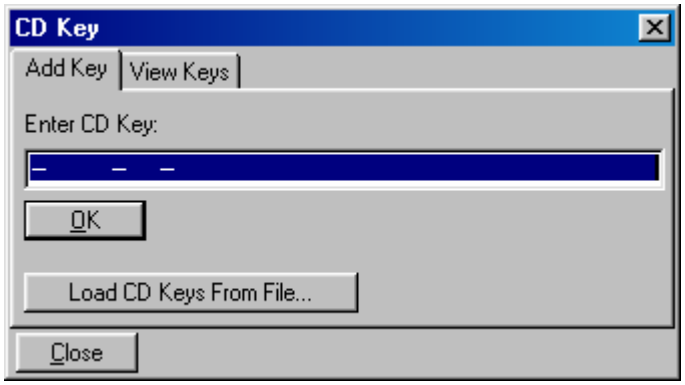
This section is a tutorial on using EziView. Along the way it covers all of the information you need to know about the basic use of EziView. You should have a meter connected directly to the computer using an Optical head or an RS-232 link to complete this tutorial.

CD Keys

EziView uses a system of CD keys to control use of the software. When EziView is first run the following screen will be displayed (Figure 2-1).

- Figure 2-1 EziView welcome screen

Clicking *OK* will display the *CD Key entry dialog* (Figure 2-2).



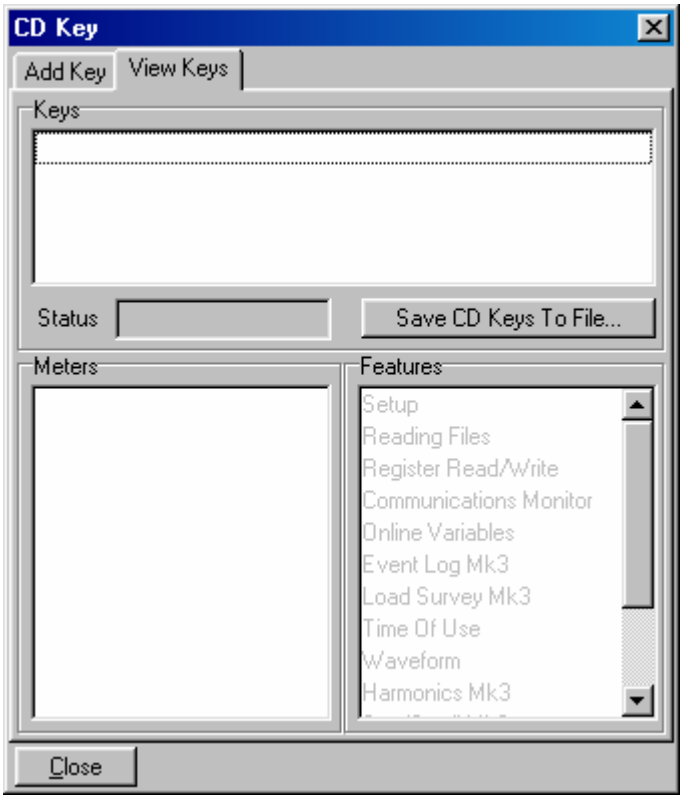
- Figure 2-2 EziView CD key entry dialog

CD keys may be provided with the CD packaging, on a separate disk or via email. CD keys may either be typed into the *Enter CD Key* field, or if they are in a file the *Load CD Keys From File* button may be used.

Depending on your area you should have one or more CD keys. Each key is a series of 26 letters or numbers, followed by a customer name. The customer name must be the

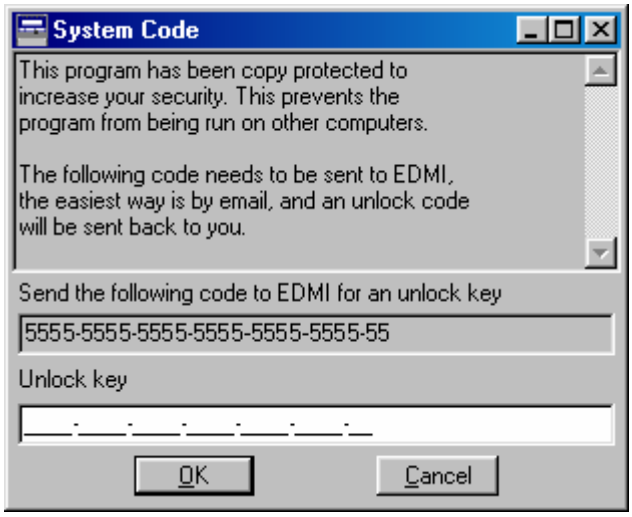
same for all keys in use. New keys may be added after the first run of EziView by using the *Tools → CD Key* option.

To see what CD keys are in use, change to the *View Keys* tab (Figure 2-3). The keys that have been entered will be listed in the *Keys* section. The *Status* indicator shows whether the currently selected key is valid and active or not. The *Save CD Keys to File* button may be used to save all the installed CD keys to a file.



- Figure 2-3 EziView CD Key information

The *Meters* pane displays any restrictions on what meters the CD keys may be used on. The *Features* pane displays what EziView features are enabled (shown in **Bold**) by the CD keys.



- Figure 2-4 EziView *System Code* confirmation

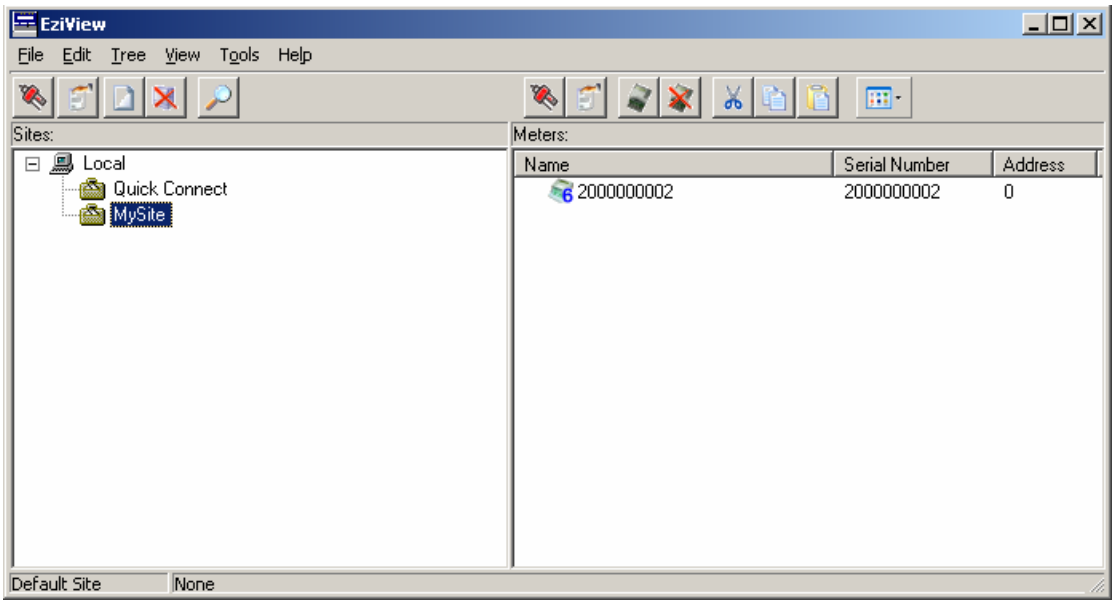
With some CD keys EziView will ask for a system code confirmation. In this case the dialog of Figure 2-4 will be displayed. The indicated code needs to be sent to EDMI or your local agent, who will send you the corresponding unlock key. Email is the easiest way to do this, but fax or phone may also be used. This locks EziView such that it will run only on your system.

Running EziView

Upon running EziView the main EziView screen is shown, along with a login prompt (Figure 2-5). Use the name "EDMI" and the password "IMDEIMDE" to log into EziView. Stars will be displayed instead of the password for security. Ignore the *Link Security* field. Click *OK* after the username and password has been entered.

- Figure 2-5 EziView login

This brings you to EziView's main screen (Figure 2-6).



- Figure 2-6 EziView main screen

The screen consists of several parts. The left hand pane shows a diagram of meter sites, the right hand pane shows the meters at the selected site (discussed later). Above each pane is a toolbar of actions for the pane.

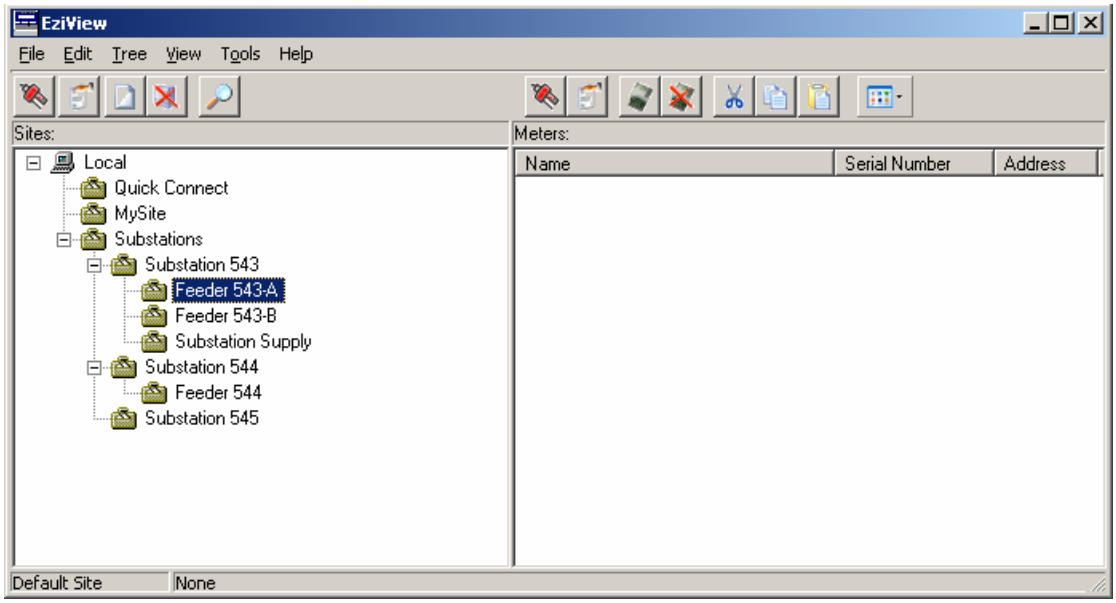
Sites

A meter site represents a connection point to a meter (or meters). It defines such things as the phone number and baud rates.

Each site contains meters. The meters in the selected site are listed in the right hand pane. Most connections will have only one meter, but an RS-485 multi-dropped site may have many more, all on the same connection defined by the site.

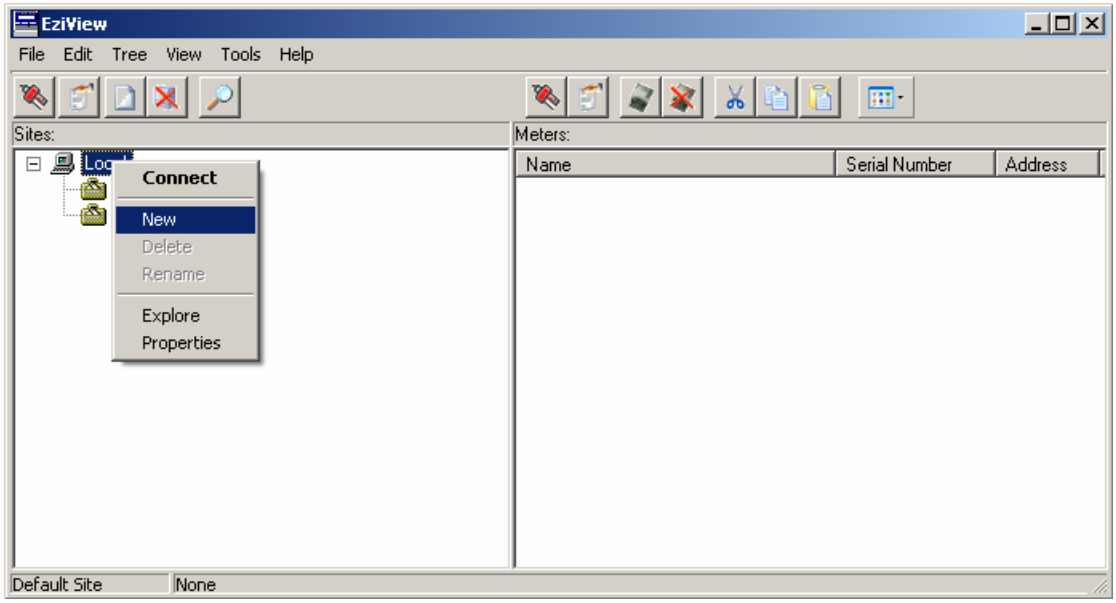
Clicking on *MySite* selects it, showing in the Meters pane that it has a single meter (as shown in Figure 2-6). This is a default site installed with EziView as an example, with a serial number of 10000000 to indicate that it is not a real meter. The meter's name defaults to its serial number, which is shown in the second column. The *Address* column is not used with the Atlas meter.

Sites may be nested, like the directory structure on a computer's disk. New sites may be created within any other site. Which site a site resides in has no effect, and is purely to enable sites to be organised easily. To this end sites do not need meters, they can simply be used for organisation. For example, a "substations" site might contain a series of sites like "substation 543" etc. (See Figure 2-7). The plus and minus icons on the tree diagram may be used to expand and collapse the tree. The *Tree* menu also contains options to expand and collapse the whole tree or parts of it.

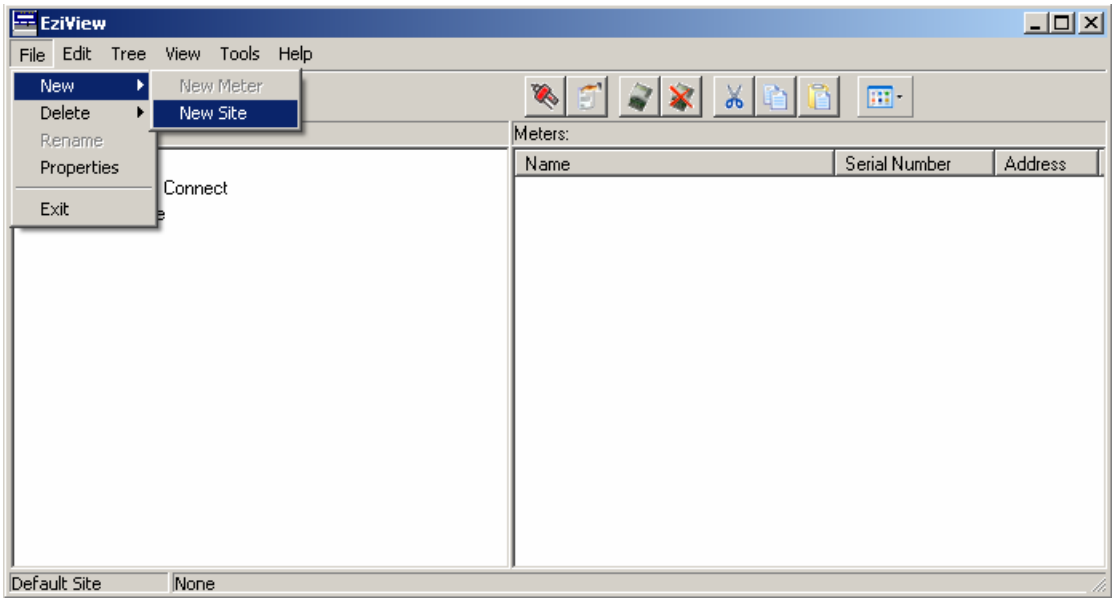


- Figure 2-7 EziView main screen with complex site setup

To create a new site select the site to place the new site under. Then either right-click and select *New* from the popup menu (Figure 2-8), or click on the *New Site* button on the *Sites toolbar* (3rd button from the left), or use the *File→New →New Site* menu option (Figure 2-9). For this tutorial create a site off the *Local* site, the root of all sites.

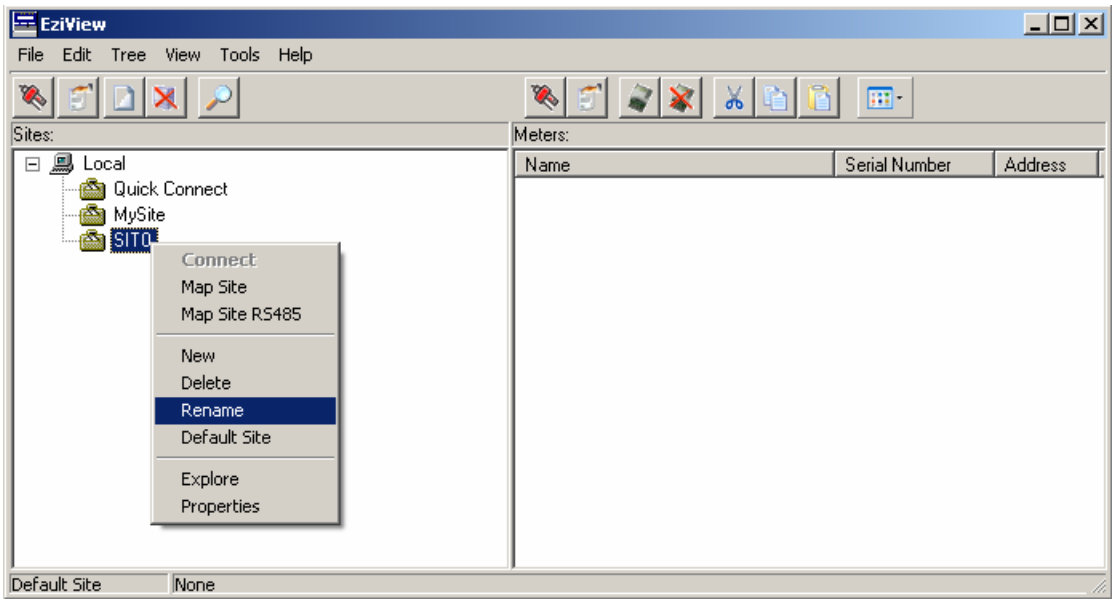


- Figure 2-8 EziView tree diagram new site menu option



- Figure 2-9 EziView *File* menu new site menu option

This will create a site called *SIT0*. To change the name either right-click on it and select *Rename*, or click on the name while it is highlighted. A new name can then be entered. All site names must be unique. If a site of the same name already exists, a number is added to the end to differentiate it. Site names may contain spaces, and may be any length. Rename the site to "*Tutorial Test*" (Figure 2-10).

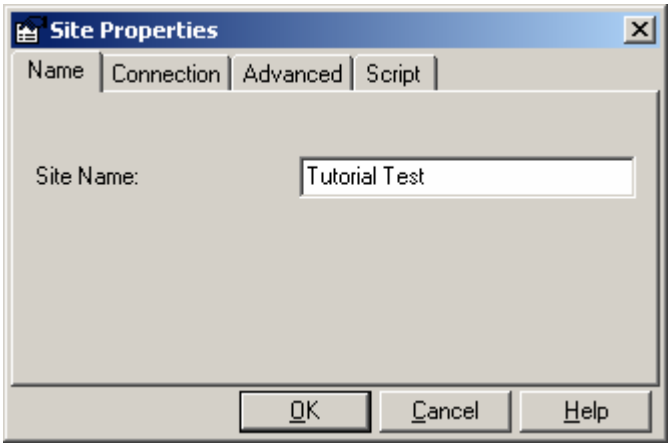


- Figure 2-10 Renaming a site

Sites may be deleted by choosing delete from the right-click menu, or by pressing the delete key, or by selecting *File→Delete→Delete Site*, or by using the delete toolbar button (4th button on the *Sites toolbar*). A site may not be deleted if it contains any other sites. Those sites must be deleted first. A site may also not be deleted if EziView is connected to a meter within the site.

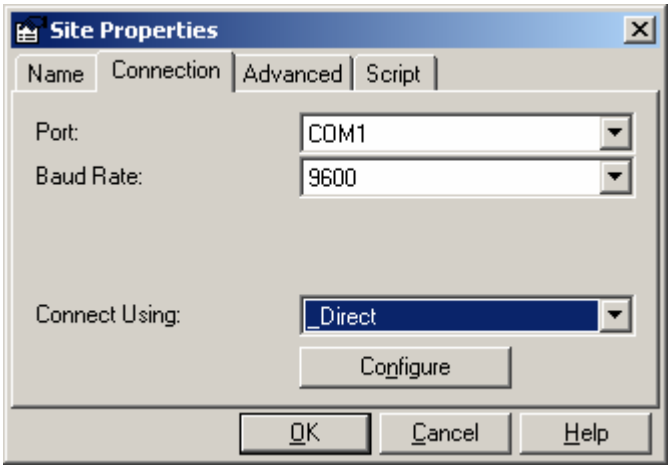
The properties of the site can now be configured. Select the site then select properties from the right-click menu, or the *File* menu, or the *Site toolbar* (2nd button from the left). This will display the *Site Properties* dialog box.

Site Properties



- Figure 2-11 EziView *Site Properties*, *Name* page

There are four pages to the *Site Properties* dialog. The first page, *Name* (Figure 2-11), shows the site name. This is yet another way to change the site name.



- Figure 2-12 EziView *Site Properties*, *Connection* page

The *Connection* page (Figure 2-12) allows the method of connection to the meter to be configured. The *Connect Using* box allows the type of connection to be picked.

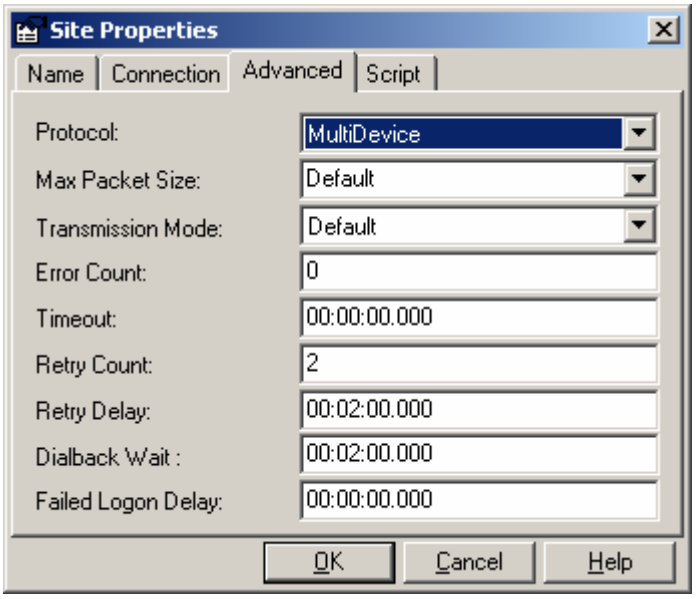
The *_Direct* option shown in Figure 2-12 uses a serial port on the computer to connect directly. This includes use with optical reader heads, or null modem cables, connected to the RS-232 port. With this option the *Port* and *Baud Rate* fields are used to select the details of the serial port. The *Baud Rate* must be set to the same rate as the meter, which defaults to 9600 baud. The *Configure* button allows the number of data bits, stop bits, parity and flow control to be set. Unless the meter settings have been changed, these may generally be left as their default values of 8 data bits, 1 stop bit, no parity, and no flow control. 8 data bits must be used for correct operation with the meter at all times.

If using a smart read head with the meter, use this screen to set DTR to be low. This will cause the read head to be properly configured for the meter. When using with Genius or MK3 meters, DTR should be set to high.

If any modems are installed in Windows these will appear as options in the *Connect Using* field. Selecting a modem to use allows properties such as phone number to be set. These settings are not covered in detail in this guide.

The _*Socket* protocol option is for connection to a port redirector or Ethernet to serial converter using a network. Enter the network address of the converter, the port number, and whether the converter is TCP or UDP based.

The _ModemPool option is a special option to allow use of EziView modem pools, to allow one modem to be allocated from a pool of available modems. Use of this option is not covered here.



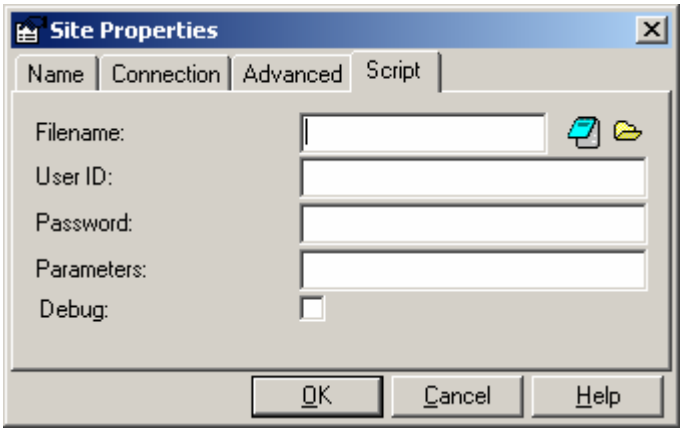
- Figure 2-13 EziView *Site Properties*, *Advanced* page

The *Advanced* page allows a number of specialised settings to be changed that may be used to tweak a connection. Table 2-1 lists the options.

Setting	Description
Protocol	There are several options listed, but only a few are relevant for this meter. The "*MultiDevice*" protocol should be used for the Mk10 or Mk7 meter. It allows many different devices to be on the site and the correct protocol chosen for each device. For example, Mk3, Mk6, and Mk10 can all be on the same RS485 bus and communicating simultaneously i.e. one message for one device using one protocol, then the next message for the next device using another protocol. The "*AnyDevice*" protocol can also be used for the Mk10 or Mk7 meter, but is designed for single meters. It allows any device to be on the site and the correct protocol chosen for that device. The serial number is not used for EDMI meters allowing it to communicate with any meter. For other devices, if the serial number is a general serial number, the message is sent as a broadcast message (unit address is 0). Not all devices will respond to a broadcast message. Other selections are available under the "*Custom*" option. The "*General Protocol*" protocol is a generic protocol to all EDMI meters. This is the protocol to be used for mapping a site (discussed later). Not all features can be used with this mode, but it does not require the serial number to be correct. "*IEC1107*" may be used if the meter has been configured for autoswitch to IEC1107, or is in IEC1107 mode. Other protocols listed are only useful for other meter types besides the Mk10 or Mk7.
Max Packet Size	When using a GPRS communications session, the packet size needs to be reduced to make sure the packets can get though. *Default* allows EziView to generally pick the correct one, but *GPRS* can be used to force smaller packets, and *Full* can be used to force standard size packets. LON DLC forces very small packets for use with IK30 concentrators and PLC meters.
Transmission Mode	While the EDMI command line protocol generally only requires a half duplex communications link, if the link is known to be full duplex then certain optimisations can be made, particularly in upgrading firmware remotely. Normally this can be left in the Default setting, but the Full-Duplex and Half-Duplex settings can be used to override this.
Error Count	This is the total number of errors counted while communicating with any meter on this site. By checking this value, problems such as cable faults and bad modem connections will become obvious.
Timeout	EziView waits for a response to a message. If no response occurs it sends the message again. This wait time is called the timeout period and is calculated by adding the timeout for the site and the timeout for the meter. By changing the timeout for the site, the timeout is changed for all meters. This is most useful if a site has special characteristics e.g., using a low speed mobile modem.
Retry Count	These options fine-tune the connection to a site.
Retry Delay	Connecting to a site involves dialling a modem or opening a serial port. If the serial port is in use by another application, or if the modem does not answer, EziView will retry *Retry Count* number of times. The delay between retries is *Retry Delay* milliseconds. The settings can be overridden per meter.
Dialback Wait	This is the time to wait in milliseconds for a dialback from a meter.
Failed Logon Delay	This is the time to wait after a logon has failed to try the alternate logon.

- Table 2-1 Site Properties, Advanced page settings

These settings can generally be left at their default values.



- Figure 2-14 EziView *Site Properties*, *Script* page

Finally, the *Script* page (Figure 2-14) allows a *login script* to be specified, along with parameters for the script. Login scripts allow EziView to navigate past devices such as "Datagates" that allow a single modem connection to be shared. Details of their usage are not covered in this guide.

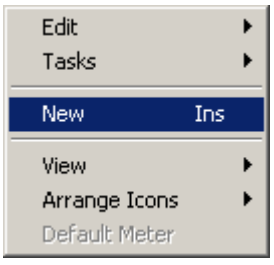
Automatically Creating a meter file in a Site

After creating a site as shown in Figure 3-10, right-click on it and select *Map Site*. If the option is not available, check the site has no meters in it, and that the protocol is set to "*General Protocol*". EziView will automatically look for an attached meter, and add a meter to the site. Note that this will not work for 485 multi-dropped meters – they must be added to the site manually. The *Map Site 485* option does not detect Mk10 or Mk7 meters.

Manually Creating a meter file in a Site

This may be used when the automatic method is not possible, for instance on a multi-dropped site or configuring EziView without access to the meter.

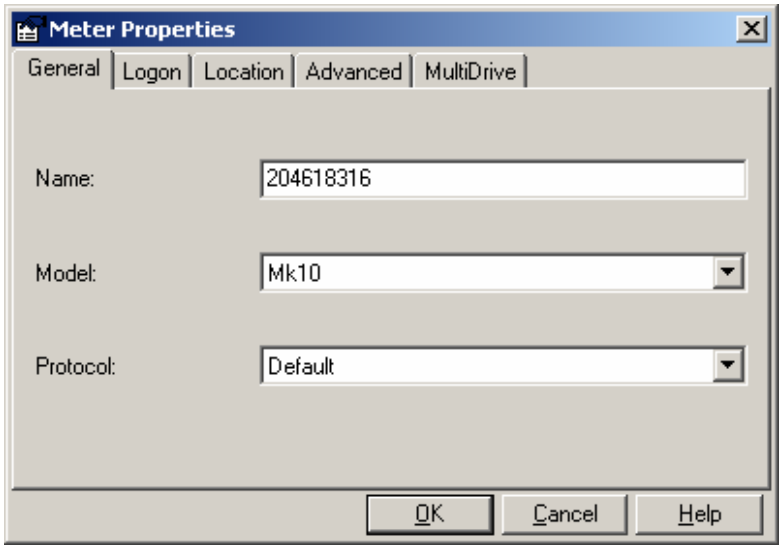
Create a site, and make sure the connection properties are correct. Setup of connection properties is as shown earlier in this section. Make sure that the baud rate and com port is set correctly, and set protocol to MultiDevice.



- Figure 2-15 Dropdown menu to create a new meter file

After creating the site right-click on the right pane. A dropdown menu as shown in Figure 2-15 should now be displayed. Click on New Ins, and a new icon for an MTR file will be created. A default filename will be assigned starting from 1000000000 onward. EziView will make sure that the number will be unique and no newly created meter file will be

assigned with the same number. Rename the MTR file to the serial number of the meter to be connected. Right-click on the newly created meter and select *Rename* to rename it. Note that if the meter name is not 1000000000 or bigger, this operation will just change the name, not the serial number, which is also used as an address for the meter.



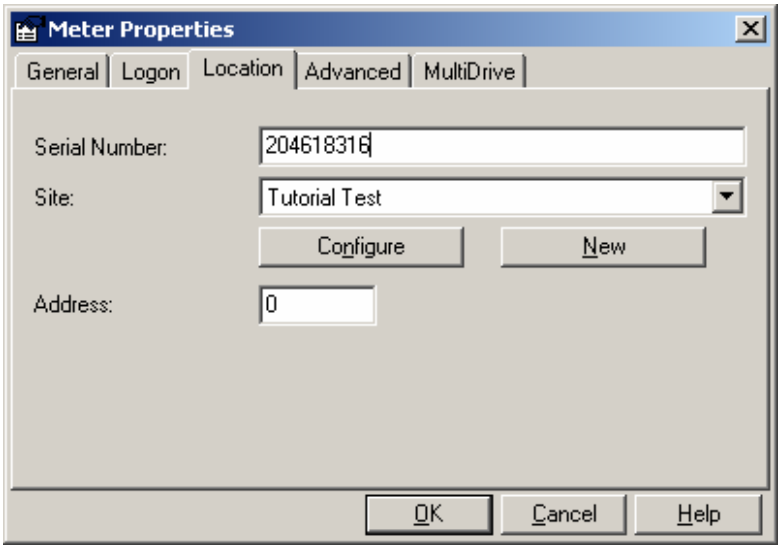
- Figure 2-16 Meter Properties

Right-clicking on the meter and selecting *Properties* brings up a dialog which allows a number of properties of the meter itself to be configured. The first page of this screen (Figure 2-16) allows the meter *Name* to be changed, as well as allows the Model and Protocol to be selected. Model should be set to Mk10 or Mk7 as appropriate. Protocol can generally be left as Default, as it should select the appropriate protocol from the Site Properties and other settings. The other protocol options are listed in Table 2-2

Protocol Setting	Description
Default	The recommended option, which will autoselect the best option generally.
EDMI Command Line	This is the native protocol of the Atlas meters.
IEC1107-> EDMICommandLine	This attempts to log into the meter through the optical port using IEC1107 and then negotiate into EDMI command line. The meter must have IEC1107 functionality and must be configured for autoswitch. It will fall back to trying EDMI command line if IEC1107 fails.
EDMI MiniE	Only generally used for EDMI internal testing.
EDMI MiniE Packet	Used for GPRS communications in combination with UDP.
LON DLC	This is used with an IK30 PLC concentrator to communicate with the emter via the concentrator.

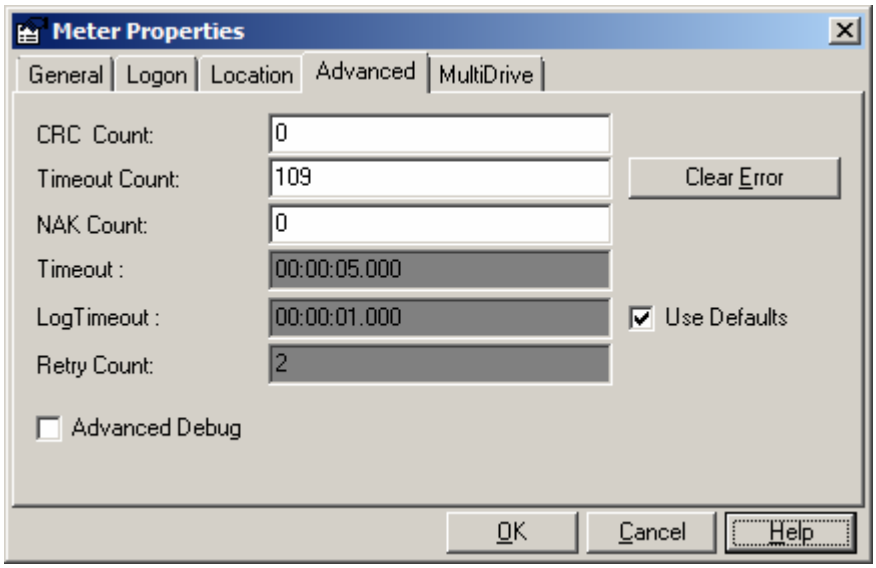
- Table 2-2 General Meter Properties, Protocol settings

The *Logon* page allows specific *User ID* and *Password* settings to be made. The *Location* page (Figure 2-17) allows the serial number to be changed, which also acts as the address of the meter in multi-drop communications. The *Site* can also be changed from here, and the site properties can be displayed. The *Address* setting has no effect.



- Figure 2-17 Meter location

The *Advanced* page (Figure 2-18) keeps track of communications errors, and allows per meter settings of Timeouts and Retries.



- Figure 2-18 Meter Advanced settings

The *Use Defaults* option will get the settings for Retry Count, Timeout and LogTimeout from the settings in *Tools → Options → General → Connection Screen* settings (Figure 2-22 shows this page). *Use Defaults* is the default for a new meter.

The *Advanced Debug* option is currently used in conjunction with MultiDrive COM Server. So if the meter is connected through the COM Server, ticking this option will return the meter schedule log

The *Clear Error* button will clear the error statistics.

The meanings of the fields are listed in Table 2-3.

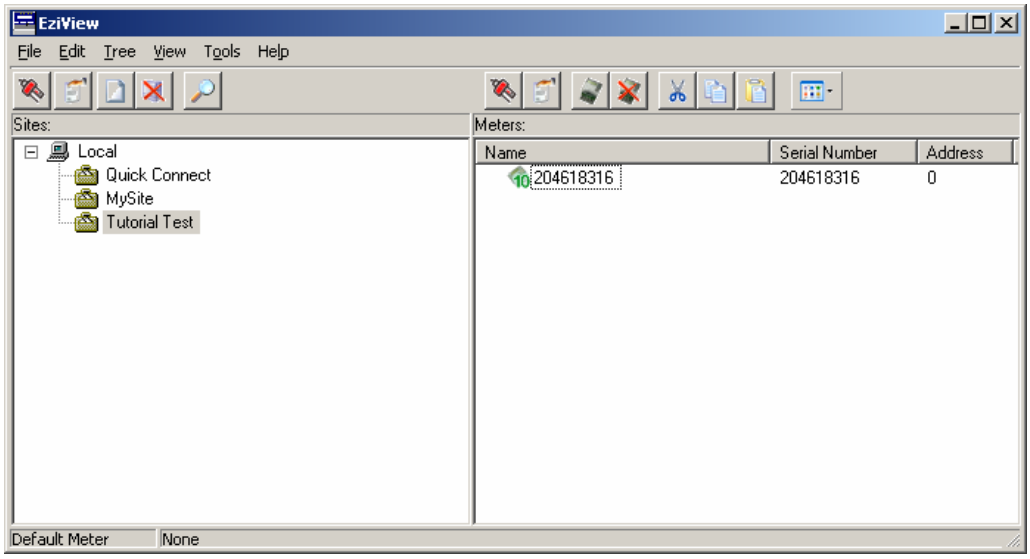
Setting	Description
CRC Count	This is the count of errors found during the transfer of data to and from the meter by CRC. This value can be cleared.
Timeout Count	This is the number of times the meter time outs before logging on or during a communication. See Timeout below. This value can be cleared.
NAK Count	This is the number of times the meter does not acknowledge the message sent to it by EziView. This value can be cleared.
Timeout	EziView waits for a response to a message. If no response is received, it sends the message again. This wait time is called the timeout period and is calculated by adding the timeout for the site and the timeout for the meter. By changing the timeout for the site, the timeout is changed for all meters. This is most useful if a site has special characteristics e.g., using a low speed mobile modem.
Log Timeout	When the meter has already been logged into and connection is broken midway through a function, the Log Timeout is the period to wait before the meter is automatically logged out.
Retry Count	These options fine-tune the connection to a meter. If the meter does not respond to a message sent by EziView, EziView will retry Retry Count number of times.

- Table 2-3 Meter Advanced settings

The *Multidrive* page allows the Multidrive *DeviceID* to be set. Set the *DeviceID* of the meter to map it to the MultiDrive database. Leave this blank if you do not have the MultiDrive package installed.

MultiDrive is a complete meter/data management and data accumulation software package that allows the collection of a large range of data from a meter or measuring devices using Automatic Meter Reading (AMR) communications technology. For more details, please contact EDMI or your local vendor.

Meters in EziView



- Figure 2-19 A newly created meter in EziView

A site's meters appear in the *Meters* pane when the site is selected. The meter may be renamed or deleted in a similar way to sites. The right hand four icons on the tool bar control how the pane is displayed, with the *Details* view being the preferred method.

Each meter in the *Meters* pane represents what is called an MTR file. This is kept by EziView, and primarily consists of the configuration for the meter. EziView allows the configuration in this file to be edited, and offers a set of tools to send the configuration to the meter.

The cut, paste and copy tools can be used to move meters between sites. This is useful if the physical location of a meter changes. It is also a useful way to create a new meter without going through the mapping process. Simply copy an existing meter, paste it into a new site, and then set the serial number of the meter and the protocol of the site appropriately.

Another way to create a new meter is to use the *File→New→New Meter* option (or toolbar icon or right-click menu in the *Meters* pane or the Ins key). This creates a new meter in the selected site with the default properties. To change the default properties simply select an existing meter and select the *Default Meter* option from the right-click menu, or the *File* menu. New meters will be created with the same settings as the default meter.

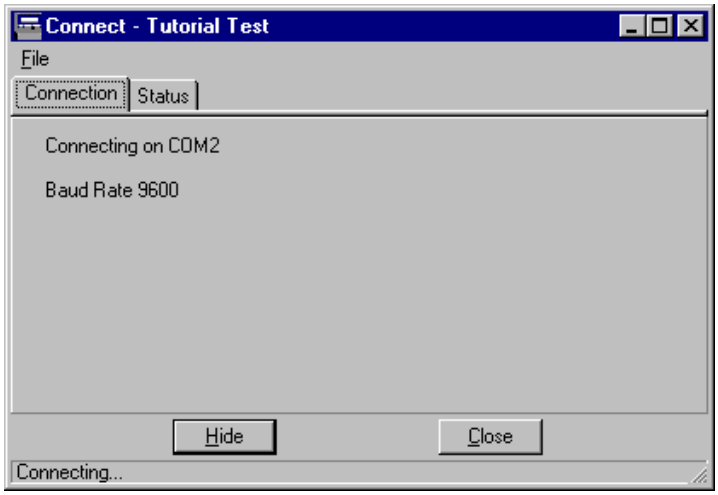
The use of *Setup* is covered in Chapter 3.

Connecting to a meter

To connect to a meter, double click on the meter or its site. Alternatively the right-click menus have a *Connect* option (as shown in Figure 3-16), as does the *File* menu and the tool bars (icon furthest to the left).

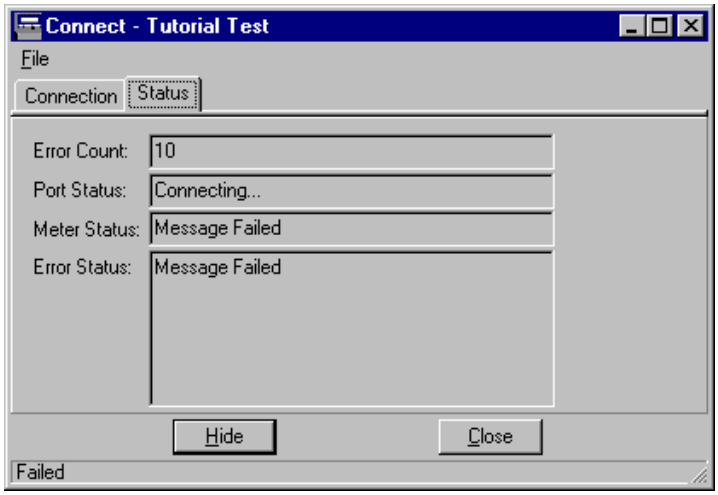
If a site has multiple meters such as an RS485 multi-dropped site, EziView will always try to connect to the meter with the lowest address number and treat it as the master. If several meters have the same address, it will pick the lowest serial number. This can cause some confusion if that meter is off-line as EziView will not connect.

EziView treats this lowest address/serial number meter as the master meter and stays logged into it until the connection is broken. If this is not the master meter then the connection can be broken if the real master is communicated with then its window is closed – since EziView logs out of the real master and it hangs up the modem.



- Figure 2-20 EziView connecting to a meter

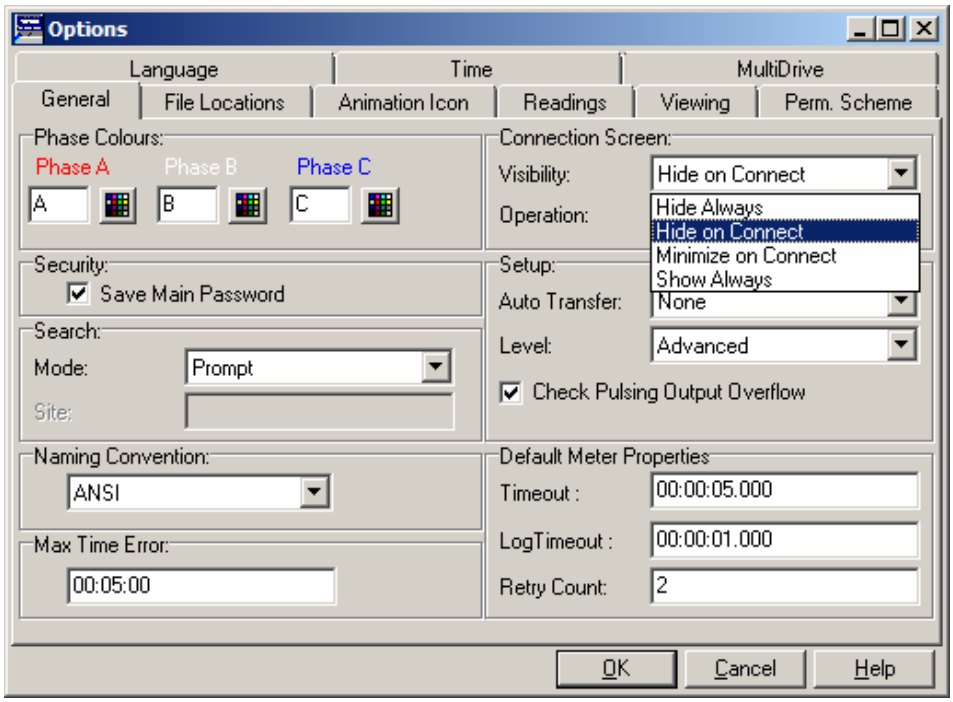
A screen similar to Figure 2-20 is shown while EziView is attempting to connect. The *Hide* button hides this screen, but has no effect on operation.



- Figure 2-21 EziView connection *Status* page

If the meter does not connect immediately the *Status* page can give useful information as to what is failing. The screen of Figure 2-21 was generated by disconnecting the serial connection to the meter. Clicking the *Close* button will abort the process. EziView tries to make sure that the meter is logged off before disconnecting, so the disconnection sequence may take some time if the meter is not responding.

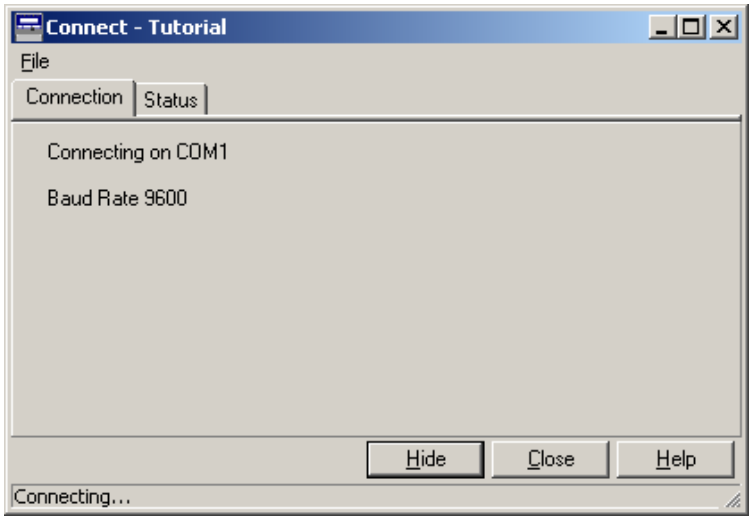
The times at which the *Connect* screen is shown may be controlled using the *Tools → Options → General → Connection Screen* settings (Figure 2-22).



- Figure 2-22 EziView Connection Screen options

Visibility controls when the connection screen is displayed. *Hide Always* never shows it, *Hide on Connect* hides it after connection is established, *Minimise on Connect* minimises it after connection is made, and *Show Always* shows it until the connection is broken.

The *Operation* setting controls when interactive mode is used. In interactive mode the connection details are displayed before the connection is attempted (Figure 2-23).



- Figure 2-23 Interactive connection

Automatic never uses interactive mode, *Interactive Modem* uses it only for modem connections, and *Interactive Always* uses it for all connections.

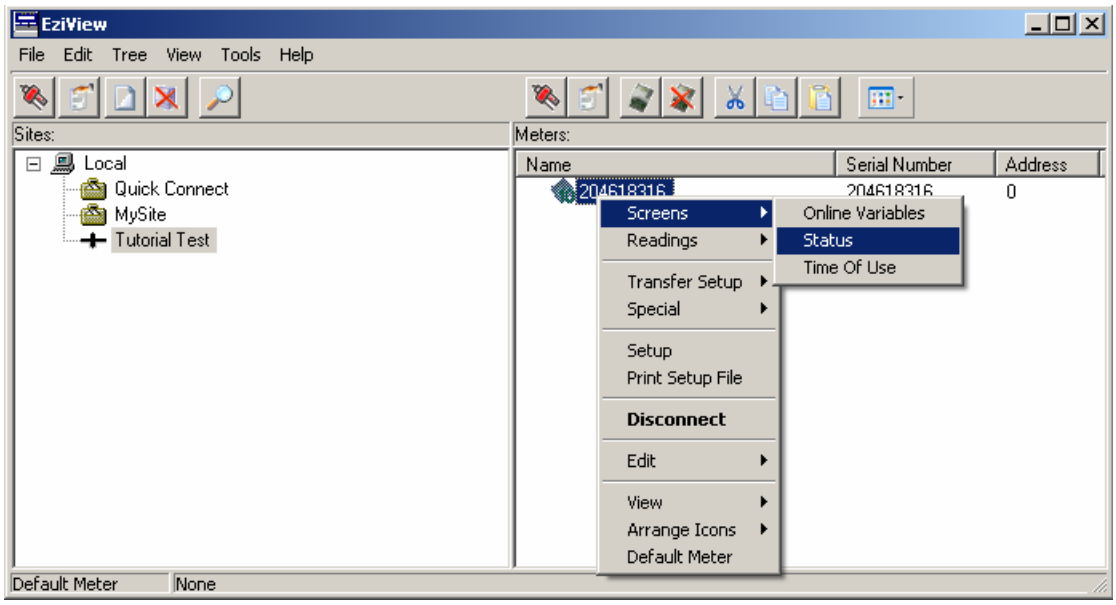
Quick Connect

This option causes EziView to connect to a meter it finds on the serial port defined in the Quick Connect Site. Generally this would be used with an optical read head. Since EziView does not know the serial number and needs to ask the meter for it, this method does not work on RS485 connected meters unless connecting to the meter directly via its optical port.

To use *Quick Connect*, click the quick connect button  . The meter may be in any site in EziView, not just the Quick Connect site. If the meter does not exist, a meter is created in the Quick Connect site.

Online Functionality

Once the meter is connected and online, extra options become available on the meter's menu. Figure 2-24 shows these options. Most obvious is the *Disconnect* button, which terminates the connection with the meter.



- Figure 2-24 EziView online options

The *Screens* group provides a range of status screens updated in real time, along with those settings that can only be performed online such as setting the clock.

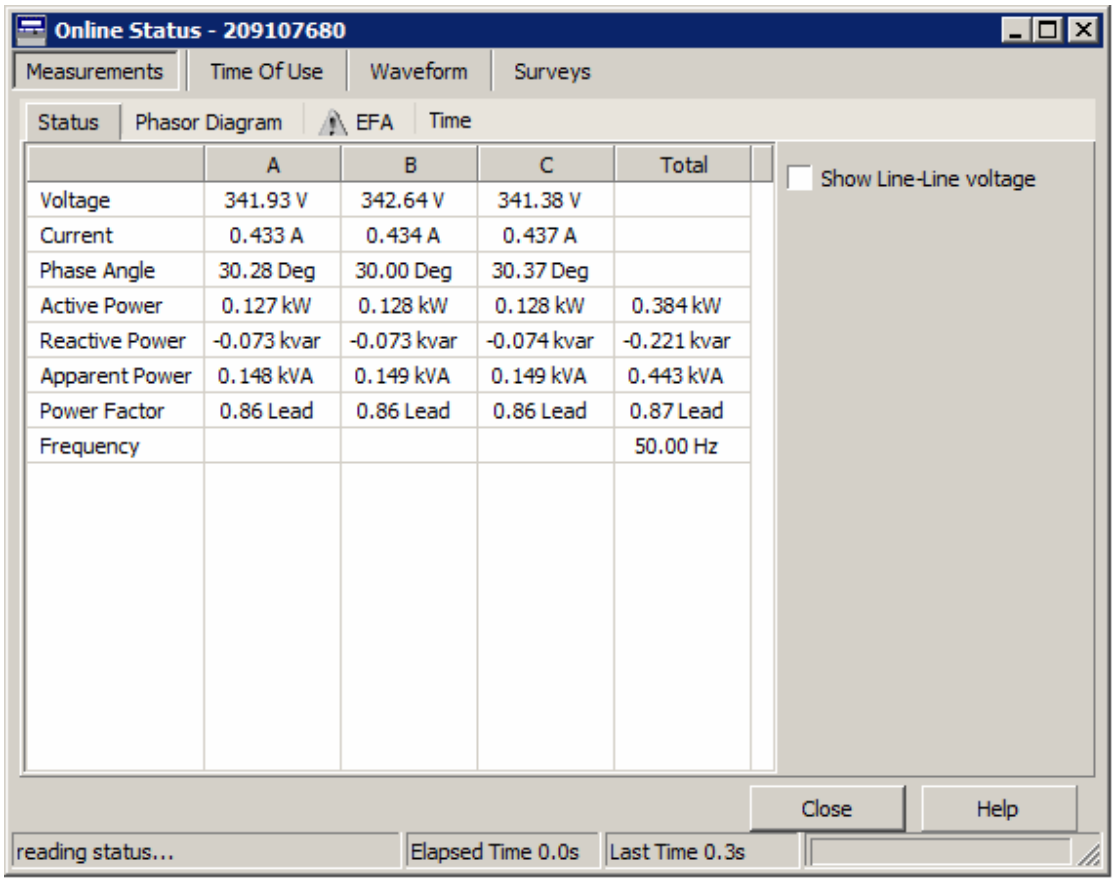
The *Transfer Setup* group allows transfers between the setup in the MTR file kept by EziView and the setup in the meter itself.

The *Special* group allows registers in the meter to be changed directly, and allows the meter to be restarted, simulating a momentary loss of power.

The use of these menu options is explained in the following chapter.

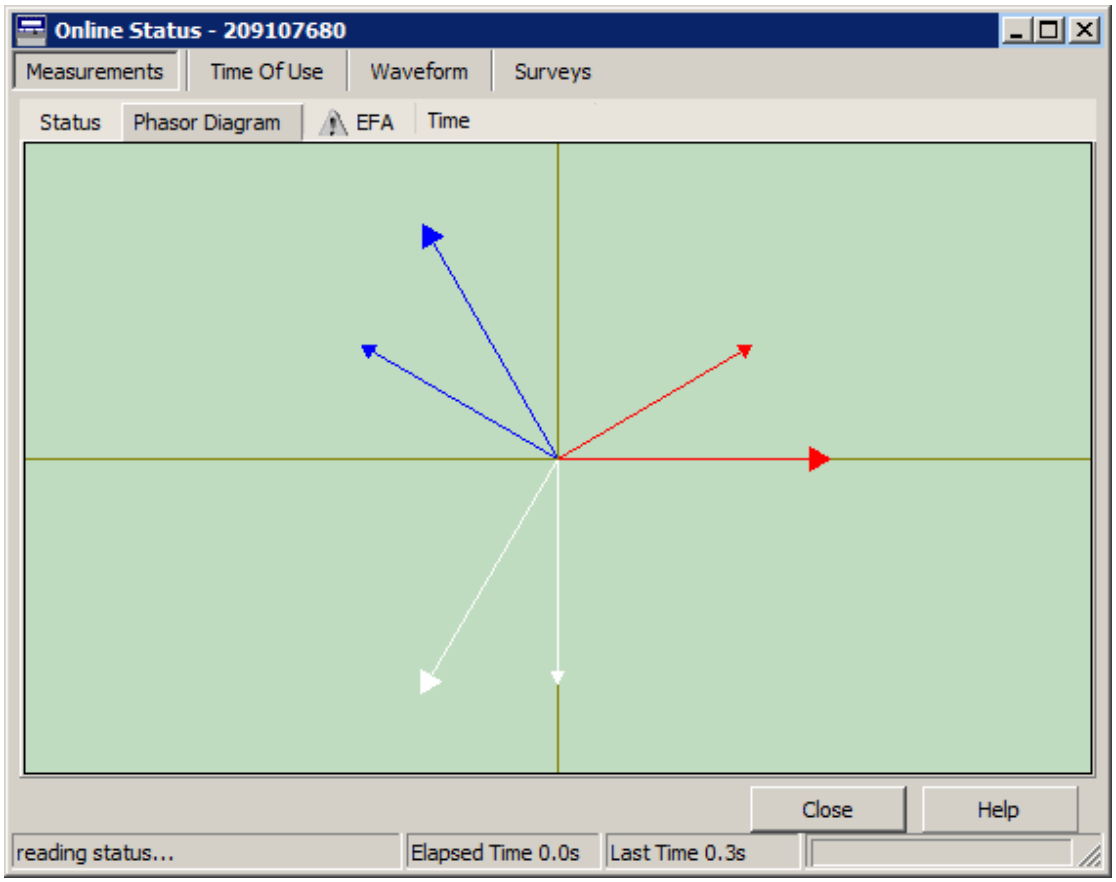
Live Measurement Display

EziView can display live readings from a connected meter.



- Figure 2-25 EziView *Status* screen example

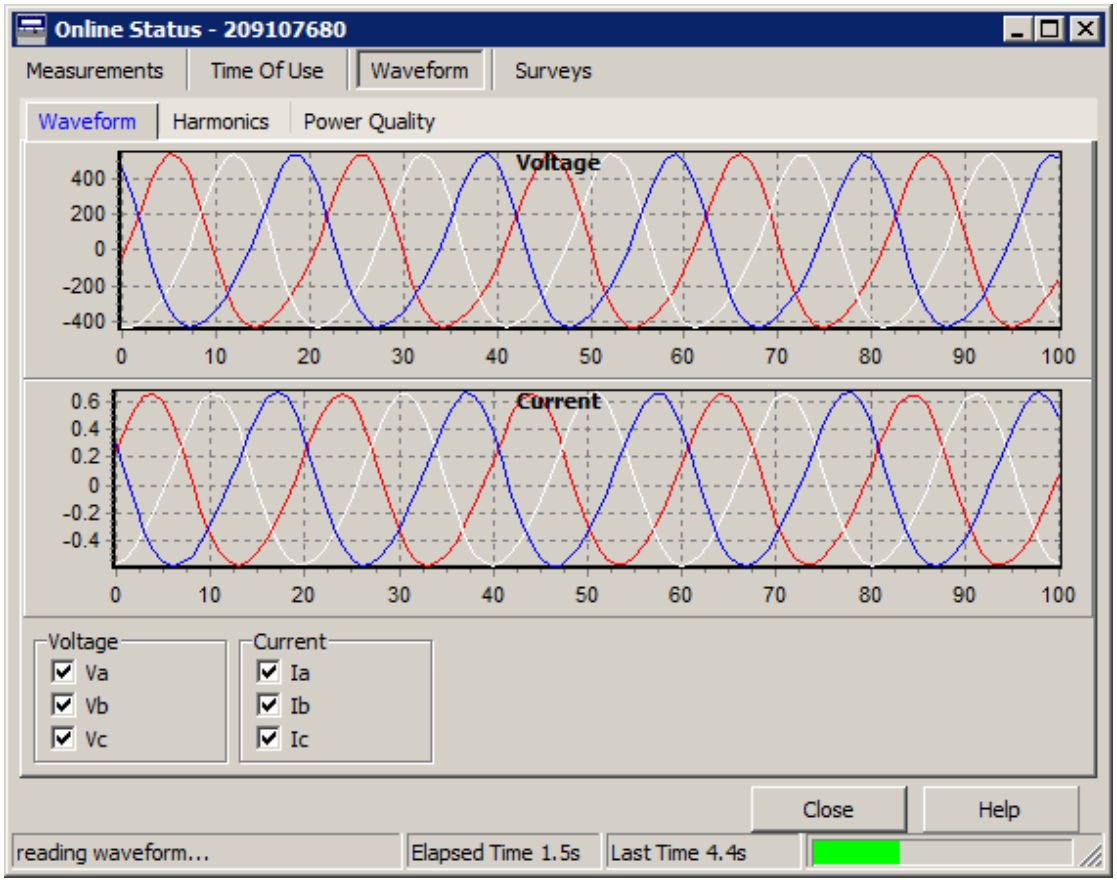
Selecting *Screens→Status* gives a real time display of the meter's basic measurements Figure 2-25). In this example the meter is reading 0.128 kW per phase – this same set of input conditions in maintained though the rest of the measurement displays in this chapter. These readings will update as fast as they can be read from the meter. Note that the per phase power factor is calculated by EziView.



- Figure 2-26 EziView *Phasor Diagram* example

The *Phasor Diagram* page shows a phasor diagram of the system, indicating the relative magnitude and angle of the voltages and currents (Figure 2-26). In this example it can be seen that there is a 30 degree phase shift on all the currents, but otherwise the system is well balanced.

Waveform Display



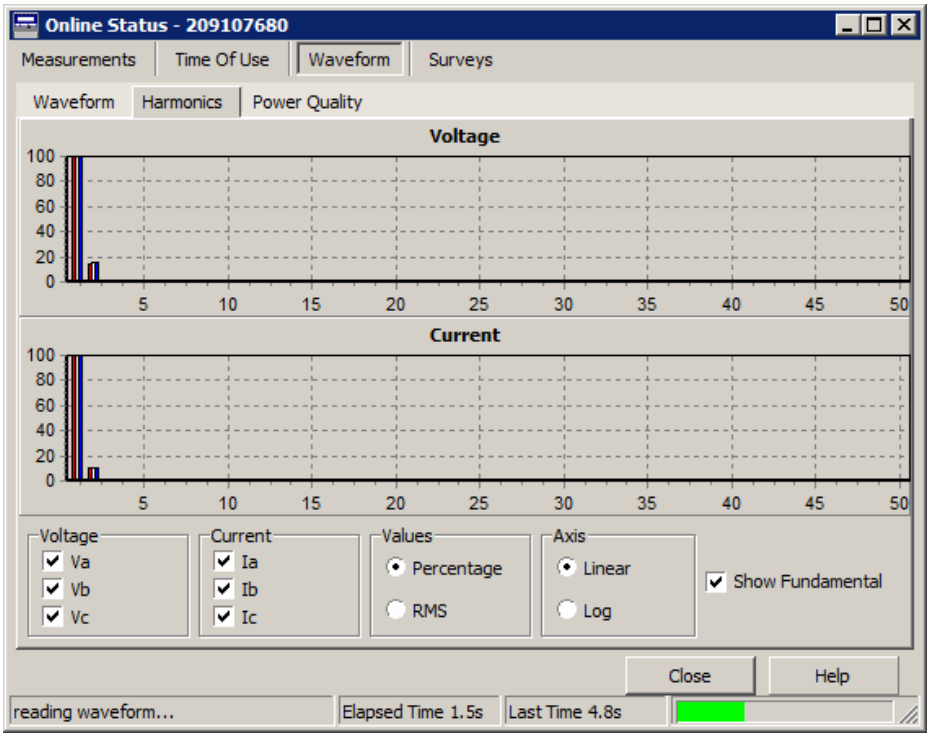
- Figure 2-27 EziView *Waveform* example

The *Waveform* tab shows a variety of detailed information on the meter measurements. The *Waveform* page displays a capture of 5 cycles of the waveform as measured by the meter. Individual channels can be hidden to clarify the display. Note that the captures of the 6 waveforms happen in sequence, not simultaneously – keep this in mind when looking at non-repetitive signals.

To display the Waveform tab and its sub tabs the meter must be a Mk10E.

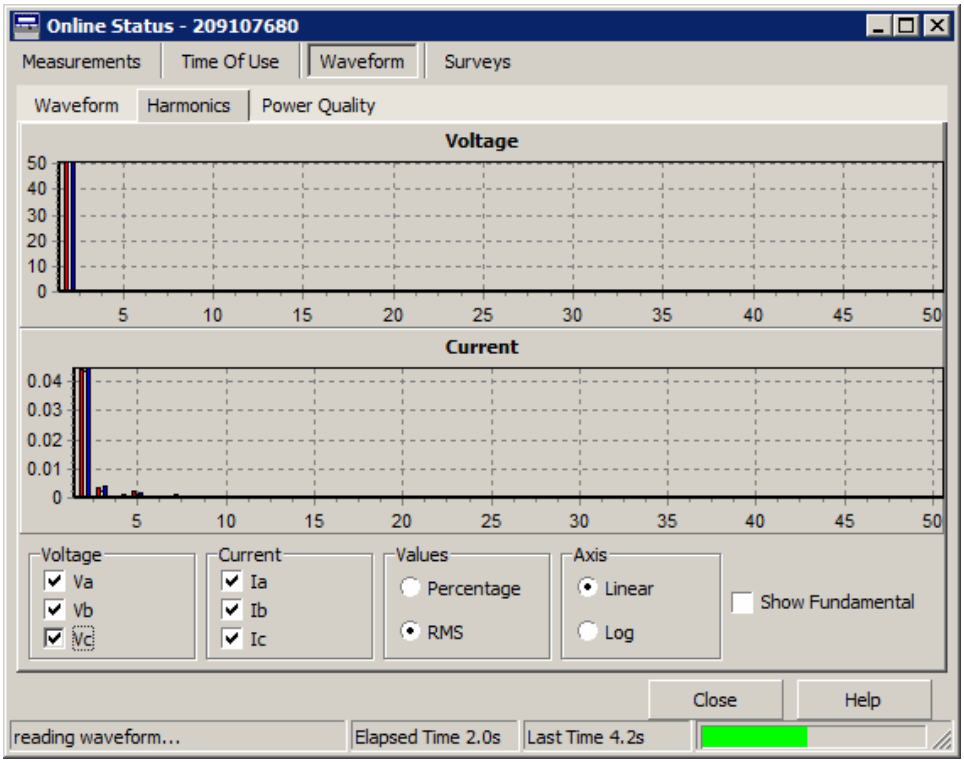
In this example it can be seen that the waveform looks quite good, but there are some small distortions.

Harmonics



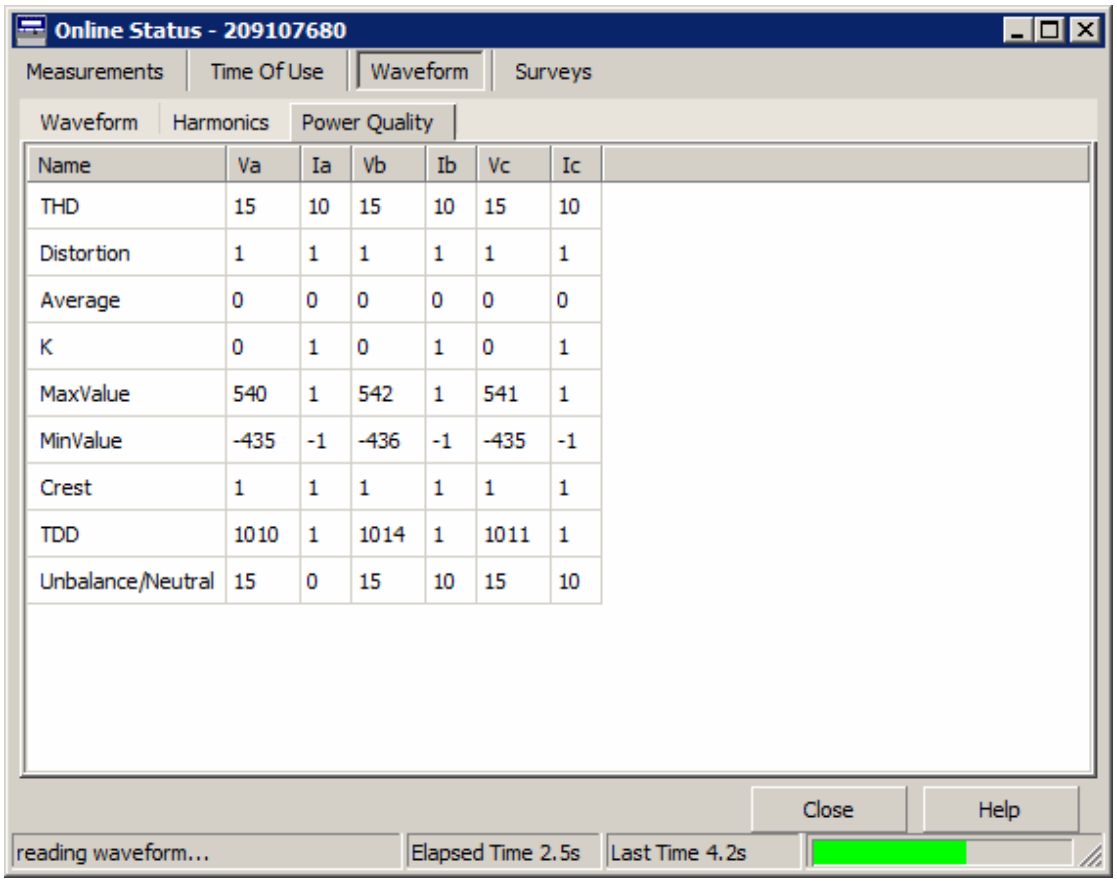
- Figure 2-28 EziView *Harmonics* example

The *Harmonics* page displays an analysis of harmonics, calculated from the waveform display. In this case it can be seen that the levels of second harmonic are present on both voltage and current. Changing the display options allows a closer look at the harmonics.



- Figure 2-29 EziView *Harmonics* example with finer detail

Power Quality



Name	Va	Ia	Vb	Ib	Vc	Ic
THD	15	10	15	10	15	10
Distortion	1	1	1	1	1	1
Average	0	0	0	0	0	0
K	0	1	0	1	0	1
MaxValue	540	1	542	1	541	1
MinValue	-435	-1	-436	-1	-435	-1
Crest	1	1	1	1	1	1
TDD	1010	1	1014	1	1011	1
Unbalance/Neutral	15	0	15	10	15	10

- Figure 2-30 EziView *Power Quality* example

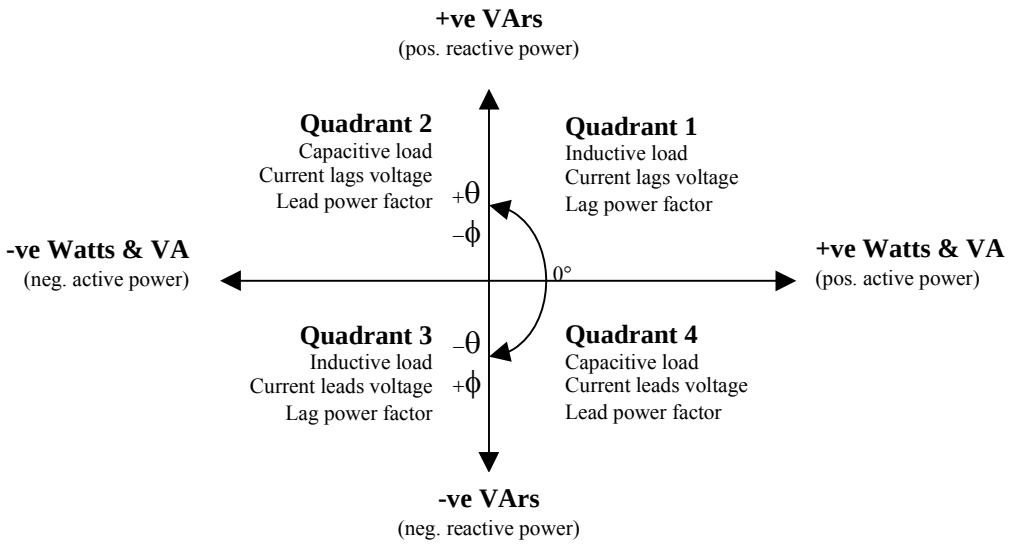
The *Power Quality* page displays a variety of power quality figures calculated from the waveform capture. We can see the THD caused by the 2nd harmonic influence. Note that which channels are displayed on this screen are affected by the settings on the Harmonics/Waveform screens.

Disconnecting

To disconnect from the meter simply choose *Disconnect* from either the site or the meter's right-click menu, or from the *File* menu, or by using the *Connect/Disconnect* icon on the left hand end of each tool bar.

Measurement Conventions

The convention for energy directions is as shown in Figure 2-31 below.

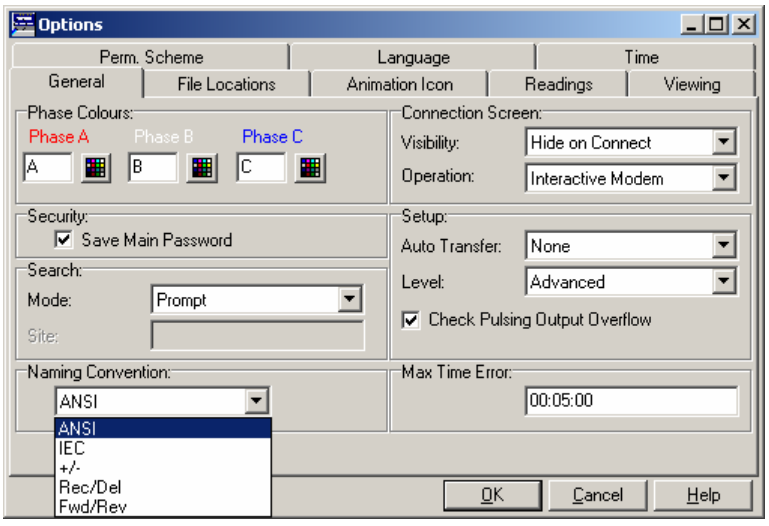


- Figure 2-31 Energy Directions

Export is exporting or delivering energy to the customer's load, import is importing or receiving energy from the customer. All conventions are from the point of view of the supply authority.

θ is the impedance angle of voltage with respect to current. ϕ is the admittance angle of current with respect to voltage. The meter measures the angle in terms of current with respect to voltage (ϕ, admittance).

Since conventions change around the world, there is a setting called *Naming Convention* in the EziView *Tools → Options → General* page (Figure 2-32). The colour used for each phase may also be edited here.



- Figure 2-32 *Naming Convention* settings

The naming conventions are as in Table 2-4.

Standard	Positive Energy	Negative Energy	Abbreviated
ANSI	Export	Import	Exp/Imp
IEC	Import	Export	Imp/Exp
+/-	+	-	+/-
Rec/Del	Delivered	Received	Del/Rec
Fwd/Rev	Forward	Reverse	Fwd/Rev

- Table 2-4 Naming conventions

See Import/Export Conventions on page 5-5 for meter options affecting measurement convention.

Intentionally Left Blank

Chapter

3

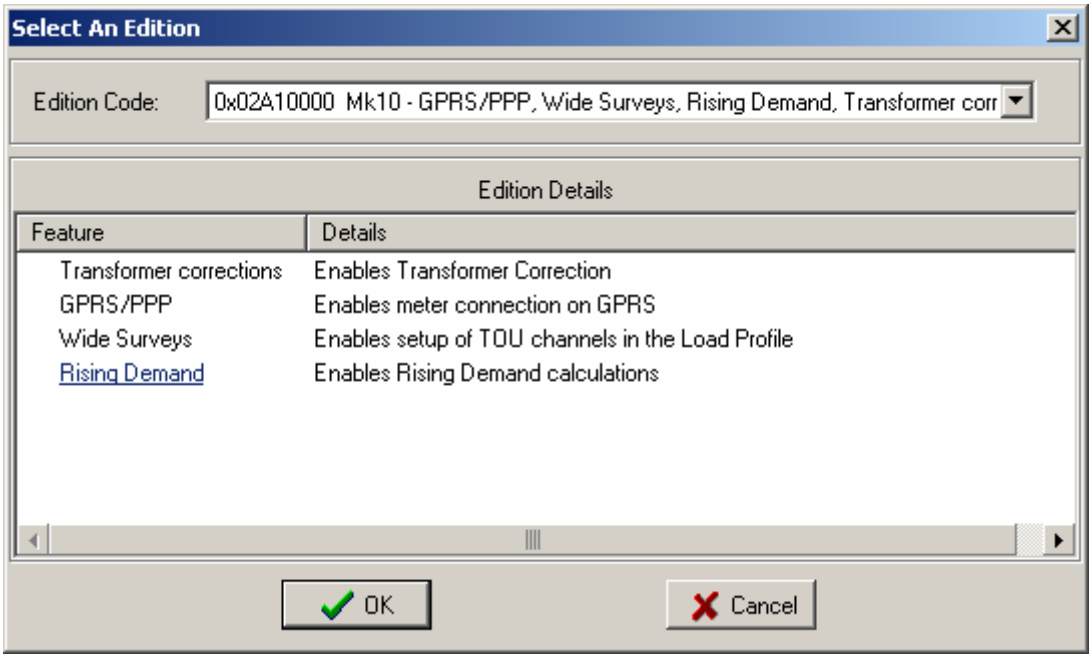
Configuration Basics

The *Setup* option for a meter allows the configuration for the meter to be changed. What is edited is the copy of the configuration kept by EziView in the MTR file for the meter. This chapter deals with the basics of setting up, and ways of transferring this information between EziView and the meter.

Editions

Editions allow multiple builds of the same firmware version to be released. Each edition tailors the functionality available to support certain applications. For instance support for GPRS communications may be omitted in one edition to make room for a different protocol.

Since different editions have different capabilities it is important to let EziView know what edition is in use, so that only the available setup options are displayed. If the setup has been read from a meter then EziView will have this information, but for new MTR files and pre v4.05 MTR files EziView will ask for the edition as shown in Figure 3-1.



- Figure 3-1 Edition selection screen

The default selection is *Edition Not Found in File*, which prompts for EziView to ask. The *All* option causes EziView not to restrict any of the setup options based on edition, although the edition will still be checked when the setup is actually written to a meter.

The edition options that EziView knows about for that meter type (eg Mk7) are listed to allow a specific edition to be selected – this is the recommended approach if the edition that will be used is known, to avoid errors being generated when the setup is written to the meter.

The edition code is represented as a hexadecimal number, eg D10000. Each part of the edition code represents a different feature. The bottom 4 digits are related to a hardware platform (eg the Mk10 and the Mk7 are different) – in this case, only the edition designed for your hardware may be used. The top 4 digits are for software functionality (such as supporting certain communication protocols) – different editions can be loaded into the same meter, as long as the hardware part of the edition matches. The edition code and the version uniquely identify the firmware.

For information on changing editions, see Appendix A: "Upgrading Firmware". The available editions may be viewed on the *SystemParameters* setup page (Figure 3-2). No meter has all features, and the features that may be present together in a firmware edition are determined by the size of each feature and the hardware.

Table 3-1 lists the hardware options, and Table 3-2 lists the software options.

Feature	Description
Disconnect Relays	The meter has physical disconnect relays. This enables configuration of the Relay system
Enhanced Processor	Meters with an Enhanced Processor have more firmware and RAM space in the meter's processor. This allows for more features in the one firmware edition, and is a requirement for some features.
LCD Type	This indicates meters with a special LCD (at this time, a Chinese LCD is the only option besides the standard display) (Not shown in EziView)
Meter Type	Mk10, Mk7A, Datahub, Mk7C, Mk10D, Mk10E (not shown in EziView)
Power Management for Capacitive Power Supplies	Meters based on capacitive power supplies such as low end mk7C variations have this option to control the amount of power used by the meter itself.
Reconnect Button	If set then the 2nd button is a reconnect button. Otherwise it is a Billing reset button.
SPI Flash	A higher density flash option, this is set when the meter has this memory option (commonly used with 2 Mbyte flash devices).
Third Serial Port	This indicates that a third serial port exists in the hardware. This enables configuration of the 'SCADA' port.
UPS	The meter has UPS functionality and hardware. This also enables Current in TOU, push alarming, and LCD alarming.

- Table 3-1 Hardware Edition Features

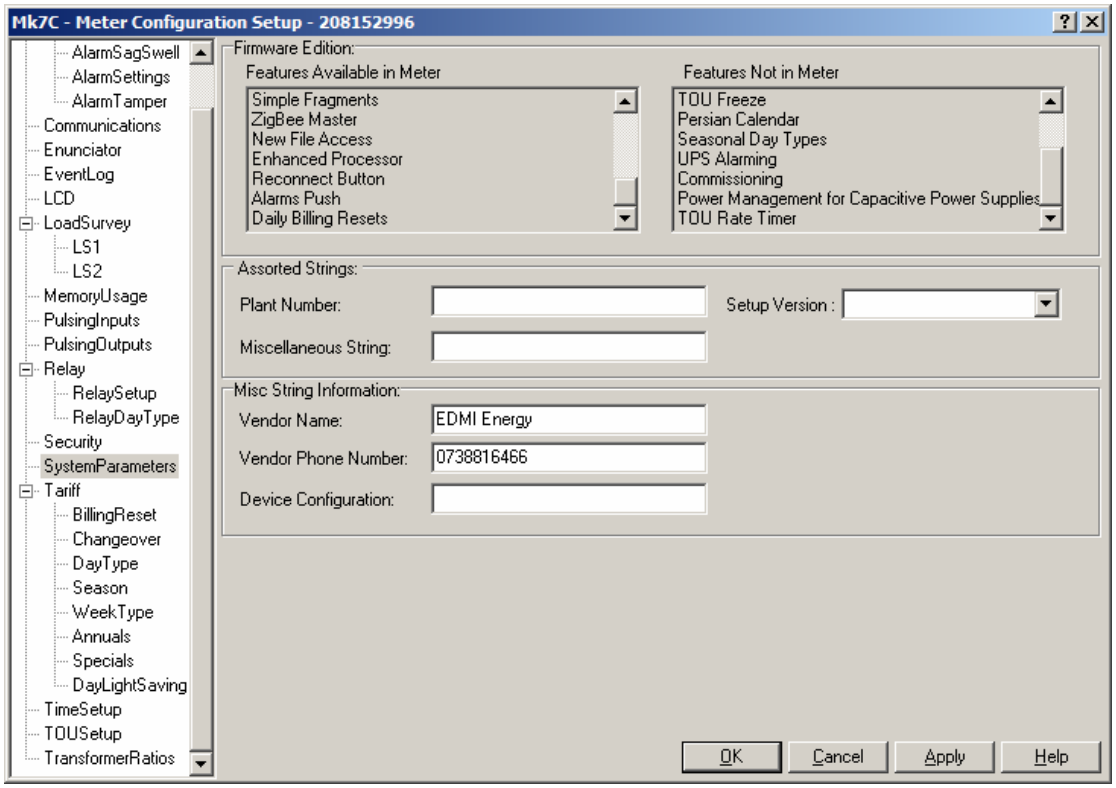
Feature	Description
Alarms Push UPS Alarming	Either code enables Alarms to be pushed to a server using GPRS when they occur.
China Features	This includes Chinese Protocol and several other features specifically related to the Chinese market.
Command Line Redirect	This enables the option for packets to be redirected between serial ports of the meter, enabling the meter to be a gateway to other meters.
Commissioning	This enables the commissioning process for use with MultiDrive.
Coronis	This adds support for talking to Coronis radio devices, used in the DataHub product
Daily Billing Resets	This allows Billing Resets to be performed daily.
Disconnect Via IO	Allows disconnect functionality to be used via outputs on meters with no hardware disconnect relay.
DLS	This enables the meter to make allowances for Daylight Saving Time.
Gating	This enables the meter to be tested on an EDMI accuracy testing system
GPRS/PPP	This feature is required for the meter to operate on GPRS, which uses the PPP, IP, and UDP protocols.
IEC1107	This enables IEC1107 communication, which gives basic access to the meter using the IEC1107 protocol, also known as IEC62056-21.
Load Limiting	This feature enables the load limiting features on relays, where a load can be turned off if certain limits are exceeded.
Modem Support	This enables support for modems, both PSTN and GSM.
New File Access	This extends the command line protocol to allow larger packets for setup changes, remote firmware upgrades, and IHD updates – substantially speeding up communications.
Tamper	This enables the Tamper Log which can detect a wide range of tamper attempts.
Tariff Input	This enables an input to be used to control the active tariff rate.
TOU Freeze	This allows some of the TOU register to be frozen – this feature is not actively supported.
TOU Rate Timer	Enables the option to record the time spent in each TOU rate.
Transformer Corrections	This enables errors in measurement transformers to be corrected by the meter.
Persian Calender	This provides support for the Persian Calender, as opposed to the Gregorian Calender.
Power Quality	Power Quality, this enables measurement of THD, fundamental quantities, and sequence components.
PLC	This adds an interface to the PLC circuit in PLC meters, along with smaller versions of some registers, integer TOU readout, and some special LCD screen handling.
Relay Change On Input	Allow the state of a disconnect relay to be controlled by an input.
Rising Demand	This feature calculates rising demand and makes it available in several registers for display on the LCD.
Seasonal Day Types	This allows TOU daytypes to be configured differently for each season.
Simple Fragments	Used with ZigBee, this allows a command line packet to be fragmented for transmission over the network.
Wide Surveys	This allows TOU channels to be recorded in the Load Survey.

ZigBee Master	This allows the meter to act as a ZigBee master in a Mini-Mesh network.

- Table 3-2 Software Edition Features

Changing Configuration

To change the configuration/setup of a meter select *Setup* from its right-click menu. The meter may be connected or off line. A screen similar to Figure 3-2 will be displayed.



- Figure 3-2 *Meter Configuration Setup* screen

The data shown in the fields is the data in the MTR file maintained by EziView. Changing the data and clicking *OK* saves the changed data back to the MTR file and closes the setup screen. Clicking *Apply* saves the data to the MTR file but does not close the screen. The *Cancel* button will exit the screen and cancel any changes made since the last *Apply*. The *Help* button is currently non-functional – refer to this manual when help is required.

Most configuration changes are made using the Setup pages. The tree on the left side shows the available pages, and clicking on the tree moves to the selected page.

Changing data in the *Setup* pages may be performed when connected to the meter or offline. The changes will not be sent to the meter in either case unless they are transferred (discussed next).

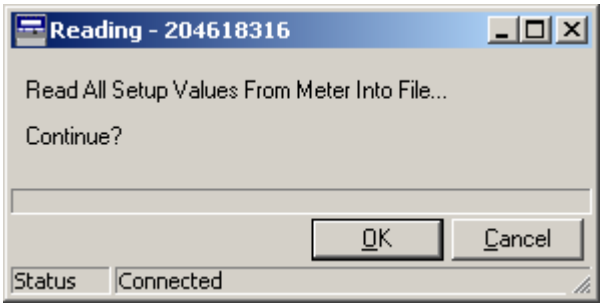
The *Firmware Edition* section on this page shows the available features in the selected firmware edition.

Transferring Configuration

Read Setup from Meter

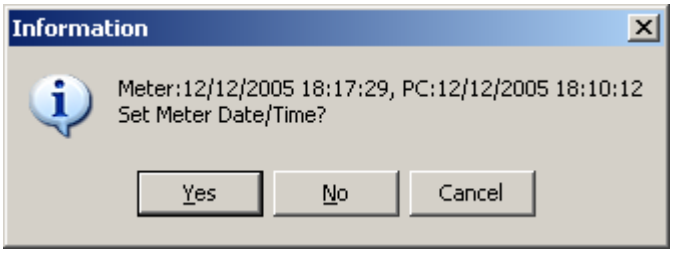
This is the most basic option. It simply reads the entire setup from the meter into EziView. To change the setup of an existing meter use this option first to ensure that the EziView copy of the meter configuration is complete. The setup can then be edited and sent back to the meter.

EziView first asks for confirmation to proceed with the download (Figure 3-3).



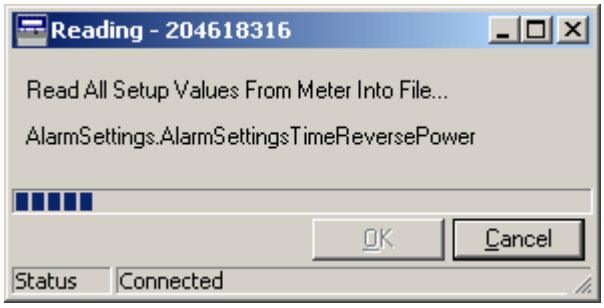
- Figure 3-3 Read all setup values dialog

Continuing, EziView checks the meter's time against the computer's time. If it is different by more than the amount set in *Tools → Options → General → Max Time Error*, EziView will prompt you to set the clock in the meter (Figure 3-4). Clicking *Yes* will set the time in the meter to the same as the computer. Clicking *No* will skip the time set, and clicking *Cancel* will abort the read operation.



- Figure 3-4 Set time dialog

EziView will now download the entire setup from the meter (Figure 3-5). This operation may take some time, depending on the speed of the communications link.



- Figure 3-5 Read setup in progress

If any problems occur during the transfer you will be notified. The most likely problem is that you do not have permission to read some of the setup values. Any values that could not be read will be listed. For these values EziView will retain its existing settings.

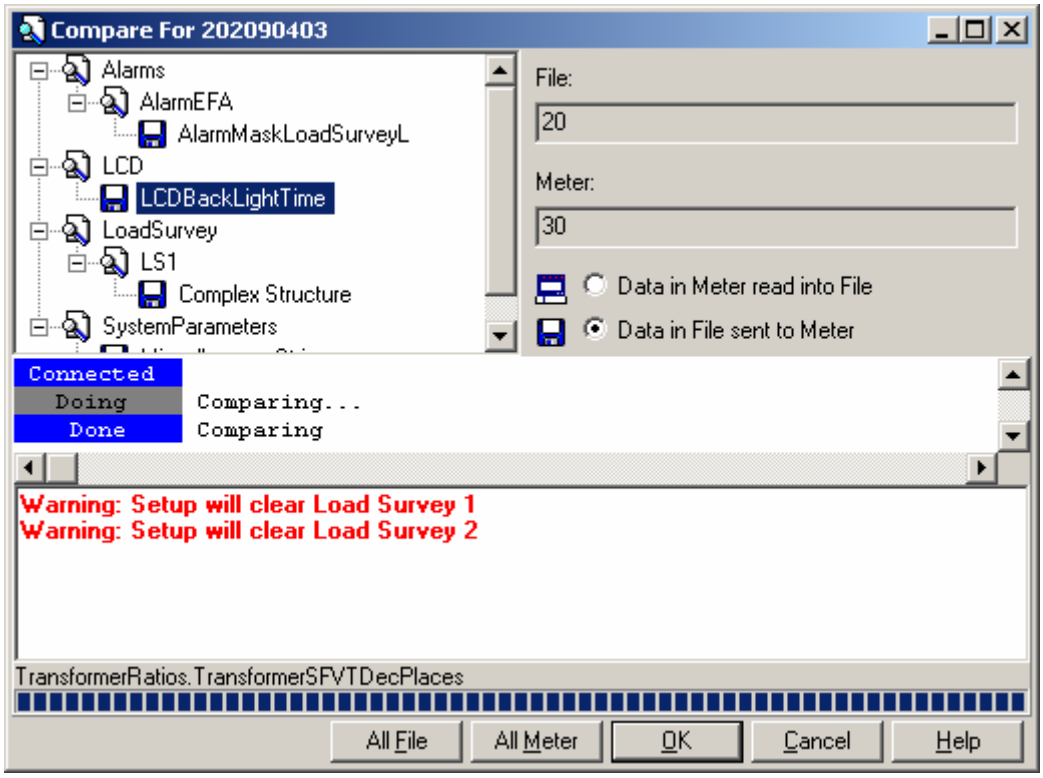
EziView caches reads and writes to setup registers in the meter. As a result, if the setup is read again without disconnecting, the data will "transfer" very quickly. EziView is simply using its cached values. To force EziView to clear the cache, disconnect from the site and reconnect.

Write Setup to Meter

This option writes all of the setup to the meter. You should be sure that you want to overwrite all existing settings in the meter before using this option. EziView will prompt before sensitive sections (*TOU Setup* and *Security*) are written. Meter calibration is never written.

Compare Setup with Meter

This is the most sophisticated of all of the transfer methods. It compares the setup in the meter with the setup maintained by EziView, and then allows fine control over how to resolve the differences.



- Figure 3-6 Compare setup

The comparison is done in two parts. The first part compares the meter and EziView without making any changes. A screen such as that shown in Figure 3-6 is displayed, which details any differences between the meter and the EziView file. The top left pane lists the properties that had differences. Selecting one of these properties displays the differences in the right hand pane. The radio button allows the method of resolving the difference to be set.

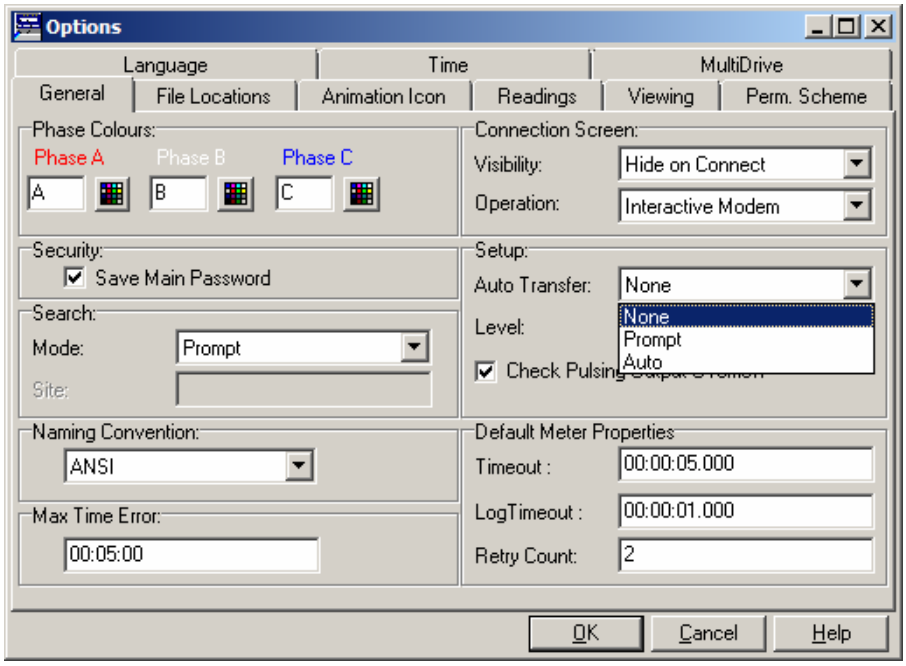
The first option *Data in Meter read into File* will read the setting from the meter and write it to the EziView file. The second option does the reverse. A meter or disk icon is displayed next to each setting to indicate its selection. The *All File* and *All Meter* buttons may be used to change the settings of all parameters.

The bottom pane lists any critical data that may be affected by the change. This covers load surveys, TOU, and pulsing outputs. In this example the size of load survey 1 has changed, and this has also affected load survey 2. Thus both would be cleared if the OK button was pressed. By selecting the load survey setup to come from the meter, the clearing of the surveys can be avoided.

Once the method of resolving the differences has been finalised, click the *OK* button. This performs the writes and reads as selected. Clicking the *Cancel* button will abort the operation without making any changes.

Automatic Transferral

EziView may be configured to automatically initiate setup transfers. This option is configured using the *Tools* → *Options* → *General* → *Auto Transfer* option (Figure 3-7).



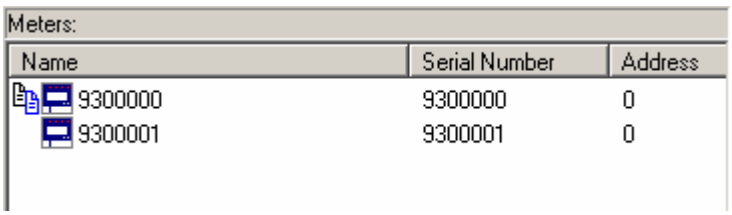
- Figure 3-7 *Auto Transfer* options

The *None* option is the default, which disables auto transfer. The *Prompt* option causes EziView to prompt whenever the setup pages are opened while the meter is connected. The prompt asks if the setup should be transferred from the meter to ensure that the current meter setup is edited. EziView will also prompt when the *OK* or *Apply* buttons are clicked on the setup pages to ask if the new setup should be written to the meter immediately.

The *Auto* option performs a similar function, but performs the transfer without prompting.

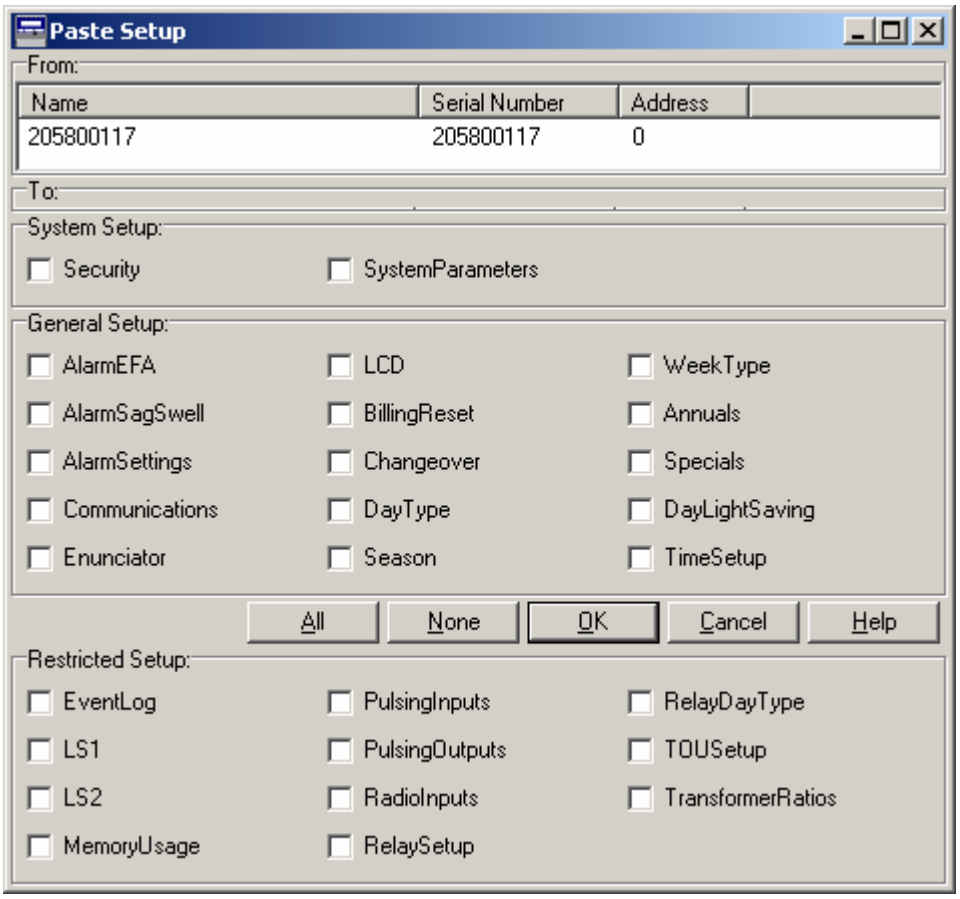
Copying Setup

EziView also provides tools to copy setup from one meter and transfer it to another. This is useful where the setup for one meter needs to be copied to a number of other meters. Select *Edit*→*Copy Setup* from the right-click menu (or *Edit* menu) of the meter to copy setup from. A copy icon will appear next to the meter as a reminder which meter is being copied from.



- Figure 3-8 Copy setup

Now select the meter or meters to paste the setup to and select *Edit→Paste Setup* from the right-click menu (or *Edit* menu). The following screen will be displayed (Figure 3-9).



- Figure 3-9 *Paste Setup*

The source and destination meter are listed at the top of the dialog. If multiple destination meters have been selected they will all be listed. Multiple meters may be selected at a site by holding the control or shift key down while selecting, following standard windows conventions.

The bottom part of the dialog selects what parts of the setup will be copied. Where the box is unchecked, that part of the setup will remain unchanged. Where the box is checked, the setup will be copied from the source meter to the destination meter. The *All* and *None* button provide an easy way to select all boxes or clear all boxes.

The *Restricted Setup* options may require information such as load surveys to be cleared in the destination meter if written. Warnings are given that setting the option may "impair" operation of the meter, in that data may be cleared. This does not mean the meter will not operate correctly.

Clicking *OK* performs the copy of the selected parameters.

Protected Setup

Certain setup pages are protected from accidental editing. These are the transformer ratios, the TOU setup, the load surveys, pulsing inputs and outputs, and the event logs. Changing many of the items on these pages can result in data being cleared in the meter, as it may change scaling factors, or require memory to be reallocated. Just because a page is protected does not mean that any change on the page will cause things to be cleared, but there is a risk, and caution must be used when writing setups to the meter that warnings are taken heed of if data clearing is to be avoided.

If a page is unprotected, the settings can be changed and the message shown in Figure 3-10 will be shown at the bottom of the page. Click on the message to turn on protection.

- Figure 3-10 Protect setup

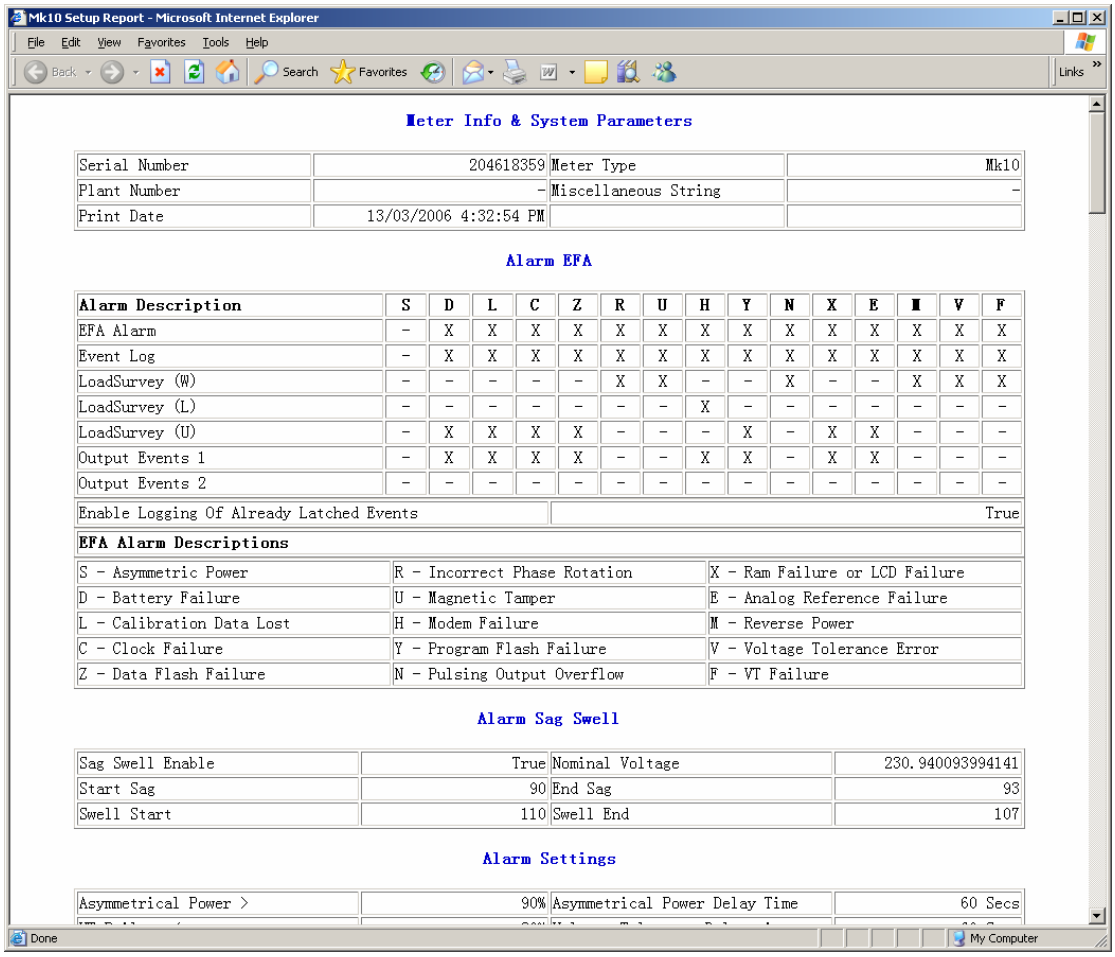
If a page is protected, the settings will be greyed out and the message shown in Figure 3-11 will be shown at the bottom of the page. Click on the *One time only* message to turn off protection just for this editing session. Click on the *Everytime* option to turn off protection all the time.

- Figure 3-11 Unprotect setup

These settings are global – they are not per setup page or per meter.

Print Setup

A summary of a meters setup can be produced, useful where a printed report is required. Select the meter to print the setup for and select *Print Setup File* from the right-click menu. EziView will generate a html document of the report (Figure 3-12), which may then be printed or saved.



Meter Info & System Parameters

Serial Number	204618359	Meter Type	Mk10
Plant Number	-	Miscellaneous String	-
Print Date	13/03/2006 4:32:54 PM		

Alarm EFA

Alarm Description	S	D	L	C	Z	R	U	H	Y	N	X	E	M	V	F
EFA Alarm	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Event Log	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LoadSurvey (W)	-	-	-	-	-	X	X	-	-	X	-	-	X	X	X
LoadSurvey (L)	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
LoadSurvey (U)	-	X	X	X	X	-	-	-	X	-	X	X	-	-	-
Output Events 1	-	X	X	X	X	-	-	X	X	-	X	X	-	-	-
Output Events 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Enable Logging Of Already Latched Events	True

EFA Alarm Descriptions

S - Asymmetric Power	R - Incorrect Phase Rotation	X - Ram Failure or LCD Failure
D - Battery Failure	U - Magnetic Tamper	E - Analog Reference Failure
L - Calibration Data Lost	H - Modem Failure	M - Reverse Power
C - Clock Failure	Y - Program Flash Failure	V - Voltage Tolerance Error
Z - Data Flash Failure	N - Pulsing Output Overflow	F - VT Failure

Alarm Sag Swell

Sag Swell Enable	True	Nominal Voltage	230.940093994141
Start Sag	90	End Sag	93
Swell Start	110	Swell End	107

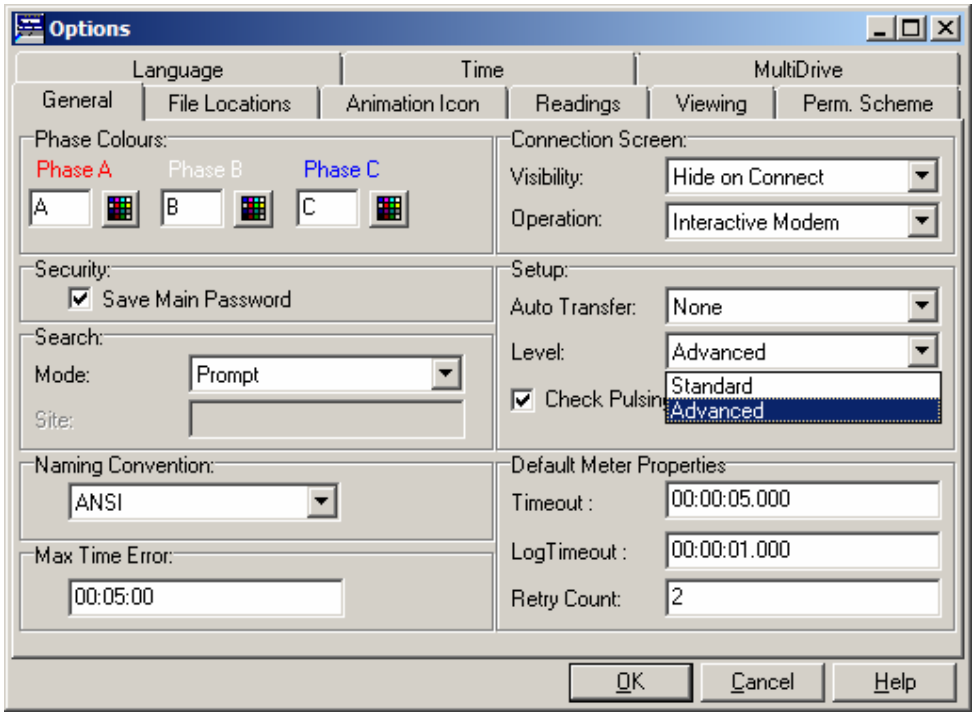
Alarm Settings

Asymmetrical Power >	90%	Asymmetrical Power Delay Time	60 Secs

- Figure 3-12 Setup File Report

Setup Level

EziView supports two levels of user – standard and advanced. When in standard mode, certain options are hidden to reduce the complexity of setting up a meter. This option is configured using the *Tools* → *Options* → *General* → *Level* option (Figure 3-7).



- Figure 3-13 *Level* options

Some of the items hidden are the options for firmware upgrade, dial test mode for LCD display, and specialised TOU options.

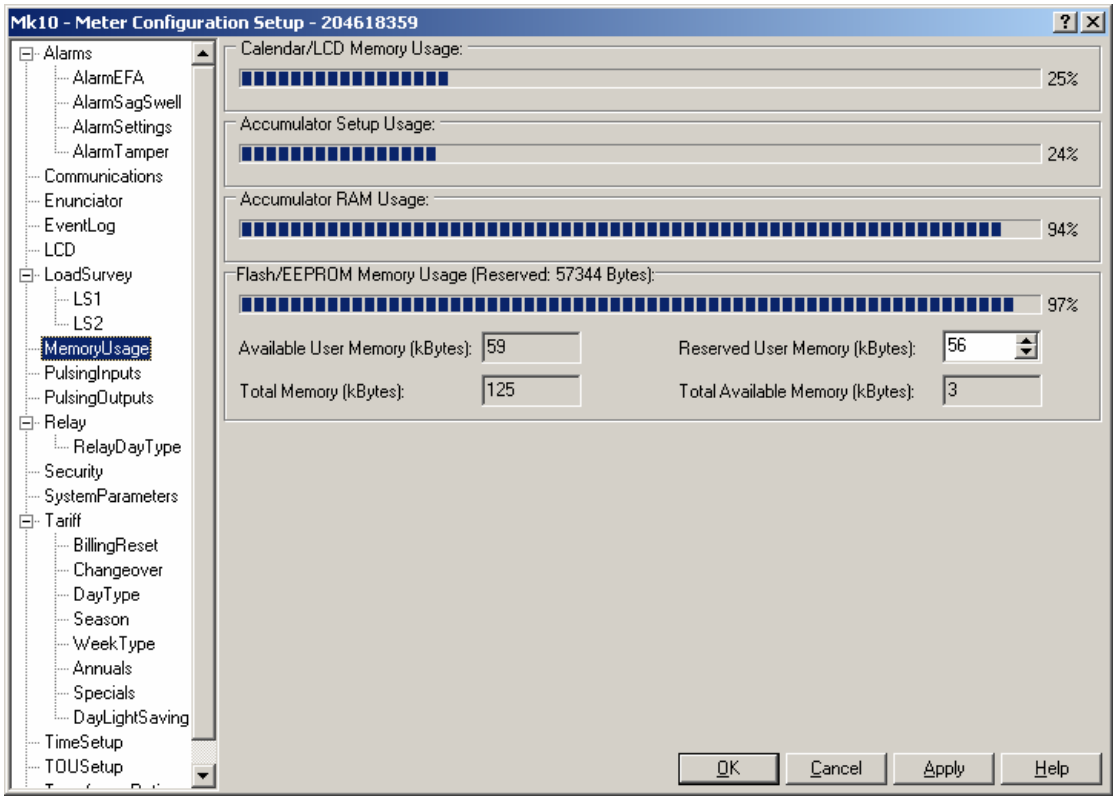
Chapter

4

Memory Usage

This section describes how the meter manages memory usage. The meter only has finite resources of memory for processing and storing information. The memory usage page (Figure 4-1) for allows the usage of these resources to be managed. It is updated when the setup pages are closed or applied.

This chapter discusses advanced topics. In most cases simply looking at the graphs gives enough information to resolve low memory conditions.



- Figure 4-1 *Memory Usage* page in EziView

Memory Usage

The following sections explain the different memory resources, what uses memory, and how to manage it.

Calendar/LCD

The TOU calendar definition, LCD screens configuration, daylight savings setup and a few other settings share the same memory space. The meter has 900 bytes of memory reserved for this usage.

Each LCD screen uses 10 bytes of memory, thus a maximum of 90 LCD screens may be defined.

Each TOU calendar "entry" uses 2 bytes of memory. What is defined as an entry? Each special day or annual day is one entry. When defining day types, each rate change point is one entry. Another entry is needed if the day starts with a rate other than A. The rate change points from each day type in each time controller and changeover set must be added.

The maximum number of special days is thus over 400, but since some LCD screens must generally be defined 200 is a more reasonable limit to keep in mind. Season, week type, billing reset, and changeover settings do not use memory.

Daylight saving uses 4 bytes of memory, plus 4 bytes per year the daylight saving calendar is defined for. Thus if daylight saving is programmed for the next ten years, 44 bytes are used. No memory is used if daylight saving is disabled.

Miscellaneous strings (*SystemParameters* page) use in addition to the number of characters in the strings 1 byte, plus 2 bytes overhead per string.

Tamper Alarms are also configured in this space. It uses 2 bytes when enabled, plus 6 bytes for each tamper criteria.

There is also some additional setup usage of this block. The second set of EFA's uses 20 bytes, and the over current alarm uses 12 bytes.

Accumulator Setup/RAM Usage

Each definition of TOU channel, load survey channel, and pulsing output uses both setup and RAM memory. There are 314 bytes of RAM, and 240 bytes of setup memory available.

Each pulsing output uses 4 bytes of RAM, and 2 bytes of setup memory.

Each load survey channel uses 8 bytes of RAM, and 4 bytes of setup memory, plus 4 bytes extra of RAM per survey. Thus a 4 channel load survey uses 36 bytes of RAM, and 24 bytes of setup memory.

Each TOU channel uses 16 bytes of RAM and 8 bytes of setup memory. If the channel has more than one rate, add 10 bytes of RAM per extra rate. If rolling demand is used

on a channel, add 2 bytes of RAM and 2 bytes of setup memory per extra subinterval. Thus if a channel has 4 rates and 3 subintervals, it will use 50 bytes of RAM and 12 bytes of setup memory.

Transformer corrections use 8, 24, or 48 bytes of setup memory depending on whether simple, intermediate, or advanced mode is used. Relay support uses 20 bytes of setup memory.

EziView does some optimisation of these settings, so the actual memory used may be less than that listed here. To optimise memory usage, set the rate limits for TOU groups appropriately. If some channels need more rates than others, split them up into separate groups.

Some quick setups based on these figures:

TOU – 2 channels, 8 rates each, uses 172 bytes of RAM, 16 bytes of setup memory.

TOU – 8 channels, 3 rates each, uses 288 bytes of RAM, 64 bytes of setup memory.

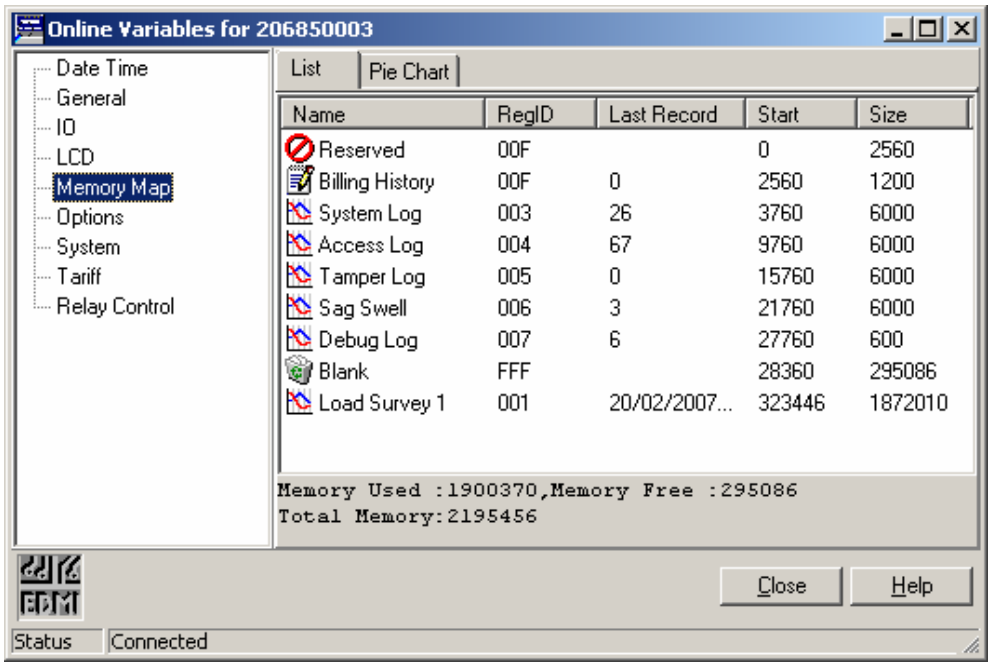
TOU – 4 channels, 3 rates each, 15 subintervals, uses 256 bytes of RAM and 144 bytes of setup memory.

If space is reserved for pulsing outputs, 2 bytes of memory will be reserved for each fitted pulsing output.

The meter will do a backup to flash of these running system variables and several others at the modem power cycle time. If no time is set, the backup will occur at 23:33.

Flash/EEPROM Memory Usage

This type of memory is used for billing history, event logs, and load surveys. The amount fitted to the meter is specified at the time of order. The meter's *Screens→ Online Variable →Memory Map* Screen (Figure 4-2) shows the available memory, as well as a map of what the memory is used for.



- Figure 4-2 *Memory Map* screen in EziView

The *LastRecord* field is the last entry number stored for event logs, and is the time/date of the last entry for load surveys – these can be useful if watching for a new entry to be saved.

The *Start* and *Size* fields give the starting offset (in bytes) and the size (in bytes) of each section of memory. The summary at the bottom of the page gives an overview of memory usage. The *RegID* column is useful to track default names of downloaded data.

Low level users (without setup read access) will not see the *Start* and *Size* columns, or the *Reserved*, *Billing History* and *Blank* entries since this data is unavailable.

The *Reserved* section is a block of memory reserved by the meter for internal use.

The size of the *Billing History* in bytes will be:

((Number of TOU channels × number of rates) + 1) × 10 × (previous periods + 2)

The size of an event log is 6 bytes per entry allocated.
The size of a load survey in bytes is:

((Number of Survey channels × 2) + 1) × number of entries + 10

Reserved EEPROM

The *Available Memory* indication on the setup page indicates roughly how much memory is available. This memory may be used by special functions in the meter such as remote firmware upgrade. The reserved option allows up to 255kB of this "spare" memory to be reserved, so that space can be guaranteed for these special functions. A minimum of 56kB available memory is required for a remote firmware upgrade, 115kB for enhanced processor meters. Of course memory that is reserved cannot be used for load surveys, TOU history, or event logs.

Chapter

5

External Transformers

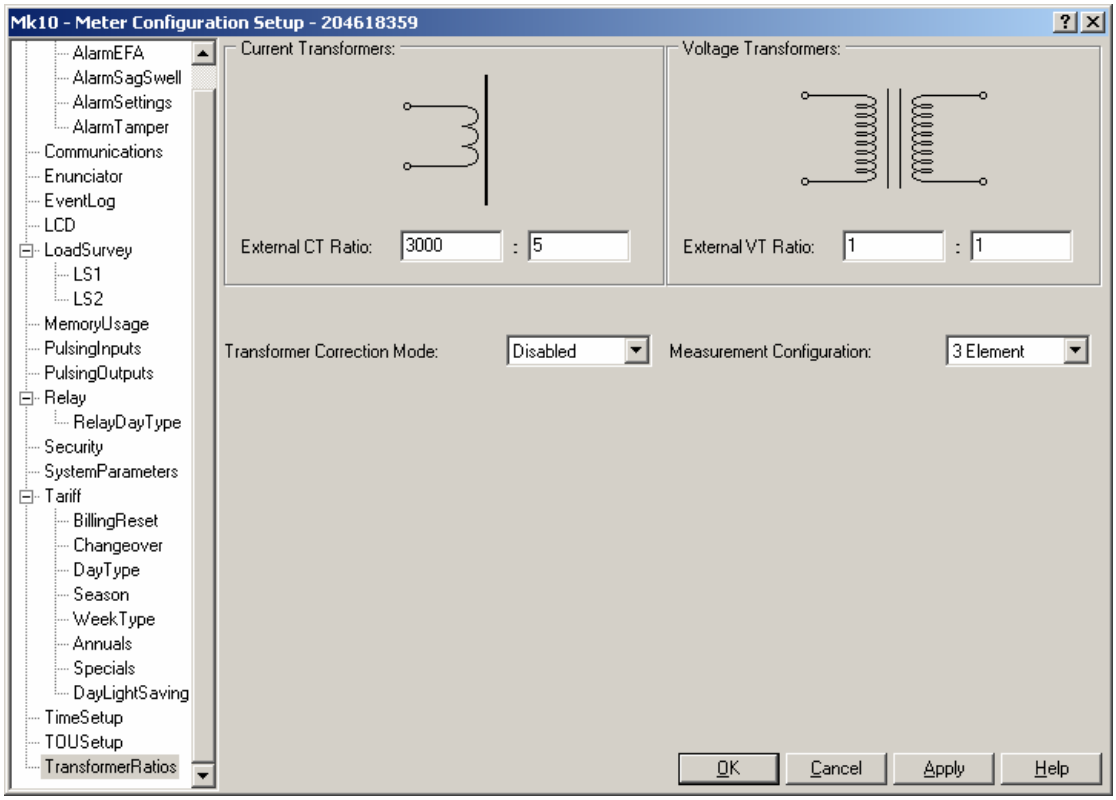
This section is dedicated to configuring the meter for its voltage and current connections.

In many applications external measurement transformers are used between the meter and the system to be measured. The values at the input to the meter are defined as secondary quantities and the values on the high voltage/current side of the measurement transformers are defined as primary quantities. The meter allows the ratios of these VTs and CTs external to the meter to be accounted for. This way the meter will read out all values in primary quantities.

Changing the transformer ratios in a meter will generally clear all existing load survey and TOU data.

EziView automatically determines appropriate scaling factors for TOU, load surveys and LCD displays. This includes the determination of the unit multiplier to use – e.g. Wh, kWh, MWh, GWh. The "k" multiplier will generally be used when possible. This automatic setting can be overridden for LCD screens. Not all meters have M and G multipliers on the LCD.

Transformer Ratios



- Figure 5-1 Transformer ratios page in EziView

To set up the connection characteristics of the meter:

1. Go to the *TransformerRatios* page of the *Meter Configuration Setup* screen (Figure 5-1).

2. *Measurement Configuration* allows only for 3 element measurement method. 2 element method is only supported in the Mk10E at present.

3. Set the *External CT* ratio. This is the ratio of an external measurement CT. Set to 1:1 if no external CTs are used, such as for whole current meters.

4. Set the *External VT* ratio. This is the ratio of an external measurement VT. Set to 1:1 if no external VTs are used.

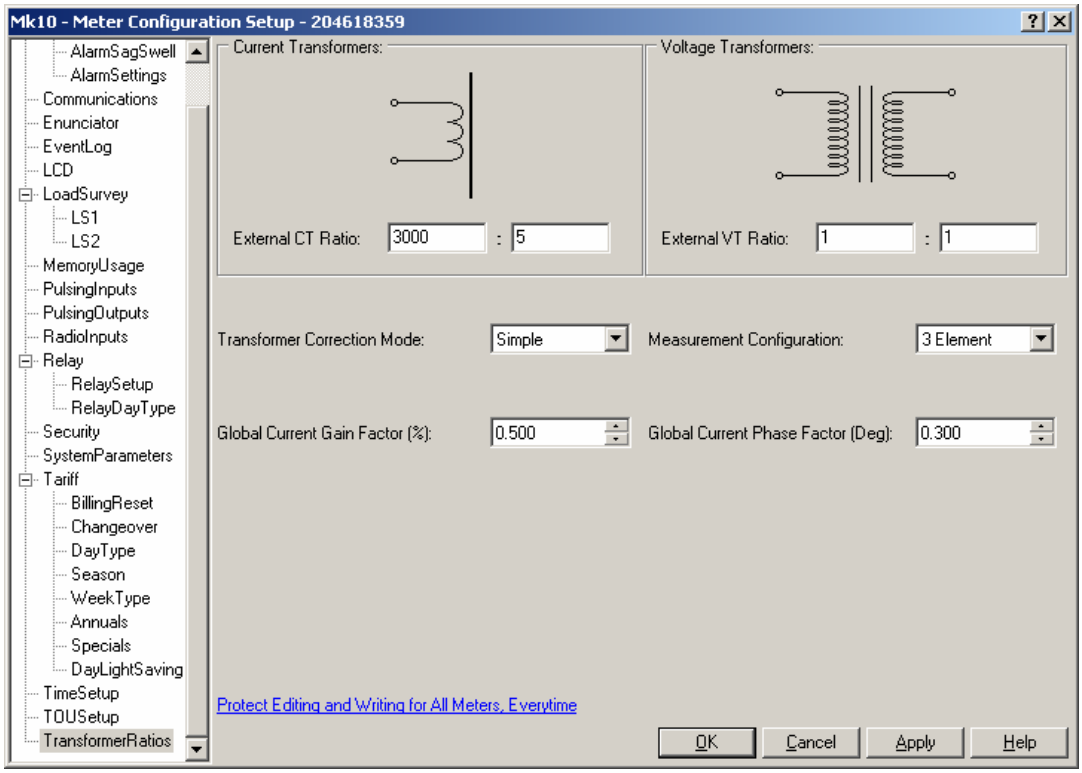
Note that like all changes to the setup pages, these changes take effect when written to the meter (see Chapter 3).

Only whole numbers may be entered for CT and VT ratio.

This page may be protected from editing to reduce the risk of accidental change. To unprotect it select one of the *Edit* options at the bottom of the page. See "Protected Setup" on page 3-10 for more information.

Transformer Corrections

This requires the transformer corrections edition of firmware to have an effect.



- Figure 5-2 Simple Transformer Corrections page

Transformer corrections allow for errors in external CT's or VT's to be corrected for. There are 3 modes controllable via the *Transformer Correction Mode* setting – *Simple*, *Intermediate*, and *Advanced*. A setting of *Disable* turns off this function.

In Simple mode (as shown in Figure 5-2) a single gain and phase correction for current can be made. This will be applied to the measurement of current on all phases in an equal amount. Of course this will thus also apply to power and energy measurements.

A *Gain* setting of 0.5% will apply a correction of :

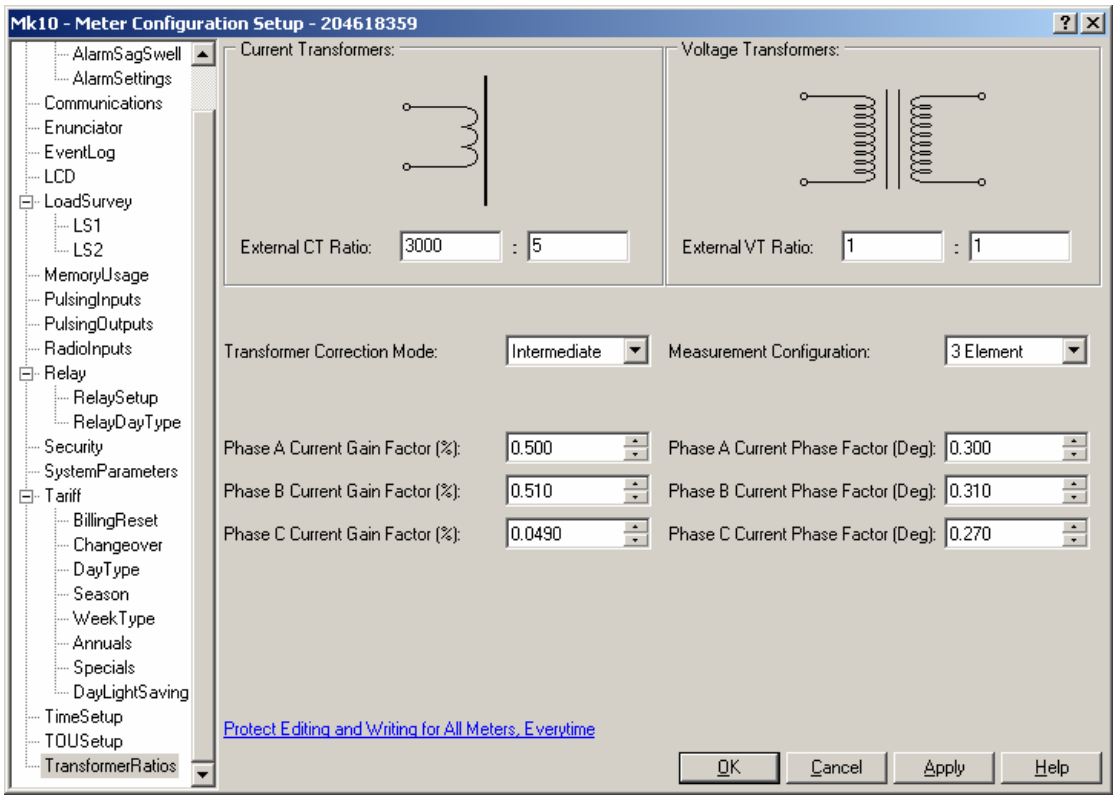
(1 / (1 + 0.005)) * measured_reading = final_reading <EziView 4.01 and later>

(1 – 0.005) * measured_reading = final_reading <EziView 4.00 [1]>

A *Phase* setting of 0.3 degrees will apply a correction of:

measured_reading - 0.3 = final_reading [1]

[1] The method was changed after EziView 4.00 to better reflect expected operation. Reading out settings from a meter programmed using EziView 4.00 using EziView 4.01 will show a slightly different reading to the original setting (in the above example, a difference of 0.002%). While it will generally be insignificant, it is noted here for completeness. The meter setting is unchanged, only EziView's display of it changes.



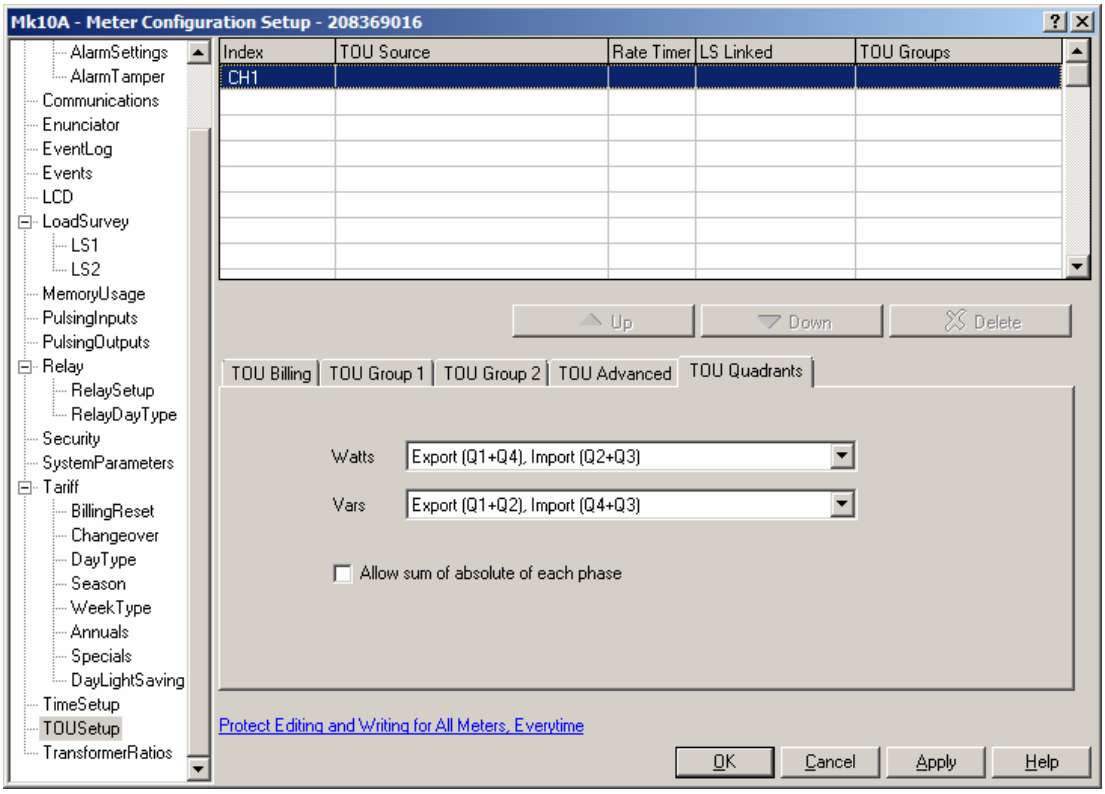
- Figure 5-3 Intermediate Transformer Corrections page

In the *Intermediate* mode individual factors can be set for each current phase – see Figure 5-3. In *Advanced* mode individual factors can be set for each current and voltage phase, however the ability to correct voltage measurements separately is not implemented in firmware as at version 1.38. Configuring it will do no harm, but it will have no effect on the voltages.

For the Mk7 only the used elements will be shown.

[1] Angle is measured as ϕ, admittance. See Measurement Conventions, page 2-24 for more details.

Import/Export Conventions



- Figure 5-4 *TOU Quadrant* Import/Export conventions page

There are several definitions for Import and Export energy in use around the globe. Version 1.41 firmware introduces the ability to use alternate definitions. These are configured on the *TOU Quadrants* tab on the *TOUSetup* page (Figure 5-4).

The options for Watts are:

- Export (Q1+Q4), Import (Q2+Q3)
- Import (Q1+Q4), Export (Q2+Q3)
- Capacitive (Q2+Q4), Inductive (Q1+Q3)

The options for vars are:

- Export (Q1+Q2), Import (Q4+Q3)
- Import (Q1+Q2), Export (Q4+Q3)
- Capacitive (Q2+Q4), Inductive (Q1+Q3)
- Capacitive (Q1+Q4), Inductive (Q2+Q3)

The Allow sum of absolute of each phase checkbox changes the way the individual phases are processed. Normally the meter sums all phases before deciding on import or export. This avoids certain types of load from recording both import and export energy

during their normal operation. Checking this option means the meter will calculate import and export energy per phase, so it is possible for a meter to have import and export energy accumulating at the same time.

See Measurement Conventions on page 2-24 for more information on normal conventions.

Chapter

6

LCD Display

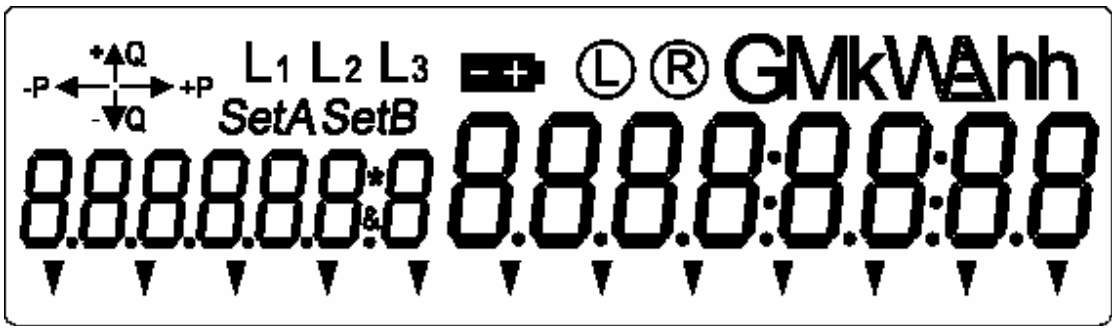
The LCD is primarily for displaying information from the meter's registers for meter readers. It is also useful during installation, configuration, and diagnosing problems. It has 8 seven-segment digits to display values and up to 7 seven-segment digits to display description. It has arrows to indicate import and export for active and reactive energies, indicators for phase voltage, indicators for display sets A and B, battery indicator, connection type indicator for connection through local or remote port and units and multipliers.

The enunciators are covered in Chapter 13: "Outputs and Enunciators".

LCD Variations

There are several variations of the LCD display for different meters, mostly varying in the number of enunciators and id digits. They all operate in a very similar manner though, presenting a series of pages of information. Each page can display a single register's contents. On the display the smaller digits at the left are the label for the display, and the larger digits to the right are the value.

The Mk10 and Mk10E display (Figure 6-1) has 7 label digits, and 12 enunciators.

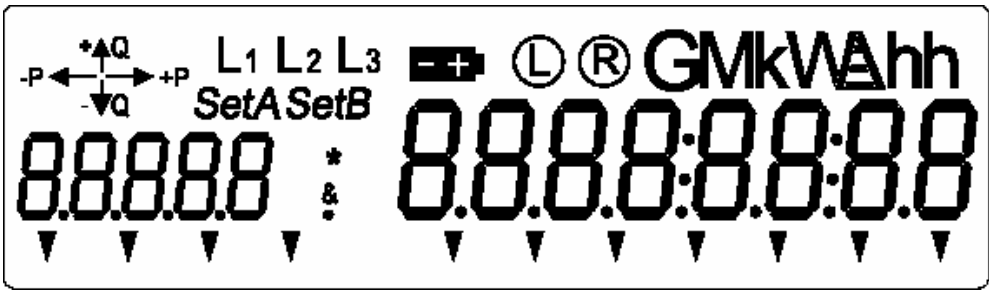


- Figure 6-1 LCD with all segments turned on

There is also a Chinese version of the LCD as shown in Figure 6-2.

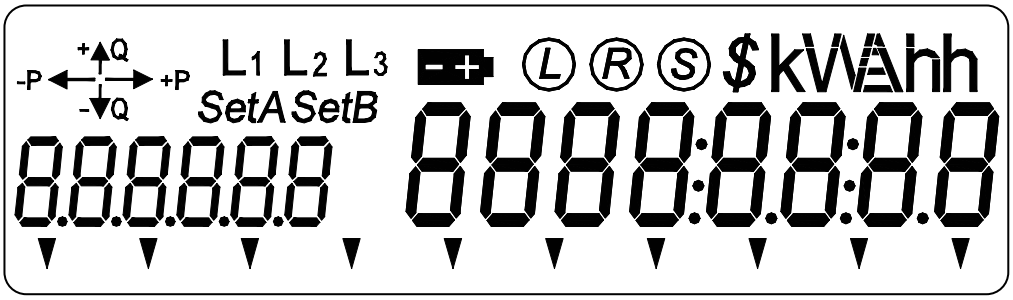
- Figure 6-2 Chinese LCD with all segments turned on

The Mk10D LCD is the same as the Mk10, but some of the segments are unused (Figure 6-3). It has only 5 label digits, and 11 enunciators.



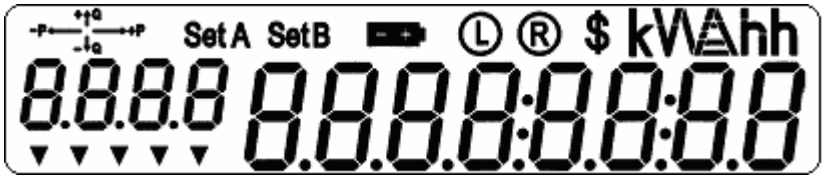
- Figure 6-3 Mk10D LCD with all segments turned on

The Mk10A LCD (Figure 6-4) is similar to the Mk10, but has 6 label digits and 10 enunciators. It adds a currency symbol and a SCADA port symbol, but drops the G and M multipliers, and limits the decimal places to 4.



- Figure 6-4 Mk10A LCD with all segments turned on

The Mk7 LCD is very similar to the Mk10, but has fewer features and is physically smaller (Figure 6-5). There are 4 label digits, and 5 enunciators.



- Figure 6-5 Mk7 LCD with all segments turned on

LCD/Select Button Usage

The data is displayed on the LCD as a series of pages, up to a maximum of 90. The number of maximum pages depends on the number of Specials and Annuals days specified in the calendar in the Tariff Setup, daylight saving entries, miscellaneous strings and other data in this space. Each page displays a single quantity from the meter. The left seven-segment characters show the description and the right seven-segment characters show the value, with an optional unit showing above the value.

If the display is too long to fit into the 8 characters of seven-segment, the display will scroll a character every second to show the entire line. An underscore "_" shows the start of the line. The 7 characters of the seven-segment display on the left will not scroll. Thus a description will have to be abbreviated to a maximum of 7 characters.

To progress to the next page, press the *Select* button. Each time the button is pressed the display moves to the next page. The display may also be setup to automatically cycle the display through the pages, pausing if the *Select* button is pressed.

The LCD can come with or without a backlight. The backlight may be set to only activate while the LCD is in use, which is recommended to reduce power consumption. The turn on time of the backlight can be configured using EziView. The backlight does not operate when running on the UPS battery.

If the meter is off (no voltage applied), pressing and holding the *Select* button will wake up the meter using its internal battery (it may take up to a second for the meter to wake up). All LCD screens may be viewed in this mode, including alternate display sets. This allows a manual meter reading even if power is lost. The display will automatically turn itself off after the *No Power Timeout* (Figure 6-7).

Note that the meter does not measure in the wakeup state, and the communication ports do not operate. The time the meter is woken up is still counted as off time ("Time Statistics" page 10-8).

Display Sets

In order to make it easier to find a certain page and to allow for different users of the LCD, each page belongs to a display set. Only pages from the current display set are

shown. There are two display sets – A and B. Firmware 1.40 introduces 4 display sets – A, B, C, and D. To change display sets press and hold the *Select* button for a second. Set D cannot be entered unless the terminal cover or lid is open, to effectively restrict access to meter installers.

The LCD will indicate the change in display set as seen on the LCD as either SetA for A, SetB for B, flashing SetA for C, flashing SetB for D, The LCD will then change to display the new display set, starting with the first page in the set.

Holding the *Select* button down for 10 seconds takes the display to a special predefined set (Set AB, both SetA and SetB are lit). This includes screens such are serial number and time/date to facilitate diagnostics. Holding the button as per changing display sets will revert to Set A.

EziView can also force the LCD to display a particular page, in which case neither SetA nor SetB are lit.

Default Display

If there is no LCD screen setup in the meter, the time will be shown as a default page.

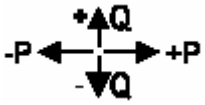
The example display of Figure 6-6 shows Import active energy, which is a page in Display Set A.

- Figure 6-6 Example of first page of Set A LCD display

If there is an LCD setup, the first display page in display set A will be shown when the meter is powered up.

Display Organisation

In general, the organisation of the display from the top left is as follows (Table 6-1):



The four arrows with characters and plus/minus sign at the top left display the direction of Watts and vars respectively. A plus sign indicates positive/export/delivered energy, while a minus sign indicates negative/import/received energy[3].

L1 L2 L3

The three characters show presence of phase voltage. L1 represents phase A voltage, L2 represents phase B voltage

[3] Please refer Figure 2-31 for Measurement Convention.

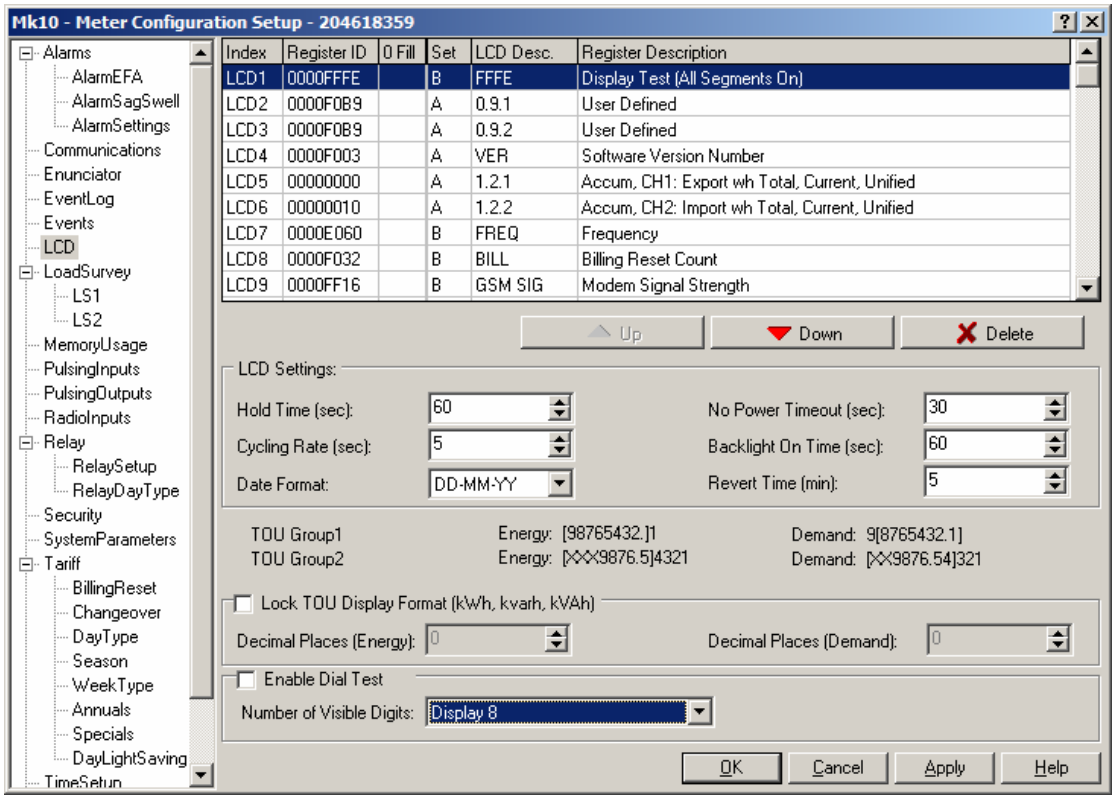
	and L3 represents phase C voltage. Not present on Mk7.
	Low Battery indicator. Please refer to the section on the battery earlier this chapter.
	L shows local communication or login on the local port. R shows remote communication or login on the modem port. The R will flash if the meter is connected to the GPRS network in persistent mode but no one is logged in.
	S shows local communication or login on the SCADA port, Mk10A only.
	Currency indicator, Mk7 and Mk10A only.
	GMk is the multiplier. G for Giga, M for Mega and k for kilo. M and G are not available on Mk7.
	These segments allow for display of units. The units are W, var, VA, Wh, varh, VAh, V and A.
	Display set as explained in the Section LCD/Select Button above.
	Label in seven-segment characters. There can be a maximum of 7 characters to describe the value shown in the value digits on the right side of the LCD. The Mk10 has 7, the Mk7 has 4, the Mk10D and Chinese displays have 5, and the Mk10A display has 6. The size of each seven-segment character is 7.75 mm x 3.45 mm for a Mk10 size display, 6.15 mm x 3.23 mm for a Mk7 size display.
	8 characters of seven-segment displays register contents as setup in LCD setup. The size of each seven-segment character is 10.7 mm x 4.67 mm for a Mk10 size display, 9.30 mm x 4.35 mm for a Mk7 size display.
	The enunciators allow various meter states to be displayed, and may be paired with a customised label. See Chapter 13: "Outputs and Enunciators" for more information.

- Table 6-1 Sections of the LCD

The energy direction arrows, battery, communication status, and phase presence indicators are not related to the register being shown, they are a display of the meter's state.

As the LCD is a numeric type, alphabetic characters are difficult to display. The meter will attempt to display them as best it can, but readability will vary depending on the letter.

LCD Setup



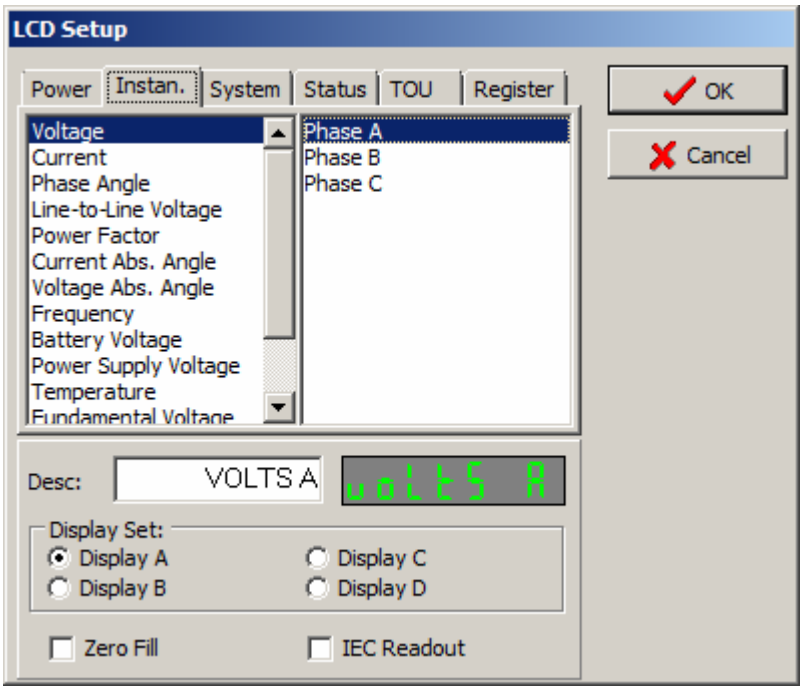
- Figure 6-7 EziView LCD setup

The *LCDScreens* page in EziView (Figure 6-7) has the setup for the LCD pages. Each line of the table is the setup for one page. The displays higher up the table are shown before those shown further down.

To add an LCD screen:

1. Double click on the first blank register field of the table. This displays the register selection screen (Figure 6-8). If there is no channel in TOU Setup, the LCD setup form will not show the TOU tab.

The Mk7 has slightly different measurements available than the Mk10, but the process is the same. The LCD description is only 4 characters on the Mk7.



- Figure 6-8 EziView *Register Selection Dialog* with "Phase A Instantaneous Voltage" selected

2. Select the register to display. If the register to display is known, is can be entered directly using the Register Tab on the LCD Setup Form.

3. To add a register to the list of screens click on the *OK* button. The LCD Setup button will disappear.

4. To display leading zeros check the *0 Fill* box.

5. The meter knows the units of all registers, although not all registers have units, the units will be automatically written on the LCD together with the register content.

6. *IEC Readout* is set to allow readout using IEC 1107 protocol. When a data read is requested via a communication port, all the LCD screens with this option selected will be transmitted. Note that IEC 1107 support is an optional firmware feature controlled by editions.

7. Select the display set the register belongs to from the list in the *Set* field. There are four display sets Set A to Set D. Set D can only be entered if a lid or terminal cover tamper is active. In firmware before 1.40 there are only 2 display sets – sets C and D on these meters will map to sets A and B.

8. Enter a description of the register, which will be displayed at the 7 seven-segment characters at the left side of the LCD (Figure 6-1). A default description is entered when a register is selected from the *LCD Setup* Form. Descriptions may be up to 7 characters long. If the description is blank, the description "XXXX" is used, where the Xs represent the register number in hexadecimal. To the right of the description is a preview of how the description will look on the LCD.
Chinese displays and the Mk10D have only 5 digits for the description, Mk7 meters have only 4 digits, and the Mk10A has only 6 digits.

To delete an LCD screen:

1. Select the screen to remove.

2. Click the *Delete* button (or press the delete key).

To move an LCD screen:

1. Select the screen to move.

2. Use the up and down buttons to move it.

Other Display Parameters

Set the *Cycling Rate* to a non-zero number of seconds to enable display cycling. The display will automatically step to the next screen after the *Cycling Rate* period has passed. The range is 1 to 250 seconds. A setting of zero disables display cycling.

Set the *Hold Time* to the time in seconds to pause automatic display cycling when the *Select* button is pushed. The range is 0 to 255 seconds.

The backlight of the display is usually configured to light only when the meter is being read. Set the *Backlight On Time* to the time in seconds (1 to 254) that the backlight should remain on after the *Select* button is pressed. A setting of 0 disables the backlight. A setting of 255 keeps the backlight on permanently.

Setting the backlight to light on permanently is not generally recommended since it increases power consumption of the meter

Set the *No Power Timeout* field to a non-zero number to allow the LCD to be woken up (using the *Select* button) when there is no power from mains. The range for this time is 1 to 250 seconds. The time is the duration the LCD will be powered up, though every press of the *Select* button will restart the timeout. A setting of zero disables No Power operation. If the meter is not fitted with any battery, set this value to zero.

The *Date Format* option allows the order of date fields on the LCD to be set to different conventions. Options are DD-MM-YY, MM-DD-YY, or YY-MM-DD. The YY-MM-DD (P) option displays the Persian Calender date, and requires a firmware edition with the Persian Calender feature.

The *Revert Time* field sets a time in minutes after which the LCD will go back to set A. A setting of 0 disables this function. Note that the meter only checks this once a minute, so the actual revert time may be up to a minute less than the setting – thus it is recommended to use a setting of at least 2 minutes.

The *Lock TOU Display Format* option allows the default formatting for TOU energy registers to be changed. Note that this does not change how the value is stored, only how it is displayed. The multiplier is forced to be "k". The number of decimal places to show can be set separately for Energy and for Demand values.

Note that changing the number of decimal places can reduce the resolution or range of readings shown. E.g. Showing 3 decimal places when the meter is only recording 1 decimal place will effectively "lose" the top two digits. The meter still keeps them in its registers though. Note that for energy there are 9 digits of precision, but normally only the top 8 digits are shown on the LCD.

The *Enable Dial Test* setting has a similar effect. If disabled the meter shows the top 8 digits of precision for energy, and the bottom decimal place is not shown (as long as there was a decimal place to hide). If enabled then it is effectively a 'dial extend' – the top digit is hidden to enable the bottom decimal place to be shown for energy. The enabled setting only has an effect if *Lock TOU Display Format* is not used.

The *Number of Visible Digits* allows the number of digits shown on the LCD to be adjusted. This will hide higher digits to leave the selected number of digits only. This can be useful where meters readers are familiar with a certain number of decimal places. These settings can be used along with *Lock TOU Display Format*.

With versions below 1.35 of firmware the rollover settings of 7 digits and less are not supported (they have the same effect as a setting of 8).

This setting is only shown in the *Advanced* EziView user mode.

LCD Formatting

There is a range of formatting options available which affect how a register's contents are displayed. All displays are right justified.

Base Data Type	Name	Display Format
A	String	Displayed as is, letters are displayed as best as possible.
F	Float	Displayed as a number with decimal point (automatically placed)
I	Short	Displayed as a number from -32768 to 32767.
L	Long	Displayed as a number from to –2147483648 to 2147483647.
Q	Time	Displayed in the form "HH:MM:SS"
R	Date	Displayed in the form "DD.MM.YY"
T	Time/Date	Displayed as alternating "HH:MM:SS" and "DD.MM.YY".
S	Special	Cannot be displayed. "Undefined" is shown instead.

- Table 6-2 LCD data type formatting

If a value is longer than 8 characters it will scroll across the screen to show the whole value, with an underscore ("_") marking the start.

If the number is shorter than set by the parameter it is padded with spaces from the left. If the *0 Fill* parameter is set then the number is padded with zeros instead of spaces. This option should not be used with numbers that may be negative. The zero fill option is useful for duplicating the look of mechanical counters.

Units and Multipliers

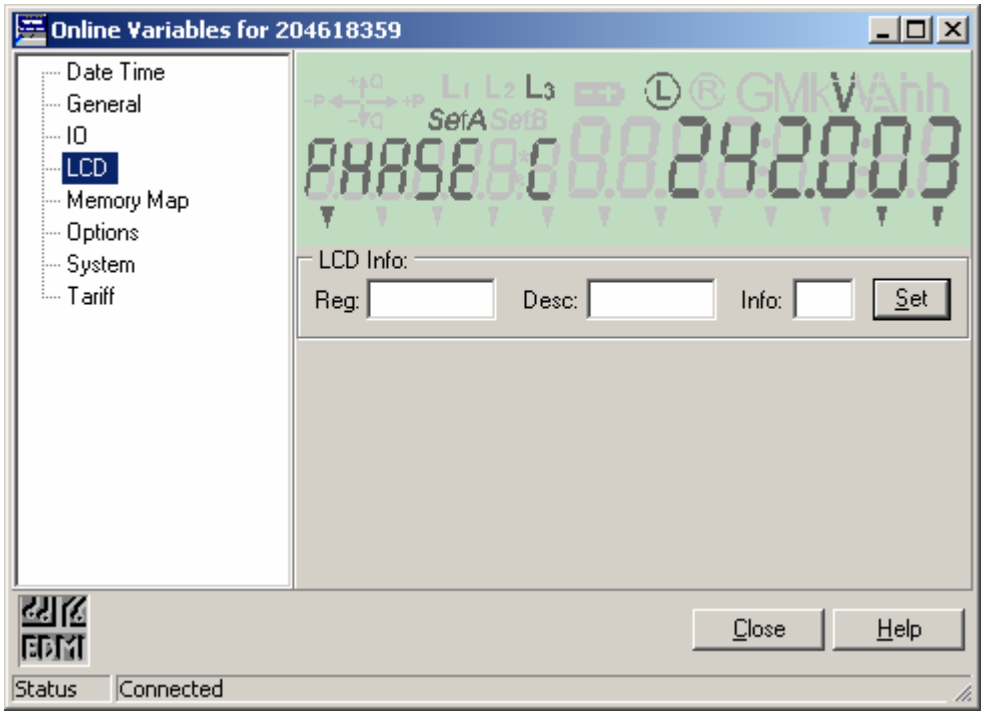
The meter knows the units of all registers and will display the unit automatically.

The multiplier will be automatically assigned to the value. The number will be scaled with the correct multiplier and up to 3 decimal points for voltages and currents, 4 decimal places for powers and angles, and 2 decimal places for energies.

Registers with a *Unit* of *Q* (Power Factor) use the sign of the number to indicate lead and lag.

LCD Status and Control

EziView has an *Online Variables* page for the LCD. Go to the *Online Variables* → *LCD* Screen as shown in Figure 13-6.



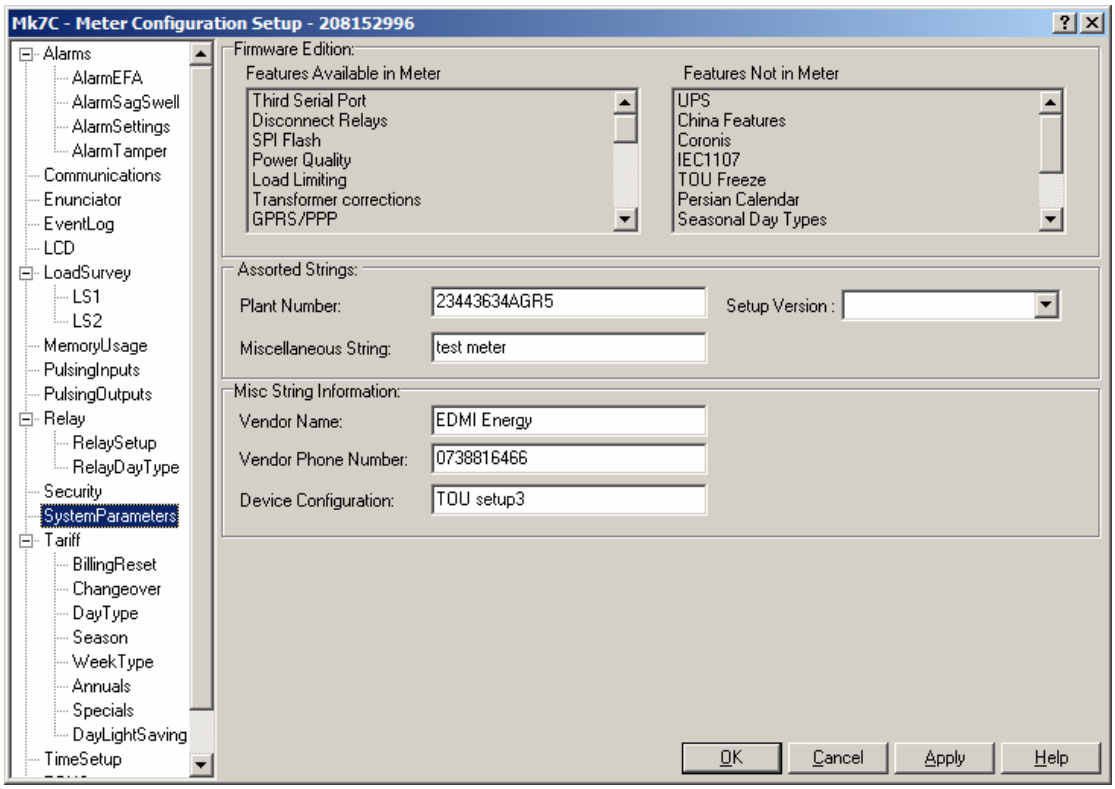
- Figure 6-9 LCD online status

The top part of the page displays what is actually being shown on the LCD of the meter at present. If this part of the page is not shown, check that you have the *"Mk7LCD.bmp"* and *"Mk10LCDxx.bmp"* files in your EziView directory – contact EDMI if they are missing. This is an EziView v4.03 and later feature, and also requires meter firmware version 1.18 or later.

The bottom section of the page allows any register to be displayed on the LCD of the meter. Enter the register to display in the *Reg:* field, enter the description to display in the *Desc:* field, and then click the *Set* button to update the LCD. The indicated register will be immediately shown. Pressing the *Select* button on the meter will change back to the normal display, as will normal automatic display cycling timeouts.

The *Info:* field controls a few parameters. The default is zero, but a setting of 4 will cause the display to be zero filled.

System Parameters



- Figure 6-10 System parameters

The *SystemParameters* page in EziView (Figure 6-10) has the setup for assorted strings.

The *Plant Number* is a general string that may be used to set the plant number of the meter. This is effectively a serial number allocated by the customer, and may contain letters and punctuation. A factory option is to have the plant number set by the factory. In this case the plant number will be displayed here, but will be greyed out and cannot be changed. It may be up to 19 characters.

The *Miscellaneous String* is a general string that can be entered and displayed on the LCD screen, often used for things setup identifiers. It may be up to 19 characters.

Setup Version stores the minimum version of EziView needed to properly use this setup.

The *Misc String Information* block provides a number of additional strings. *Vendor Name* and *Vendor Phone Number* are shown on LCD of the meter when the main disconnect relay is disconnected, to indicate to a customer who they should call to arrange reconnection. If *Vendor Name* is blank then nothing special is shown on the LCD. The maximum length of each is 20 characters. This display is only supported on firmware version 1.31 and later.

Device Config is a place to put a name for this meter setup to identify it. This can be useful in tracking meter configurations. This is only supported for access via a register or LCD screen on firmware version 1.31 and later, though it may be stored in the meter on earlier versions.

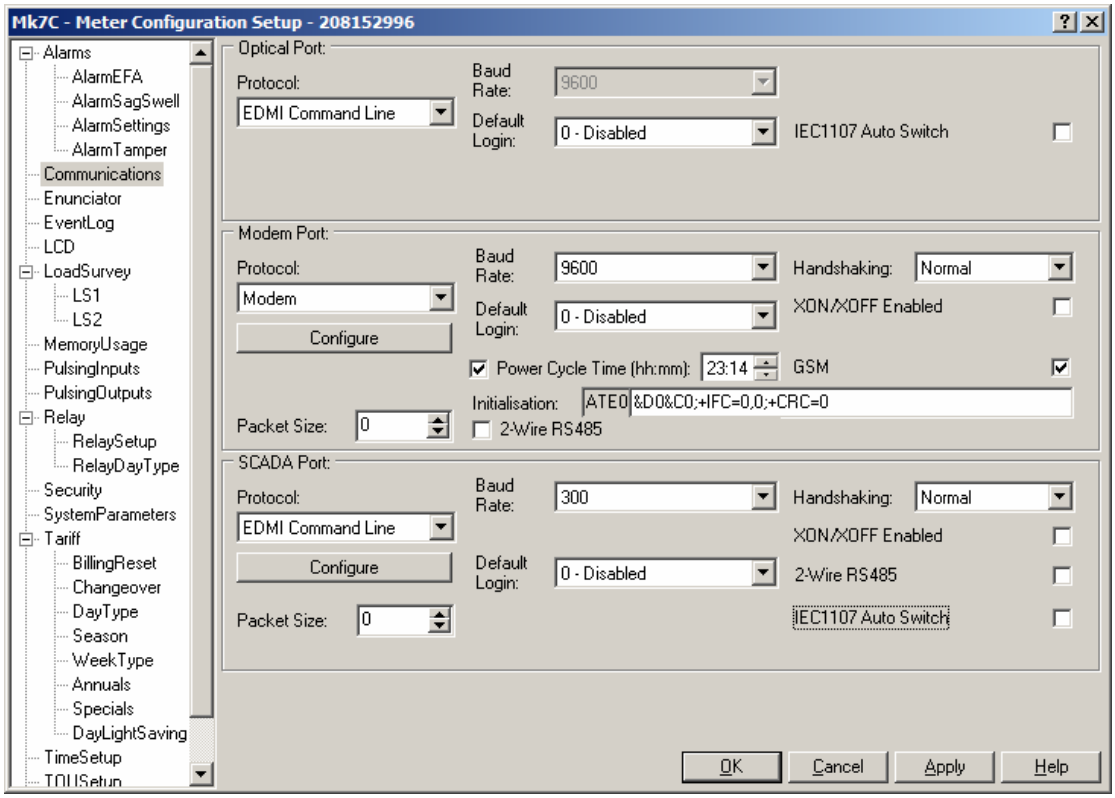
Chapter

7

Communications

This chapter covers the setting of serial communication settings in the meter.

The communication parameters are configured using the *Communications → Ports* setup page (Figure 7-1).



- Figure 7-1 Communications ports setup

Optical Communications Port

The optical communications port on the front of the meter may be ordered with either a FLAG or ANSI physical standard port. The protocol used is primarily EDMI's command line protocol. Standard FLAG or ANSI read heads may be used to connect the meter to a computer. EDMI can also supply read heads.

Set *Baud Rate* to the baud rate of the connection, up to 19200 baud. The default and recommended setting is 9600 baud. The recommended setting for the optical port is *EDMI command line* mode, as connection to the meter will be faster and the meter will automatically detect an IEC1107 login if attempted. Autoswitch can be disabled by unchecking the *Enable Autoswitch* checkbox, though normally it should be left enabled.

IEC1107 requires the IEC1107 firmware edition to function.

- Figure 7-2 *Default Login*

When in *EDMI Command Line* mode, the *Default Login* option (Figure 7-2) allows for a user to gain access to the meter at the selected user level – without having to enter a password. This is useful for automatic systems, or simple meter readers. A normal login overrides this level.

Modem Port

The Modem port is the generic name for the second communications port of the meter. It is designed for connection to a modem, or a direct connection to a SCADA system. The physical port can be either RS232 or RS485, which will affect how the meter is configured.

The *Protocol* may be set to either *Modem* or *EDMI command line*. The configure button gives access to advanced options relevant to the selected protocol. The *Modem* option requires the *Modem Support (Protocol)* Edition feature, and for GPRS use the *GPRS/PPP* edition feature is also required.

Modem Setup

To work with a modem, the *Protocol* should be set to *Modem*. The *Baud Rate* setting should match that of the modem if the modem has a fixed DTE speed. For modems set to DTE autobaud, a setting of 9600 or 19200 should give good performance. Speeds higher than this are not recommended for general use.

Handshaking should be set to *Normal*. The *Initialisation* string is designed to send a configuration AT command to the modem. The "AT" does not need to be included, and the command "E0" (echo off) is always included. On newer modems "+CRC=0" is needed to make the modem return conventional RING messages. The command "&D1" will allow the modem to more quickly respond to the meter in GPRS modes. For meters with passive serial ports, "+IFC=0,0" and "&C0" will enable CTS and DCD respectively to help power the port.

Thus the recommended initialisation string is "ATE0&D0&C0;+IFC=0,0;+CRC=0". For meters with a passive serial port, the modem must be set with this initialisation

string before connecting it to the meter – otherwise communication can never be established.

Note that for Intercel SAM modems auto answer should definitely not be enabled (eg "S0=3" causes problems), as it interferes with that modems GPRS operation.

The *Power Cycle Time* sets a time of day each day that the modem should be turned off for briefly (30 seconds). This can recover a modem from a latch up condition. This only works if the modem is powered from the serial port, or if the modem supply is switched using an output configured for modem control.

The meter will also do a backup of the running system variables to flash at this time. If no time is set, the backup will occur at 23:33.

In version 1.30 firmware and later, a dither has been added when used with a GPRS connection. This is a delay from when the modem is turned on, to when the meter tries to attach to the GPRS network (used in persistent mode). The delay is a number of seconds based on the last 7 bits of the meter serial number (ie 0 to 127 seconds).

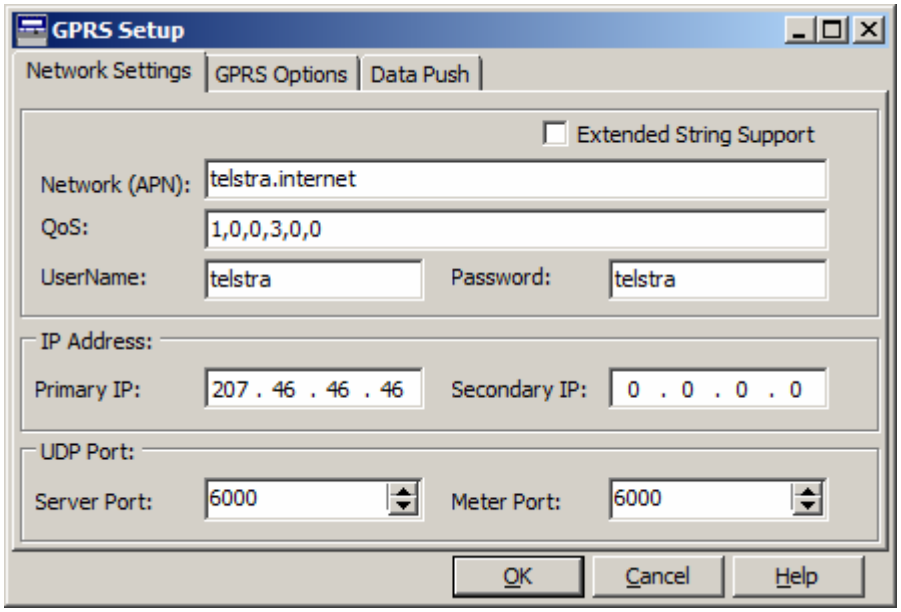
The *XON/XOFF Enabled* checkbox enables XON/XOFF handshaking with the modem for flow control. This allows the meter to slow down transmission if the modem is not transmitting fast enough, and is recommended for use if the modem supports it. The feature also has to be present and enabled for the modem. The EDMI command line protocol is transparent to XON/XOFF signalling. The normal AT command to enable XON/XOFF handshaking is /Q1 on most modems.

The *GSM* option enables extended support for GSM modems, which allows readout of the modem signal strength and other functionality related to GSM connections (such as GPRS). It should not be checked for PSTN modems.

The *Packet Size* option is used with a ZigBee network, though it can be used with any network with a packet size limit. When the meter is redirecting messages to another meter, this setting limits the size of the packet transmitted and will fragment the packet if it is larger than this. It is only used between meters, and it requires the "Simple Fragments" edition feature.

The *2-Wire RS485* option limits the command line messages to extended command line only (ie addressed commands). This prevents looping of messages on 2-wire RS485 bus. It does not generally need to be used with a modem.

The *Configure* button gives access to advanced options related to GPRS connectivity (Figure 7-3).



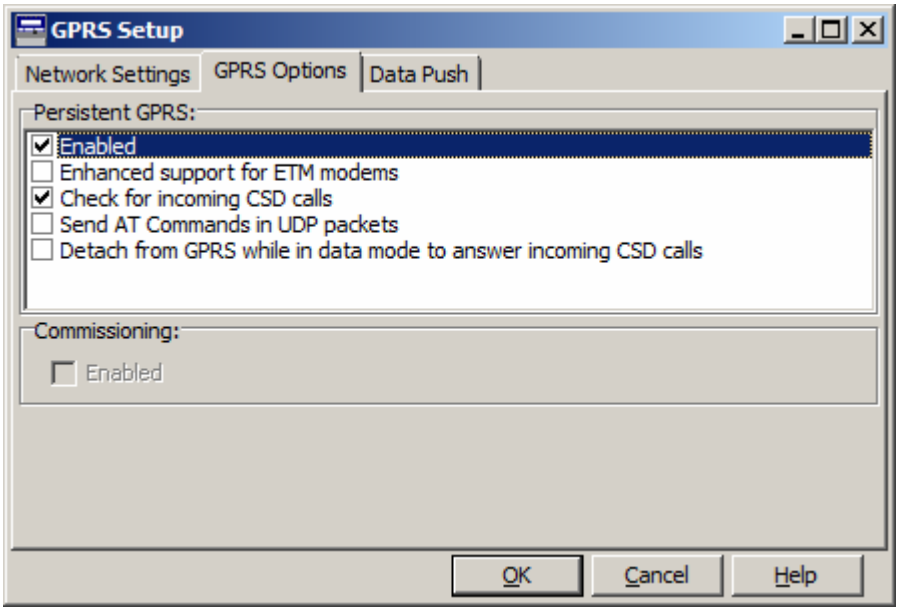
- Figure 7-3 Modem communications advanced Network Settings

Table 7-1 gives a brief description of the options. If you have problems configuring the meter for GPRS please contact EDMI.

Setting	Description
Network	This is the APN for the GPRS network to connect to. Up to 29 characters.
QOS	Quality of Service setup information for the network. This will be something like “1,0,0,3,0,0”, and may be up to 23 characters. The same value is used by the meter for requested (AT+CGQREQ) and minimum (AT+CGQMIN) QOS. It is not editable.
UserName	This is the username that the PPP login sequence uses to access the network. Up to 11 characters long. This should not be left blank - still put something here even if the network does not require a username.
Password	This is the password that the PPP login sequence uses to access the network. Up to 11 characters long. This should not be left blank - still put something here even if the network does not require a password.
Extended String Enable	This allows the strings in this box to be longer, useful for some countries with long usernames. This option should only be used on meter with firmware version 1.09 or later. It allows the total length of the Network APN, QOS, Username and Password fields to be 74 characters all together, rather than the individual limits.
Primary IP Address	The IP address of the server for the meter to connect to.
Secondary IP Address	A fallback IP address in case the Primary address fails. This setting is currently not used by the meter v1.09 firmware. Firmware 1.38 uses it as a fallback for commissioning and for alarm pushing.
UDP Server Port	This is the UDP port to connect to on the server.
UDP Meter Port	This is the UDP port that the meter will accept connections on, and used as the source port in meter initiated messages.

- Table 7-1 GPRS Network settings

The *GPRS Options* tab allows a number of options in the way GPRS works to be finetuned (Figure 7-4). Table 7-2 describes the options.

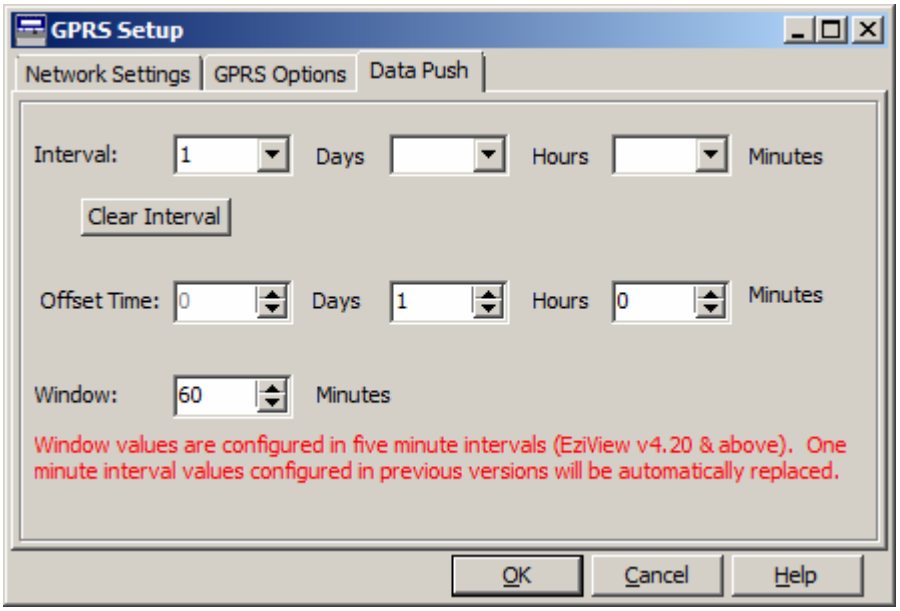


- Figure 7-4 Modem communications advanced GPRS Options

Setting	Description
Enabled	Setting this option will make the meter stay online after sending data – *Persistent* mode. This is useful where the meter has a fixed IP address and allows an external server to connect to the meter. It is recommended that DTR support is enabled in the modem (generally &D1) in this mode for Mk10 meters, though it works fine without it. Without the option checked, the meter will disconnect from the GRPS network when it is not sending data.
Enhanced support for ETM Modems	This enables enhanced support for ETM brand modems using a Siemens module in persistent mode. The option is useful when persistent mode is enabled.
Check for incoming CSD calls	This options makes the meter check for signal strength and for a GSM data call while on a GPRS connection. It should generally be enabled. Disabling it is useful with certain 3G modems to avoid incompatibilities.
Send AT commands in UDP packets	An alternative to *Check for incoming CSD calls*, this is for modems where AT commands can be sent while on a GPRS connection using UDP (some 3G modems)
Detach from GPRS while in data mode to answer incoming CSD calls	When enabled the meter will return to data mode to terminate the GPRS session after detecting an incoming call. This is needed for some modems (eg the SAM2W).
Commissioning Required	If set a new meter will start the commissioning process as soon as it is turned on. If not set then the commissioning process needs to be manually started – useful if commissioning is not being used.

- Table 7-2 GPRS Options settings

The *Data Push* tab allow configuration of data push timing (Figure 7-5). Table 7-3 gives a brief description of the options.



- Figure 7-5 Modem communications Data Push timings

Setting	Description
Interval	The meter will try to connect at this interval. E.g. set to 15 minutes for regular updates, or 1 day for daily reads. Setting it to zero will disable pushing of data from the meter (a bug in EziView 4.08 prevents it from being cleared though).
Clear Interval	Clicking this button clears the Interval, and thus disables pushing of data from the meter.
Offset Time	This allows the interval to be offset. E.g. To do a daily read at 1am, set this to 1 hour.
Window	This gives a window after the connect time that the meter can delay within so that simultaneous connection from a lot of meters can be avoided. E.g. set to 1 hour to allow a connection to be attempted between the connection time and 1 hour after that. When EziView writes the setup to the meter, a random value is chosen within this window. The maximum is 1275 minutes, which is just over 21 hours. A setting of 0 disables the window.

- Table 7-3 GPRS Data Push settings

Note that to disable automatic pushing of data, clear the interval settings (using the *Clear Interval* button)

In GPRS mode the meter will make at most 8 attempts to connect during an hour. This counter is reset if a successful attempt is made, or the meter is logged into. This limits the call costs the meter can cause if there is a problem with the network or server.

When the meter is in persistent mode and is connected to the GPRS network the ® on the LCD will flash. When the meter is actually logged into by a user the indicator will stay on.

RS-485 Setup

To work on an RS-485 multi-drop connection, the EDMI command line protocol should be selected. Handshaking should be set to *Transmit Enable.* The *Initialisation* string and other modem related settings are not used and are hidden. XON/XOFF handshaking has an effect, but should normally be disabled. The *Baud Rate* setting should be the same for all meters on the RS-485 bus, and match the device talking to the meter. Speeds higher than 19200 are not recommended for general use.

The *Default Login* option allows the security level of the port when no user is logged in to be raised, useful for simplifying access for SCADA systems.

The *2-Wire RS485* option limits the command line messages to extended command line only (ie addressed commands). This prevents looping of messages on 2-wire RS485 bus. It must be enabled for reliable 2-wire bus operation, and is recommended for 4-wire bus operation.

Other Options

The option *EDMI CmdLine Redirect* will redirect command line packets between ports configured with this option, if the packet is not directly addressed to this meter. This is useful where a meter is connected to a modem, and other meters are connected to the other port.

The *Coronis* option is for use with the wireless datahub, which has a Coronis module connected to the SCADA port.

The Wireless Device option is used for ZigBee MiniMesh networks, and is tied to the ZigBee Master Edition feature.

These protocols require their respective firmware edition codes to be present.

ZigBee

ZigBee connectivity is still in ongoing development. To use the meter with a ZigBee network an EDMI ZigBee modem is connected to the MODEM port of the slave meters, and the SCADA port of the master meter. These ports should be set to Wireless Device, and the *Packet Size* should be set to 60 bytes, *Baud Rate* 9600, *Handshaking* Normal.

The slave meters need the serial number of the master device entered into the Wireless Device field under the Configure button settings. A setting of 0 will use the first network it finds. This lets the meter calculate the Extended PAN ID of the master meter. On firmware before 1.40 the PAN ID of the master meter is entered.

The coordinator Extended PAN ID is set from the serial number of the master meter. In version 1.40 of firmware and later the PAN ID is set as <EDMI OUI (24-bits)> <0x00 (8-bits)> <Master meter serial number (32-bits)>. If firmware before version 1.40 the

value is the bottom 14-bits of the serial number. The easiest way to work out the PAN ID is to do the following:

1. Using windows calculator in scientific mode (or other appropriate calculator), enter the serial number in decimal.

2. Now select Hex to change the serial number into hexadecimal format.

3. Next press the 'And' button, then enter '3FFF' and press '='.

4. The resulting answer is the PAN ID in Hexadecimal format, which is what is needed for the slave meter setup explained later in the document.

So for example, given the serial number 207750016 (in decimal). This converts to 0C 62 03 80 in hexadecimal. Therefore 0C 62 03 80 'And' 3F FF = 380 in hexadecimal = PAN ID.

An EziView site needs to be created with all the meters. The master meter should have the Address set to 0, and the other meters should have the address set to non-zero (to ensure EziView talks to the master meter first).

SCADA Port

Some meters have the option of a 3rd serial port, which we call the SCADA port as this is frequently what it is used for. Settings are similar to those for the Modem port, but this port does not support operation of a modem.

In present hardware the SCADA port will be power cycled at the same time as the Modem port. The exception is the Mk10E, which can power cycle the ports separately. The other exception is a MK10A with two RJ45 ports, which can use power from the next meter in an RS485 chain to keep the RS485 port running while the meters own modem power is cycled.

In all Atlas meters but the Mk10E there is one DTR/transmit enable signal shared by both ports. The handshaking settings need to be made to control is appropriately. If the SCADA port is set to Normal handshaking, the signal is used to control DTR on the modem port. If the SCADA port is set to *Transmit Enable* or *Always Active*, the signal is used for the SCADA port.

This means if the SCADA port is an RS485 port, the SCADA port handshaking setting must be set to *Transmit Enable* or *Always Active.* If the SCADA port is an RS232 port, the handshaking of the SCADA port should be set to *Normal*.

On the MK10A the modem port is always RS232, and the SCADA port is RS232 or RS485. On the Mk7C and Mk10D the Modem port may be RS232 or RS485, and the SCADA port is always RS232. This means that on a Mk7C/Mk10D with an RS485 port a modem cannot be used, as the only RS232 port is the SCADA port.

On the Mk10E the SCADA and Modem ports are independent.

The MK7A has no RS485 option, and does not support DTR.

Support for the 3rd serial port requires the physical port to be fitted, and the Third Serial Port firmware edition code.

Commissioning & Heartbeat

The meter has a system of automatically commissioning GPRS meters in the field. This works in conjunction with Multidrive and other backend software, and was introduced in v1.31 firmware. The system allows a meter to be easily connected to the network, and confirmation given that the connection is working.

The meter has a number of states, from uncommissioned though to commissioned. Register FF19 indicates the current state, from 0 to 7. This register can be displayed on the LCD to provide a useful state display. Pressing and holding the *Select* button for 6 seconds while on this display will force the commissioning process to be restarted (as does writing a 0 to this register).

Table 7-4 covers the commissioning process by commissioning state.

State	Description
0	The meter will connect to GPRS, and send a commissioning packet to the server (Primary IP Address). This packet has the meter serial number, plant number, modem IMEI number, device config string (from *SystemParameters* page), meter type, firmware version and edition. The LCD will show "SEND INSTALL" when a commissioning packet is sent. Once the packet is sent the meter goes to state 1.
1	The meter expects to get an acknowledgement from the server, which then displays "GOT RESPONSE" and moves the meter to state 2. If no acknowledgement is received, the meter will retry 3 times. If this still doesn't work it will try again next time the connection is re-established (ie after a power up) or the push interval occurs (as configured on the Communications Modem page). Alternatively restarting the commissioning process will force the meter to try again.
2	The server will log into the meter and writes a 4 digit commissioning code to it. The meter displays this code followed by the word "COMPLETE". The meter then moves to state 3. The commissioning code is designed to be recorded by the installed on site. This gives proof that the installer was on site until the process was complete, and acts as a method of confirming job paperwork and meter.
3	The commissioning code will be displayed until the push button is pressed for 2 seconds, or the meter power is cycled. When this happens the meter moves to state 7.
4,5,6	Reserved
7	The meter is commissioned. It will not try to commission itself again unless instructed to do so.

- Table 7-4 Commissioning States

Heartbeat

Heartbeat messages are used to keep in touch with the server in a GPRS system. A heartbeat message contains the serial number, plant number, and modem IMEI number. The UPS meter sends a variation which includes more system status information.

The heartbeat message is sent when either:

1. The connection is re-established and the IP address has changed.

2. On the push interval IF the meter hasn't been logged into since the last push interval.

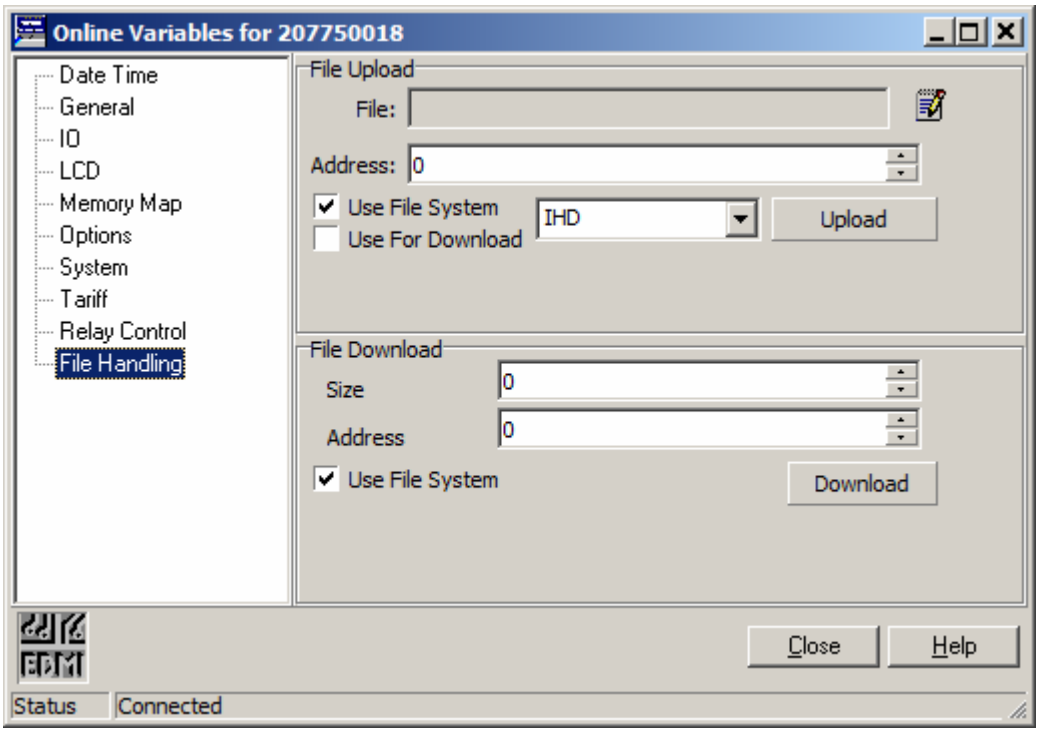
3. Writing to register FF14 or pressing the *Select* button for 6 seconds while display the FF14 register on the LCD.

The meter will display "SENT HEARTBEAT" when sending, and "GOT RESPONSE" when an acknowledge comes in. The meter will retry 3 times.

In Home Display

To configure the meter to operate with a Millennium In Home Display (IHD) the port with the ZigBee modem connected should be set to Command Line. Load Survey 1, channel 1 should be the same quantity and interval as TOU channel 1.

Online Variables has a *File Handling* page (Figure 7-6) that allows files to be sent to and retrieved from the meter, which the IHD can pick up. Note this uses the same memory are (user space) as is used for firmware upgrades, so do not perform both operations at once.



- Figure 7-6 File handling controls

To upload a file to the meter click the  button and select a file. *Address* should generally be left as 0, and *Use File System* should be selected as this uses the correct semaphores to avoid data contention. Clicking the *Upload* button will start the transfer.

To download a file specify the size of the file to download, *Address* should generally be left at 0, and *Use File System* should be checked. Click the *Download* button to start the transfer.

Intentionally Left Blank

Chapter

8

Time of Use

This chapter covers the setting of Time of Use (TOU) in the meter, which includes the *TOU Channel Setup* and *Tariff and Rates Setup*.

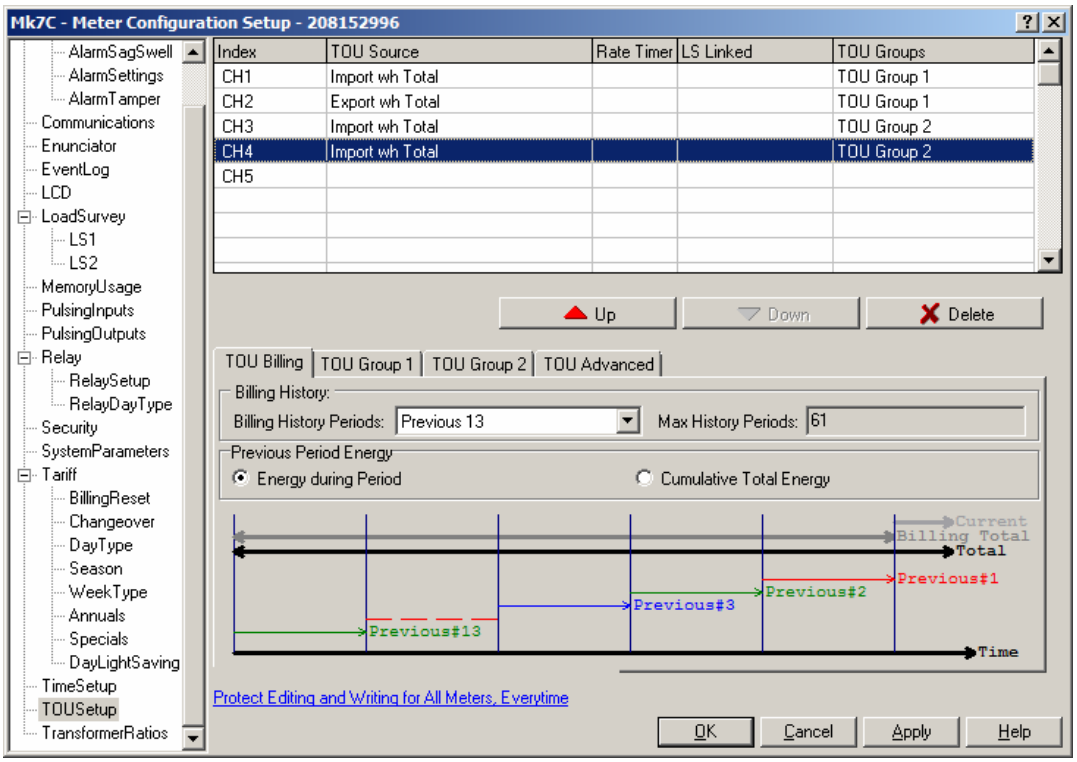
An energy quantity such as import Wh is recorded in a TOU channel. Each TOU channel records both accumulated energy, and the maximum demand and the time the maximum demand occurred. It can record these quantities separately for different times of the day, thus the term Time of Use. These are called different rates, as generally a different price rate is applied by the utility to each.

A calendar determines when these rates occur. The meter supports up to 8 rates. In addition the meter can take a reading of all these quantities, generally once a month or when the *Billing Reset* button on the front of the meter is pushed. It can store up to 13 of these, as well as total values.

The calendar allows different rate structures for different days of the week, and for different special days during the year. It can take account of seasons or complete changes in the rate structure.

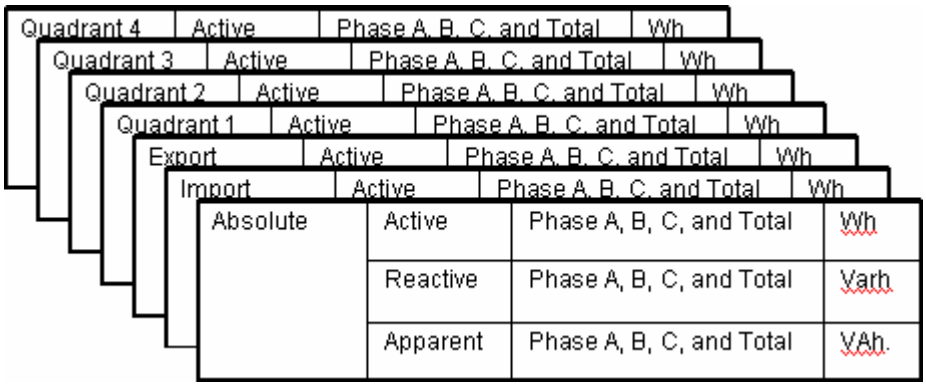
TOU Channel Setup

Each quantity to be recorded by the TOU system is recorded in a TOU channel. The TOUSetup page allows selection of what is recorded in each channel from a selection of over 80 sources. Up to 32 channels can be defined, but this is usually limited by available memory. Figure 8-1 shows the channel definition page.



- Figure 8-1 Time of Use setup

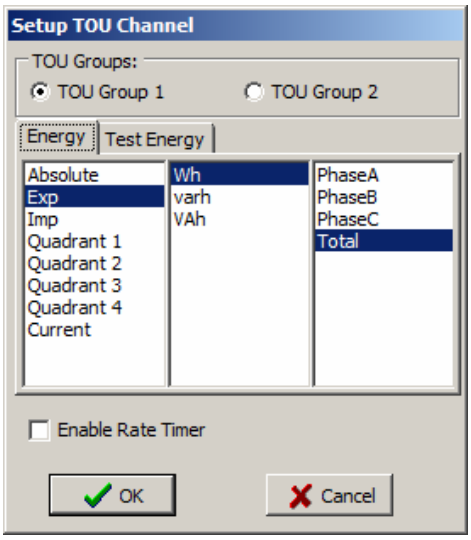
The TOU source column describes what is being recorded in that channel. The TOU group column lists which one of the two TOU groups the channel belongs to. Each group can be separately configured for the maximum number of rates, the demand interval, for block or rolling demand, and for calendar setup. A wide variety of quantities can be selected from to record in a channel (Figure 8-2).



- Figure 8-2 Types of energy available for *TOU Channel Setup*

The Mk7 has Main, Load, and Neutral instead of Phase A, B, and C. Total is the sum of Main and Load.

Double click on a channel to edit the settings, or on the last blank entry to add a new channel. Use the *Delete* button to delete the selected channel. Editing a channel brings up the *Setup TOU Channel* form as shown in Figure 8-3.



- Figure 8-3 Setup TOU channel

The *Energy* tab has all the energy quantities that the meter can measure. The first column selects which quadrant(s) the energy comes from. The *Absolute* setting reads positive energy for import or export energy. See then end of any of the hardware chapter Figure 2-31 on page 2-24 for clarification of import, export and quadrant conventions.

The second column selects the type of energy, Wh, varh, or VAh.

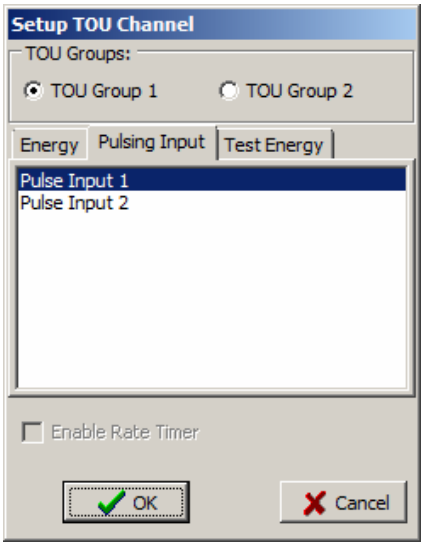
Finally the third column selects which phase to record the energy from. *Total* is the sum of all three phases. The individual phase selections allow energy from only one phase to be recorded, useful if there are separate loads on each phase or for tamper monitoring. Figure 8-2 summarises these selections.

The order that some of the channels appear is determined by EziView for optimal memory usage. Thus after setting a series of channels EziView may rearrange them slightly.

Changing TOU channel configurations will generally result in clearing of all TOU data, and possibly load survey data since the meter optimises memory usage between these systems. It may also clear load surveys and reinitialise pulsing outputs, depending on the exact configuration.

The channel setup page may be protected from editing to reduce the risk of accidental change. To unprotect it select one of the *Edit* options at the bottom of the page. See "Protected Setup" on page 3-10 for more information.

When there are pulsing inputs configured in the meter a *Pulsing Input* tab becomes available. This shows the available pulsing inputs for selection (Figure 8-4).

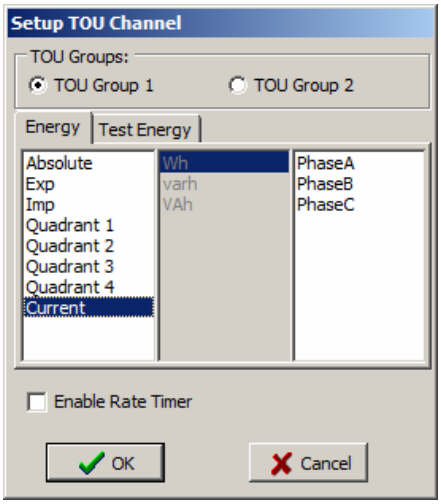


- Figure 8-4 Pulsing input channel selection

The Test Energy tab allows selection of a phantom energy source, useful for testing when no load is available.

The LS linked column indicates if a TOU channel is being recorded in a load survey.

There is an additional feature in the UPS meter which allows current to be recorded in the TOU system. This gives a reading in Ah for accumulated data, and a reading in Amps for demand data. Figure 8-5 shows the options.



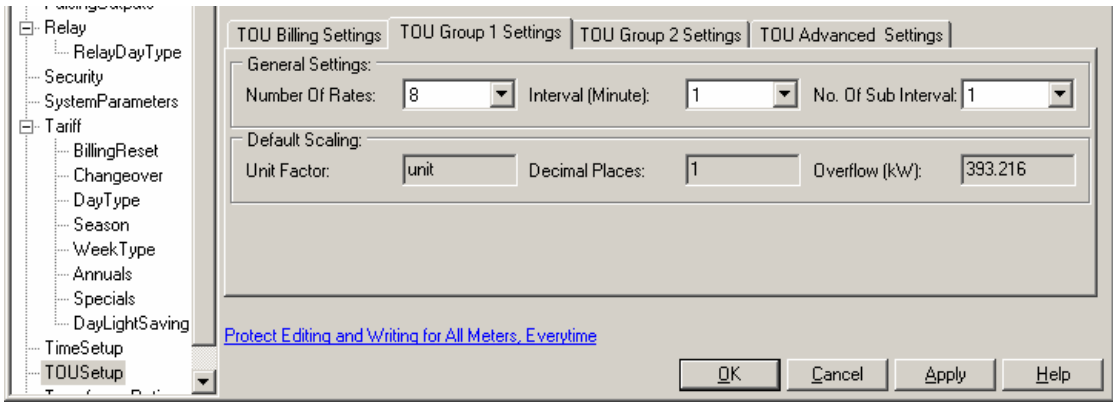
- Figure 8-5 Current in TOU channel selection

The *Enable Rate Timer* option is used if the exact time each rate is active is needs to be recorded. Enabling this option records the time spent in a rate instead of the time of maximum demand for that TOU channel. The unified maximum demand returns the total time across all rates. Channels with this option selected are identified by an 'X' in the *Rate Timer* column.

An edition of firmware with the TOU Rate Timer feature is needed to use this feature.

TOU Groups

A TOU group defines how many rates are available, and how demand is calculated. It also allows for different day configurations in the calendar. TOU group settings are under the *TOU Group 1 Settings* and *TOU Group 2 Settings* tabs at the bottom of the *TOUSetup* page (Figure 8-6).



- Figure 8-6 TOU group settings

Each TOU channel belongs to one of two TOU groups, called *TOU Group 1* and *TOU Group 2*. All channels that belong to a rate group have the settings of that rate group. Changing a TOU group's settings will affect all channels that belong to it.

Reasons for splitting channels into different groups include conserving memory (eg could have 3 rates for Wh channels, but only 2 rates for varh channels), applying different demand calculations (eg running a demand interval of 15 minutes and 60 minutes), and allowing different rate structures (eg could have two separate rate setups for Wh and varh, or calculate Wh under two different rate structures). If this flexibility is not needed, simply use *TOU Group 1* for all channels.

The *Number of Rates* setting determines the maximum number of different rates that can be recorded. When setting up the calendar you will be restricted to this many rates. Only set this to as many rates as you are likely to need, as larger settings use significantly more memory.

Interval and *Sub-Interval* are used to configure how maximum demand is calculated. Both *Interval* and *Sub-Interval* are given in minutes.

Scaling is discussed later on page 8-8 under "Scaling, Units and Overflows".

Accumulation and Demand

Each TOU channel records accumulated energy, maximum demand, and time of maximum demand for its source. It has a separate set of registers for each rate, as illustrated in Figure 8-7. At any time only one of the rates of a TOU channel is active,

determined by the calendar. Channels belonging to different TOU groups may have different rates active.

	Channel 1	Channel 2	Channel 3	Channel …
Rate A	Accumulated Max Demand Time of Max			
Rate B				
Rate C				
Rate …				
Unified				

- Figure 8-7 TOU *Channel* and *Rate* structure

The unified rate is an extra set of registers that are calculated without rate switching. The accumulated register is the sum of all the rates' accumulated registers. The maximum demand is the maximum of the other rates' maximum demands, and the time is the time of this maximum.

Accumulated Energy

Energy is added to the accumulation register for the active rate as it is measured.

Maximum Demand and Time of Maximum Demand

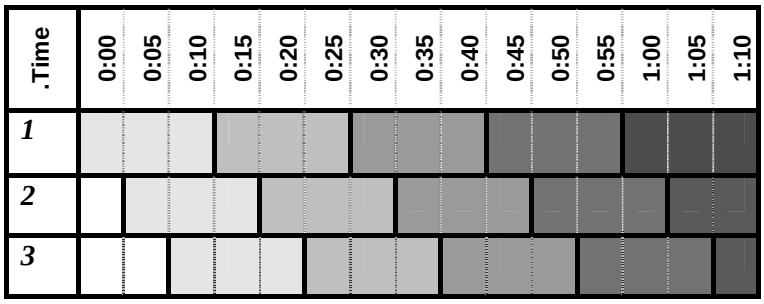
Demand calculations effectively calculate the average power over a short time period called the demand *Interval*, generally 15 to 30 minutes. Demand is measured in order to give an indication of the peak loading on the network.

At the end of every demand interval, the measured demand of each TOU channel is compared against the maximum demand value for the active rate of that channel. If it is larger, the maximum demand is replaced with the new maximum, and the time is recorded as the time of maximum demand.

Block and Rolling Demand

There are two ways to calculate demand. The simplest method is called *Block Demand*, where the demand is simply calculated at the end of each demand interval. In this case the *Interval* is set to the demand interval, and the *No. of Sub Intervals* is set to 1. Demand intervals of 1, 5, 10, 15, 30 or 60 minutes can be selected.

For *Rolling Demand*, a series of demand intervals begin sequentially, overlapping one another. Figure 8-8 illustrates a 15 minute demand interval with 3 sub intervals. Effectively a new demand interval starts every 5 minutes in this case. Up to 15 sub intervals can be selected using the *No. of Sub Intervals* setting, depending on how many can evenly fit into the demand interval. Rolling demand is generally used to get a better indication of demand for intermittent loads.



- Figure 8-8 Demand periods example

Billing History

Billing History keeps records of previous accumulated energy, maximum demand and time of maximum demand for every rate of every TOU channel. Whenever a *Billing Reset* occurs, all these values are stored as a previous billing period, and the current values are reset to zero. Generally a *Billing Reset* is generated automatically once a month.

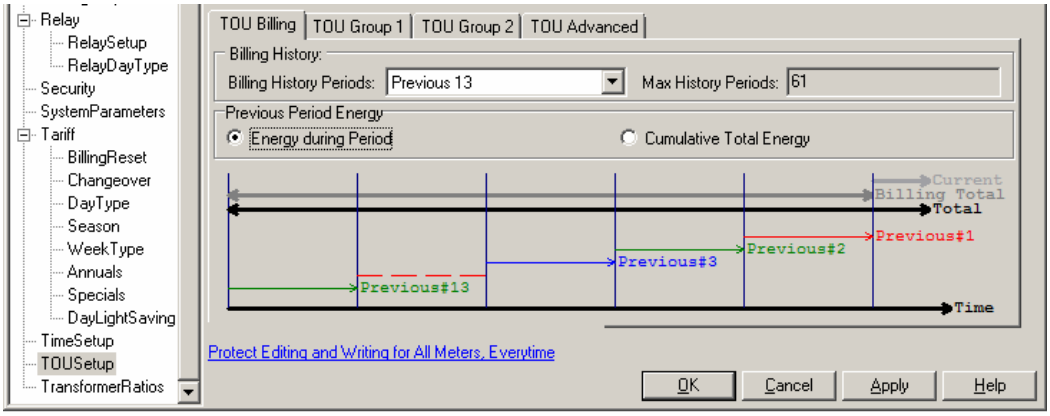
There are a maximum of 13 previous periods stored, though meter firmware 1.40 increases the maximum number of periods from 13 to 61. If this is the N^{th} billing reset then *Previous 1* records the values gathered between the N^{th} billing reset and the $(N-1)^{th}$ billing reset. The same way, *Previous 2* keeps the record of values from $(N-1)^{th}$ billing reset to the $(N-2)^{th}$ billing reset, etc.

A brief illustration of the *Billing Reset* concept is that if an automatic billing reset is done every first day of a month, and *3 Previous* is selected under *Billing History*, the meter will keep a record of the end of month values for the last three months. E.g. January (*Previous 3*), February (*Previous 2*) and March (*Previous 1*). When April ends the previous periods slide down by one, and the values for January are discarded. The new order would be February (new *Previous 3*), March (new *Previous 2*) and April (new *Previous 1*).

In addition to these previous periods, the billing history keeps a record of the total values for all time either including the current period (total) or excluding the current period (billing total). For these values the accumulated energies are added, and the maximum demands are added from each period. Time of maximum demand is not available as it has no meaning in this context.

The time of each billing reset is stored with the data for that billing period, so it gives the time of the end of the billing period. This is in addition to any event log entries. When automatic *Billing Resets* occur is controlled by the "Billing Reset" settings on page 8-19

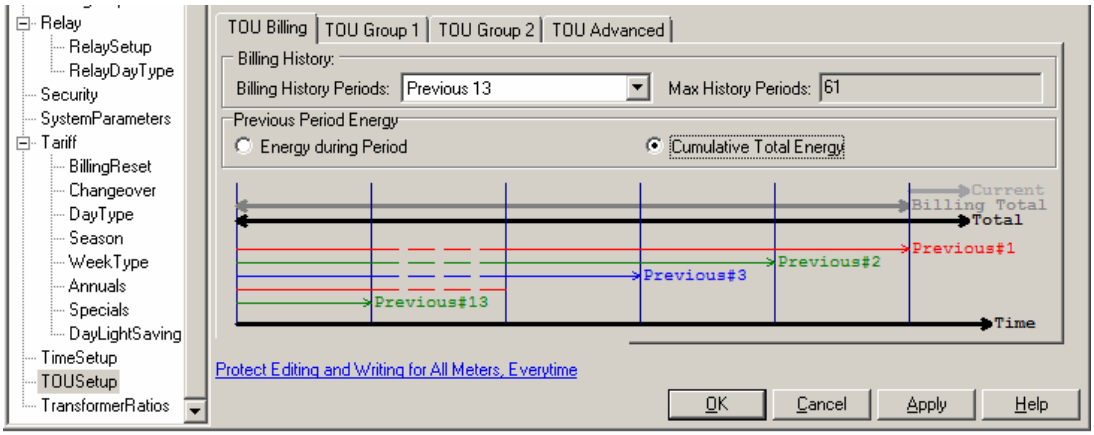
The number of previous billing periods to store may be set on the main *TOUSetup* page (Figure 8-9). The maximum number it can be set to based on available memory is also displayed. The diagram at the bottom of the setting page illustrates how all the periods are organised in time.



- Figure 8-9 Billing History options

Choose at least one previous period to allow *Billing Total* to record energy and maximum demand values upon billing reset. If there are no previous periods, a billing reset will effectively clear all TOU registers.

Normally the accumulated energy stored in a previous period is the amount of energy accumulated over the billing period. This is what happens when the *Previous Period Energy* is set to *Energy During Period*. Setting this option to *Cumulative Total Energy* changes this so that the previous period stores the **total** energy accumulated, rather than just the energy recorded in the billing period. Previous period maximum demand is unaffected. The diagram on the bottom of the settings page shows the different operation (Figure 8-10).



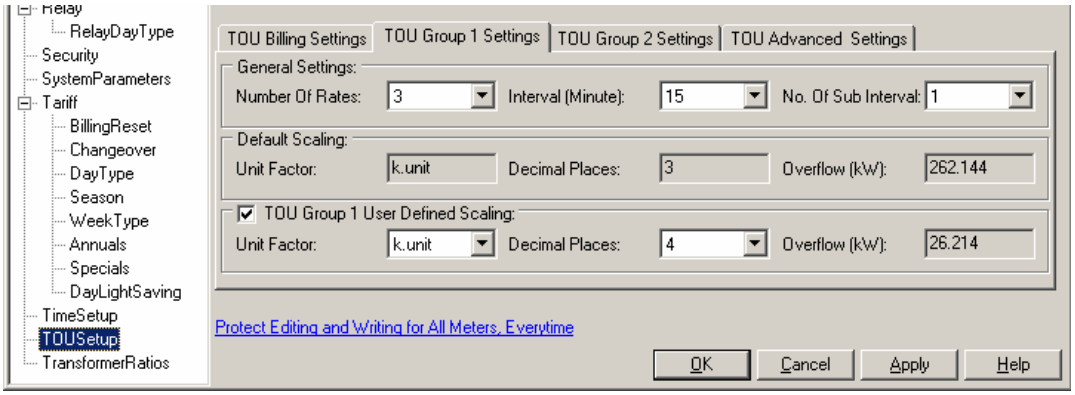
- Figure 8-10 Billing History Cumulative Total Energy

Scaling, Units and Overflows

The *Scaling* settings allow for the default settings that EziView makes to be overridden. These can be used to increase the resolution of accumulated readings, or set a certain multiplier.

The meter records energy as pulses, each pulse representing an amount of energy. If the meter is showing Wh to 1 decimal place, each pulse is 0.1 of a Wh. The meter can record up to 65535 pulses in a demand period. Beyond this it will "saturate" at 65535

until the end of the period, and flag a pulsing overflow EFA. It can record up to 999999999 pulses (9 digits) in an accumulator before rolling over. Saturation of the demand period should be avoided.



- Figure 8-11 Time of Use *Scaling* setup, *User Defined Scaling* enabled

Figure 8-11 shows the TOU channel scaling setup. The *Default Scaling* sections indicate what EziView recommends based on the interval and maximum voltage and current. The indicated *Overflow* amount is designed to give an indication of the maximum power the meter can record continuously before overflow occurs. The decimal places shown on the LCD for accumulated energy is one less than set here, as only the top 8 digits are displayed (unless decimal places is set to zero, where the bottom 8 digits are displayed).

E.g. in Figure 8-11 the *Overflow* is 26.214kW. With the 15 minute period, this means that a maximum of 6.5535 kWh can be recorded in a demand interval before the demand calculation overflows. On a 3 phase, 240V system this would represent a continuous load of around 36 amps. At the meters full rated load of 20 amps, the accumulators would roll over after 289 days.

It is strongly recommended not to use the override controls. The *User Defined Scaling* section is normally hidden, as incorrect use can lead to overflows and truncation. Do not use *User Defined Scaling* unless you are very sure of what you are doing. Beware of situations such as setting a user defined figure, then changing **transformer ratios**. If you do need to use it, contact EDMI.

If the load is known to be less than 3.6 amps on average, the scaling can be overridden to something like a unit scaling with 2 decimal places. This is done by checking the *User Defined Scaling* box and setting a new scaling. EziView will warn that the changes are different to the recommended settings.

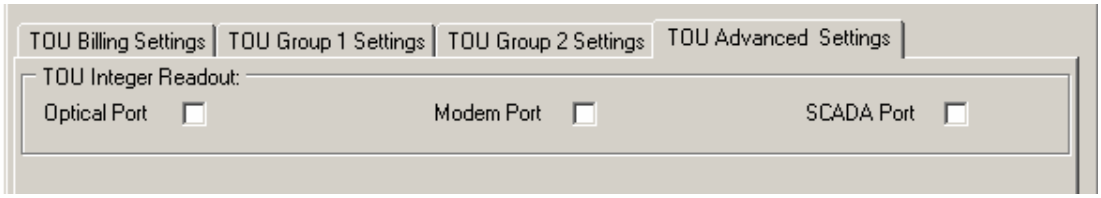
The unit factor and the number of decimal places apply to the display of demand. Accumulated energy is also recorded to this accuracy, but is displayed with one less digit of resolution on the LCD.

The other usage is to change the multiplier. If in the example the energy is wanted to be shown as kWh rather than Wh, EziView can be overridden. Set the Unit factor to "k"

and the decimal places to 4 to get the same effective scaling, but with a scaling factor of k. It is better and safer to do this using the scaling tools on the LCD setup page.

Advanced TOU Setup

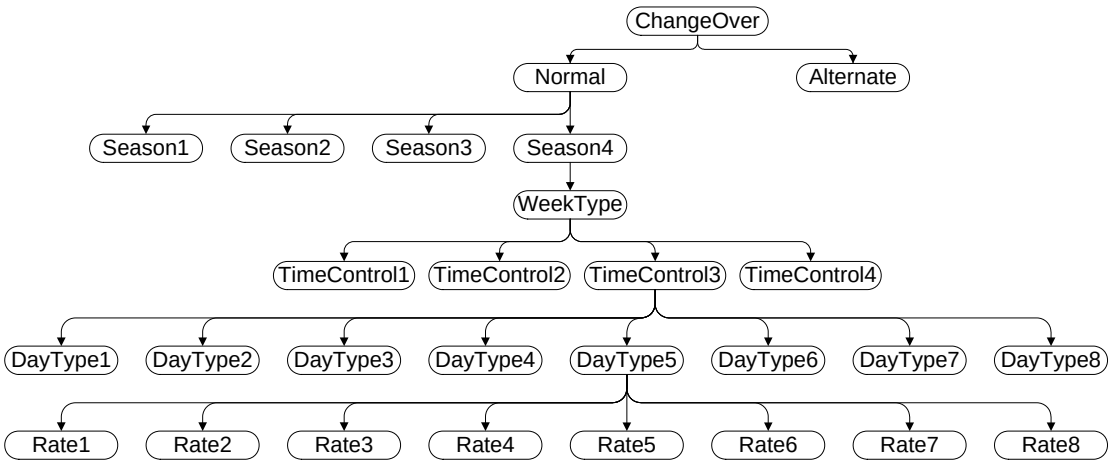
The *TOU Integer Readout* setting (Figure 8-12) when enabled means that when the TOU registers for accumulated energy and maximum demand are read from the meter, they are read as integers rather than as floating point. This is designed to make it easier to interface with certain external units such as PLC. The integer values will match the scaling of the LCD. This option can be enabled per port, since it would generally only be enabled for communication with certain devices.



- Figure 8-12 TOU advanced settings

Tariff Calender Setup

The structure of the calendar system is illustrated in Figure 8-13 below. For simplicity it shows only one branching route since the other branches are identical. E.g. *Alternate* has the same structure as *Normal*; and, similarly *Season3* has the same structure as *Season4*, etc.



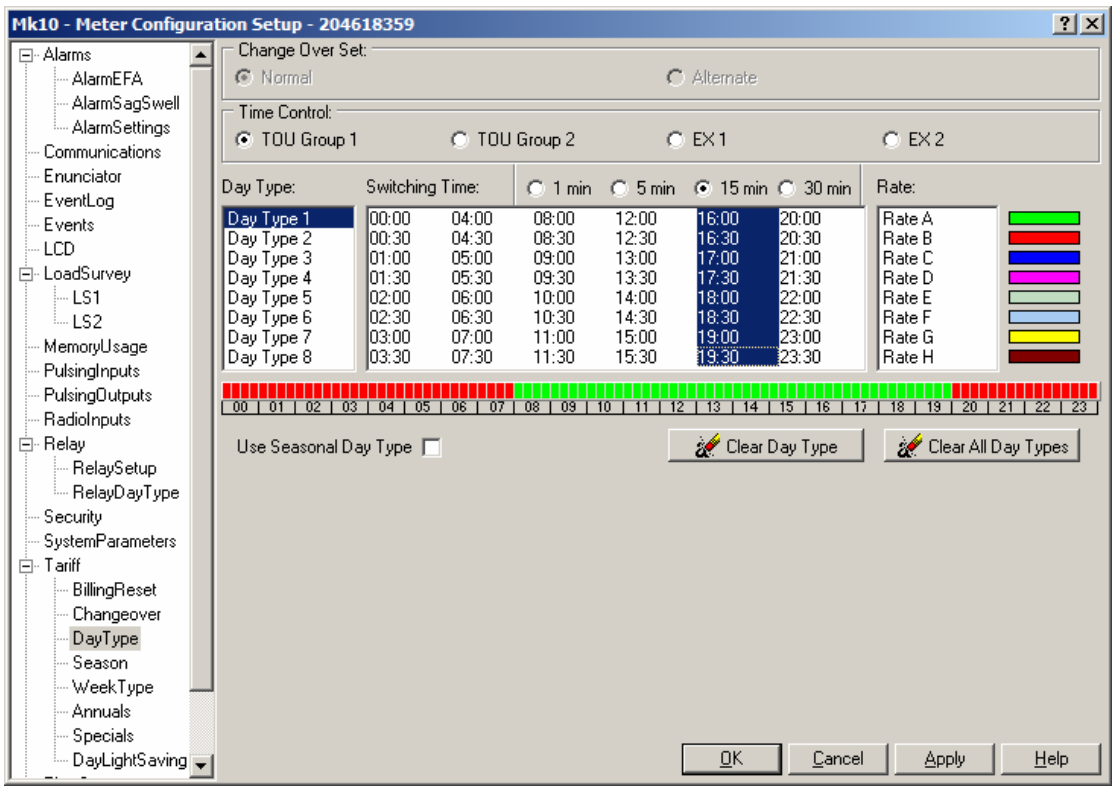
- Figure 8-13 Structure of Tariff

The two TOU groups already mentioned in earlier sections are part of the *Time Control* system. In addition to these two there are another two called *Ex1* and *Ex2*. *Ex1* and *Ex2* are designed for time clock type operations, where an output is controlled to switch at various times of the day. If this functionality is not required they can be ignored.

The meter has a limited amount of memory for calendar entries. If the meter is out of memory, you will not be able to add more entries. On the *MemoryUsage* page the *Calendar/LCD Memory Usage* bar shows how much memory is used. If you run out of entries, either remove some other calendar entries, LCD screens, or future daylight saving changeover times.

Day Type

A "*Day Type*" defines the switching of rates during a 24 hour day, midnight to midnight. Up to 8 *Day Types* for a time controller (TOU group) may be defined. Each time controller has its own independent set of up to 8 day types. The *DayType* setup page (Figure 8-14) allows the *Day Types* to be defined.



- Figure 8-14 *Day Type* setup

To configure a particular *Day Type*, select the *Time Controller*, and then the *Day Type* number from the left hand column. Its current configuration is indicated by the graph at the bottom of the screen. The colours correspond to the rates, a legend is shown to the right.

There are a maximum of 8 rates, from *Rate A* to *Rate H*. To set a particular rate, say *Rate B*, highlight the time in *Switching Time* box and click on *Rate B* in the *Rate* box. Please refer to Figure 8-14. Using the shift and control keys in combination with the mouse allow ranges to be specified (in standard windows usage).

A rates can be setup with a default resolution of 30 minutes. A finer resolution that 30 minutes may be used by selecting a resolution from 1 min to 30 min using the radio

buttons above the table. Note that if a resolution smaller than the demand interval is used it is recommended not to have a rate change in the middle of a demand interval. This will avoid maximum demand calculations being skipped due to crossing a rate change.

EX2 is used for relay tariff control – if this functionality is used, EX2 should not be configured here.

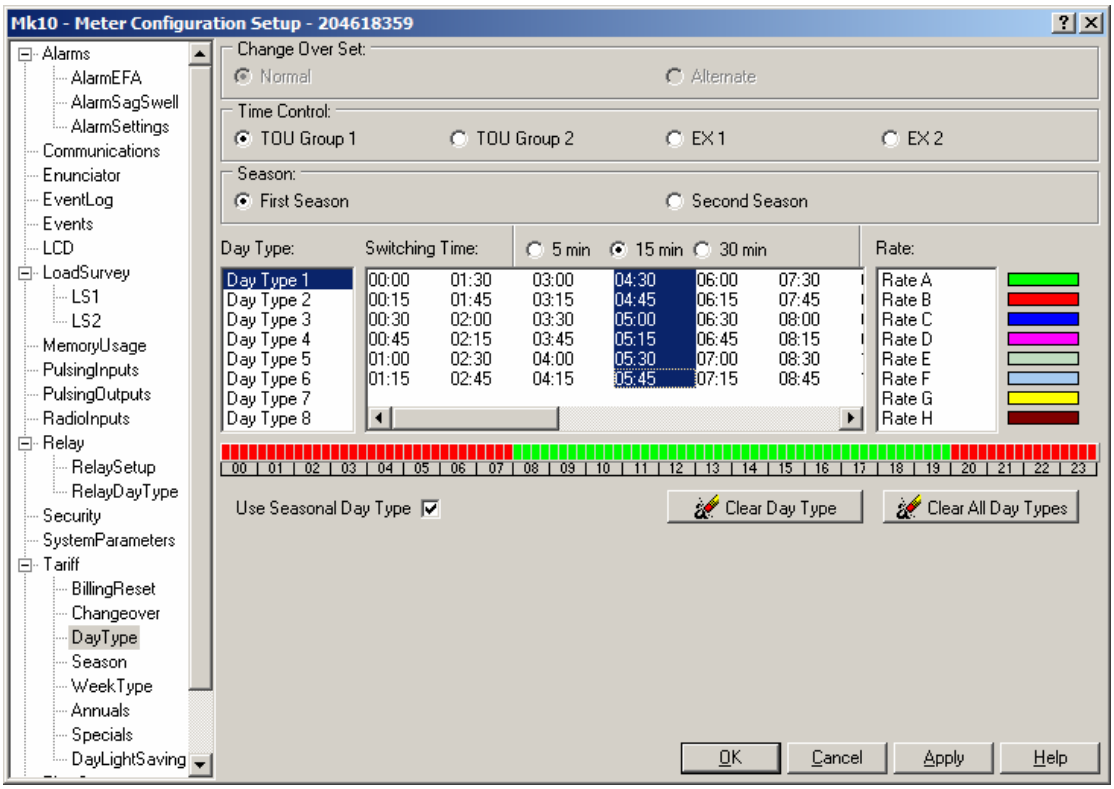
Click the *Clear All Day Types* button to clear rate arrangement for every *Day Type*, and for every *Time Control* group.

Change Over Set

If there is no *Change Over* date selected, the *Change Over* will be disabled on this page. See the section on *Change Over* for details. If change over is enabled two completely independent configurations can be made on this page, normal and alternate.

Use Seasonal Day Type

Normally the *Day Type* settings are the same for every season. The *Use Seasonal Day Type* option allows different *Day Type* configurations for each season. The compromise is that the finest resolution is 5 minutes, rather than 1 minute.



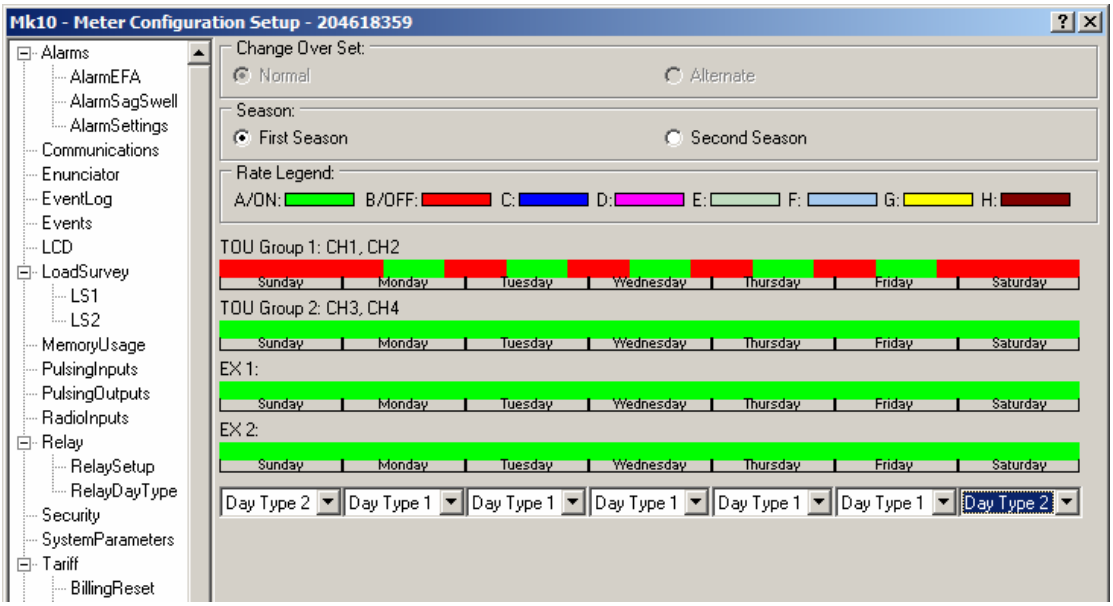
- Figure 8-15 Seasonal *Day Type* setup

The *Seasonal Day Type* option requires an edition of firmware with the Seasonal Day Type feature.

Week Type

Week Type configures which *Day Type* occurs by default on each day of the week. *Day Type* selected for a particular day affects all the 4 *Time Control* groups.

For instance, *Day Type 1* is selected for Monday, all the *Time Control* groups will use *Day Type 1* for Monday. However, since *Day Type* definitions for a *Time Control* group is independent of the other, Monday for each *Time Control* group can be different in terms of tariff rate arrangement.



- Figure 8-16 *Week Type* setup

Figure 8-16 shows *Day Type* selection for every day of a week. Select the *Day Type* for each day of the week using the drop down boxes.

Season

If more than one season is defined an independent week setup is made for each season. Select the season to display its current settings. The number of seasons shown depends on the number of seasons configured in *Season Setup* page. See details in the next section.

Day Types are only unique for every *Time Control* group, BUT are NOT unique for every *Season* unless seasonal day types are used (page 8-12). *Week Types* are unique for each *Season*.

Change Over Set

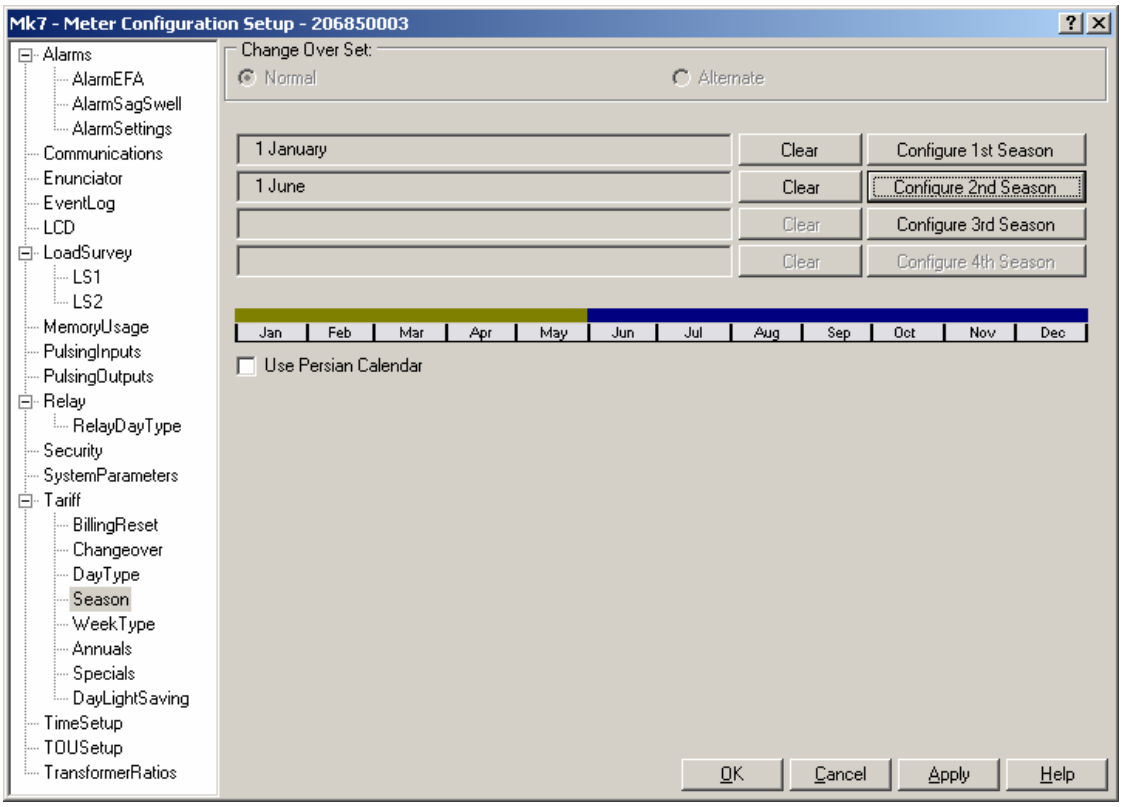
As with *Day Type* definitions, a completely alternate definition can be made using the change over setting. If there is no *Change Over* date selected, the *Change Over* will be disabled on this page. See the section on *Change Over* for details.

Season

Season allows a portion of a year to have a different arrangement of *Week Type* than the other portion(s) of the year.

There are a maximum of 4 seasons. To add another season simply click the *Configure Season* button and set the season start date. Figure 8-17 shows a configuration of 2 seasons.

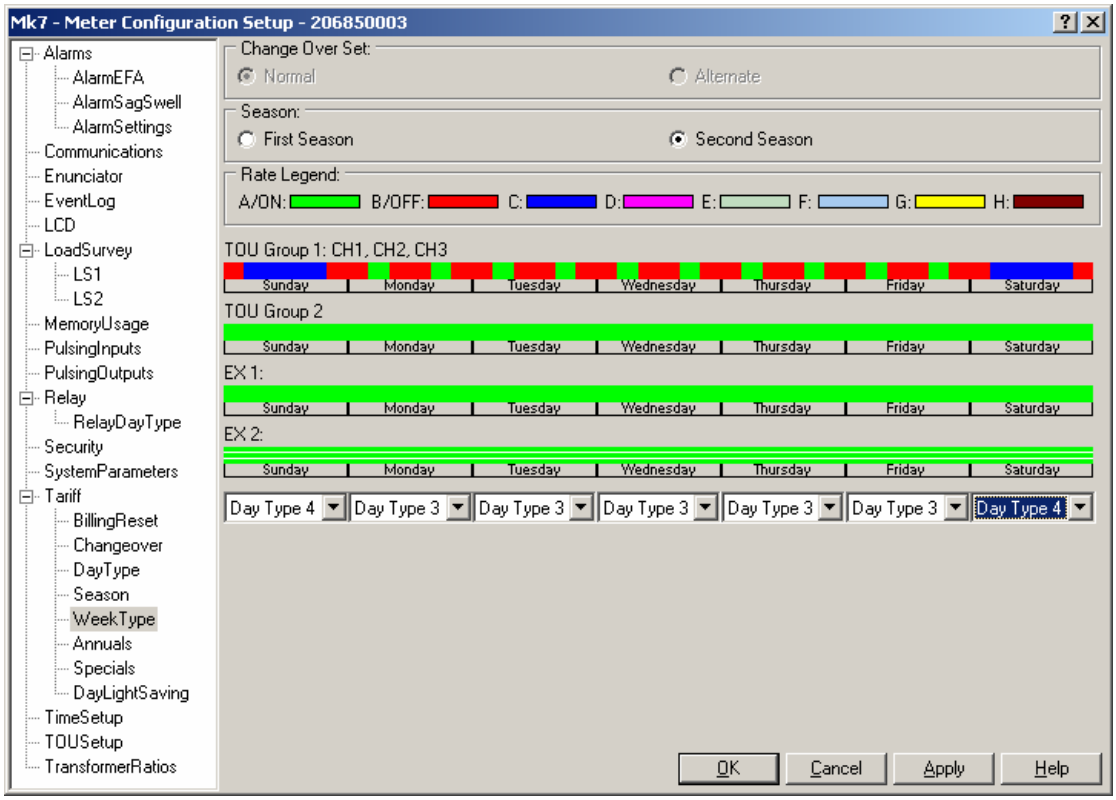
To remove a season click its *Clear* button.



- Figure 8-17 *Season* setup

The *Use Persian Calendar* option allows the dates to be set using the Persian Calendar. The default is the Gregorian Calender (January, February, etc).

Persian Calendar edition firmware must be used if using Persian Calendar dates.



- Figure 8-18 *Week Type* in a season

All seasons are using the same set of *Day Types*. If a completely different rate scheme is wanted for a season, use different *Day Types*. A simple example is: *Season 1* uses *Day Type 1* and *Day Type 2*; and, *Season 2* uses *Day Type 3* and *Day Type 4*. Figure 8-18 illustrates this example – compare with Figure 8-16.

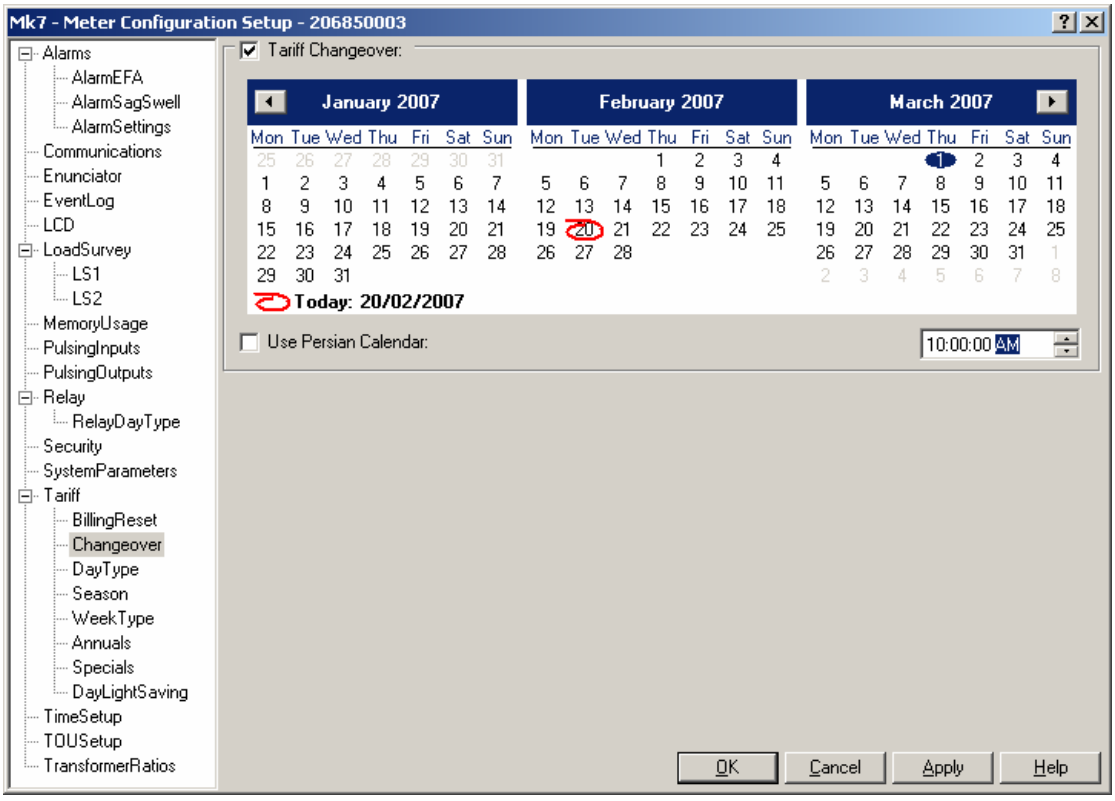
Relay Daytype

This option is available on meters fitted with load control relays. See Chapter 16: "Relay Outputs" for more information.

Change Over

Tariff Change Over defines a date in which the whole tariff scheme reverts to an alternative scheme. *Tariff Change Over* is applicable for a specific date in the future.

To set this date, tick *Tariff Change Over* as shown in Figure 8-19. Choose the date from the calendar.



- Figure 8-19 *Tariff Change Over* setup

If *Tariff Change Over* is implemented, on the selected date the whole tariff scheme will be changed to the alternative scheme.

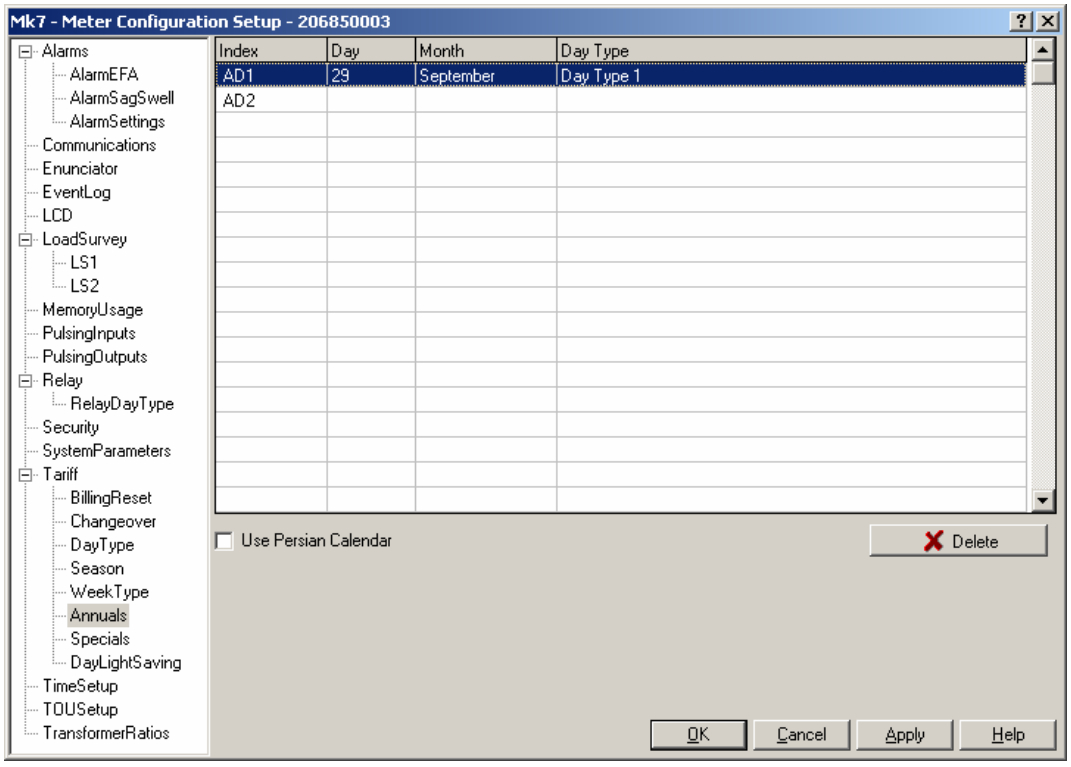
The scheme affects *Day Type*, *Week Type*, and season. Annuals and specials (discussed below) remain undisturbed.

The *Use Persian Calendar* option allows the date to be set using the Persian Calendar. In this case the date is entered as a day/month/year.

Persian Calendar edition firmware must be used if using Persian Calendar dates.

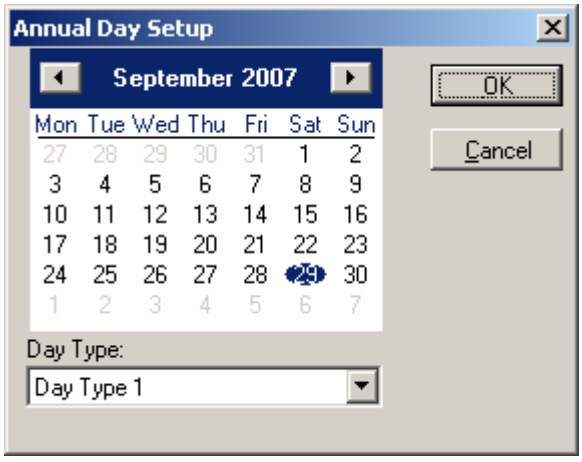
Annuals

A specific day of a year can be programmed to have a different tariff scheme than the week configuration would select. Each year on the selected day the meter will use the indicated day type rather than that selected in the *Week Type* definitions. The number of annual days that can be set depends on available configuration memory, but will generally be at least 200. See Chapter 4 – "Memory Usage".



- Figure 8-20 Schedule of *Annual Days* setup

Double clicking on an entry for a specific day of a year will pop up an *Annual Day Setup* page (Figure 8-20). Choose the date from the calendar. From the 8 *Day Types* at the bottom of the page, select the one that should be applied on that date.



- Figure 8-21 *Annual Day* setup

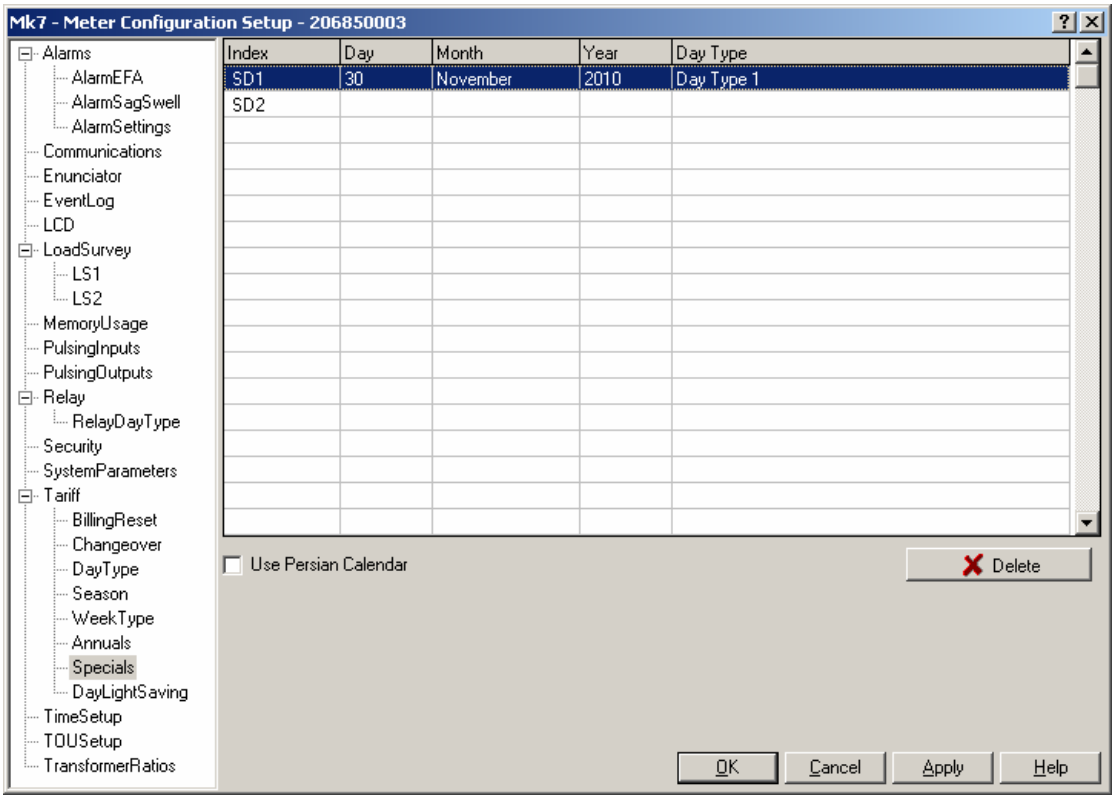
The *Use Persian Calendar* option allows the date to be set using the Persian Calendar. In this case the date is entered as a day/month/year.

Persian Calendar edition firmware must be used if using Persian Calendar dates.

Specials

Particular dates can be selected to have different tariff schemes. Unlike annual days, these days will not be repeated annually. If it coincides with a day chosen in *Annuals Setup*, priority will be given to *Specials Setup*.

Figure 8-22 shows the setup page. The actual number of allowable special days depends on memory availability, as for annual days.



- Figure 8-22 Schedule of *Special Days* setup

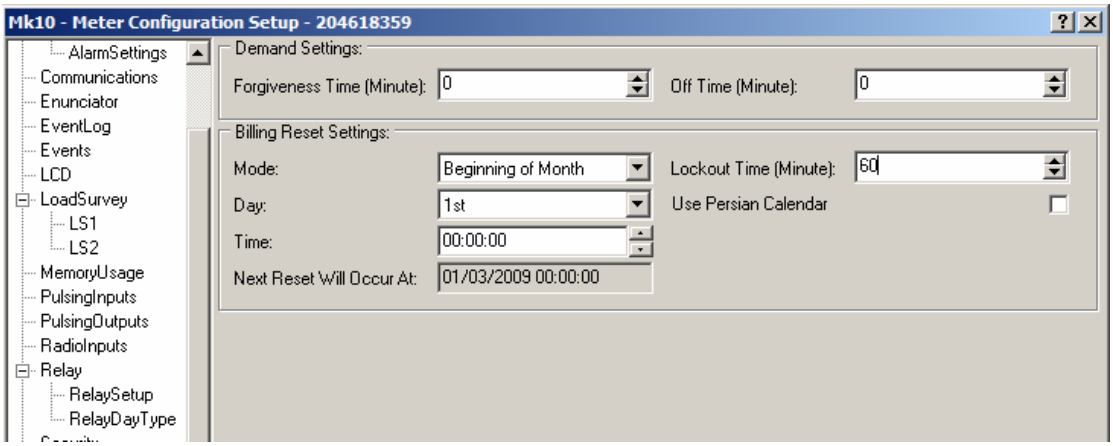
To add a special day, double-click on the entry row. A form will pop up similar to the annual version, except that the year can be chosen.

The *Use Persian Calendar* option allows the date to be set using the Persian Calendar. In this case the date is entered as a day/month/year.

Persian Calendar edition firmware must be used if using Persian Calendar dates.

Billing Reset

Billing Reset setup allows a manual reset or an automatic reset to be done periodically.



- Figure 8-23 *Billing Reset* setup

Mode

Mode allows billing reset to be done on monthly basis by selecting either *End of Month*, *Beginning of Month, or Special Dates*. The first two select whether the *Day* and *Time* are measured from the start of the month or the end. The *Special Dates* option allows the exact date (including the year) and time to be specified for each billing reset (See Figure 8-24) – up to 449 entries (limits by calendar/LCD memory) each up to 499 days apart may be configured. Select *None* if automatic billing resets are not required.

A *Daily Reset* option was added in firmware version 1.31 which allows a reset to happen every day at a nominated time.

A firmware edition with the Daily Billing Reset feature is needed to use Daily Reset.

Day and Time

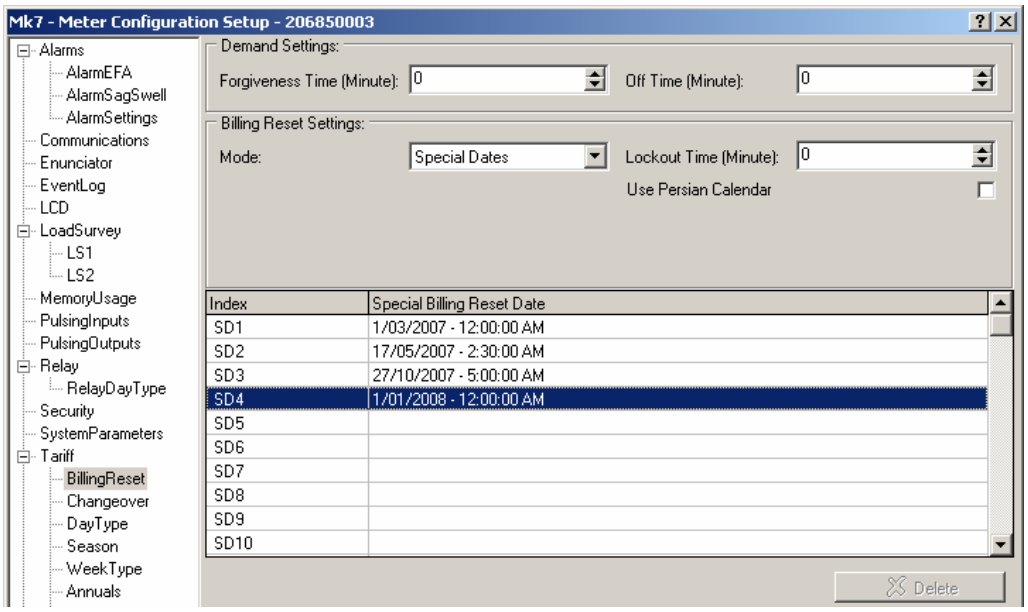
Set the desired day and time for the meter to automatically perform a billing reset.

Lockout Time

Lockout Time specifies the number of minutes after one billing reset before another can occur. *Lockout Time* prevents accidental extra billing resets from being performed, particularly when manually pressing the *Billing Reset* button. If *Lockout Time* is not required, the value should be set to 0.

Demand Settings

Setting a *Forgiveness Time* means that if the power has been off for longer than the *Off Time* then the meter will block the recording of a new maximum demand until the *Forgiveness Time* has elapsed.



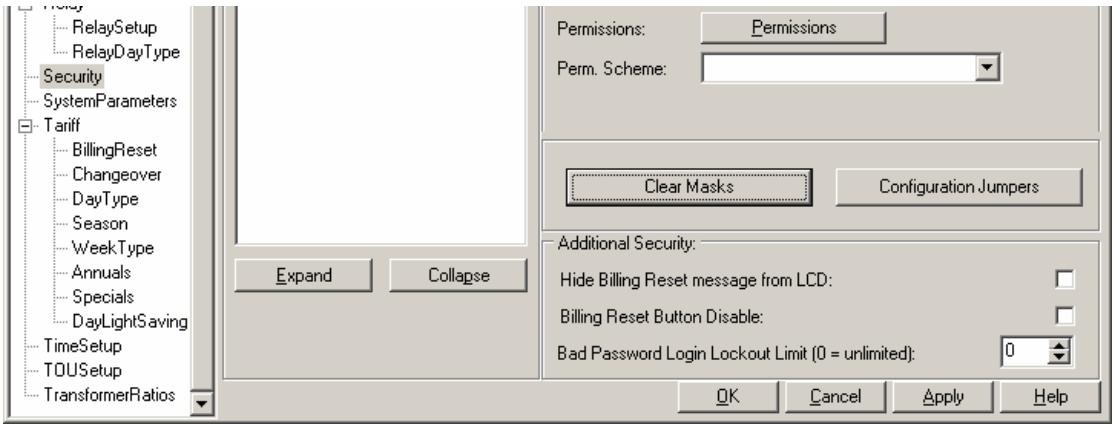
- Figure 8-24 *Billing Reset* special dates setup

The *Use Persian Calendar* option allows the special dates or the repeating date to be set using the Persian Calendar. In this case the date is entered as a day/month/year.

Persian Calendar edition firmware must be used if using Persian Calendar dates.

Disabling Billing Reset Button

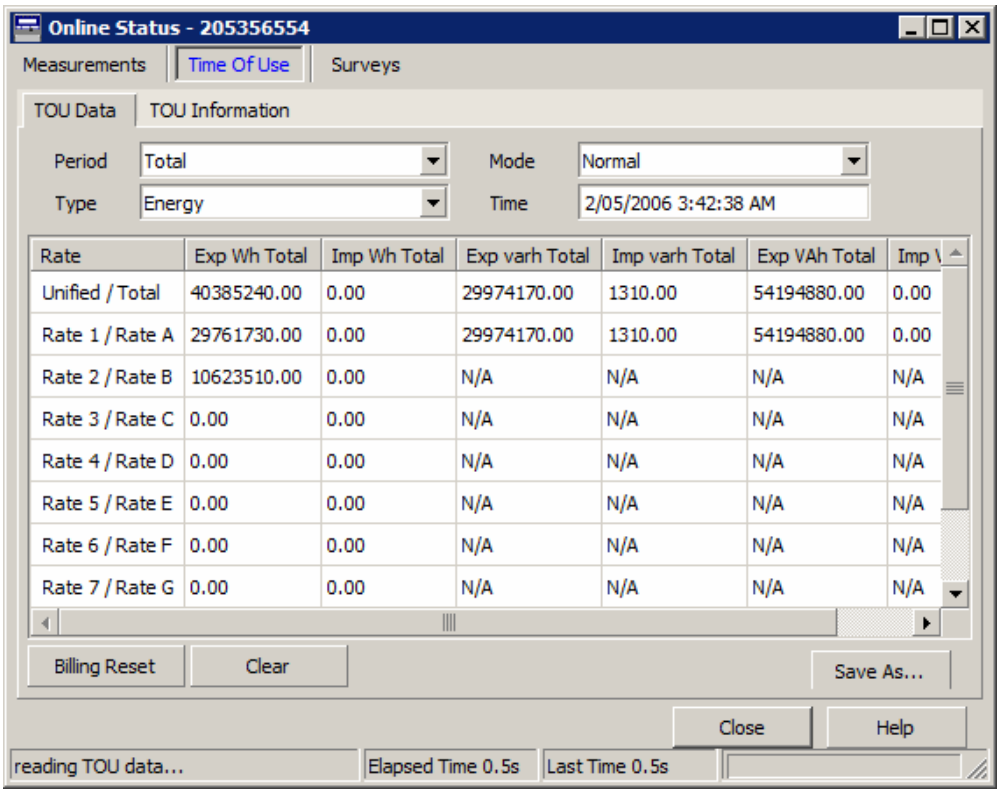
If manual billing reset is not required on meters with a billing reset button, go to Security Setup and tick *Billing Reset Button Disable*. Please refer to Figure 8-25. The *Hide Billing Reset message from LCD* option simply stops the "Billing Reset" phrase from being displayed on the LCD.



- Figure 8-25 Disabling the *Billing Reset* button

Viewing TOU

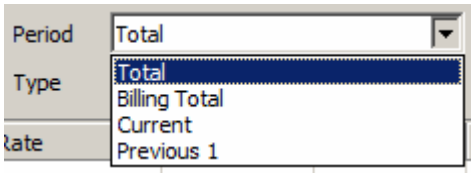
When connected to the meter there are a number of information pages available. Selecting *Screens* → *Status* on the *Time Of Use* tab brings up the main TOU status page (Figure 8-26).



- Figure 8-26 TOU status

The information is updated continuously from the meter, and displays the current meter time at the top. The screen automatically adjusts to the number of channels and rates. Selecting the *Type* will select which TOU readings are displayed. Fields that are not available will be marked as *N/A* – e.g. if a channel does not have a listed rate, or a time of maximum demand has not been set. *Mode* has no effect for Atlas meters.

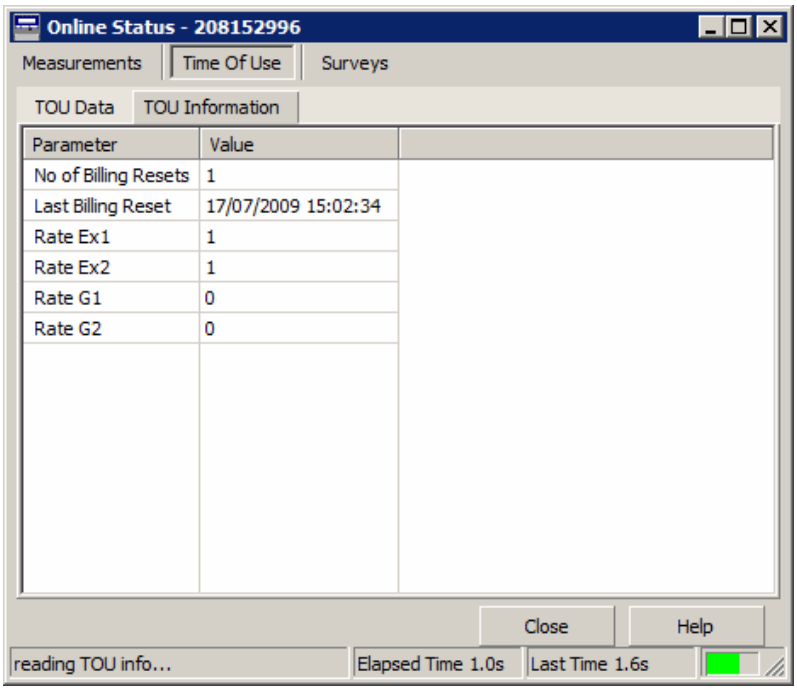
The *Save As* buttons allows the TOU information to be saved to a file.



- Figure 8-27 TOU Status period selection

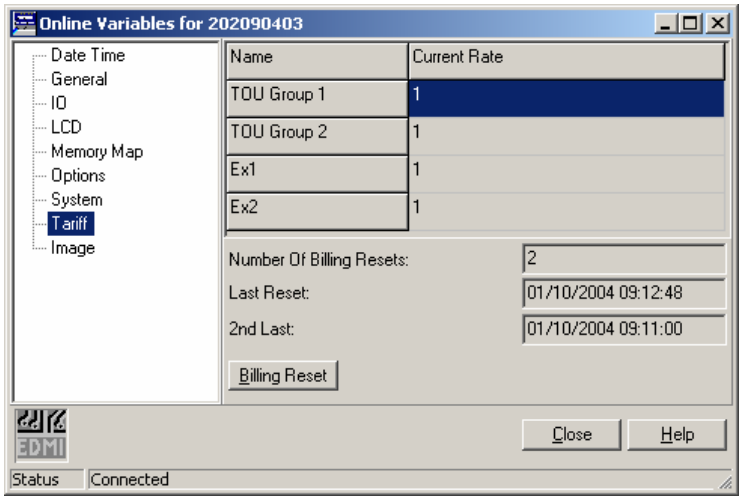
The *Period* setting in Figure 8-27 allows the billing period to be selected. Note that only the number of billing periods that are available for viewing are shown in the list. If a billing period occurs while this screen is shown the list may not be updated - exiting the screen and reopening it will refresh the list.

The *Billing Reset* will perform a billing reset. The *Clear* button will **clear** all TOU information, including all previous periods. Note that this does not do a billing reset – it clears everything.



- Figure 8-28 TOU Online Variables

The *TOU Information* tab (Figure 8-28) provides some status information about the TOU system – number of billing resets, date of the last reset, and the active rate for the 4 rate groups.



- Figure 8-29 TOU Online Variables

Similar system information is available under the *Online Variables → Tariff page* shown in Figure 8-29. The active rate for each rate group is shown, 1 being rate A, 2 being rate B and so on. The number of billing resets since the TOU system was last cleared is listed, along with the time and date of the last two billing resets. Note that

since these dates come from the stored billing periods themselves, if no previous periods are configured to be stored (Figure 8-1) they will not be available.

The *Billing Reset* button will ask the meter to do a billing reset immediately.

Intentionally Left Blank

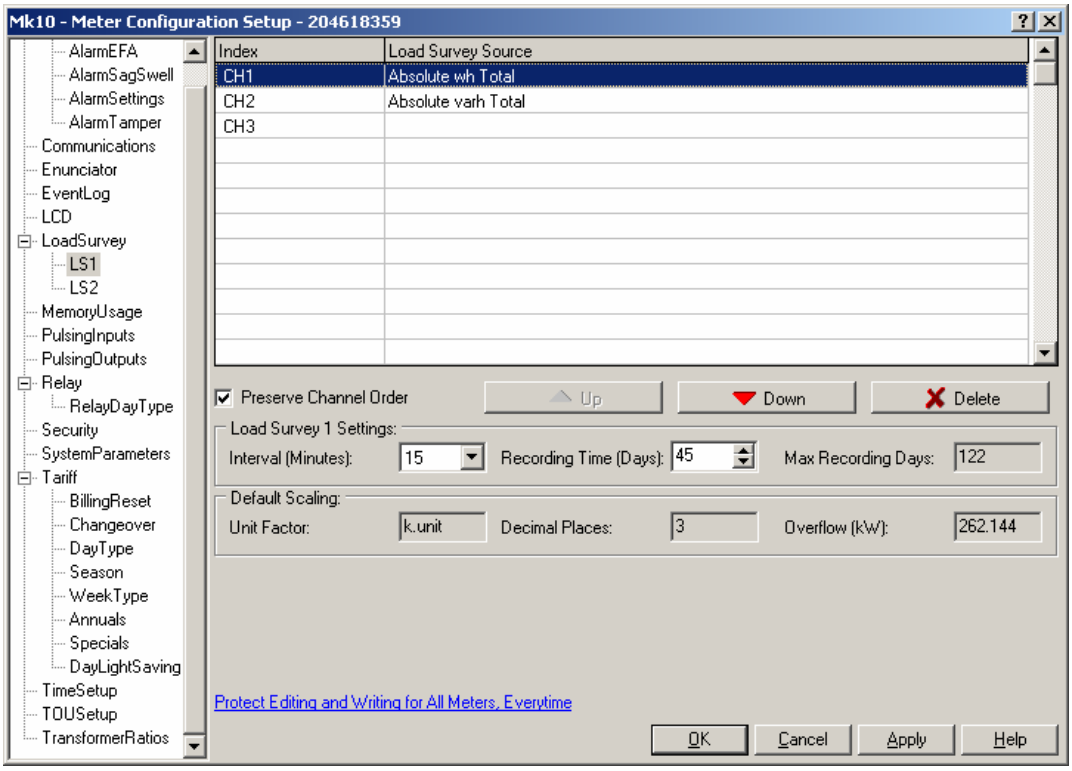
Chapter

9

Load Survey

A load survey, otherwise known as a load profile, is designed to give a detailed record of energy usage. The meter has two load surveys available, each independently programmable. Each can record up to 32 channels, although generally this is limited by memory. The load surveys in the meter also have the ability to record instantaneous figures such as voltage and current.

Survey Setup



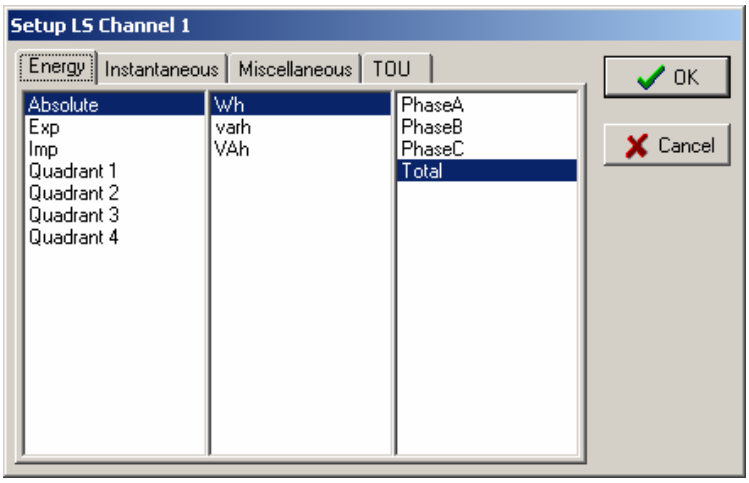
- Figure 9-1 *Load Survey Configuration* page.

Selecting *LoadSurvey → LS1* or *LoadSurvey → LS2* will bring up the configuration page (Figure 9-1). The list shows the configured channels. The Interval setting configures how long each recording interval is. The *Recording Time* allocates enough

memory to the survey to record for the specified time. The maximum recording time is indicated, based on available memory and the survey configuration. The scaling factors are discussed later (page 9-9), but default to sensible values. They operate in a similar way to TOU scaling factors.

To add a channel, double click on the last "blank" entry. To change a channel, double click on it. Both these actions will being up the source selection page (Figure 9-2). To delete a channel, select it then click the delete button.

This page may be protected from editing to reduce the risk of accidental change. To unprotect it select one of the *Edit* options at the bottom of the page. See "Protected Setup" on page 3-10 for more information.



- Figure 9-2 Load survey source selection

The channel setup works in a similar way to TOU channel setup, except that there are a few more options.

As with TOU, the Mk7 has Main, Load, and Neutral instead of Phase A, B, and C. Total is the sum of Main and Load. Unfitted elements are not shown, or listed as *Unused*.

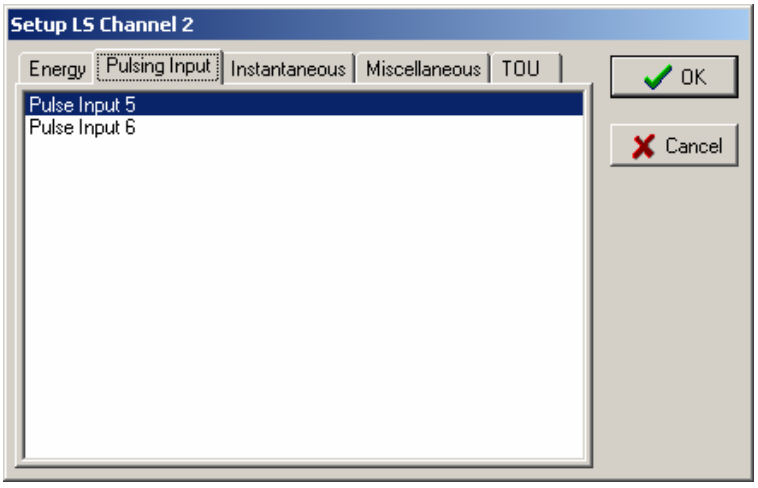
The *Energy* tab has all the energy quantities that the meter can measure. The first column selects which quadrant(s) the energy comes from. The *Absolute* setting reads positive energy for import or export energy. See Figure 2-31 on page 2-24 for clarification of import, export and quadrant conventions.

The second column selects the type of energy, Wh, varh, or VAh.

Finally the third column selects which phase to record the energy from. *Total* is the sum of all three phases. The individual phase selections allow energy from only one phase to be recorded, useful if there are separate loads on each phase or for tamper monitoring.

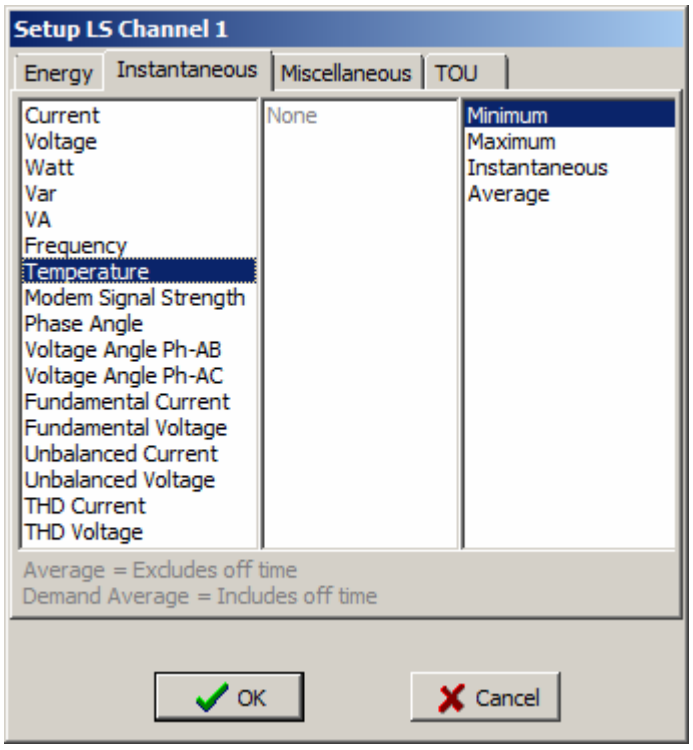
The order that some of the channels appear is determined by EziView for optimal memory usage. Thus after setting a series of channels EziView may rearrange them slightly. The *Preserve Channel Order* option will stop this optimisation from happening, but it may result in more memory usage.

When there are pulsing inputs configured in the meter a *Pulsing Input* tab becomes available. This shows the available pulsing inputs for selection (Figure 9-3).



- Figure 9-3 Pulsing input channel selection

The *Instantaneous* tab allows the recording of measured quantities such as voltage and current.



- Figure 9-4 Instantaneous channel selection

The first column selects the quantity to measure. *Average Current* is an average of the three phases, as is *Average Voltage*. *Watts Sum* is a sum of the three phases, as are *Vars Sum* and *VA Sum*.

Fundamental measures the fundamental component only of the selected phase of either voltage or current. *Unbalanced* measures the zero, positive, and negative sequence

components in a three phase system. *THD* measures the THD expressed as a percentage of the fundamental. Fundamental current, Unbalanced current and THD of current are not available in the current firmware (v1.31).

Fundamental, Unbalance, and THD readings are only available with the Power Quality firmware edition code.

Signal Strength was added in version 1.30 firmware. It allows the signal strength of the modem to be logged. A signal strength of 99 (unknown strength) is interpreted as 0.

Temperature is the internal temperature of the meter in degrees Celsius.

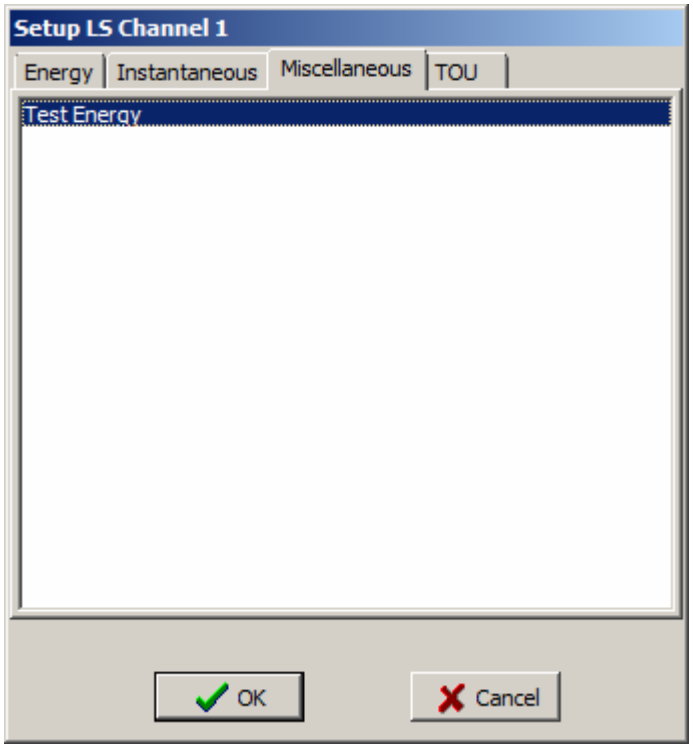
The second column selects the phase to record. The *Operation* column selects how to process the data.

When *Average* is selected, the meter averages the quantity over the interval. If the meter is turned off during part of the interval that time is ignored in calculating the average. The *Demand Average* option means that if the meter is turned off during part of the interval, that time will be counted as if the reading was zero for that period. E.g. A meter measuring 240W, and the meter is off for half of the interval. *Average* will report 240W, while *Demand Average* will report 120W.

Since *Demand Average* is more relevant for power quantities, the voltage and current *Demand Average* options are unavailable in Power Quality editions of firmware, to make room for the new Power Quality features – there use should thus be avoided. In newer versions of EziView (4.07) the voltage and current demand average options have been removed.

When *Minimum* or *Maximum* are selected, the meter calculates the minimum or maximum of the quantity over the interval, based on 5 cycle readings.

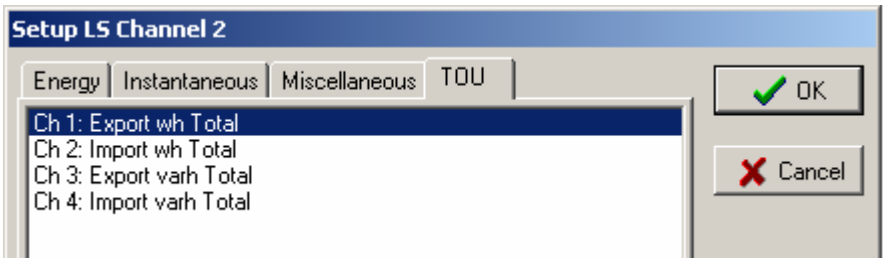
When *Instantaneous* is selected, the meter takes a single 5 cycle reading at the end of the interval.



- Figure 9-5 Miscellaneous channel selection

The *Miscellaneous* tab allows selection of special options. *Test Energy* uses a phantom Wh energy source, useful for testing when no load is available.

Changes to the channel setup will cause the load survey to be cleared in the meter. It may also clear the other load survey, the TOU system and reinitialise pulsing outputs, depending on the exact configuration.



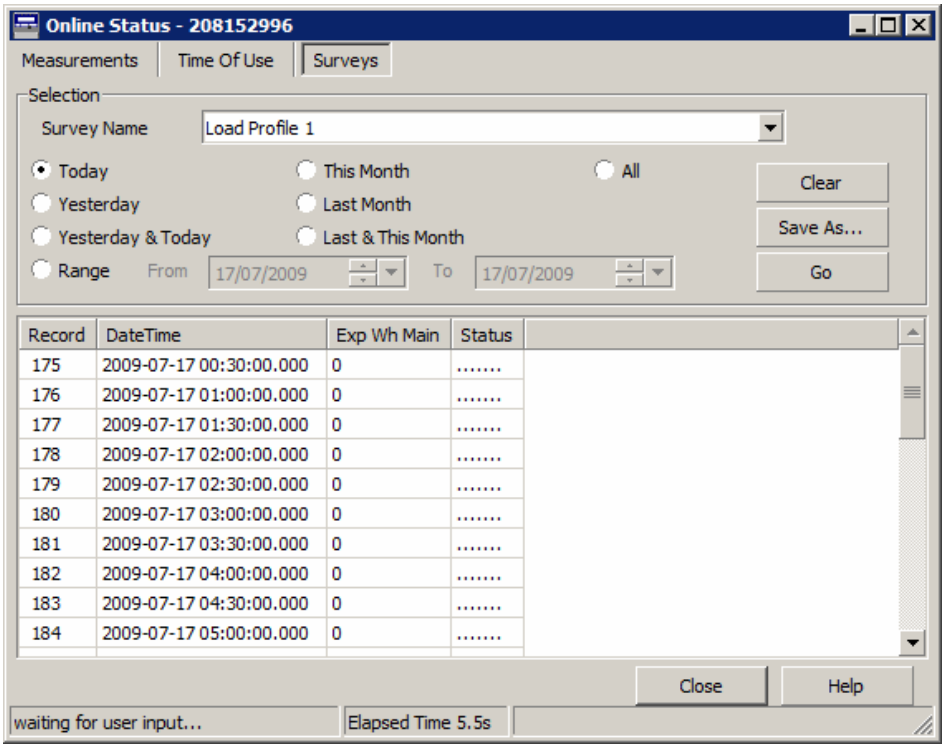
- Figure 9-6 TOU channel selection

The *TOU* tab allows TOU accumulated unified rate totals to be recorded in the load survey. Each one takes up the space of 2 normal channels. This requires a firmware edition that supports this feature. Figure 9-6 shows an example of the options.

You **MUST** have the "Wide Surveys" firmware edition that enables this feature. If the meter does not properly support it, you will get corruption of the load survey and TOU.

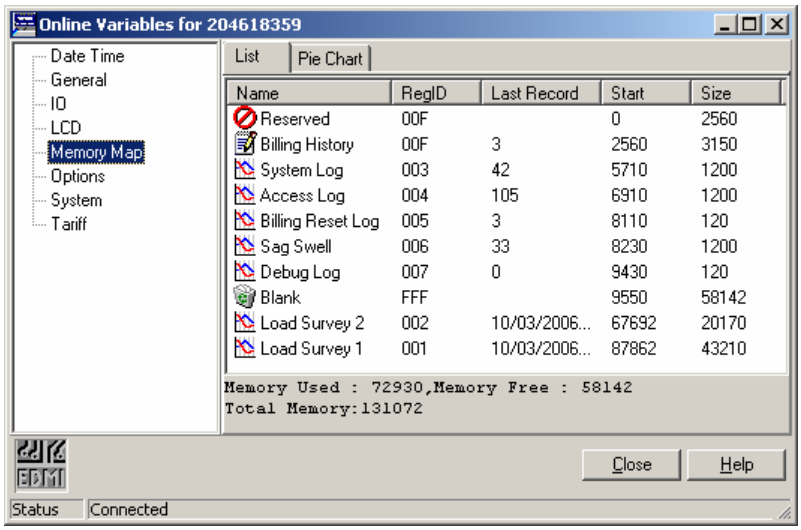
Retrieving a Survey

Surveys can be downloaded using a readings file (advanced usage), from the Status screen, or from the memory map page of online variables. Only the latter two are discussed here.



- Figure 9-7 *Online Status*

The *Status* screen *Surveys* tab (Figure 9-7) allows selected periods to be downloaded, or the entire survey. The data is displayed in the lower part of the page, or can be saved to a tab delineated file using the *Save as…* button.



- Figure 9-8 *Online Variables Memory Map*

To use the *Online Variables* screen (Figure 9-8, see Flash/EEPROM Memory Usage on page 4-3 for more information) right-click on the survey to download, and select either *Download* and select a filename to download to, or use the *Send to* option. Programs to use with *Send to* can be entered using the *Make New…* command in the *Send to* menu.

The survey is downloaded as a text file with a tab delimited format, similar to Figure 9-9. The header section is used by EziView to track download progress. Each record has a unique number starting from when the survey was started, which is only reset if the survey is cleared. The time and date is of the end of the interval that the value was recorded over.

[LoadSurvey]
LastRecord=000000007
StartTime=20/01/2004 10:56:00

Record No	Date/Time	V PhC Min (0x00002185)	V PhC Max (0x00002285)	V PhC Inst (0x00002385)	V PhC Acc (0x000000A5)	Status
0	20/01/2004 10:56:00	243.00	249.96	246.91	236.91	.I.....
1	20/01/2004 10:57:00	246.83	246.96	246.86	246.88	....W..
2	20/01/2004 10:58:00	246.83	247.31	246.88	247.05	....W..
3	20/01/2004 10:59:00	246.80	246.94	246.84	246.88	....W..
4	20/01/2004 11:00:00	246.82	247.25	246.89	247.02	....W..
5	20/01/2004 11:01:00	246.82	246.93	246.86	246.87	....W..
6	20/01/2004 11:02:00	246.82	247.19	246.88	247.02	....W..
7	20/01/2004 11:03:00	246.85	247.00	246.93	246.91	....W..

- Figure 9-9 Downloaded survey

The status channel records a series of flags about the interval, mostly for use with data validation. Table 9-1 lists the options.

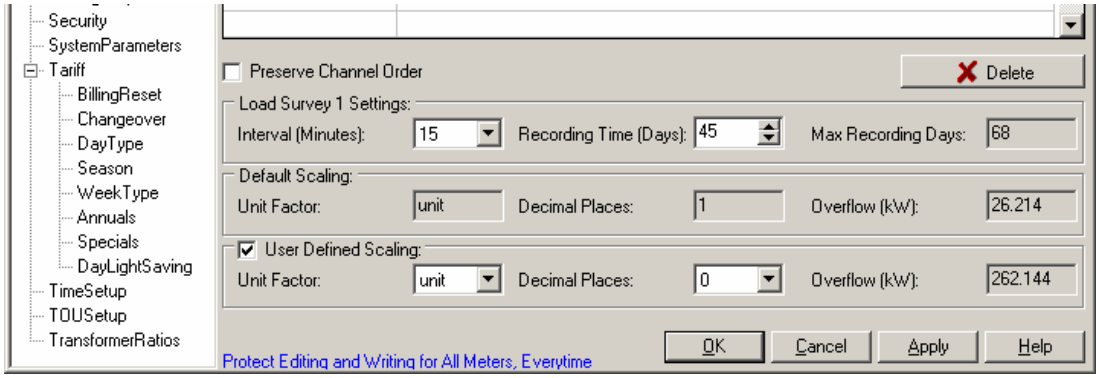
Bit	EziView Code	Meaning
0	A	Absent Reading - Filled entry - no data. All data values to be ignored (they will generally be zero)
1	I	Incomplete interval. Normally this specifies any interval where the interval was short or long, whether due to a time change or power outage, or the very first interval. When the *Load Survey I Flag on all Intervals with a Time Change* option is set (See Figure 11-2) then the I flag only flags intervals where a time change occurred (or that a time change skipped over). Usually used with the P flag option on the same page, this separates the P and I flags to indicate short/long intervals due to time changes, or short/long intervals due to power outage.
2	P	Power failed during interval. This is set in the interval where power was lost, not where it just continued to be lost or was restored. The operation can be changed to indicate the P flag in all intervals where power was lost, restored, or continued to be lost, using the *Load Survey P Flag on all Intervals with a Power Outage* setting. See Figure 11-2.
3	L	User programmable flag derived from the active EFA status. MV90 labels this as a critical error using interval bit 5.
4	W	User programmable flag derived from the active EFA status. MV90 labels this as a clock error using channel bit 7.
5	U	User programmable flag derived from the active EFA status. MV90 labels this as a VT failure using channel bit 9. May also be configured to indicate a setup change using the *Load Survey U Flag Records Setup Changes*. See Figure 11-2.
6		Reserved

- Table 9-1 Survey status byte information format

Scaling, Units and Overflows

The *Scaling* settings allow for the default settings that EziView makes to be overridden. These can be used to increase the resolution of survey entries, or set a certain multiplier. They only affect energy quantities – the scaling of instantaneous quantities is always controlled by EziView.

The meter records energy as pulses, each pulse representing an amount of energy. If the meter is showing Wh to 1 decimal place, each pulse is 0.1 of a Wh. The meter can record up to 65535 pulses in an interval. Beyond this it will "saturate" at 65535 until the end of the period, and flag a pulsing overflow EFA.



- Figure 9-10 Survey scaling setup

Figure 9-10 shows the survey scaling setup. The *Default Scaling* sections indicate what EziView recommends based on the interval and maximum voltage and current. The indicated *Overflow* amount is designed to give an indication of the maximum power the meter can record continuously before overflow occurs.

E.g. in Figure 9-10 the *Overflow* is 26.214kW. With the 15 minute period, this means that a maximum of 6.5535 kWh can be recorded in an interval before saturation occurs. On a 3 phase, 240V system this would represent a continuous load of around 36 amps.

Do not use *User Defined Scaling* unless you are very sure of what you are doing. Incorrect use can lead to overflows and truncation. Beware of situations such as setting a user defined figure, then changing transformer ratios. Due to the risks, *User Defined Scaling* settings are now hidden. If you need to use them contact EDMI.

If the load is known to be less than 3.6 amps on average, the scaling can be overridden to something like a unit scaling with 2 decimal places. This is done by checking the *User Defined Scaling* box and setting a new scaling. EziView will warn that the changes are different to the recommended settings.

The unit factor and the number of decimal places apply to the display and resolution of an interval.

The other usage is to change the multiplier. If in the example the energy is wanted to be shown as kWh rather than Wh, EziView can be overridden. Set the *Unit Factor* to "k" and the decimal places to 4 to get the same effective scaling, but with a scaling factor of k.

Chapter

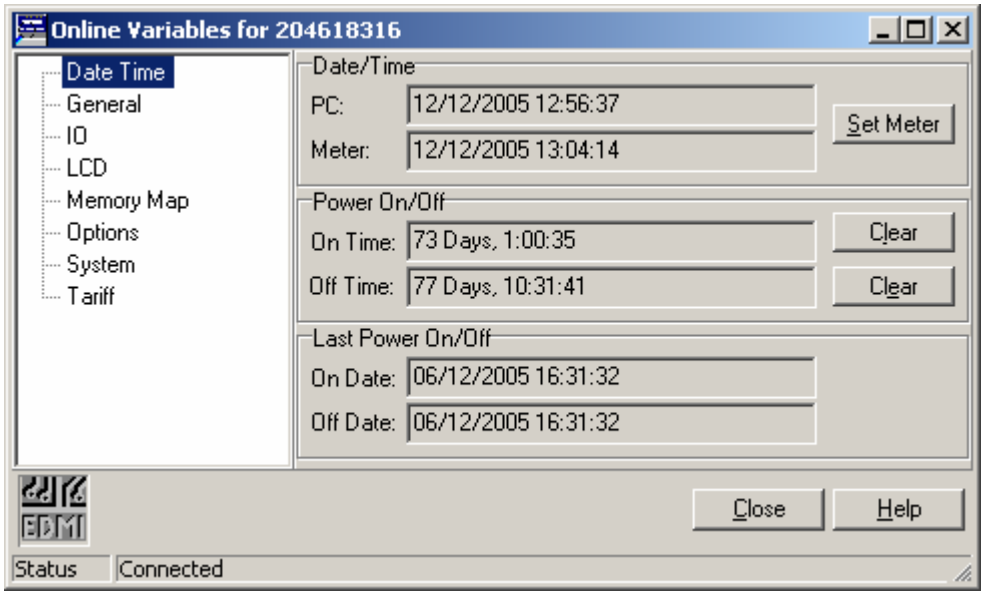
10

Date and Time

Time is a fundamental quantity. The management of time is extremely important, especially in how time changes are handled. For example, having two 2pms in the one day is not physically possible, but is possible for the meter to experience when a time change occurs.

Changing the Time

Time and date information from the meter is accessible from the *Screens → Online Variables → Date Time* dialog in EziView (Figure 10-1).



- Figure 10-1 EziView Date and time page.

The top panel displays the time on your computer (*PC*) and the time read from the meter. To set the time on the meter to the same as the computer click the *Set Meter* button.

Changing the time may have an effect on stored data. Make sure you understand the possible consequences before changing the clock by large amounts (see below).

The time displayed is daylight saving time. As such, the computer time should be set to daylight saving time – not standard time.

Note that EziView checks the time difference between the meter and the computer when transferring setup with the meter. If the time difference is too large, it will ask if it should synchronise the time. See Chapter 3 – "Configuration Basics" for more information.

Consequences of Changing the Time

Changing the time may affect the time of use and load survey systems.

For TOU, if a billing reset is skipped, it will be performed. If multiple billing resets are skipped, only one will be performed. Setting the time backwards will not cause a billing reset to be performed as it is assumed to have already happened. Energy accumulation and maximum demand calculations will immediately change to the rate of the new time, though the first maximum demand periods will be skipped since they represent partial intervals.

For load surveys if the time is changed forward the affected period at the start and the end (for a large change) will be marked as incomplete intervals. Any periods skipped over will be marked as absent. If the time is set back by less than an interval it will result in a longer than normal interval. If the time is set back by more than one interval (ie one complete interval is skipped over), the load survey will be cleared.

Year 2000 Issues

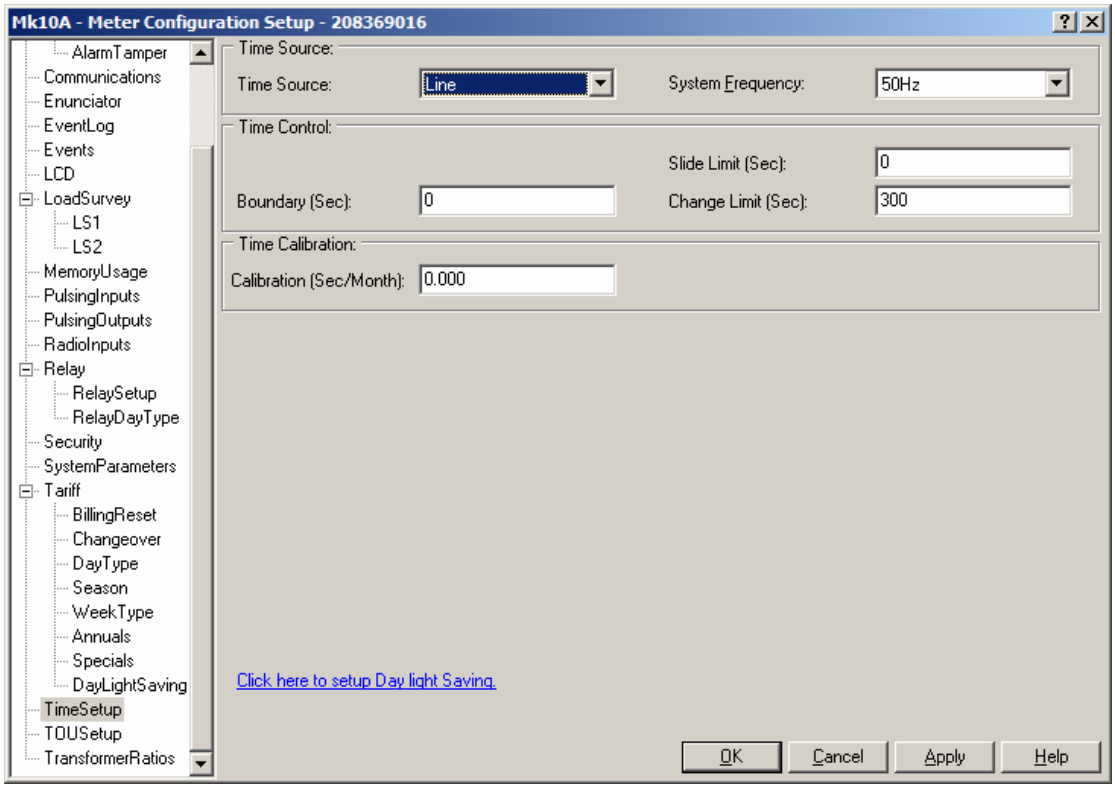
The meter is fully year 2000 compliant. It uses two-digit year, with a defined pivot date of 96. Years from 96 to 99 are treated as 1996 to 1999. Years from 00 to 95 are treated as 2000 to 2095. The year 2000 is treated as a leap year. The meter keeps time internally as the number of seconds since the start of 1996, using 32-bit numbers to ensure operation beyond 2050.

Timing Source

The reference for timekeeping may come from one of two sources. The first is an internal crystal clock. This clock is also maintained during loss of power by the meter's battery.

The second time source synchronises the time to the system frequency of the measured voltages and currents, any phase. Many generation authorities adjust the system frequency slightly over the course of the day to ensure that clocks based on the system frequency read correctly in the long term. There may be some short-term variations that will depend on the generation authority.

The meter may be set to operate only on the internal crystal clock (called *Internal* operation), or to operate in the system frequency (called *Line* operation). In *Line* mode the clock will revert to *Internal* operation if there is no signal to extract the system frequency from.



- Figure 10-2 EziView date and time setup page

The time source is configured via EziView's *TimeSetup* page (Figure 10-2). Set the *Time Source* field to the required mode of operation. The *System Frequency* field allows the base system frequency to be specified.

Time Calibration

The *Time Calibration* setting allows the internal clock accuracy to be adjusted. The clock is calibrated in the factory, but external factors such as average temperature can affect accuracy. The setting may be made here in seconds per month (for a 30 day month). A positive value will make the clock run faster.

Time Change Control

The *Time Control* settings allow the effect of time changes to be lessened. *Change Limit* is the time in seconds that a low level user can change the time by in one go.

If a time change is less than the number of seconds in *Slide Limit*, the time change is not made straight away. Instead the time is sped up or slowed down by up to 2 seconds per minute to catch up with the programmed time. When changing the time it will appear that the time has not changed, but after the time has been allowed to slide the time will be correct.

The *Boundary* setting is used to minimise the effect of time changes on load surveys and demand calculations. The setting is in seconds, and should generally be set to match the demand and/or survey period. If a time change would cross an interval the meter will delay the time change so that it will only affect one interval. If the time change would cross more than one boundary a normal time change is made. If the meter can slide the time, then the boundary functionality will not be used.

For example: a meter with 30 minute load survey and demand intervals, using the recommended *Boundary* setting of 30*60 = 1800 seconds. This creates boundaries at half hour intervals (eg 8:00, 8:30, 9:00). A time change from 8:25 to 8:35 would be delayed until 8:30, when the time would change to 8:40. A time change from 8:35 to 8:25 would be delayed until 8:40, when the time would change to 8:30. A time change from 8:10 to 8:20 would occur normally, since it does not cross a 30 minute boundary.

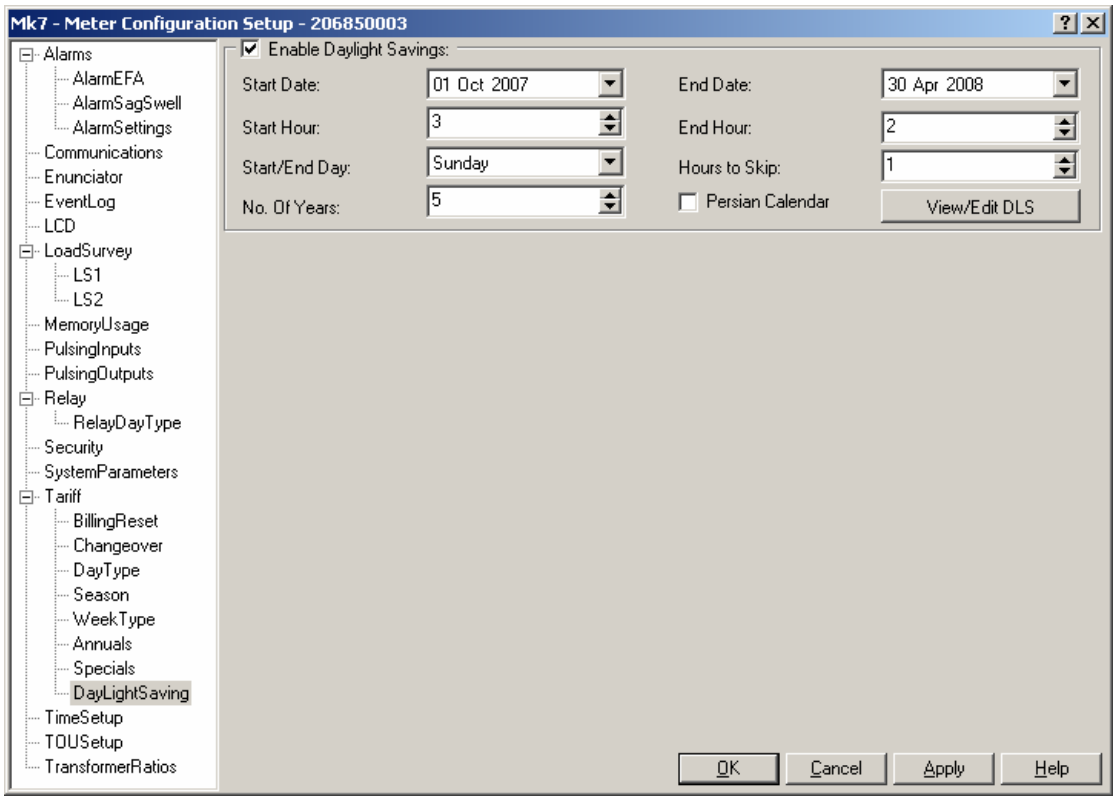
In this way only the 8:30 – 9:00 interval is affected by the time change, rather than both the 8:00 – 8:30 interval and the 8:30 – 9:00 interval.

Loss of Power

If no battery is fitted or it is discharged the meter will use the time that the meter powered off, or if that is not available then it reverts to 1/1/1996. A *Clock* alarm will also be raised. Restarting with the "power off" time reduces the possible "loss" of data that changing the time could cause.

Daylight Saving

The meter fully supports daylight saving. Figure 10-3 shows the setup page.



- Figure 10-3 EziView date and time setup page – *Daylight Savings*.

Check the *Enable Daylight Savings* box to enable the other settings. When unchecked daylight saving is not used, and daylight saving time is always the same as standard time.

Daylight Saving requires an edition for firmware that supports it (DLS). If this is not present, daylight saving setting will be ignored by the meter.

Start Date: The date on which daylight savings will begin. The exact date on which daylight savings will occur will be the day (*Start/End Day*) on or after the set date, unless it is set to fixed day.

Start Hour: This is the hour during the day when daylight savings will become active on the specified date, generally 2 or 3 am. This is always specified as standard time.

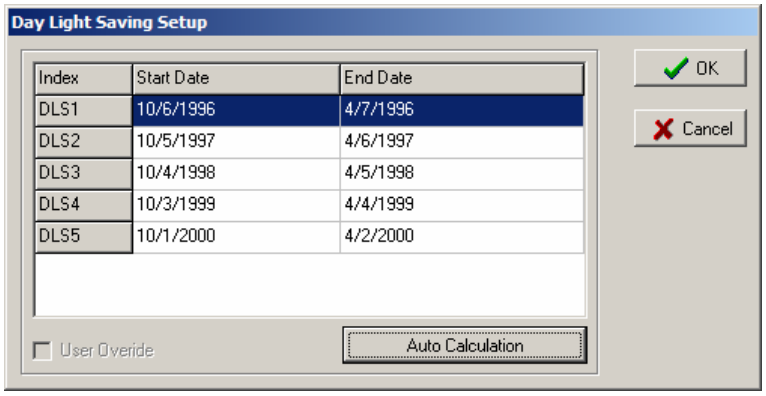
Start/End Day: This is the day of the week on which daylight savings will begin or end. In most cases this will be Sunday. The *Fixed Day* option makes the changeover occur on the exact date.

The *End Date* is the date on which daylight savings will end. The exact date on which daylight savings will occur will be the day (*Start/End Day*) on or after the set date, unless it is set to fixed day. The *End Date* must follow the start date and be within 12 months. For Southern Hemisphere use this means the *End Date* will be a date in the year following the *Start Date*.

The *End Hour* is set to the **standard time** at which time should revert back from summer time. This means if the rule is to change the clock back an hour at 3am (making it 2am), the setting would be 2am.

The *Hours To Skip* setting specifies in whole hours the number of hours to jump forward on the *Start Date* and the number of hours to jump back on the *End Day*.

No of Years specifies how far ahead EziView calculates daylight saving time. Beyond this time the meter will stop changing into daylight saving time. The *View/Edit DLS* button brings up a page (Figure 10-4) to edit the exact dates of change.



- Figure 10-4 Daylight saving details

The exact switchover times that EziView will write to the meter are listed. The Auto Calculation button will recalculate them based on the previous page's settings (and they will generally recalculate when the page settings change). These dates can be edited, to allow for cases where daylight saving was different (e.g. for the Sydney 2000 Olympic games the daylight saving start date was changed for that year only).

Example

To set the start time to be 2 a.m. (Standard Time) on the first Sunday in February:
Start Hour = 2, *Start Day* = Sunday, *Start Date* = 01/02/xx

To set the end time to be 2 a.m. (Summer Time) on the last Sunday in October:
End Hour = 1, *End Day* = Sunday, *End Date* = 25/10/xx

Register F061 reports the system time after any daylight savings corrections have been added. The register cannot be written. The meter time can only be set to standard time through the normal registers.

Persian Calendar allows the start and end date to be entered using the Persian Calendar system. This requires an edition that supports the Persian Calendar.

How DLS affects meter operation

1) The actual time change will occur as follows in Table 10-1 for the previous example of start/end times in 1999 using a jump of one hour:

Time	Time Mode
01:59:58 07/02/99	Standard
01:59:59 07/02/99	Standard
03:00:00 07/02/99	Summer Started
03:00:01 07/02/99	Summer
…	Summer
01:59:58 31/10/99	Summer
01:59:59 31/10/99	Summer
01:00:00 31/10/99	Standard Started
01:00:01 31/10/99	Standard

- Table 10-1 DLS example 1

2) Load surveys and event logs will always use standard time for the date stamp. The record of Billing Reset in the event log is in standard time.

3) The TOU system (billing resets, rates, seasons and changeover) will run off summer time if daylight saving is active and standard time if it is inactive. All TOU registers including time of maximum demand and date/time of billing resets are recorded in summer time.

4) Avoid setting billing resets to occur in the period over which the time jumps. From the example, a billing reset set to occur at 2:30:00 07/02/99 (standard time) will not occur since there is no actual 2:30 on that day. Similarly, a billing reset set to occur at 1:30:00 31/10/99 (summer time) will occur twice, since there are two instances where the time is 1:30.

5) Settings such as rates and seasons will work correctly. However if a range begins during the period in which time is changed back, the results may seem odd. In the case of a season or a rate beginning at 1:30:00 31/10/99 (summer time) the following would result (Table 10-2).

DLS Active?	Time	Active Rate
D	01:29:59 31/10/99	Rate 1
D	01:30:00 31/10/99	Rate 2
D	01:30:01 31/10/99	Rate 2
D	…	Rate 2
D	01:59:59 31/10/99	Rate 2
Ending	01:00:00 31/10/99	Rate 1
	01:00:01 31/10/99	Rate 1
	…	Rate 1
	01:29:59 31/10/99	Rate 1
	01:30:00 31/10/99	Rate 2
	01:30:01 31/10/99	Rate 2

- Table 10-2 DLS example 2.

This is correct since there are two 1:30 time instances on 31/10/99.

6) To display standard time on the LCD use register F03D. Register F061 gives daylight saving time, but cannot be written. All time settings to the meter are done using standard time to avoid ambiguous times. EziView converts daylight saving time to standard time when writing the time to the meter.

7) Modem power cycle times and GPRS push timings are based on standard time.

Time Statistics

The meter maintains a set of statistics about when it was operating. These can be useful in fault and outage tracking, and in tamper detection. The *Screens → Online Variables → Date Time* dialog in EziView displays this information (see Figure 10-1).

The *Power On/Off* panel gives accumulated power on and power off times since they were last cleared. To clear the on and off times click associated *Clear* button. The off time count can be used to monitor the usage of the meter's battery.

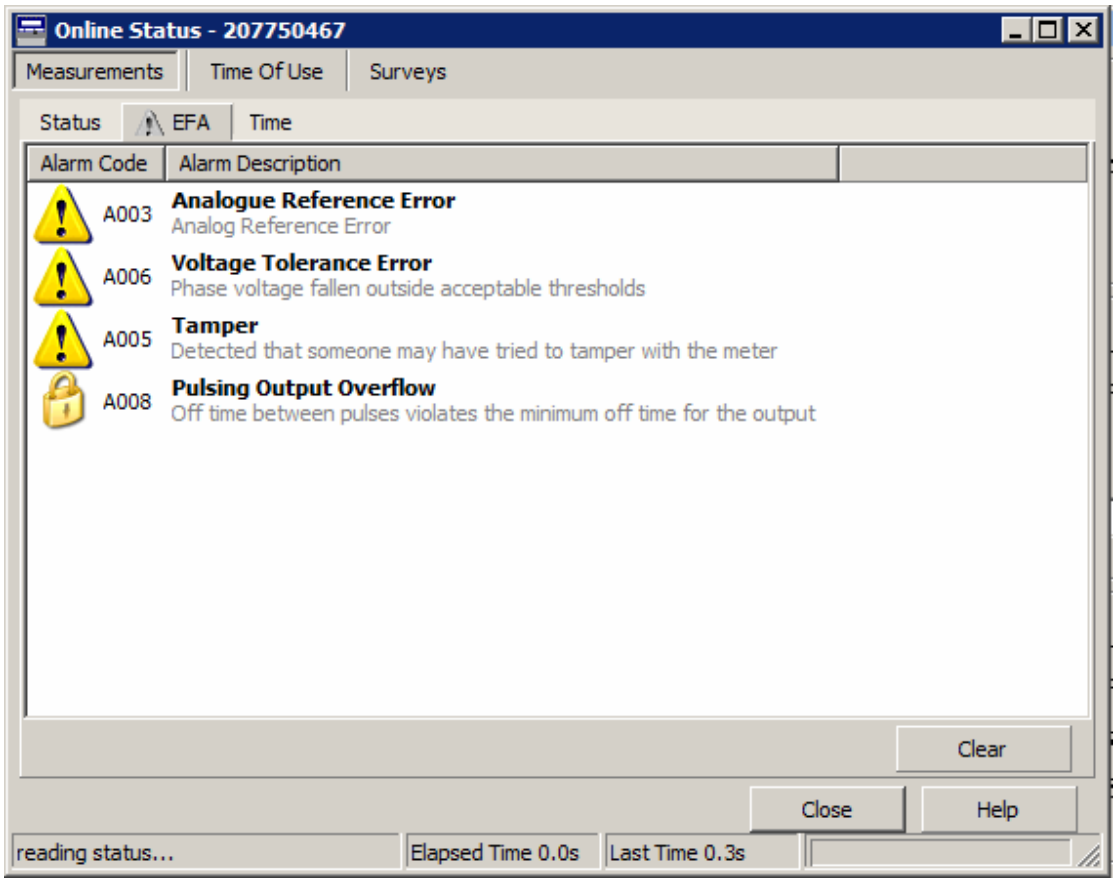
The *Last Power On/Off* panel gives statistics about when and how long ago that power was last lost and applied.

Chapter

11

Alarms

During operation the meter monitors a variety of internal and external conditions. If a problem is detected an alarm is raised called an *Equipment Failure Alarm*, or *EFA*. These tests are designed to detect measurement faults, tampering attempts, and hardware failure.



- Figure 11-1 EziView *Status* screen

The alarm status can be viewed on the *Screens* → *Status*, *EFA* tab screen using EziView (see Figure 11-1). Unique alarms are raised for different types of monitored conditions. In this case there is a series of active measurement and tamper alarms (indicated by), and a latched Pulsing Output Overflow alarm (indicated by). The EFA tab

flashes when there are active alarms. Latched alarms can be cleared using the *Clear* button.

Alarm States

There are 17 different alarms, each representing a different type of fault. Each alarm has a corresponding flag letter that represents it, listed in Table 11-1. There is also an alarm code, which ties in with MultiDrive alarm handling.

Flag Letter	Alarm Name	Alarms Page Code
E	Analog Reference Failure	A003
S	Asymmetric Power on Mk10 Neutral current Mismatch on Mk7	A000
V	Voltage Tolerance Error.	A006
F	VT Failure.	A007
R	Incorrect Phase Rotation. (not on Mk7)	A002
T	Lid Tamper	A005
C	Clock Failure.	A017
M	Reverse Power.	A004
L	Calibration Data Lost.	A001
H	Modem Failure.	A012
X	RAM Failure or LCD Failure.	A015
Y	Program Flash Failure.	A015
Z	Data Flash Failure.	A015
N	Pulsing Output Overflow.	A008
D	Battery Failure	A016
U	Tamper	A005
O	Overcurrent (Extra EFAs group)	

- Table 11-1 Alarm names and flag letters.

An alarm flag can have one of 3 states. The active state means that the alarm has been detected and is still occurring. The latched state means that the alarm was active but isn't now. The inactive state means that the alarm is not active and has not been in the past.

Latched alarms stay latched even if power is removed from the meter. They may be cleared using the *Clear Flags* button on the *Screens* → *Status* screen in EziView.

Alarms that should not cause an EFA may be disabled. Each alarm has a mask that stops it from causing an EFA when set.

When reading the alarm state from a register a string format is used. The alarm status is displayed as a string of 16 characters, with each alarm's flag letter used to indicate an alarm. An inactive or masked alarm is represented by a full stop. An active flag is represented by upper case. All flags active looks like "ESVFRTCMLHXYZNDU". The full stop represents an unused alarm position. The letters always appear in the same locations.

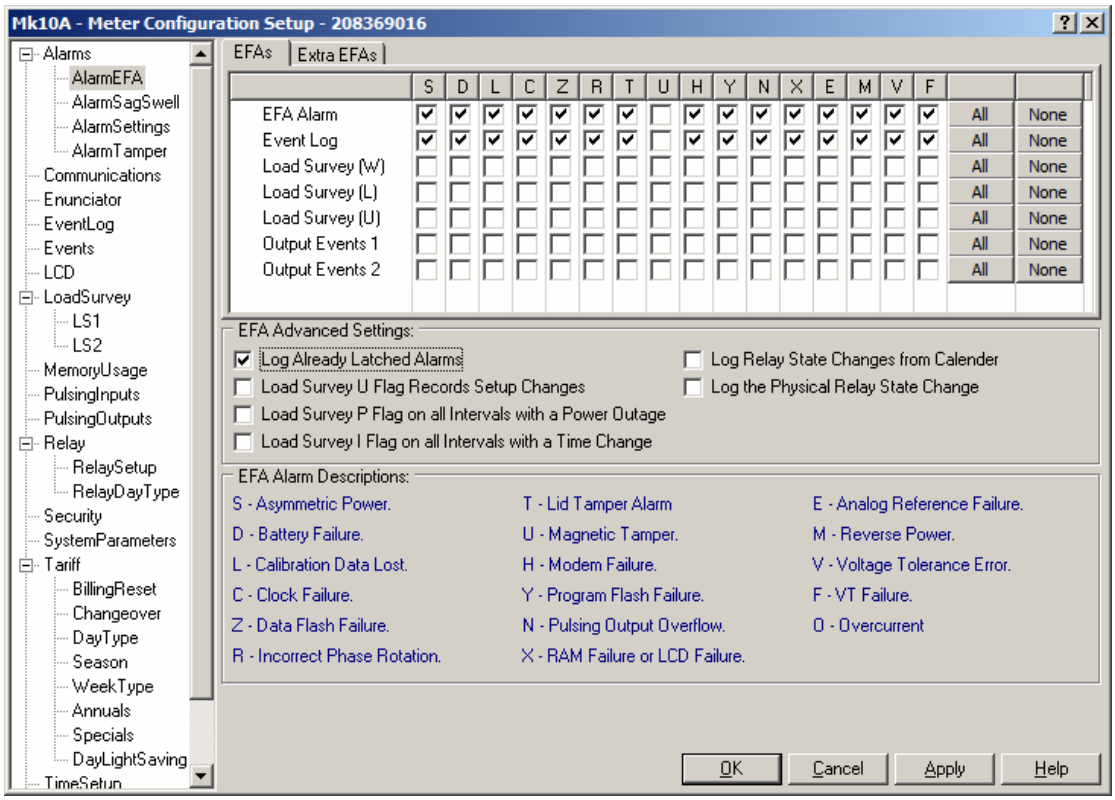
In version 1.40 firmware space for an extra 16 flags was added, the first of these being the Overcurrent alarm. This second set of flags has its own registers for display. All active for the second set looks like "O……".

EFAs can be displayed on the LCD Screen. Please refer to Chapter 6 under the "LCD Setup" section. Pulsing outputs and enunciators can also be used to indicate a particular EFA being raised (refer to Chapter 13).

When an EFA is raised and indicated on the LCD Screen, it may not mean that the meter itself is malfunctioning. Some EFAs are caused by external abnormalities – check which EFA is active.

Alarms

There are 17 types or alarms available.



- Figure 11-2 Alarm masks

The *EFAs* and *Extra EFAs* tabs at the top of the screen allow selection between the first 16 and second 16 alarms.

The checkboxes at the top half of the screen define a series of 7 alarm masks. When the checkbox for an alarm is checked, that alarm is allowed to trigger that EFA. The *EFA Alarm* mask is used to generate the generic EFA alarm. The *Event Log* mask affects which alarms will generate an event in the event log. The *Load Survey* masks affect which alarms will cause the respective EFA flags to be set in the load survey entry's status field. The last two are for general use with output or enunciator control.

The *All* button will set all checkboxes for that row, and the *None* button will clear all the checkboxes (note it does not set the checkboxes on the other tab).

Normally when an event log EFA is raised, it is recorded in the event log only if the alarm is not already latched. If the *Log Already Latched Alarms* box is checked, the meter will log the occurrence of an EFA even if it is already latched.

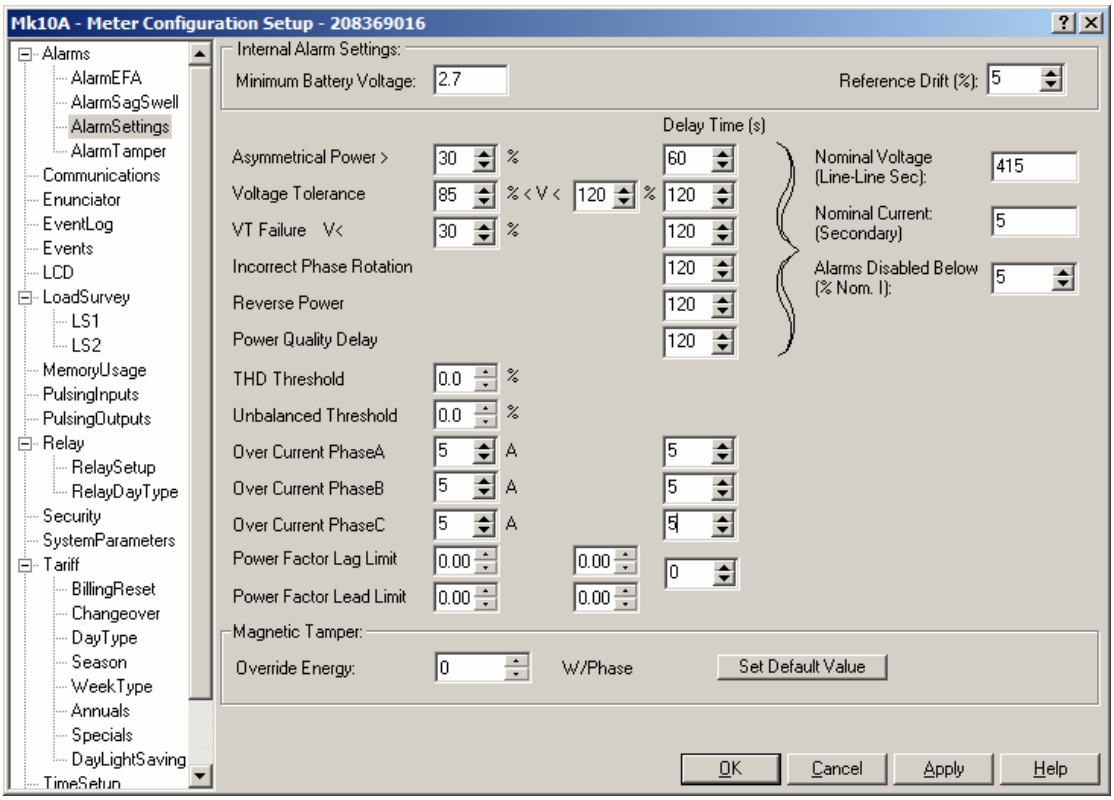
The *Load Survey U Flags Record Setup Changes* option causes the **U** flag in load surveys to be set if a setup change occurs in that interval. This is in addition to any EFA flags that may be configured in the settings above to activate the **U** flag. This feature requires firmware version 1.18 or later.

The *Load Survey P Flag on all Intervals with a Power Outage* option causes the **P** flag in load surveys to be set for all intervals where power was lost, restored, or absent. The default mode of operation is to only set the **P** flag for intervals where power was lost. This feature requires firmware version 1.18 or later.

The *Calendar is Used to Change Relay State* option will put entries into the system event log (code 60) when a relay is switched by a calendar program, such as setting a relay to turn on and off for a certain time period every day.

The *Relay Physical Switch Used to Change Relay State* option will put entries into the system event log (code 61) whenever the relay physically changes state. This is in addition to the other relay change log entries, and signals exactly when the relay physically changed state.

Many of the alarms have options as to when they will trigger. Figure 11-3 shows the available options.



- Figure 11-3 Alarm settings

The *Nominal Current* is the nominal secondary current of the meter. This is the nominal current at the meter terminals. *Alarms Disabled Below* sets a condition (referred to as *Imin*) that stops alarms from activating when the current is very low – useful to stop false triggers.

The *Nominal Voltage* is the nominal secondary line to line voltage of the Mk10 meter. This is the nominal voltage at the meter terminals. For example, a 110V/63.5V system the *Nominal Voltage* should be set to 110V, regardless of whether the meter is connected in 2 element or in 3 element mode. The voltage is always specified as a line to line voltage – the meter adjusts it automatically based on the element mode.

The *Nominal Voltage* is the nominal secondary line to neutral voltage of the Mk7 meter. This is the nominal voltage at the meter terminals. For example, a 415V/240V system the *Nominal Voltage* should be set to 240V.

Voltage and Current Setting

Many of the alarms have settings relative to the *Nominal Voltage* and *Nominal Current*. These are *Asymmetric Power*, *Voltage Tolerance*, and *VT Failure*. All these plus *Incorrect Phase Rotation* and *Reverse Power* have a time they must be active for, and a current that must be flowing before they are active (*Alarms Disabled Below* setting). These factors are used to prevent false triggering.

The *Asymmetrical Power* setting gives the limit in percent for the unbalance in power. The *Voltage Tolerance* figures set the allowable voltage range, given as upper and lower percentages of nominal. The *VT Failure* setting gives the minimum VT voltage (referred to as *VT fail*), given as a percentage of nominal.

Battery and Reference Settings

The *Minimum Battery Voltage* is the setpoint in volts at which a low battery alarm will be triggered. The *Reference Drift* setting is used for the *Analog Reference Failure* EFA.

THD and Unbalance Settings

These set the level at which a THD or Unbalance event is added to the event log, The *Power Quality Delay* sets the time that these limits must be exceeded continuously before an event is registered. The *THD* event is calculated from the voltage THD's, and the *Unbalance* event is calculated as ((voltage negative sequence) / (voltage positive sequence)) * 100 = %. The maximum setting for the limits is 25.5%, in 0.1% steps.

See Power Quality on page 12-11 for more information.

Over Current

The *Over Current* settings give the setpoint in Amps which if exceeded will trigger an *Over Current* EFA. The setting can be made per phase, or per element for Mk7 meters. There is a separate delay control for each phase/element.

Power Factor Lag Limit

These settings configure the Power Factor monitor, which monitors the per phase (not in 2 element mode) and total power factor of the meter. If a power factor when in lag is less than the first setting for the delay period, a low severity lag power factor start event is added to the event log. When less than the second setting for the delay period a high severity lag power factor start event is added to the event log. When the power factor returns within limits an end event is added to the log. The event includes the phase affected, and operates independently per phase and total.

Only available in firmware version 1.40 and later on enhanced processor meters. If all 4 (high/low, lag/lead) limit settings are zero the feature is disabled. See Power Factor on page 12-16 for more information.

Power Factor Lead Limit

As per the *Power Factor Lag Limit*, but for leading power factors.

Magnetic Tamper

Setting a non-zero value here will cause the meter to register that much power while a magnetic tamper is detected. The idea is to make the meter read maximum if a tamper is detected to discourage tampering the meter.

Alarm Types

A detailed description of each alarm is provided below.

Note that where a programmed delay time is specified, this means that the fault must exist continuously for the set time before an alarm will be raised. Meter reset/loss of power will restart the timers.

Analog Reference Failure - E

This is a check of the meter's measurement reference. If it has shifted by a significant amount the alarm is triggered. The allowed variation may be set. Variations of several percent are normal, as the reference is checked against a regulated voltage.

Calibration Data Lost - L

This is a check for valid calibration data in the meter. If the calibration data has been lost or cleared a "Calibration Data Lost" alarm will be raised. This will occur if a unit has never been calibrated, or if a major fault causes both the non-volatile RAM and FLASH to be corrupted.

Asymmetric Power - S

Mk10

Power Symmetry (Pu) is defined as the amount of unbalance between the individual phase powers. The calculation of this figure depends on the measurement configuration (2 or 3-element) as detailed below. This test is not performed if all of the input currents

are below the minimum current threshold, *Imin*. This test is not done on the Mk7, though space is reserved for neutral current detection.

If the value Pu is greater than or equal to the set limit, then a power symmetry error is considered to be present. Unbalance must exceed the bounds for a programmed time (default 1 minute) before an alarm is raised.

For 3 Element configuration:

The calculation of power unbalance (Pu) is based on the maximum and minimum power levels from the three phases (Pmax and Pmin):

$$Pu = \frac{abs(P\max - P\min)}{abs(P\max)}$$

For 2 Element configuration:

The voltages must be in tolerance, and:

$$Pu = \frac{abs(I_A - I_C)}{\left(\frac{I_A + I_C}{2}\right)}$$

Voltage Tolerance Error - V

The voltage input levels on each phase are tested to ensure that they remain within the limits set by *Vmax* and *Vmin*. Only those phases with at least *Imin* current are tested. Vmax and Vmin are specified as a percentage of the nominal voltage, Vn. For 3-element measurements, Vn = line to line nominal / √3, for 2-element measurements, Vn = line to line nominal. In 2-element mode, only inputs Va and Vc are tested. A programmed time delay (default 1 minute) is applied to this test.

VT Failure - F

A VT failure is indicated if the voltage measured by any input is less than *Vfail* and the corresponding current input is at least *Imin*. Phase B is not tested in 2-element mode. A programmed time delay (default 1 minute) is applied to this test.

Reverse Power - M

A reverse power alarm is indicated if power is negative on any phase (provided the phase is carrying current and the voltage is within tolerance). In 2-element mode this test is applied to the total power. A programmed time delay (default 1 minute) is applied to this test.

Incorrect Phase Rotation - R

The phase rotation of the applied signals is tested to ensure that the correct phase rotation is maintained. The method of determining the phase rotation is dependent upon the measurement configuration. For both methods, the test is applied only if all of the voltages are between the limits of *Vmin* and *Vmax*. A programmed time delay (default 1 minute) is applied to this test. (An error condition must be present for more than the programmed time delay (default 1 minute) before the alarm is activated.) This test is not performed on the Mk7.

2-Element - For 2-element measurements, the angle between the two applied voltages (Vab to Vcb) must be between +30 and +90 degrees.

3-Element - For 3-element measurements, the angles between each successive voltage input (Vab, Vbc, Vca) must be between -90 and -150 degrees.

In meter firmware versions prior to 1.19, tests were also carried out on the currents. This measurement has been removed to avoid false triggering in cases of highly unbalanced loads.

Clock Failure - C

This alarm will be triggered if the clock information was lost while the meter was turned off. This means the clock is probably wrong, and may indicate a weak battery. Available in firmware v1.21 and later.

Tamper - U

This alarm indicates that a strong magnetic field was detected, most likely due to an attempted tamper. The magnetic sense factory option must be fitted.

Modem Failure - H

This alarm is generated if the modem is found to be faulty. This would generally be indicated by no response from the modem.

RAM or LCD Failure - X

The RAM is checked for corruption, and the LCD controller is monitored for correct operation. If any faults are found, then an alarm is raised. This test is performed continuously.

Program Flash Failure Y

The content of the program Flash memory is tested using a checksum. If the checksum calculated is different from that stored with the program an alarm is raised. These tests are performed continuously.

Data Flash Failure Z

The data memory contains information about the system configuration and calibration data. Erases and writes are monitored, and the alarm is raised if an erase, read or write fails to operate correctly. This may indicate a possible error with the device.

Pulsing Output Overflow - N

A pulsing overflow alarm is generated if the rate of pulses to be output is such that the off time between pulses violates the specified minimum off time for pulsing outputs. The pulses will still be output, but the off time will be less than the specified minimum, and in extreme overflows the off time will be zero, resulting in a permanently on output. This alarm provides a warning that the settings for the pulsing outputs may need to be changed.

This alarm will also trigger if the TOU demand or load survey interval accumulators overflow. In this event energy is "missed" as the accumulators are full. This can occur if the scaling for these has been pushed beyond EziView's default settings.

Battery Failure - D

The battery is tested roughly once a minute. If the measured voltage is less than the minimum battery voltage setting an alarm is raised.

Lid Tamper - T

On meters fitted with a lid tamper switch, this alarm will be raised if the lid is opened. The switch may be built in (eg Mk7C), or controlled by an input ('Input Setup' on page 14-1).

Over Current - O

The meter monitors the current on each phase, or element for Mk7 meters. If the *Over Current* limit is exceeded for the corresponding delay the Alarm will become active, and will remain active while the condition continues. This is useful to flag if a site is using too much current for the meter or CT rating (eg over 100A for a 100A meter), or if some phases show current when there should be none (tamper). It could also be used to detect situations where a predictable load such as a hot water system has additional loads connected.

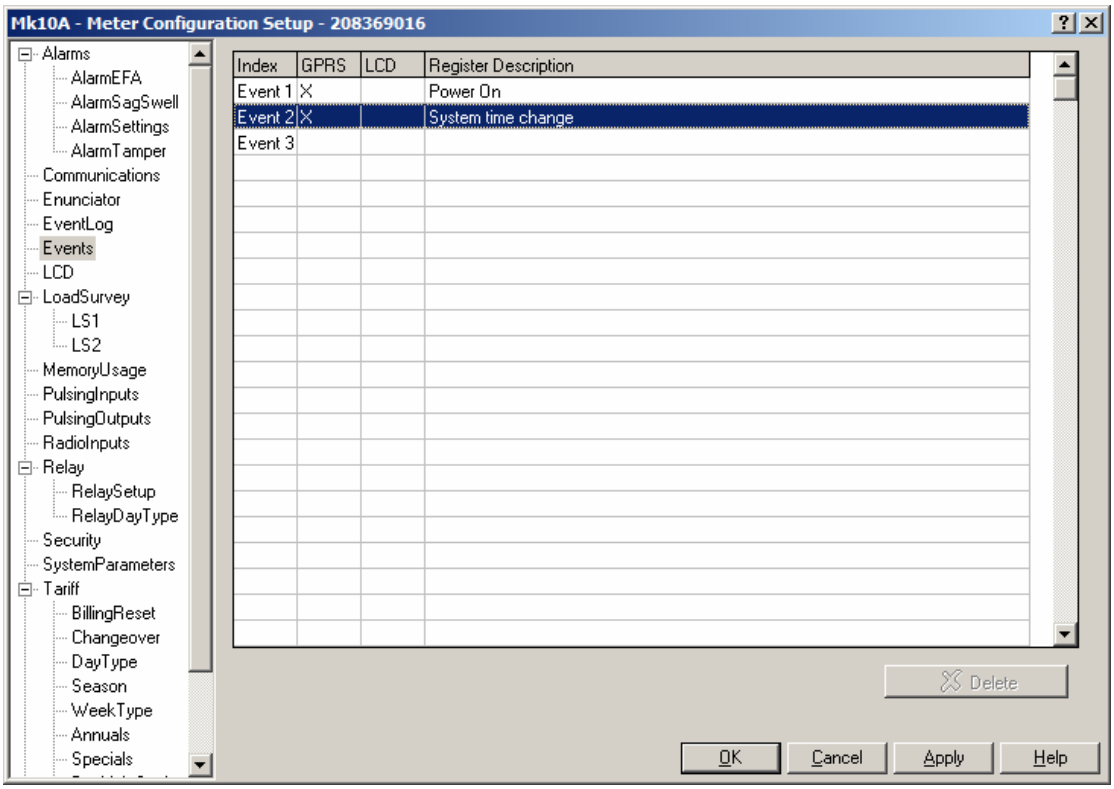
Note that this alarm does not show up on the Status screen in EziView 4.21.

Push Alarms

Push alarms is a feature where an alarm message can be sent via GPRS or displayed on the LCD when certain events occur. This is used by the Mk10 UPS meter, and is now also available in other editions.

This system uses the tamper log and diagnostics log to buffer events. The diagnostics log is renames to the Push Alarm log and holds messages to be sent via GPRS. In UPS meters the tamper log is renamed the LCD Alarm log and holds alarms to be displayed on the LCD - it **must** be set to 10 entries. In other meter types with events enabled the tamper log serves its usual purpose (tamper events). The Push Alarm log should be 100 entries.

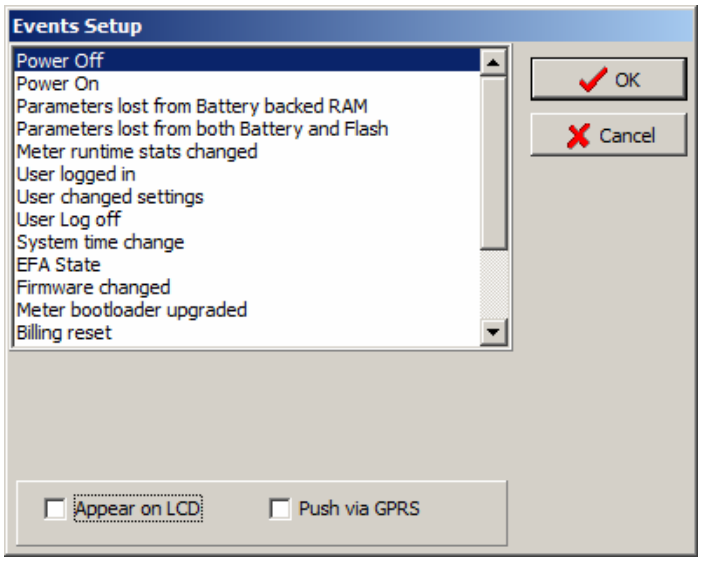
To configure the events to trigger the *Events* page is used (Figure 11-4).



- Figure 11-4 Event Push settings

When *GPRS* is selected the event will be added to the queue and pushed via GPRS. When *LCD* is selected the selected event will be added to the LCD alarm display.

Double clicking on an event will edit it, or create a new event if it is the bottom blank entry. This brings up the *Events Setup* page shown in Figure 11-5.



- Figure 11-5 Events Setup

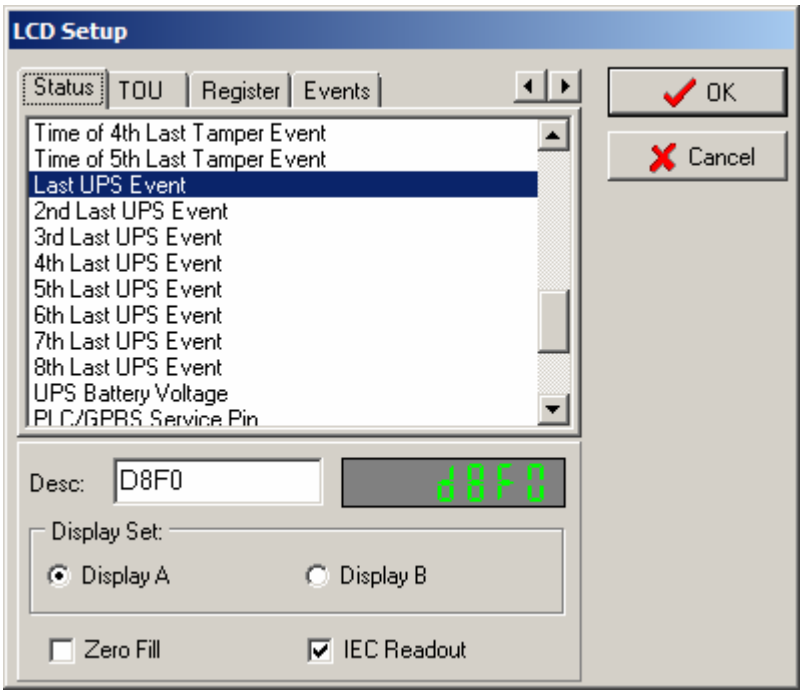
Most of the events listed are normal event log events. There are some special entries though, listed in Table 11-2.

Event Name	Code	Description
UPS Alarm - Power Outage, UPS engaged	B200	Indicates that the UPS was started in response to loss of supply.
UPS Alarm - Power restored before UPS went off	B201	Indicates that power returned while the UPS was still active (ie the meter never shutdown).
Unable to successfully send an alarm	B210	We tried to send an alarm to the server but no acknowledge was received.
Latched input alarm	B22X	The state of Input X changed from off to on.
Unlatched input alarm	B23X	The state of Input X changed from on to off.
Momentary input active alarm	B24X	The state of Input X changed (either from off to on, or on to off)

- Table 11-2 Alarm Push extra events

The *LCD Desc* field is used to enter a 3 letter code which is displayed when showing the alarm on the LCD.

The actually display the alarms on the LCD then some LCD screens need to be configured to display the last alarms. These can be selected on the *Status* page (Figure 11-6). "Last UPS Event" gives the most recent event. "2nd Last" gives the second most recent, etc.



- Figure 11-6 Last UPS Event settings

When the alarm is shown on the LCD it is shown with the number of the alarm (from newest to oldest), a 3 letter alarm code, and the date and time of the alarm. For example "01 BAT 12:30:00", where BAT is the three letter code entered in the description, and the date and time alternate every second.

To clear an alarm press and hold the *Select* button for 10 seconds while the alarm is shown. The LCD will display "ALARM CLEARED" and will shuffle a new alarm into that position of the queue.

To clear the alarms remotely clear the LCD Alarm Log (from *Online Variables→ Memory Map*, Figure 12-2). This clears all the alarms.

While there are alarms on the LCD the UPS LCD Alarm Active output is on, which can be used to light an LED or enunciator, or set an output. See Chapter 13: Outputs and Enunciators.

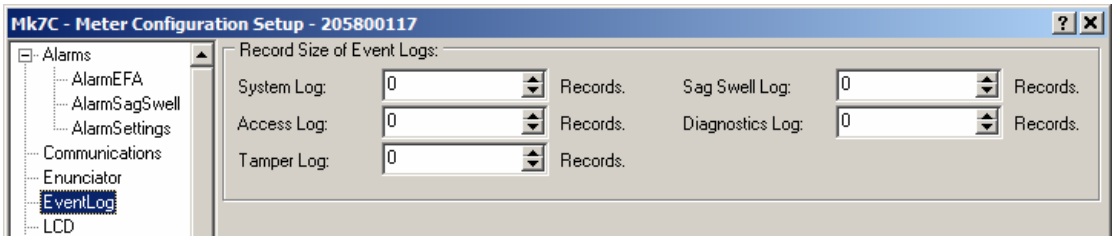
Chapter

12

Event Logs

The meter keeps a variety of logs of events that occur to the meter. The size of these logs may be configured.

Event setup



- Figure 12-1 Event log size setup

The size of each event log can be configured on the *EventLog* page, Figure 12-1. Each entry uses 6 bytes of eeprom.

This page may be protected from editing to reduce the risk of accidental change. To unprotect it select one of the *Edit* options at the bottom of the page. See "Protected Setup" on page 3-10 for more information.

Log Name	Description
System Log	Used for system events like power on and off.
Access Log	Used to track user accesses to the meter.
Tamper Log	Records when tamper events occur. (Also used as LCD Alarm LOG for UPS meters, and previously was used as a billing reset log)
Sag/Swell Log	Records Sag and Swell events.
Debug Log	Only used for diagnostics. Also used as the Push Alarm log for UPS meters and meters with Push alarming enabled.

- Table 12-1 Event log types

Table 12-1 lists the available event log types. The following tables list the events in each log. The event code is a 4 digit hex code that represents the event.

Event Name	Code	Description
Power Off	100X	The time the meter was turned off. X is reserved. Bit 0: Set if off time not known.
Power On	101X	The time the meter powered up. X gives more information: Bit 0: Set if the clock was recovered. Bits 1-3: Reserved.
Recovered	102X	Some copies of the indicated parameters were lost, but the information was retrieved. Bits 2 and 3 may indicate a low battery. X is 0 to F Bit 0 – Flash backup was bad Bit 1 – reserved Bit 2 – Energy accumulation restored Bit 3 – Control data restored
Initialised	103X	Both the battery backed up copy and the data FLASH copy of the indicated parameters was lost. The parameters have been initialised to default values. May indicate a fault in the FLASH, shutdown sequence setup, or power supply. Parameter X is as per 102X message above
Run Time	104X	Meter runtime statistics changed. 0: On time changed. 1: Off time changed. 2: Number of powerups changed. 3-F reserved.
Relay Event	1YXX	Y is the physical relay number: 1, 2, 3. XX has the form abcccccc a is 1 if the relay is enabled, 0 if it is disabled. b is 1 if the relay is connected, 0 if it is disconnected. cccccc is the reason for the log entry. This is either the reason code given when a relay change is made by an external command, or is one of several internal events: 57 – Simple command. Relay control via register F050-8 report as this since they have no option for a reason code. 58 – Disconnect button was pressed 59 – Connect button was pressed 60 – Calender (Tariff) changed 61 – The physical relay changed state 62 – If a user set reason code is >62, it is changed to this. 63 – Relay Stuck recorded if a relay should be open, but current is still flowing on the switched element (where a relay switches all current on an element). Tested 30 seconds after the switch. Events 60 and 61 are disabled by default – see “Alarms” on page 11-3.
PORT Changing System Time…	20CX	Time changed from a port, time sync, or internal command. Bit 4/5 for port #. Bits 0-3 give reason. 0: From command on port. 1: From pulsing input 2: From Ripple Control 3-F reserved. F is used for the “to” case below. The system time was changed from this time…
...System Time Changed.	20CF	…to this time.
Firmware changed	40XX	The meter’s firmware was changed. XX is the revision number it was changed to.
Bootloader changed	4100	The meter bootloader was upgraded.

- Table 12-2 System event log types

Event Name	Code	Description
Automatic Billing Reset	5000	An automatic billing reset occurred.
Manual Billing Reset Button	5001	A manual billing reset occurred from the *Billing Reset* button.
Manual Billing Reset Command	5080	Bits 4/5 indicate port.
EFA XXXX Latched EFA Conditions Cleared EFA XXXX Active EFA XXXX Inactive	30XX	The indicated EFA was latched. EFA is a number in the bottom 6 bits (5 to 0). 63 O Overcurrent 32-62 Reserved 16-31 Advanced Tamper 15 E Reference failure 14 S Asymmetric Power. 13 V Voltage Tolerance Error. 12 F VT Failure. 11 R Incorrect Phase Rotation. 10 T Tamper 9 C Clock Failure. 8 M Reverse Power. 7 L Calibration Data Lost. 6 H Modem Failure. 5 X RAM Failure or LCD Failure. 4 Y Program Flash Failure. 3 Z Data Flash Failure. 2 N Pulsing Output Overflow. 1 D Battery Failure 0 U User Defined / Magnetic Tamper Bit 6/7 indicate: 0: condition latched 1: Latched conditions cleared (bits 0-5 are zero) 2: Condition became active (already latched) 3: Condition became inactive (already latched)
Power Factor Alarm	32XX	Indicates the power factor limits have been exceeded. Bits 0/1 indicate phase 0:A, 1:B, 2:C:, 3:Total Bit 2 indicates 0:start or 1:stop Bit 3 indicates the limit exceeded. 0:Lower, 1:Higher Bit 4 indicates 0:lag or 1:lead
UPS State	B20X	UPS control information. X: 0 Meter running full powered from the UPS battery. 1 Mains power restored while running on the UPS.
Input Alarms	B2XY	X the input the alarm comes from. Y: 2 latched alarm, 3 unlatched alarm, 4 momentary pulse alarm.
UDP alarm failed	B210	The meter attempted to send a UDP alarm but never got an acknowledgement from the server.

- Table 12-3 System event log types

Event Name	Code	Description
Radio Module Tamper Alarm	31XX	This indicates the radio channel was tampered. The XX is the LSB and has the following meaning. Bit 0-5: radio channel number (32 radio input channels supported, 64 numbers possible) Bit 6: 0 – alarm went inactive 1 – alarm went active Bit 7: reserved
Radio Module Low Battery Alarm	32XX	This indicates the radio channel has low battery The XX is the LSB and has the following meaning. Bit 0-5: radio channel number (32 radio input channels supported, 64 numbers possible) Bit 6:0 – alarm went inactive 1 – alarm went active Bit 7: reserved
Radio Module Time Out of Sync Alarm	33XX	This indicated that the radio channel time is out of sync with the datahub timing by a significant amount. The XX is the LSB and has the following meaning. Bit 0-5: radio channel number (32 radio input channels supported, 64 numbers possible) Bit 6: 0 – alarm went inactive 1 – alarm went active Bit 7: reserved

- Table 12-4 System event log types for Datahub

Event Name	Code	Description
PORT: Logon User USERNUMBER	200X	User USERNUMBER logged on via the indicated port. A USERNUMBER of 0 means the user name is not known. Bit 4/5 for port (0 for optical, 1 for modem,2/3 reserved) Bits 0-3 are user number.
PORT: changed XX	204X	User changed a setting in the XX group, via the indicated port. Settings are: setup1, setup2, setup3, Bit 4/5 for port (0 for optical, 1 for modem,2/3 reserved) Bits 0-1 are the number of the setup stage, 0 to 2.
PORT: Logoff: Access Denied	2080	A user was logged off the indicated port because of a bad password. Bit 4/5 for port.
PORT: Logoff: User Request	2081	A user was logged off the indicated port because a log off was requested by the X command. Bit 4/5 for port.
PORT: Logoff: Timeout	2082	A user was logged off the indicated port because of an inactivity timeout. Bit 4/5 for port.
PORT: Logoff: Lost Connection	2083	A user was logged off the indicated port because of a lost connection. Bit 4/5 for port.
PORT: Logoff: User ID change	2084	A user was logged off the indicated port because a login under another name occurred. Bit 4/5 for port.
PORT: Logoff: Requested	2085	A user was logged off the indicated port because a logoff was requested via a register write. Bit 4/5 for port.
PORT: Logoff: Upgrade Attempt	2086	A user was logged off the indicated port because a logoff was requested via a register write attempting to do a firmware upgrade. Bit 4/5 for port.
Setup Change	AXYY	YY is a bitmask of database changes / clear commands. The bottom 2 bits of X are the 8 bit chunk this represents. The top 2 bits are the port it was done from. 0: Event Logs Cleared 1: Load Survey 1 2: Load Survey 2 3: TOU Setup Changed – TOU registers cleared. 4: Billing History Cleared (usually appears with TOU setup) 5: Pulsing Generator reset 6: TOU Calender changed 7: Reserved 8: Hardware Setup changed 9: Calibration Changed 10: Scaling Factors Changed (transformer ratios changed) 11: Transformer Ratios Changed 12: Pulse Factors Changed 13: Pulsing Inputs setup Changed 14: Pulsing Outputs setup Changed 15: Enunciators Changed 16: Optical port setup changed 17: Modem port setup changed 18: LCD screens changed 19: Alarm setup changed. 20: Security setup changed. 21: Timer setup Changed. 22: Time Setup Changed. 23: SCADA port setup changed 24-32: Reserved

- Table 12-5 Access event log types

Event Name	Code	Description
Tamper Event	3XYZ	The indicated tamper occurred. X log entries are recorded (including this one) with further information. Bits 7 to 6 indicate the tamper state: 0 Tamper Detected 1 Tamper Restored 2-3 Reserved The bottom 6 bits (5 to 0) represent the Tamper Event. Note that codes 0-15 and 63 are used for normal EFA's. 16 VT Lost Phase A 17 VT Lost Phase B 18 VT Lost Phase C 19 VT Surge Phase A 20 VT Surge Phase B 21 VT Surge Phase C 22 VT Phase Bridge 23 VT Phase Order 24 CT Lost Phase A 25 CT Lost Phase B 26 CT Lost Phase C 27 CT Phase Order 28 CT Current Reversal A 29 CT Current Reversal B 30 CT Current Reversal C
Tamper Entry Details	8XYZ	Tamper extended information record. **Time is a coded quantity, not actually a time/date.** These records follow a tamper entry start record immediately and provide additional information about the tamper. Bits 11 to 9 indicate the type of record. 0 Phase A record 1 Phase B record 2 Phase C record 3 TOU record 4-7 Reserved For phase records data on the phase angle is packed into the bottom 9 bits of the event code. The time field is packed with the voltage (11 bits) , current (15 bits), and part of the voltage to voltage angles. For TOU records the scaling factors and the source TOU channel are stored in this space. The time field holds the TOU value.

- Table 12-6 Tamper event log types

Tamper events are made up of a *Tamper Event* which indicates that a tamper started or stopped, and what type of tamper occurred. The *Details* entries include more information about the meter situation at the time of the tamper.

Event Name	Code	Description
Voltage change start. Start Time Also stores THD/Unbalance triggers	6XYY	Start time of sag/swell or PQ event. The meter may optionally record a start event both when the event started, and when it finished (default is only when finished). Bit 10 is set if this entry recorded at the start of the event, clear if recorded at the end. **Bit 11 is zero: Sag/Swell** Bits 8-9 indicate phase A, B, C, or 3=power outage. Bits 0-6 used for detailed 10ms time resolution. Bit 7 1 for surge, 0 for sag. **Bit 11 is one: THD/Unbalance** Bits 8-9 indicate phase A, B, C for THD, or 3=Unbalance. Bits 0-6 used for detailed 10ms time resolution. Bit 7 is 1 for surge (no sag definition)
Voltage change end. Duration and Magnitude Also stores THD/Unbalance triggers	7XYY SPECIAL	**Bit 11 is zero: Sag/Swell** Bits 8-9 indicate phase A, B, or C, or 3=power outage. Bottom byte indicates percent relative to nominal (like mk3). **Time is a duration instead of a date/time.** This entry marks the end of the preceding start event – reading software should match them up, channel for channel. Bit 10 indicates that the top 8 bits of the duration are actually an average reading over the disturbance, in percent. **Bit 11 is one: THD/Unbalance** Bits 8-9 indicate phase A, B, C for THD, or 3=Unbalance. Other bits as per Sag/Swell

- Table 12-7 Sag/Swell event log types

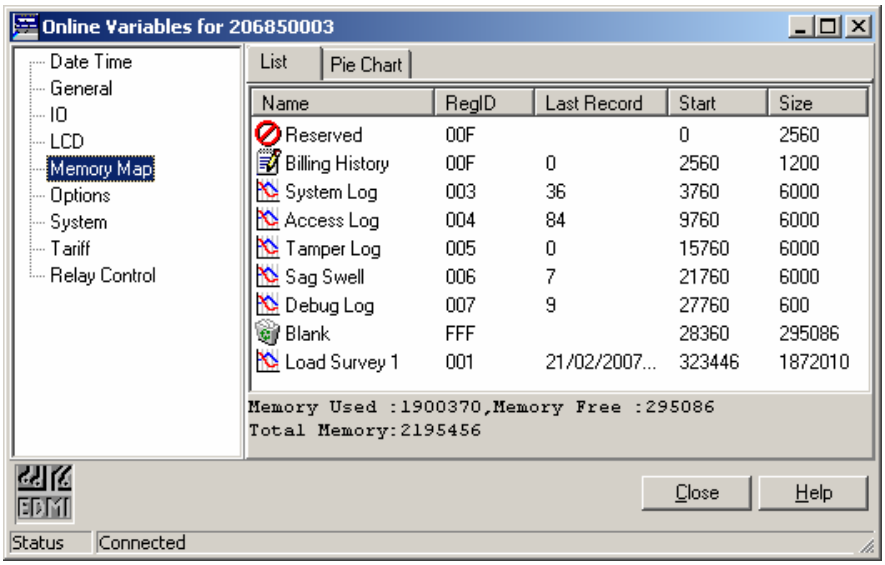
A Sag/Swell occurrence is made up of two entries – a start and a stop. EziView lines them up automatically to produce complete events.

Event Name	Code	Description
Meter Restart	B30X	The meter restarted. This may indicate a flat or missing battery.

- Table 12-8 Diagnostics log types

Retrieving an Event Log

Event Logs can be downloaded using a readings file (advanced usage), from the memory map page of online variables (Figure 12-2, see Flash/EEPROM Memory Usage on page 4-3 for more information), or from the *Status* screen. Only the memory map and status screen methods are discussed here.



- Figure 12-2 *Online Variable Memory Map*

Right-click on the log to download, and select either *Download* and select a filename to download to, or use the *Send to* option. Programs to use with *Send to* can be entered using the *Make New…* command in the *Send to* menu.

The log is downloaded as a text file with a tab delimited format, similar to Figure 12-3. The header section is used by EziView to track download progress. Each record has a unique number starting from when the survey was started, which is only reset if the survey is cleared. The *Last Record* column of the *Memory Map* screen shows the last available entry for each log. The "=>" numbers at the end of each line are the actual event codes. Note that tamper and sag/swell logs use a slightly different format.

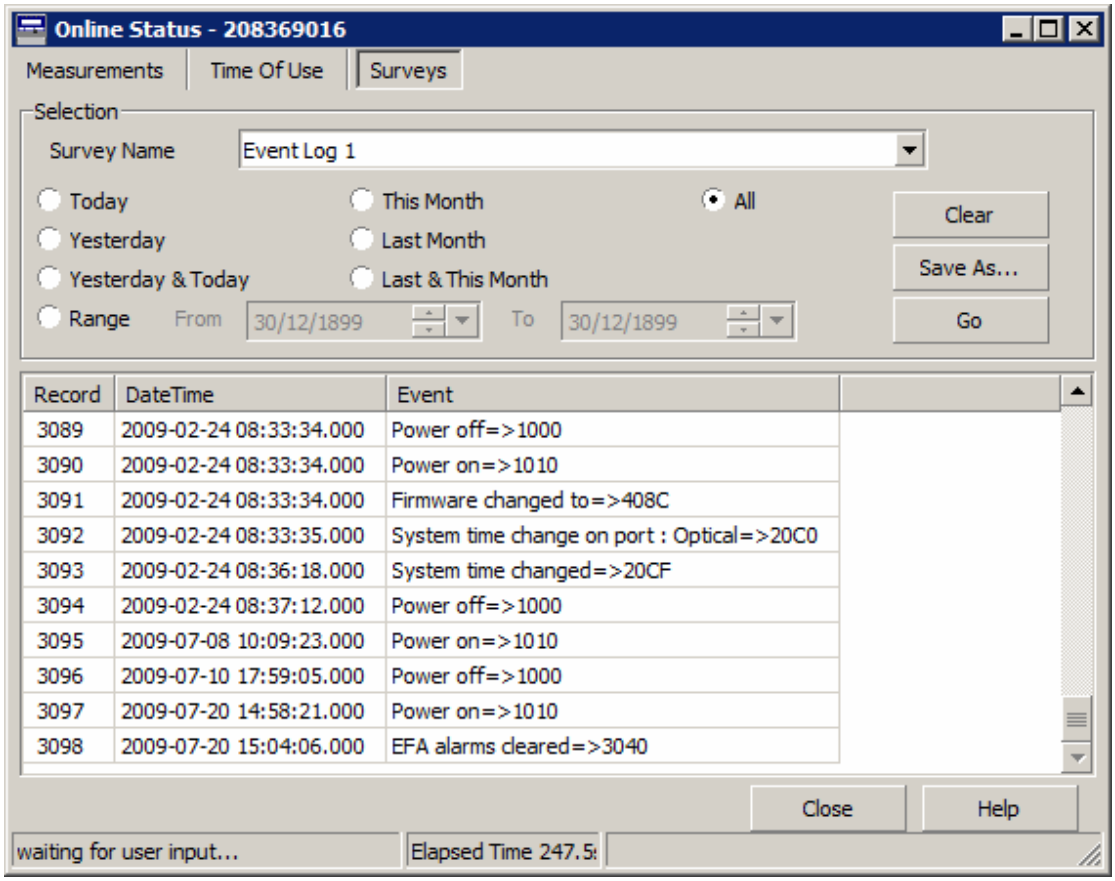
[LoadSurvey]
LastRecord=0000000061
StartTime=01/01/1996 00:20:50

Record No	DateTime	Event
	(0x0000F03D)	(0x0000FFFF)
34	01/01/1996 21:39:50	User: 1 changed database stage: Misc=>2041
35	01/01/1996 21:39:55	User: 2 changed database stage: Pulse=>2042
36	01/01/1996 21:39:57	Log off port: Optical=>2081
37	03/01/1996 07:56:58	User: 0 logged in on port: Optical=>2000
38	03/01/1996 07:56:58	Bad password on port: Optical=>2080
39	03/01/1996 07:56:58	User: 0 logged in on port: Optical=>2000
40	03/01/1996 07:57:28	Inactivity timeout on port: Optical=>2082

- Figure 12-3 Downloaded Event Log

To clear a log simply right-click on the log and select *Clear*. Each log can be cleared individually.

To use the *Status* screen method first bring up the status screen - right click on the connected meter and select *Screens* → *Status*. Go to the *Surveys* tab, and select an event log from the *Survey Name* drop down box (see Figure 12-4).



- Figure 12-4 *Status* Screen Log download

A date range can be selected to download only a certain portion of the log. The *Go* button starts the download, which is shown in the bottom pane of the screen. The *Clear* button clears the selected log (deletes the contents in the meter). The *Save As…* button saves the downloaded data into a text file in the format as shown in Figure 12-5

Record	DateTime	Event
3088	2009-02-20 09:43:23.000	Power on=>1010
3089	2009-02-24 08:33:34.000	Power off=>1000
3090	2009-02-24 08:33:34.000	Power on=>1010
3091	2009-02-24 08:33:34.000	Firmware changed to=>408C
3092	2009-02-24 08:33:35.000	System time change on port : Optical=>20C0
3093	2009-02-24 08:36:18.000	System time changed=>20CF
3094	2009-02-24 08:37:12.000	Power off=>1000
3095	2009-07-08 10:09:23.000	Power on=>1010
3096	2009-07-10 17:59:05.000	Power off=>1000
3097	2009-07-20 14:58:21.000	Power on=>1010
3098	2009-07-20 15:04:06.000	EFA alarms cleared=>3040

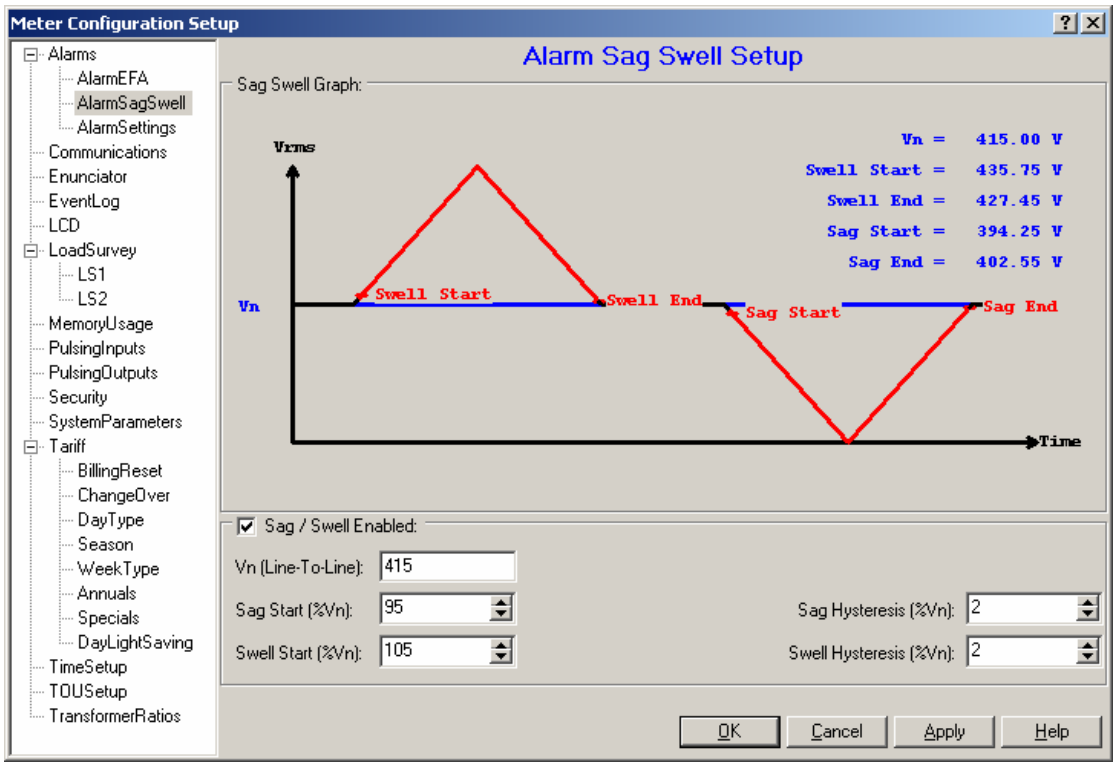
- Figure 12-5 *Status* Screen Downloaded Event Log

Sag/Swell

The sag/swell log records excursions of the voltage away from a nominal figure. The meter records:

- The phase, A, B, or C. A total supply failure (power outage) is recorded as its own event type (power outage event introduced in firmware version 1.30). Resolution is only 1 second in this case.
- The time of the occurrence with a resolution of 10ms. The voltage is measured every 5 cycles over the last 5 cycles - thus the time only has an accuracy of 100ms. The logged time is that of the end of the disturbance, at the end of the 5 cycle measurement that detected the excursion.
- The duration of the occurrence counted in cycles, with a resolution of 5 cycles. Maximum duration is 13.6 years. The duration is displayed in seconds.
- The worst excursion, as a percentage from 0% to 255% of the nominal setting.
- The average excursion, as a percentage from 0% to 255% of the nominal setting. If the duration is longer than 4 hours, the average will only be over the first four hours. If the duration is over 19 days, the average is not recorded.

Since the Mk7 only has one voltage phase, sag/swell disturbances are only reported on 'phase A'.



- Figure 12-6 Sag/swell setup

The *AlarmSagSwell* page configures how the system triggers (Figure 12-6). Vn is the nominal voltage that the other settings are referred to. The returned worst excursion and average excursion is a percentage relative to this as well.

The *Sag Start* and *Swell Start* settings set the points at which an event is deemed to have started, relative to Vn. The *Hysteresis* settings force the voltage to return within the set points before the event is considered finished. These help prevent repeated nuisance triggers.

[LoadSurvey]
LastRecord=0000000034
StartTime=18/05/2004 21:07:29

Record No	DateTime	Phase	Amplitude	Duration	Swell	Average Amplitude
	(0x0000F03D)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)
19	03/06/2004 16:45:05.180	0	61	0.4	False	70
20	03/06/2004 16:45:05.180	1	61	0.4	False	70
21	03/06/2004 16:45:05.180	2	62	0.4	False	70
25	03/06/2004 16:45:17.480	0	74	0.3	False	81
26	03/06/2004 16:45:17.580	1	75	0.2	False	78
27	03/06/2004 16:45:17.580	2	75	0.2	False	78
31	03/06/2004 16:45:20.000	0	111	0.3	True	110
32	03/06/2004 16:45:20.000	1	112	0.3	True	111
33	03/06/2004 16:45:20.000	2	112	0.3	True	111

- Figure 12-7 Downloaded sag/swell log

Figure 12-7 shows a log downloaded from a meter. Note a swell is recorded as true in the *Swell* column, a sag is recorded as false. An average amplitude of -1 is recorded if the average amplitude is not available (duration too long).

When downloaded using the *Status* screen a swell is indicated by 128, a Sag by 0.

Power Quality

The power quality log records power quality problems in a similar way to sag/swell. They are recorded in the same log as sag/swell events. Note that the Sag/Swell system must be active for power quality log events to be recorded. The meter records:

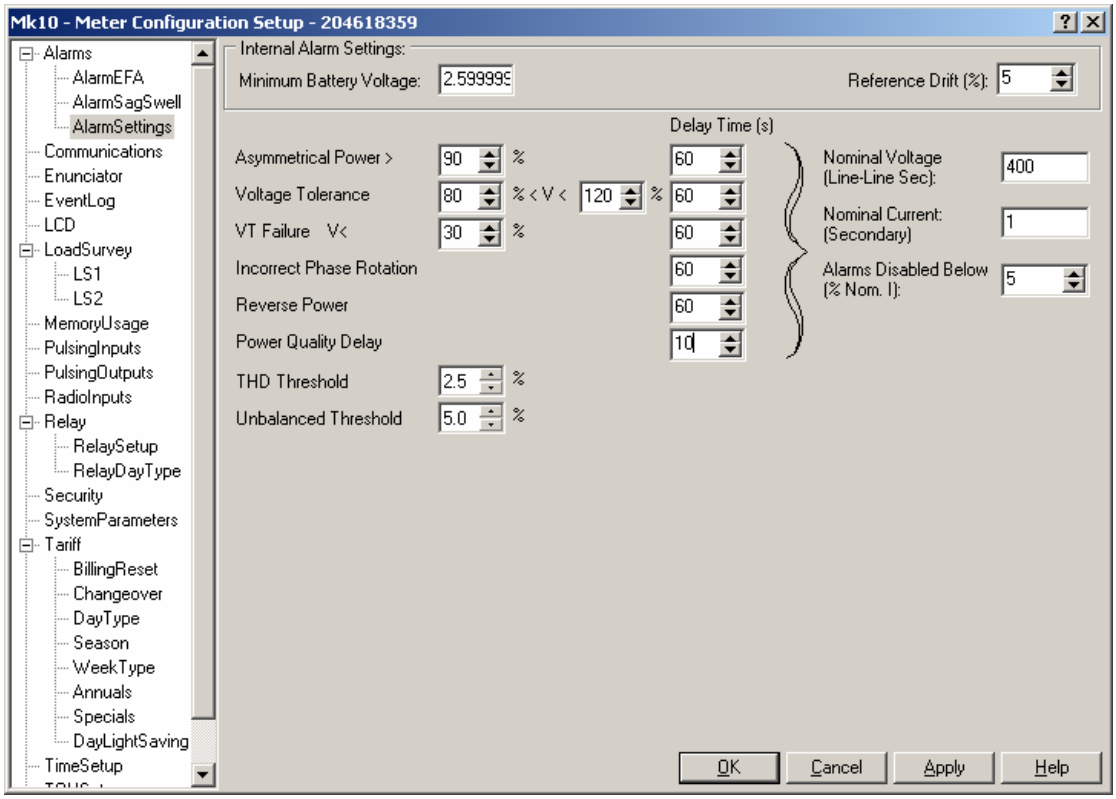
- The phase, A, B, or C is recorded for THD triggers. Unbalance of course has no phase.
- The time of the occurrence with a resolution of 10ms. The factors are measured every 5 cycles over the last 5 cycles - thus the time only has an accuracy of 100ms. The logged time is that of the end of the disturbance, at the end of the 5 cycle measurement that detected the excursion.
- The duration of the occurrence counted in cycles, with a resolution of 5 cycles. Maximum duration is 13.6 years. The duration is displayed in seconds.

- The worst excursion, as a percentage from 0% to 25.5%. An excursion beyond this will record 25.5%

- The average excursion, as a percentage from 0% to 25.5% of the nominal setting. If the duration is longer than 4 hours, the average will only be over the first four hours. If the duration is over 19 days, the average is not recorded.

- If a delay for triggering is specified, the time of occurrence is the time the event triggered at the end of the delay. The delay is not included in the duration, and the readings during the delay are not included in the average.

Since the Mk7 only has one voltage phase, THD disturbances are only reported on 'phase A', and unbalance serves no use.



- Figure 12-8 Power Quality Events setup

The *AlarmSettings* page configures how the system triggers (Figure 12-8).

The *THD* event is calculated from the voltage THD's, and the *Unbalance* event is calculated as:

$$\%Unbalance = \frac{VoltageNegativeSequence}{VoltagePositiveSequence} \times 100$$

These limits set the level at which a THD or Unbalance event is added to the event log. The maximum setting for the limits is 25.5%, in 0.1% steps. A setting of 0 disables that event.

The *Power Quality Delay* sets the time in seconds that these limits must be exceeded continuously before an event is registered. A setting of 0 means there is no delay.

[LoadSurvey]
LastRecord=0000000006
StartTime=06/02/2008 10:00:30

Record No	DateTime	Phase	Amplitude	Duration	Swell	Average Amplitude
	(0x0000F03D)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)
0	06/02/2008 10:00:30.440	4	6.2	0.3	True	5.4
2	06/02/2008 10:47:29.000	4	2.6	0.2	True	2.6
4	06/02/2008 10:51:13.000	4	2.7	0.8	True	2.6
6	06/02/2008 10:51:31.070	4	2.6	1.5	True	2.6

- Figure 12-9 Downloaded THD log

Figure 12-9 shows a log downloaded from a meter. Note that swell is always true for power quality events. A phase of 4, 5 or 6 indicates THD events on phase A, B, or C respectively. A phase of 7 indicates an Unbalance event.

Tamper

The tamper log system gives a level of tamper detection beyond that afforded by the EFA system. The tamper log also records much more information about the tamper event to allow easier investigation.

The following features are monitored:

- The meter is able to detect a missing and restored potential on the meters' VT.
- Detect reversal of CT phase rotation.
- The meter is able to detect CT phase reversal and also log when the phase order is restored. This type of detection also includes cases where the CT polarity is exchanged. The restoration is logged.
- Detect abnormal reductions in the current with the CT's and their restoration. This will normally detect most CT shorts.

The following information can be recorded:

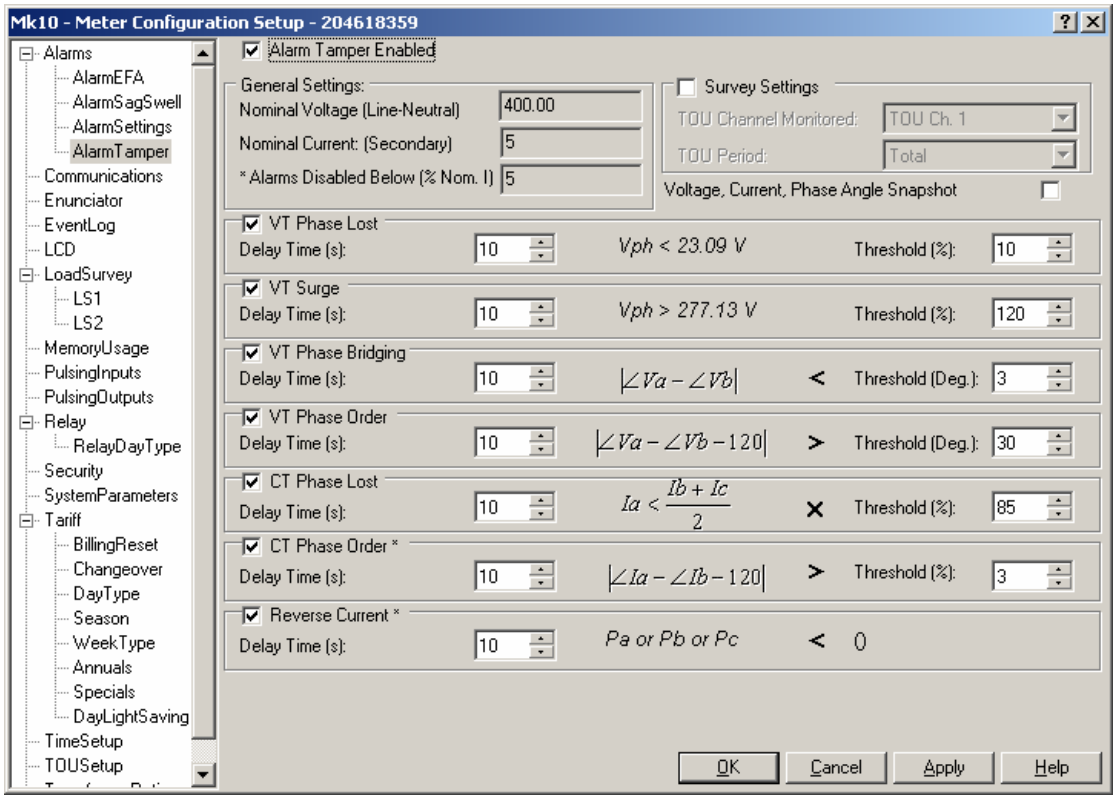
- Start and stop time for the tamper event
- The type of tamper
- A snapshot of the 3 phase voltages, currents, and phase angles.

- A snapshot of a TOU accumulated energy register.

The Tamper log requires the firmware with the advanced tamper edition to function. If this is not present no tampers will be recorded.

The Mk7 does not support the tamper log system at this time as most of the alarms are designed for 3 phase systems.

Various states of the tamper system can be displayed on the LCD. Registers D8C0 - D8C4 allows the last 5 tamper start events to be displayed, D8C0 being the most recent. D8D0 – D8D4 displays the time and date of those events. The codes shown for the tamper start events are numbers from 16 to 30, as per Table 12-6.



- Figure 12-10 Tamper setup

The configuration of the Tamper system is via the *Alarms→AlarmTamper* page. This allows each tamper source to be enabled and configured separately.

The *Nominal Voltage*, *Nominal Current*, and *Alarms Disabled Below* settings are taken from the *AlarmSetting* page.

The *Survey Settings* option enables logging of a TOU accumulated energy register when a tamper starts or stops. The TOU channel to be monitored may be selected, and

whether a Total or Current Period value is recorded. This uses one more tamper log entry for each tamper recorded.

The *Voltage, Current, Phase Angle Snapshot* option enables recording of the 3 phase voltages, currents, and phase angles - including the voltage to voltage phase angles. This gives enough information to reconstruct the phasor diagram at the time the tamper started or stopped. This uses three more tamper log entries for each tamper recorded.

The other settings on this page allow each tamper type to be enabled and configured separately.

The *Delay Time* specifies the length of time, in seconds, that the tamper has to persist for before it is logged. For example, the *Delay Time* in VT Surge specifies the number of seconds after which a tamper will be recorded in the case of a voltage surge.

VT Phase Lost

This tamper detection test will check each phase to see whether any phase has drop below the pre-calculated *Threshold* value. Essentially this determines whether the customer has removed a connection from the meters VT or other techniques to dramatically reduce the detected phase voltage.

If the nominal phase voltage is 240V, and the voltage threshold is 10% then when the voltage falls below 216V (240 x 0.9), a tamper event is logged.

VT Surge

This test determines whether the phase voltage has risen over a present voltage *Threshold*. It is performed for each phase. Voltage surge is designed to pickup cases where any of the meter's VT's are artificially supplied a large over voltage so that it can be argued that the billing information must be incorrect.

VT Phase Bridge

This test checks to see whether a phase voltage line is connected to two or more VT's. Essentially the test will check to see if two phases have their absolute voltage phase angles below a small angle *Threshold*. Since phase A phase voltage is the reference then the only comparisons that need to be made are between phases A-B and phases A-C. It is also important to note that once this tamper has been triggered or is in a triggered state then the VT phase order tamper is ignored, though version 1.27 firmware does not do this.

VT Phase Order

The VT phase rotation test checks to see whether the voltage lines are swapped on the meters VT's. Rotation reversal is checked by finding the difference of two adjacent voltage angles and then removing their nominal offset (120 degrees) so that the remaining angle should be zero. The remaining voltage angle permitted is set by *Threshold*.

If the *Threshold* is set so that both a VT phase rotation reversal tamper and VT bridge tamper are both met then the VT bridge tamper will take priority over the VT phase rotation reversal tamper. This will occur when the *Threshold* > (120 - VT Bridge Threshold). Version 1.27 firmware does not do this.

CT Phase Lost

Lost phase current aims to pick up some CT shorts or cases where the CT connection is removed. This type of tamper is very hard to accurately determine. This is because current drawn by different customers at different times of the day or week can be so greatly varying in magnitude. Current comparison *Threshold* should be set conservatively according to the customers load requirements.

CT Phase Order

This tamper test aims to detect cases where the CT phases have been exchanged. Testing for this type of tamper is quite difficult since different customers can draw diverse amounts of inductive energy from any different phase.

The tests performed to determine phase order reversal are based around finding the difference between two adjacent absolute current angles. This nominal angle (120 degrees) is removed, and the remaining angle is compared with the user adjustable *Threshold*. At least the *Alarms Disabled Below* current must be present for this test to trigger.

Reverse Current

The reverse current tamper test checks to see if active energy is importing (energy received by the supplier). This type of tamper will only be logged if there is no CT and VT phase reversal (including the time the tampers' persistence is counting). The logic is designed in such a way so that a reverse current tamper can still be restored even though a CT or VT tamper is persisting or occurring but won't trigger a tamper until both CT and VT tampers are restored. During this time the reverse current persistence counter will not be reset. At least the *Alarms Disabled Below* current must be present for this test to trigger.

Power Factor

The Power Factor monitor adds events to the System log if programmed limits for power factor are exceeded. It is available in firmware version 1.40 and later on enhanced processor meters.

There are two limits each for lagging and leading power factors. The low and high limits allow the severity of the event to be indicated. The limits are configured on the AlarmSettings setup page in EziView (Figure 11-3 on page 11-5).

The meter monitors all three phases and the total individually. An event is generated if any of them exceed (power factor less than the limit) one of the limits for the

programmed delay time. The event records the phase, which limit was crossed (high or low), lead or lag, and if this is the start or the end of an occurrence.

If all four (high/low, lag/lead) limit settings are zero the feature is disabled. The individual phases are not monitored in 2 element mode. For Mk7 meters the phases reported relate to the different measuring elements of the meter.

Log Download

Figure 12-11 shows a log downloaded from a meter after a tamper event. Phase B voltage was dropped to 30 volts. It can be seen from the logs the voltage dropping, and what else was affected. The recovered phase B voltage is a little low as the voltage is still rising back up to nominal when the entry was recorded, but is within the allowed limits. The *Finished* column is 0 for a started event, -1 for a finished event.

[LoadSurvey]
LastRecord=0000000010
StartTime=23/02/2007 14:53:37

Record No	DateTime	Event	Finished	V PhA	V PhB	V PhC
	(0x0000F03D)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)
4	23/02/2007 14:53:37	Voltage Lost PhB	0	239.77	30.01	239.77
9	23/02/2007 14:54:15	Voltage Lost PhB	-1	239.77	158.97	239.77

Columns continued…

I PhA	I PhB	I PhC	Angle PhA	Angle PhB	Angle PhC	Angle Vab	Angle Vac	TOU Value	TOUChannel
(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	(0x0000FFFF)	…(0x0000FFFF)		
1.00	1.00	1.00	0.00	0.00	1.41	-120.94	119.53	5853.00	1
1.00	1.00	1.00	0.00	0.00	1.41	-120.94	119.53	5858.00	1

- Figure 12-11 Downloaded Tamper log

Intentionally Left Blank

Chapter

13

Outputs and Enunciators

This chapter covers the setting of outputs and enunciators. These allow energy pulses to be generated, as well as provide indication of a variety of states. Enunciators provide a subset of the output features.

Each model of the meter has different output options.

There are up to 6 outputs available on the Mk10. The exact number depends on the ordered model. The first 4 outputs are also connected to the LEDs under the LCD.

There are up to 4 outputs on the Mk10 Special I/O and the Mk10A, and up to 2 LED's which are independent of the outputs.

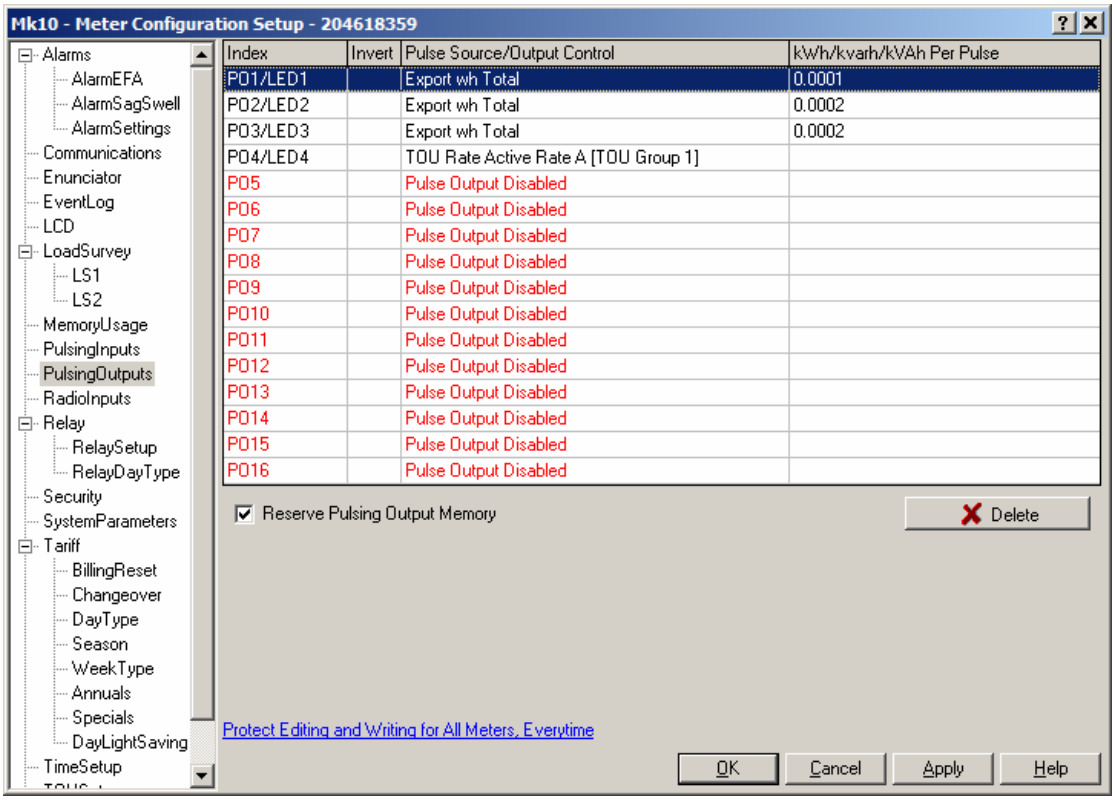
There are up to 4 outputs on the Mk10D, and up to 2 LED's which are independent of the outputs.

There are up to 4 outputs on the Mk10E, and up to 2 LED's which are independent of the outputs. In addition an expansion card may be fitted for more outputs.

There are up to 4 outputs on the Mk7A, and up to 2 LED's which are independent of the output.

There are up to 4 outputs on the Mk7C, and up to 2 LED's which are independent of the outputs.

Output Setup



- Figure 13-1 Mk10 Output setup page

Figure 13-1 shows the pulsing output setup in EziView.

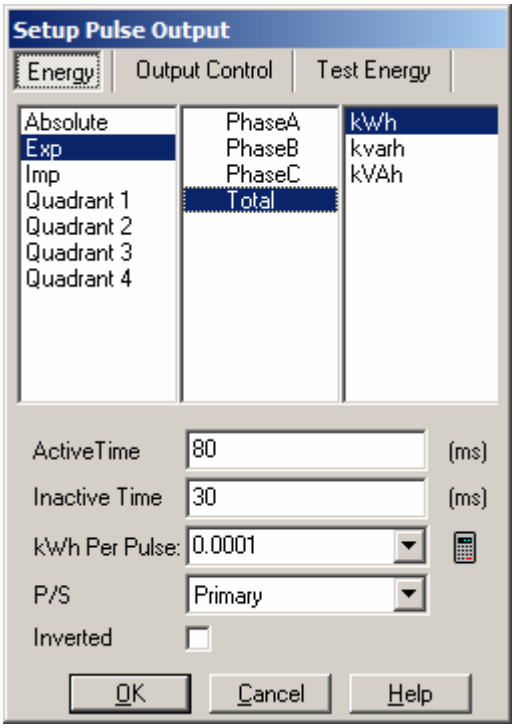
The *Reserve Pulsing Output Memory* option means that space is always reserved for all available outputs. This allows the configuration of the pulsing outputs to be changed without clearing the load survey or TOU structures. Uncheck this option to free up more space for load survey and TOU functionality.

Changing any pulsing output settings may cause the meter to clear load survey or TOU data, since the meter optimises memory use between these systems. Using the *Reserve Pulsing Output Memory* option can be used to avoid this.

This page may be protected from editing to reduce the risk of accidental change. To unprotect it select one of the *Edit* options at the bottom of the page. See "Protected Setup" on page 3-10 for more information.

Outputs that are not fitted are marked in red. Note that the order of the outputs listed is different to the physical arrangement. The PO numbers line up with the PO numbering in the hardware description for each meter. The inputs labelled as LED inputs is as a guide only - it does not mean that an LED is actually fitted.

Each line gives the current settings for that output. To edit the output double-click on the setting. This brings up the detailed setup form as shown in Figure 13-2.



- Figure 13-2 Pulsing Output Setup

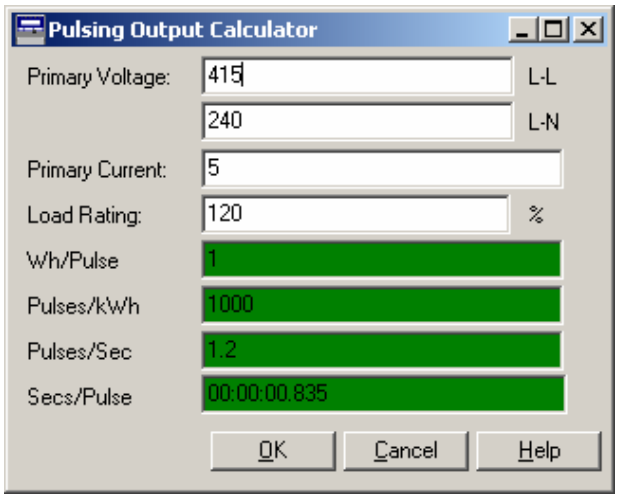
Active Time controls the length of each energy pulse, from 1 to 100ms. *Inactive Time* sets the minimum time between pulses – if the rate of pulses is too fast then the gap between pulses will fall below this and an alarm will be generated (also see "Pulsing Output Overflow - N", page 11-9).

EziView also does some checking of the pulse factors. Enabling this checking is done via the *Tools → Options → General → Check Pulsing Output Overflow* setting.

The *Active Time*, *Inactive Time*, and *P/S* settings are common between all outputs. Thus changing them for one output will change them for all other outputs.

The *Energy* tab is used to setup the output to indicate energy as a series of pulses. The energy quantity to output is selected by highlighting the required combination of factors. Each pulse represents the amount of energy entered at the bottom of the form in the *kWh Per Pulse* field. This is entered as a primary value or a secondary value depending on the setting of *P/S*. When the secondary mode is used the secondary kWh Per Pulse value will be maintained at the setting, even with changing the transformer ratio. When the primary mode is used the primary kWh Per Pulse value will be maintained at this setting, even with changing the transformer ratio. If the mode is changed the kWh Per Pulse setting on this page will remain the same, which means the rate from the meter will change by the transformer ratio.

The button brings up a calculator that can be used to help calculate suitable pulse rates. Figure 13-3 shows the calculator page. Note that this page assumes 3 phase measurement.

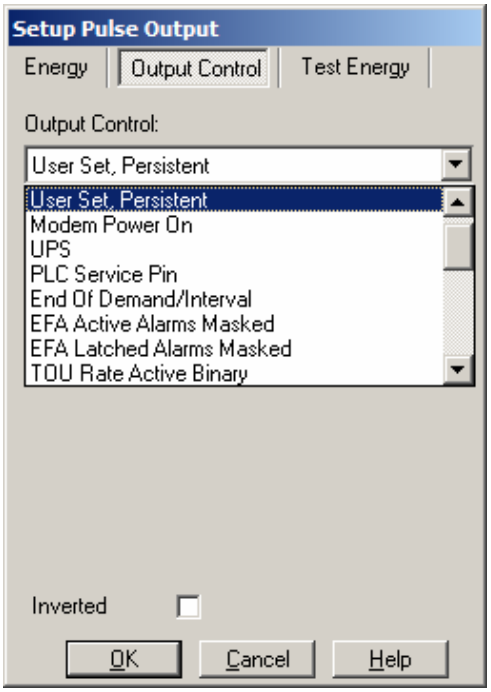


- Figure 13-3 Pulsing Output Calculator

The voltage and current settings come from the nominal voltage and nominal current, but they can be changed here to help calculate appropriate quantities. The Load Rating is the anticipated amount of load.

The last 4 fields are linked together. They show up green when the settings are within a reasonable range, and turn red if the setting is out of range.

The *Test Energy* tab selects a special energy source that produces a constant "energy output". It is useful for testing equipment when there is no load connected.



- Figure 13-4 Pulsing output *Output Control* setup

The *Output Control* tab (Figure 13-4) gives access to a wide variety of control options for the output. Some of these relate to the current meter state, while others relate to the current LCD being shown on the LCD (useful for use with enunciators).

Table 13-1 lists the available direct output controls. These are independent of the displayed LCD screen.

Status Type	Description
User Set, Temporary	Available only for outputs, this allows the output state to be controlled remotely by writing to a register. If power to the meter is removed, the output will revert to the off state when power returns. Refer to the following Output Status section for how to control this from EziView.
User Set, Persistent	As for User Set, Temporary above, except that if power to the meter is removed and returned, the output state will be kept.
Mode Power On	Used to control power to an external modem. The meter will drop power to the modem if there are communications problems, or programmed to on a daily basis.
UPS	Provides an indication that the meter is "Running On Mains" rather than the UPS battery, or that the meter is "Running On UPS". The last option "LCD Alarm Active" indicates that one of the UPS alarms set to be shown on the LCD are active. (See Push Alarms on page 11-9)
Relay	This includes the options for use with disconnect or load control relays. The State setting indicates the relay state – on for relay on, of for relay off, or flashing (0.5 Hz) for enabled but disconnected. The Drive On will give a pulse to turn on a bistable contactor, and the Drive Off setting will give a pulse to turn off a bistable contactor. The Drive On/Off setting will be on when the relay is on.
PLC Service Pin or Service Pin	Mirrors the state of the PLC service pin.
End Of Demand/Interval	This can be used to generate a 1.5 second pulse at the end of an interval. The End Of Interval setting is for use with surveys. Select the survey it is to trigger from (EX1 and EX2 are survey 1 and 2). It will give a pulse when the survey interval ends and another begins, including if caused by a time jump or power outage. The End of Demand setting is for use with TOU. Select the TOU group it is to trigger from (TOU Group 1 or 2). It will give a pulse when the demand period ends, when time crosses a period boundary, or when a billing reset occurs. Only **one** output can be setup for this at any one time.
EFA Active Alarms Masked	Will set the output if the selected EFA mask has active alarms.
EFA Latched Alarms Masked	Will set the output if the selected EFA mask has latched alarms.
TOU Rate Active Binary	Allows the active rate to be indicated as a binary number. The Rate group to use, and the "bit" to output must be selected. For example, to display the state of 4 rates with only 2 enunciators, the right hand one would be set to bit 0, and the other to bit 1.
TOU Rate Active	Allows an indication when a particular rate is active. The Rate group to use must also be selected. The Ex1 and Ex2 groups are designed to be used with this option to allow the creation of complex time controlled outputs.
EFA Active	Will set the output if the selected EFA is active, independent of any mask. The second group EFAs are not available in this form, if needed it could be put in its own mask group and that option used.
EFA Latched	Will set the output if the selected EFA is latched, independent of any mask. The second group EFAs are not available in this form, if needed it could be put in its own mask group and that option used.

- Table 13-1 Direct enunciator definitions

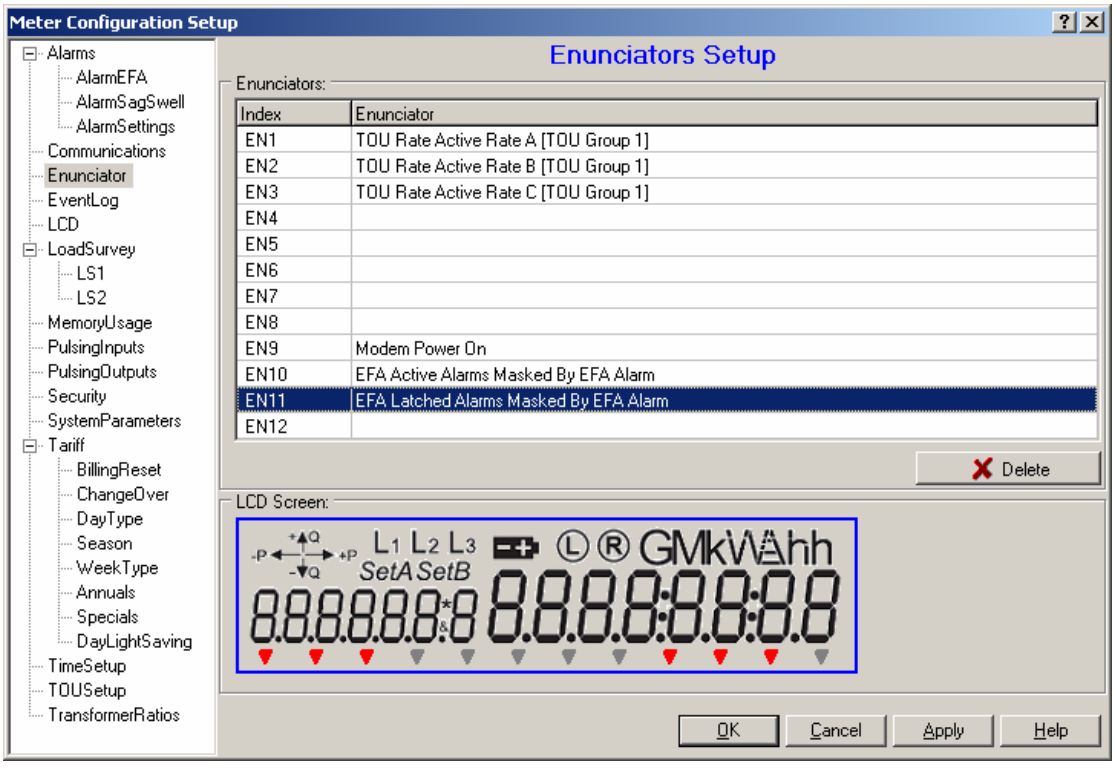
The *Inverted* option causes the output state to be inverted. This is implemented in firmware v1.32 and onwards. Understand that if power is removed from the meter the output will turn off regardless of setting.

Table 13-2 lists the available LCD related output controls. These depend on the LCD screen being shown – most useful when used with enunciators.

Status Type	Description
[LCD]TOU Channel	Set when values from the selected TOU channel are displayed.
[LCD]Previous Period	Set when values from the selected TOU period are displayed.
[LCD]Rates	Set when values from the selected TOU rate are displayed.
[LCD]Basic Unit	Set when the displayed value is of the selected unit.
[LCD]Quadrant	Set when the displayed value is in the selected quadrant.
[LCD]Phase	Set when the displayed value is measured on the selected phase. The last option is for pure pulsing energy quantities.
[LCD]Measurement Mode	Set when the type of TOU reading (Accumulated, max demand, time of max demand) matches the selected type.
[LCD]Total Reading	Set when the displayed value is a total of all phases.
[LCD]Energy Type	Set when the value is an energy quantity (Wh,varh,VAh, m^3)
[LCD]Power Type	Set when the value is a power quantity (W,var,VA, m^3/h)

- Table 13-2 LCD related enunciator definitions

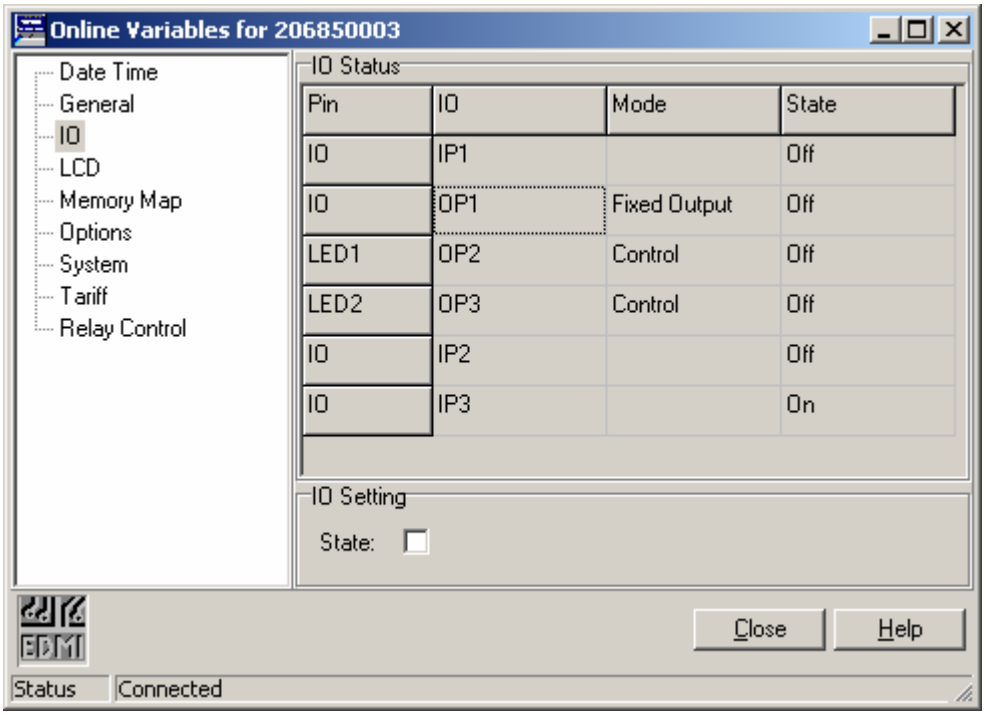
Enunciators have a similar configuration to outputs, but cannot be set to pulsing modes, a user set state, or an end of demand/interval pulse (Figure 13-5). Generally settings on this screen should match text or symbols on the label at the bottom of the LCD. The Mk10 and Mk10E have 12 enunciators, while the Mk7 has 5. The Mk10D has 11 usable enunciators – the 5th enunciator across cannot be used.



- Figure 13-5 Enunciator configuration

Output Status

EziView has an *Online Variables* page for output control. Go to the *Online Variables* → *IO* Screen as shown in Figure 13-6.



- Figure 13-6 Pulsing output online status

Each input and output is listed, with its current state. Pulsing inputs and outputs will generally not show up here reliably as the update rate is too slow to see them. Outputs that are configured as *User Set* can be controlled by selecting the output and checking or unchecking the checkbox at the bottom.

A slightly simplified version of this page is shown for lower level users (users without permission to read setup).

Intentionally Left Blank

Chapter

14

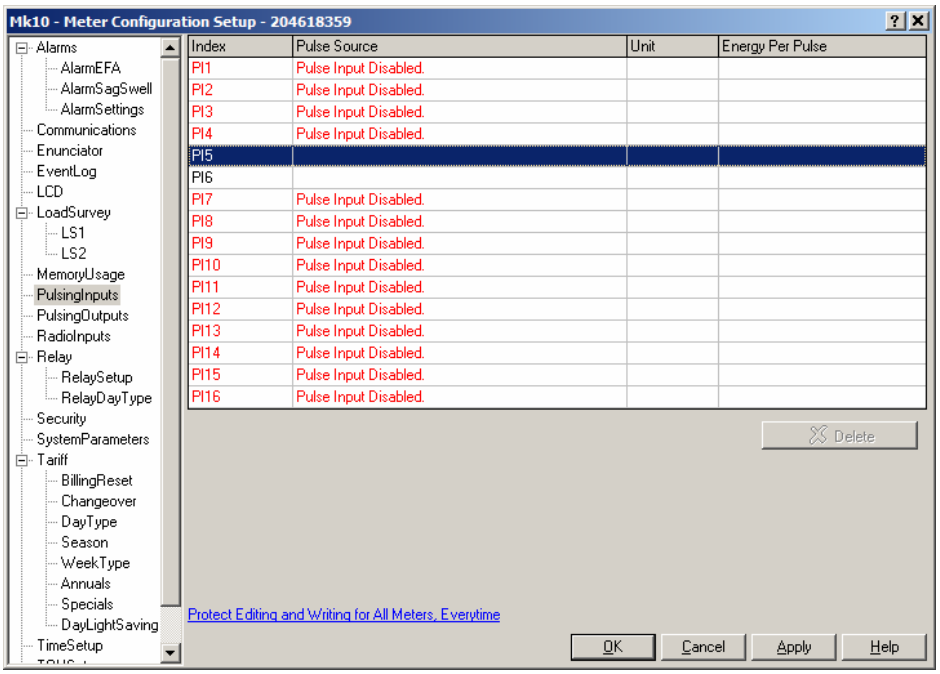
Inputs

This chapter covers the setup of pulsing inputs. These allow energy pulses from an external pulsing source to be accumulated by the meter.

Input Setup

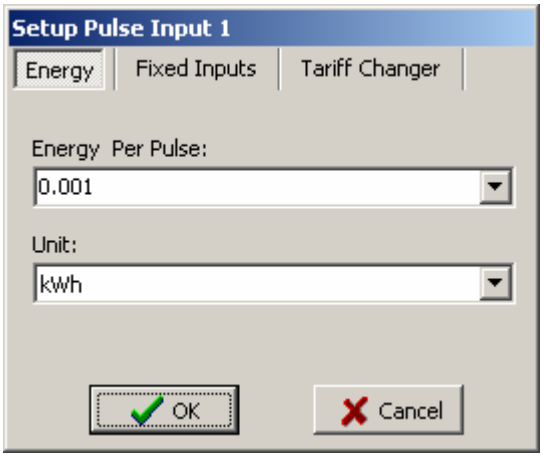
Each model of meter has options for a number of inputs. See the respective hardware section in the Atlas Hardware Reference Manual for details of the options. The exact number of inputs depends on the ordered model.

Figure 14-1 shows the pulsing input setup in EziView. Inputs that are not fitted are marked in red. Note that the order of the inputs and outputs listed is different to the physical arrangement.



- Figure 14-1 Inputs setup page

Each line gives the current settings for that input. To edit the output double-click on the setting. This brings up the detailed setup form as shown in Figure 14-2.



- Figure 14-2 Pulsing input detailed setup

Clicking OK saves these settings. The configured inputs can then be recorded by the TOU and load survey systems.

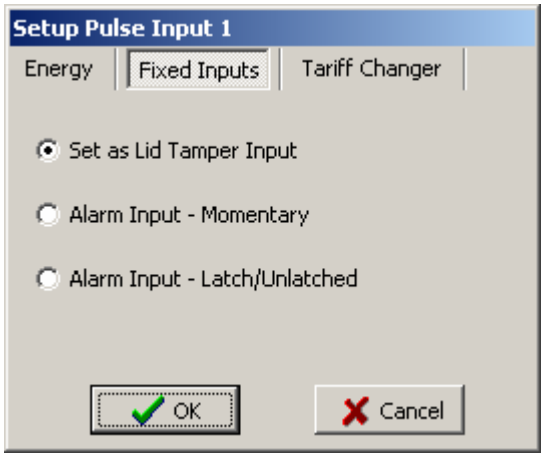
This page may be protected from editing to reduce the risk of accidental change. To unprotect it select one of the *Edit* options at the bottom of the page. See "Protected Setup" on page 3-10 for more information.

Energy

The *Energy Per Pulse* setting is used to set the energy that each incoming pulse represents. The drop down list has several defaults, but any value can be entered. It is preferred that the magnitude of energy pulses coming into the meter are a similar magnitude to what the meter is measuring, as this results in a uniformity of scaling – the meter uses the same scaling as measured energy quantities.

The *Unit* allows the unit of the incoming pulses to be selected. The energy units of Wh, varh and VAh are available, but there is also a km^3 and a kpulse setting. These simply provide support for quantities other than energy.

Fixed Inputs

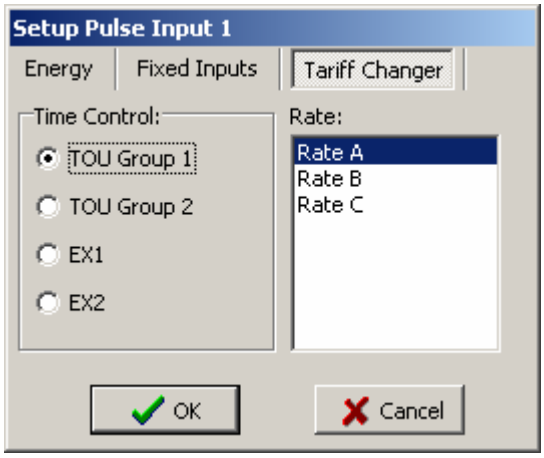


- Figure 14-3 Fixed Pulsing input detailed setup

The *Set as Lid Tamper Input* option will use this input to trigger the Lid Tamper alarm ('Lid Tamper - T', page 11-9). The switch closes when a tamper is detected.

The *Alarm Input* options are used with the UPS Mk10 to initiate an alarm transmission. *Momentary* generates an event when an input becomes active, *Latch/Unlatched* generates an event when the input becomes active or inactive. These require the UPS edition feature.

Tariff Changer

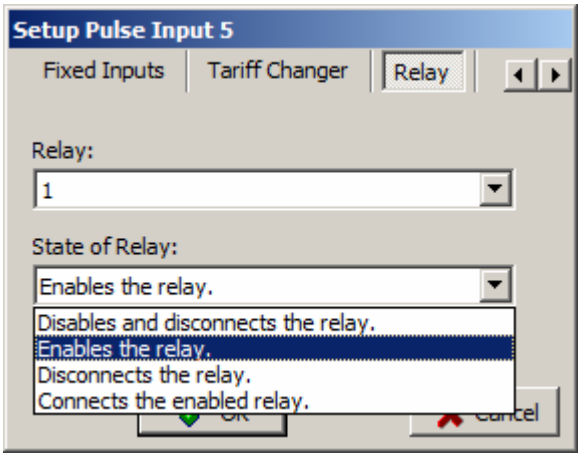


- Figure 14-4 Rate Changer Pulsing input detailed setup

The *Tariff Changer* option allows an input to control the active rate in the TOU system, overriding the calendar operation. *Time Control* specifies which time controller/rate group to control from this input. The *Rate* field specifies what rate to change to when the input becomes active.

This requires the Tariff Changer edition of firmware to have an effect.

Relay



- Figure 14-5 Rate Changer Pulsing input detailed setup

The *Relay* option allows an input to control a relay in the meter by pulsing an input. *Relay* specifies which relay to control from this input. The *State of Relay* field specifies what operation to perform on that relay.

This is only available on enhanced processor meters, though it is always shown in EziView 4.08. It requires the Relay Change on Input edition of firmware to have an effect (EziView 4.20 and later)

Chapter

15

Security

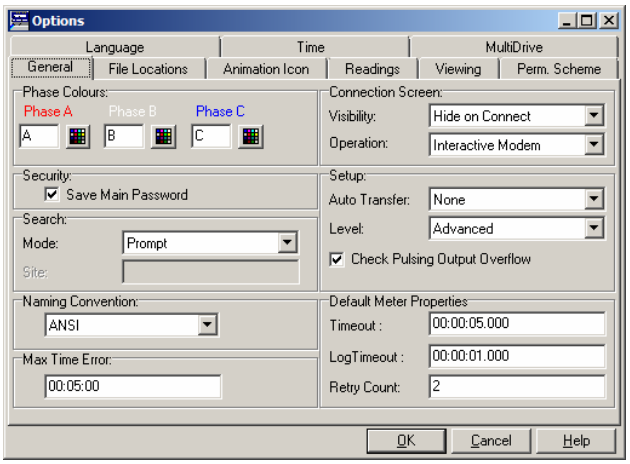
The security systems of the meter and of EziView allow for fine control over who is allowed to do what with the meter. Each user has their own user name and password. This grants them access to their user group, which defines what they can and can't do.

User's Perspective

Security is controlled by EziView using usernames and passwords on a meter by meter basis. When EziView loads it will ask for a username and password (Figure 15-1).

- Figure 15-1 EziView login dialog

Enter your username and password, and then click *OK*. Clicking *Cancel* will not log you in. To avoid entering your username and password every time you start EziView, it can be remembered by using the *Tools* → *Options* → *General* → *Save Main Password* checkbox (Figure 15-2). Note that this reduces the security of EziView as no password need be entered when starting EziView to access meters.



- Figure 15-2 *Save Main Password* setting

The username and password may be changed within EziView using the *Tools → Current User* option. If the *Save Main Password* option has been selected then a *Save Password* checkbox will also be displayed. Checking this box remembers the entered username and password.

Additionally there is a *Tools → Alternate Logon* option. This allows for the provision of an alternate password to use if the main password fails. This can be useful for instance where meters are to be configured with a new set of usernames and passwords, but the existing password to access the meter is not part of the new configuration. This can be entered as the alternate logon, while the normal password remains set to your normal password.

The *Link Security* field in a login is used when you don't have an account in the meter and are attempting to map the site. Select the MTR file of a meter in which you belong to a group. EziView will use the group username and password from that meter to map the site.

Meter Security Overview

Before going into how to configure security using EziView, this section covers the security features of the meter. This should be read first.

The meter allows for up to six users. Generally before any operations may be performed a user must log on. Each user has a user name and a password, each up to 7 and 15 characters long respectively. Sending a valid user name and password to the meter logs on the user. The user remains logged on until logged out by whatever means.

Each user has a user level, also called a user group. When a user logs on, the user group they belong to is used to decide what they can access.

There are seven user groups numbered 0 to 6. Table 15-1 lists the access levels and what each level can do. Each successive level can do all that the lower levels can do, with the exception that levels 4 and 5 are swapped – level 4 has slightly more access than level 5. There is an 8th user group (level 7) which provides access to calibration settings and is for factory use only.

Number	Access	Description
0	Read only	Only allows values to be read
1	Read All/ Limited Timeset	Also allows the time to be set by a limited amount, as per the shift limit setting.
2	Read All/Billing Reset	Also allows a billing reset to be performed.
3	Read All/Clear	Clear EFA alarms, surveys and other systems. Control user programmable pulsing outputs. Unlimited timeset ability.
4	Read All/+Setup/ Write User	Allows the setup to be read, and allows limited setup change. Added in firmware version 1.27
5	Read All/+Setup	Allows the setup to be read, but not written.
6	Read/Write All	Allows the setup of the meter to be changed.

- Table 15-1 Meter access levels

By default (unless ordered otherwise), meters are usually shipped with a single user "EDMI", which has a password of "IMDEIMDE". This user has level 6 access. This user may and should be deleted after you have configured your own administrator user.

In addition to this the access to the setup for a level 6 user can be fine tuned for each user to limit access to different sections of the setup.

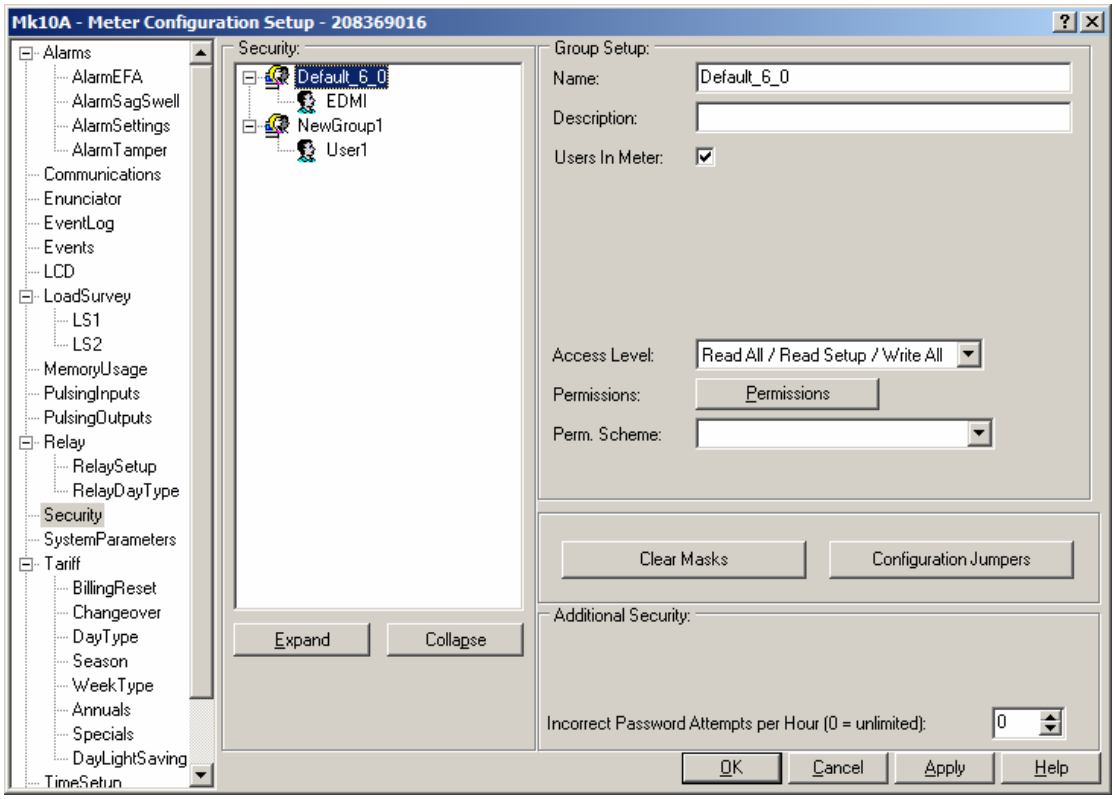
Note that users below level 4 cannot read the setup out of the meter.

Level 4 was added in firmware version 1.27. Versions prior to this will treat level 4 as level 3 type access.

As described above, the internal security provisions of the meter are substantial. EziView uses these capabilities, and adds more of its own.

EziView Security

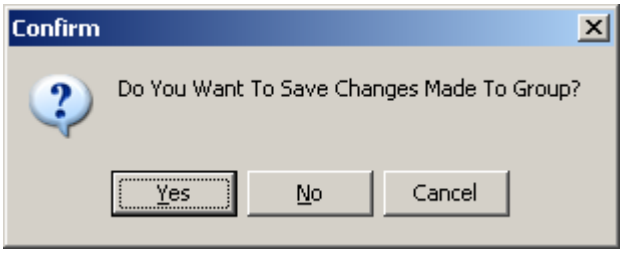
Each meter in EziView has its own separate security settings – there are no program wide settings. The *Security* page is used to configure the settings for the meter. (See Figure 15-3)



- Figure 15-3 EziView *Security* setup page

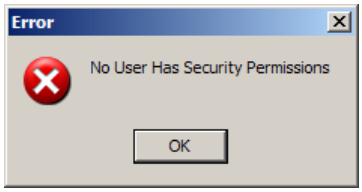
The tree diagram shows the user groups and the users within those groups. Properties for the selected item appear to the right of the tree view. The plus and minus boxes may be used to expand or collapse parts of the tree view. The *Expand* and *Collapse* buttons affect the entire tree view.

When group changes are made *OK* and *Cancel* buttons appear just above the *Additional Security* box. Settings are not validated until *OK* is clicked. Clicking *Cancel* cancels the changes. If an attempt is made to leave the settings page without clicking *OK* or *Cancel*, a dialog will ask if the changes should be made (Figure 15-4). *Cancel* returns to the settings page. The *Yes* and *No* buttons act the same as the *OK* and *Cancel* buttons discussed.



- Figure 15-4 Security change confirmation

If all users with level 6 access are deleted, EziView will display a warning as shown in Figure 15-5.

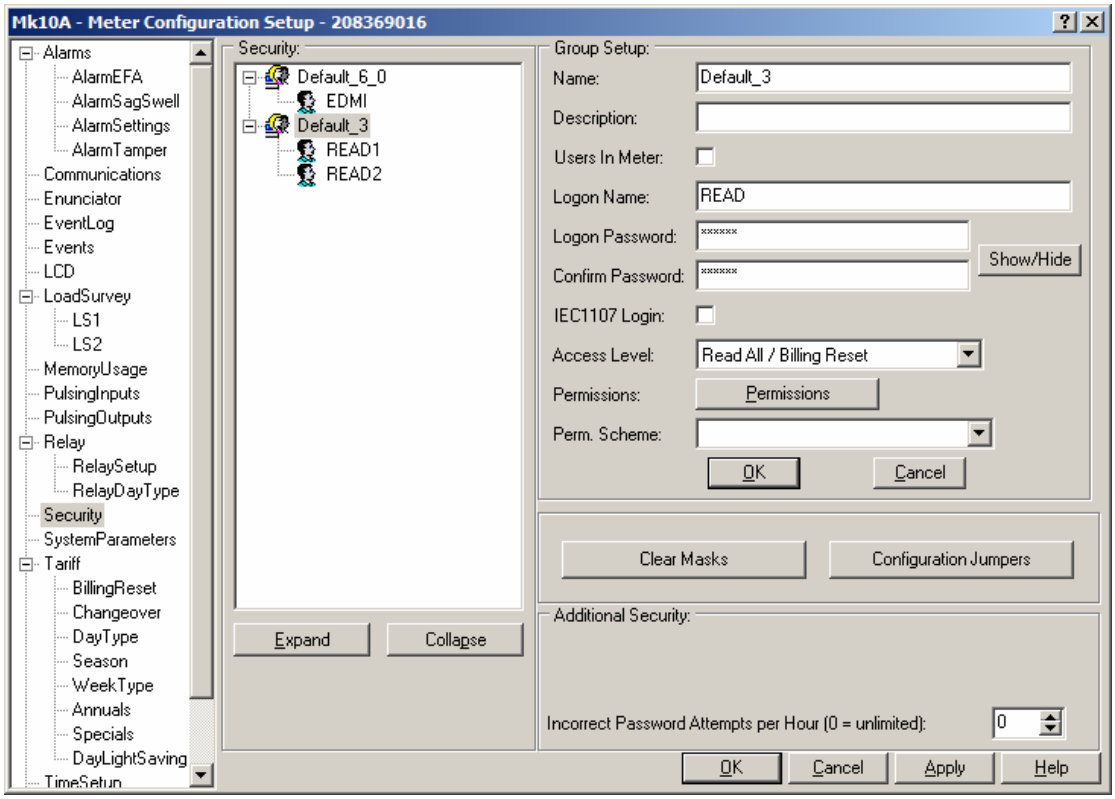


- Figure 15-5 *No User* warning

User Groups

The user groups in the meter are predefined as mentioned earlier in Table 15-1. EziView also adds some flexibility to the higher levels. Each group has a *Name* and a *Description* – these are not stored in the meter, but EziView keeps track of them in the MTR file. The name is what appears in the tree view. Users belong to one of the groups – the settings of a group affect all users belonging to the group.

Permissions allow the access permissions of the user group to be changed. The use of this is covered in the "Permissions" section later in the chapter.



- Figure 15-6 Users not in the meter settings

Users in meter allows for selection between two types of security restrictions. When the *Users in Meter* box is checked, the username and password of a user is used both for EziView and for the meter. If the box is unchecked (Figure 15-6), a logon username and password for accessing the meter must be entered for the group. This is the username and password that is stored in the meter. Users belonging to this group do not have their usernames and passwords stored in the meter – these details are only kept in the EziView meter setup (in the MTR file). When these users log into EziView, EziView looks up the group username and password to log into the meter.

This feature is useful where it is undesirable to give users the ability to perhaps use other programs to access the meter. Without the meter username and password, the only way the user can access the meter is via EziView, with the meter setup MTR file. The other advantage is that the meter only supports up to six users. By only having one user account in the meter for a group of users, the number of users in that group is unlimited. The disadvantage is that the meter can only log the connection of the user account in the meter (where the meter user name is displayed). This affects that ability to track individual access.

With this type of group, the permissions should be set to disallow access to the security setup to prevent the users in the group from finding out the login password.

From the example in Figure 15-6, the logon name 'READ' is stored in the meter – anyone knowing this username and password can log into the meter using EziView without the MTR file. The 'READ1' and 'READ2' users are not stored in the meter – the only way these users can access a meter is if they have the original MTR file, so EziView can confirm their passwords then logon to the meter using the 'READ'

username and password. Since the 'READ1' and 'READ2' users do not know the 'READ' username and password, they cannot access the meter without using the original MTR file, and any restrictions it imposes.

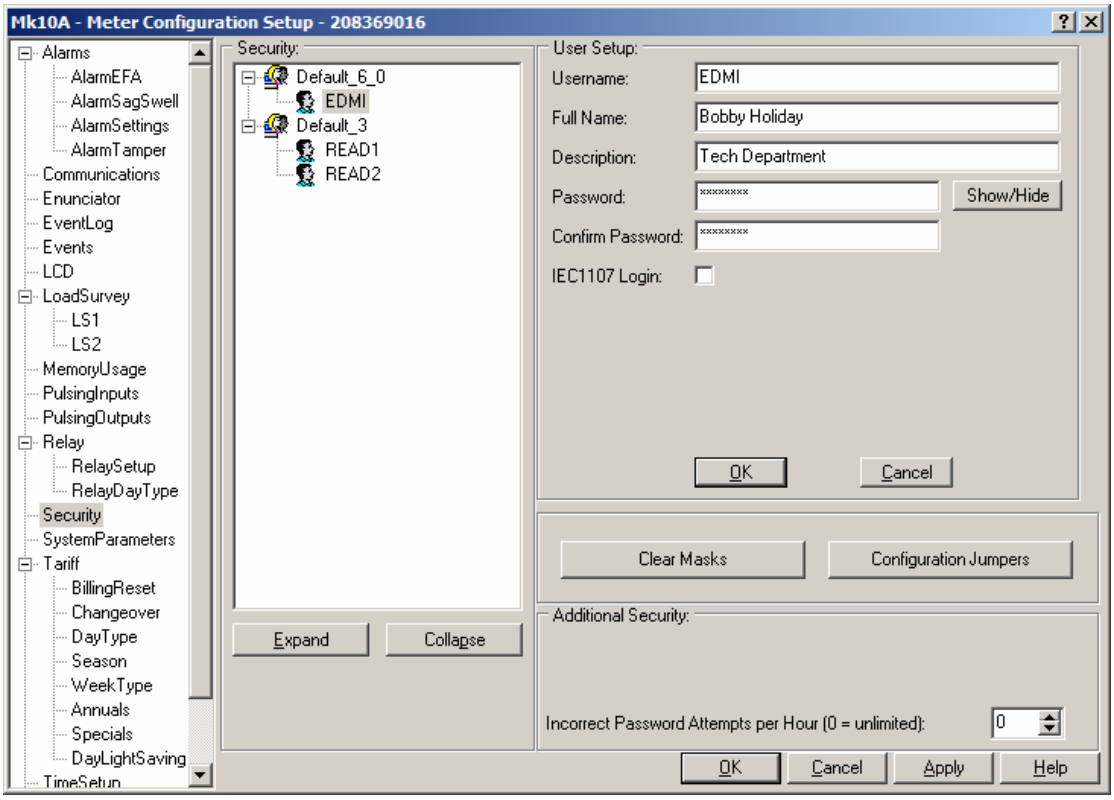
Note that if the setup is read from the meter by a user (with setup read access) without the original MTR file, the users of each group will not be shown, and the groups will appear as normal users. This is because the users in the group are only stored in the original MTR file.

Fill in the additional user information for the group as for a user (see the following section). This is the username and password that will be used to log into the meter.

Right-clicking on a group gives a number of options. *New Group* (Ctrl-G) creates a new blank group. *New User* adds a new user to the group. *Copy* creates a new group with the same settings, and *Delete* deletes the group and its users.

Users

Users may be added to a group from the groups pop-up menu, or from another user's pop-up menu. Users may be dragged from one group to another. The position of a user within a group makes no difference. The meter supports up to 6 users. For groups with user accounts in the meter each user counts as one user. For groups with user accounts not in the meter the group counts as one user.



- Figure 15-7 EziView user setup

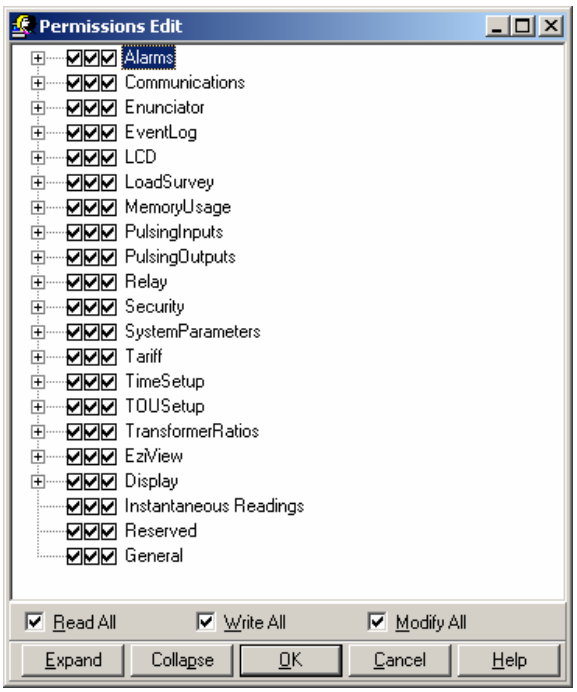
Figure 15-7 shows the settings for a user. The *Username* may be up to 7 characters long (A to Z and 0 to 9). The *Full Name* and *Description* fields are kept by EziView (not the meter) and are for information only.

The *Password* may be from 5 to 10 characters (A to Z and 0 to 9). Enter the password into both the *Password* field and the *Confirm Password* field – they must match or EziView will not accept the new password. The password will usually be starred out. The *Show/Hide* button may be used to display the password text.

EziView will try to protect you from writing a setup to the meter that has no administrator user. Care should be taken that there is always a user capable of changing user information.

Permissions

Clicking on the *Permissions* button displays the main permissions edit screen (Figure 15-8). The security groups are arranged under a tree diagram that follows the arrangement of the setup pages.



- Figure 15-8 *Permissions Edit* screen

There are three check boxes for each security group. The left-most box allows reading when checked. The middle box allows writing when checked, and the right-most box allows modifying when checked. The *Modify* setting is used to prevent users from modifying settings in EziView. If a user is not permitted to modify or write a setting, it is greyed out and cannot be changed. If all of the modify settings for a setup page are cleared, the setup page is not displayed. Note that the bottom 3 groups *Instantaneous Registers*, *Reserved*, and *General* are always accessible.

When a new user group is created, it is given a default set of permissions based on the user level, but these can be modified to suit exact requirements.

There are 23 security groups that affect meter setup, generally defined around setup pages in EziView. In addition there are another few groups that control access to EziView functions such as the meter *Properties* menu. See Table 15-2 for details.

Security Group	Description	Shared
Alarms	Alarm setpoint and masks	1
AlarmSagSwell	Sag/Swell settings	
AlarmTamper	Tamper settings	
Calibration	Meter Calibration (cannot be written)	2
Hardware	Meter Hardware (cannot be written)	
Communications	Optical and modem port settings	3
TOU	TOU Channel Configuration	4
LoadSurvey	LoadSurvey 1 and 2 Configuration	5
PulseOutput	Pulsing Output Settings	6
Enunciators	Enunciator Settings	7
LCD	LCD screens, formatting, and cycle times	
PulseInput	Pulsing Input Settings	8
RadioInput	Radio logger inputs for the wireless datahub	
EventLog	Event Log memory allocations	9
ChinaLog	China Log Options	
MiscellaneousString	Miscellaneous String setting	10
CustomerPlantNo	Plant Number (if permitted by factory setup)	
Transformer	Transformer Ratios	11
TimeSetup	Time source, time calibration, and Daylight Savings	12
MemoryRemoteUpgrade	Reserved memory for remote upgrade usage	13
SecurityBillingReset	*Billing Reset* button deactivation control	14
Security	Security access to the meter	
TariffSetup	TOU tariff calendar	15
TariffChangeOver	TOU changeover date	
TariffBillingReset	TOU automatic billing reset settings	
TariffDemand	TOU demand forgiveness settings	
RelaySetup	Relay configuration	
TariffRelayDayType	Relay schedule configuration	
Properties	EziView meter properties setting Also controls the meter lock icon	All Levels
GeneralRegister	EziView General register reads and writes	Level 3+
DisplayBillingReset	EziView show *Billing Reset* button	Level 2+
DisplayDateTime	EziView Date/Time change	Level 3+
DisplayDateTimeLimited	EziView Date/Time change by limited amount	Level 1+
DisplayDebug	EziView allows user to change to binary mode (serial port diagnostics)	Level 3+
DisplayNumberofBillingResets	EziVIew show number of billing resets	Level 3+
Display PulsingOutputs	EziView pulsing output control in online variables	Level 3+
Display PowerOnOffTime	EziView show power on/off time	Level 3+
Display Waveform	EziView display waveform	Level 3+

- Table 15-2 Meter permission groups

The meter itself only stores 15 security groups, and does not store modify flags. This means that if a meter setup is simply read out of a meter that is not known by EziView, some of the permissions are not unique. The "Shared" column of Table 15-2 indicates

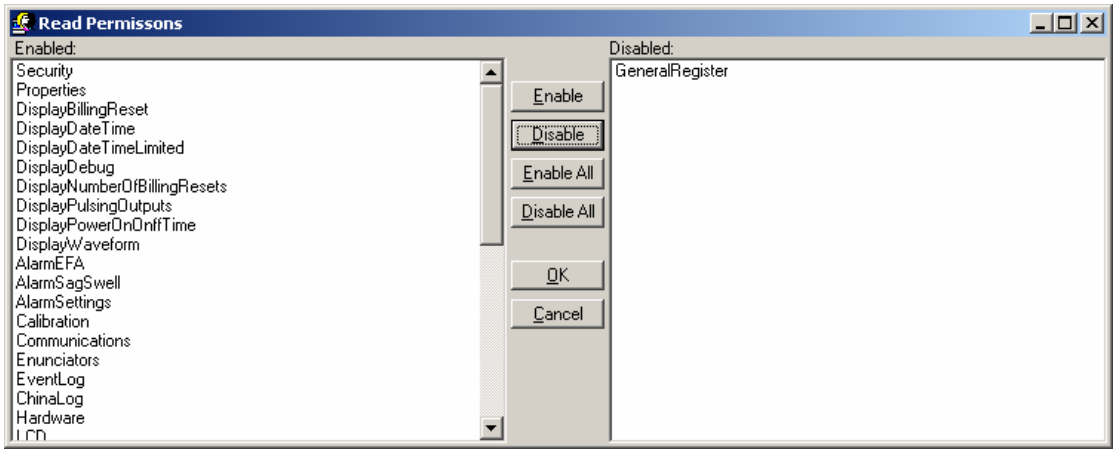
which permissions are shared. If one of a set of shared permissions is accessible to a user originally, then all of the shared permissions will be accessible in the setup read out of the meter. The modify flags are set equal to the write flags. The EziView groups (at the bottom of the table) are set based on the security level indicated.

Note that to write/read setup to/from the meter you still need the basic security level access to do so. These permissions simply allow fine tuning of what is allowed to be changed by a user.

Alternate Permissions Control

In addition to the tree view of permissions, there is another display that simply lists the security groups. They both allow the same things to be done, but are simply presented in a different way. This way may be more useful when working with registers directly.

Right-clicking on the *Permissions* button brings up a small menu with options for *Read*, *Write* and *Modify*. Selecting one of these will display the setup for that type of flags (Figure 15-9).

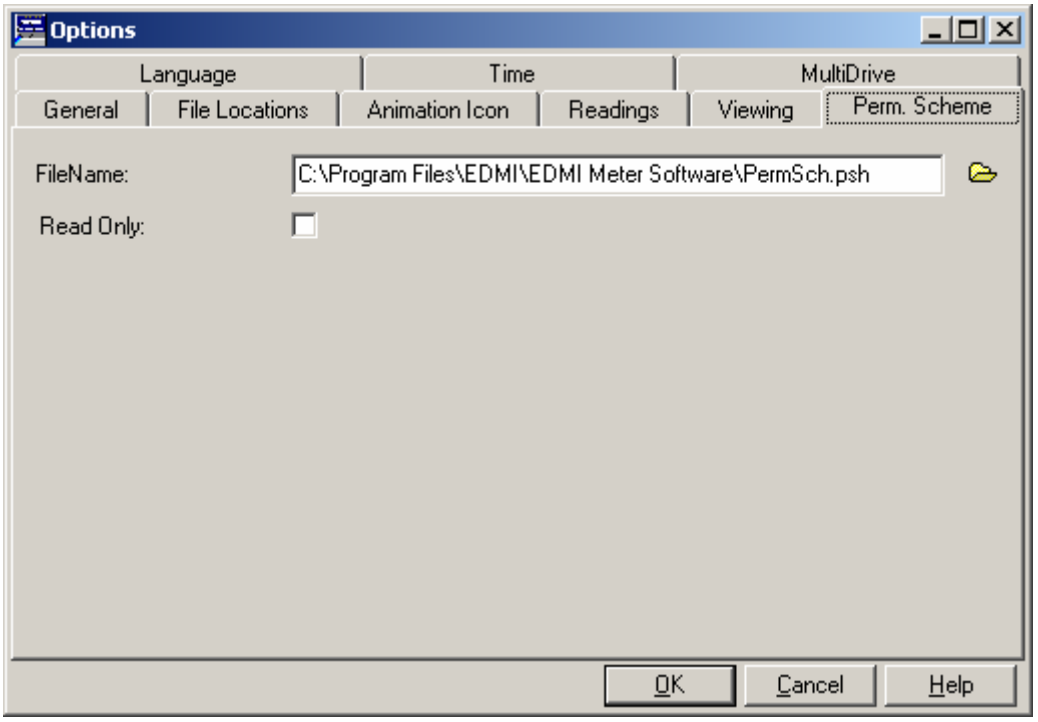


- Figure 15-9 Alternate permissions setup method

All security groups are listed, along with their security group number in brackets. The left hand pane shows the enabled security groups, while the right hand pane shows the disabled ones. Selecting entries and selecting *Enable* or *Disable* will move them as directed one side to the other. The *Enable All* and *Disable All* buttons move all entries, regardless of selection. *OK* saves the changes, *Cancel* ignores the changes.

Permission Schemes

With the large number of security groups it can become tedious to keep on setting up the same security for several users. To overcome this EziView has *Permission Schemes*. This allows permission setups to be stored and reused. The schemes are stored in a single file, the location of which may be setup in *Tools → Options →Perm.Scheme* (Figure 15-10).



- Figure 15-10 Permission scheme options

To create a permission scheme, first setup the permissions as normal. Then enter a name for the scheme into the *Perm. Scheme* field on the *Security* setup page. A save button will appear to the right of the field – click this button to save the new scheme. It will be added to the drop down *Perm. Scheme* list.

To apply a permission scheme simply select it from the drop down list. When a scheme is selected, a delete button will appear to the right. Clicking this button will delete the scheme.

In order to reduce the risk of accidentally changing a scheme, the options page (Figure 15-10) has a *Read Only* check box. Checking this box stops the display of the *Save* and *Delete* buttons and thus prevents the schemes from being changed.

Note that the Permission scheme does not change the Access Level – an appropriate access level should be selected. The default 'Meter Reader' scheme would generally be used with a *Read Only* access level.

Additional Security

The *Billing Reset Button Disable* check box may be checked to disable the operation of the *Billing Reset* button on the front of the meter. The *Hide Billing Reset message from*

LCD is purely cosmetic – it simply hides the "Billing Reset" message normally shown on the LCD when a reset occurs.

The *Incorrect Password Attempts per Hour (0 = unlimited)* setting allows a limit on the number of unsuccessful logins in an hour, in accordance with UK COP5 requirements. If the number of failed logins (due to bad username/password) during an hour exceeds the limit programmed here, the meter will deny any further logins until the end of the hour. The count of bad logins is not reset when a successful login is made, or if power is lost. It will only be reset if the meter is powered on at the end of an hour.

Writing a new *Lockout Limit* to the meter does not clear the existing count of failed logins. This means that if a meter for example has a *Lockout Limit* of 0 and already has had 10 bad logins in the last hour, setting the *Lockout Limit* to 5 will cause the meter to be locked out until the next hour.

Config Jumper

When the *Config* jumper is not fitted in the meter, there are a number of limitations imposed on the setup. The calibration and hardware setup cannot be written in any way. It also blocks lost password recovery. This is designed to offer a level of hardware security that only breaking the meter seals can override.

The *Configuration Jumpers* button views the configuration jumper limitations, which are a factory setting ((introduced in firmware version 1.26). The page shown in Figure 15-11 is displayed, which indicates what login levels are allowed with and without the *Config* jumper.

- Figure 15-11 Config Jumper Limits

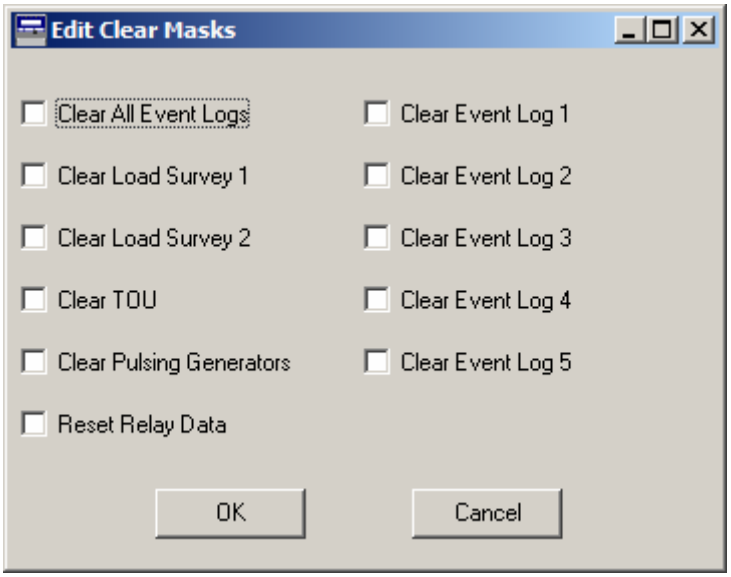
These settings would be specified at time of order, generally to control access to a level 6 user. The example in Figure 15-11 indicates that the Config Jumper does not block any normal logins (level 6 and below), but is protecting the calibration and hardware configuration settings.

If 'Level 6' was checked then a level 6 user could not log in.

Clear Masks

Users lower than a level 6 user can be blocked from clearing certain types of data. This was introduced in firmware version 1.26, prior to that the clear mask settings will have no effect.

The *Clear Masks* button views the mask settings. The page shown in Figure 15-12 is displayed, which indicates what sections of the meter cannot be cleared. Of most interest are the *Event Log*, *TOU*, and *Load Survey* options. Preventing clearing of the *Pulsing Generators* will prevent partial pulses from being cleared.



- Figure 15-12 Clear Masks

Note for EziView versions prior to 4.20 – do not block masks from *Recalculate TOU calendar* to *Reset LCD Screens.*

Lost Passwords

Care should be taken that at least one user has permission to change user security information. Contact EDMI if you do manage to lock yourself out of the meter.

Chapter

16

Relay Outputs

Relay outputs are a special type of output, designed to control a disconnect relay or a load control relay. They are generally separate from the regular pulsing output system. The meter has the ability to control up to 3 relays, which may be either internal or external to the meter.

Where relays are internal, they have a fixed relay number. In the Mk7A, Relay 1 is the disconnect relay and Relay 2 is the load relay. In the Mk7C and Mk10D Relay 1 is the disconnect relay. Unused relay controllers can be used to drive external relays using pulsing outputs.

The difference between a disconnect relay and a load control relay is subtle. A disconnect relay is assumed to control an entire customer, and there are safeguards when turning it on or off. A load relay is assumed to be controlling something like a hot water system that can be turned on and off without risk of injury, generally on a regular basis.

Relay support is an optional edition. The firmware edition must have the relay control feature for the relay settings to work. Internal Disconnect Relays or Disconnect Via IO editions are needed.

There are two levels that control each relay – enabled/disabled which controls if the relay is **allowed** to turn on, and connected/disconnected which controls if the relay **is** turned on. Table 16-1 lists the possible states.

State	Description
Disabled and disconnected	The relay is not allowed to turn on, and is thus also off.
Enabled and disconnected	The relay is allowed to be turned on, but is off.
Enabled and connected	The relay is on.
Disabled and connected	Not possible!

- Table 16-1 Relay states

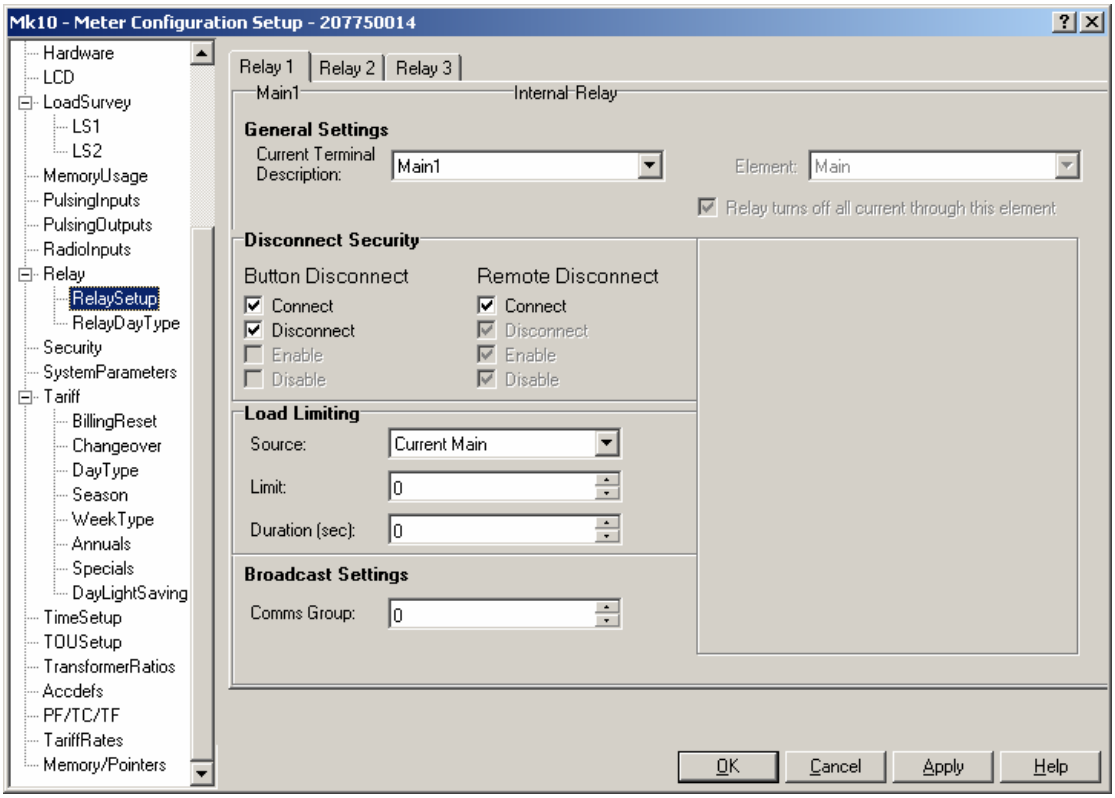
Depending on the relay, it can take a significant amount of energy to close or open it. The meter takes around 30 seconds to charge up again after a relay with these energy limitations has been switched, or after power on. During this time if another switch is

attempted the change will be *Pending*, and will occur when sufficient charge has been reached.

Relay Setup

The meter supports many variations of relay organisation. In order to handle this the configuration is very flexible. Where there are internal relays in the meter their basic arrangement is configured in the factory. The structure of external relays are not known of course, but the arrangement may be configured here.

Figure 16-1 shows the Relay setup in EziView. Note that the options available depend on what internal relays are fitted. The heading for each relay indicates if it is internal or external. The tabs select which of the 3 relays to configure.



- Figure 16-1 Relay setup page

The *Current Terminal Description* allows the relay to be given a name – it is recommended that some consistency across an installation is used here. For instance, use Load 1 for hot water systems, Load 2 for pool pumps and Load 3 for heating. This is effectively what the output terminal is called.

Element sets the measurement element that measures the current going though this relay. For internal relays this cannot be changed. In the example of Figure 16-1 both relays are measured by the main element. The *None* option is for external relays where the current is not measured by the meter.

Relay turns off all current through this element tells the meter if the current measured by this element should go to zero when the relay is turned off. This is to cover situations where there may be a switched load and an unswitched load, both measured by the one element. The meter can better detect tampering and switching faults by knowing this, and allows generation of the *Relay Stuck* event. For internal relays this cannot be changed.

Disconnect Security affects how the relay can be controlled, and the effect of the connect/disconnect button. There are two sources of control – the push buttons of the meter, and the communications system (Remote), which includes the optical port.

Not all options are available for each source – for example the button cannot Enable or Disable a relay. These fixed settings are indicated by greyed out selections. Table 16-2 lists the allowed options for the button. The button always controls all 3 relays.

Button Setting	Meaning	Description
☐ Connect ☐ Disconnect	Button disabled	The button cannot control the relay.
☑ Connect ☐ Disconnect	Button can connect a relay	If the relay is enabled, pushing the Connect button will connect it.
☑ Connect ☑ Disconnect	Button can connect and disconnect a relay	If the relay is enabled, pushing the Connect button will connect it. If the relay is connected, pushing the Connect button together with the select button will disconnect it (but it remains enabled).

- Table 16-2 Button Options

Remote Options always allow a user to *Enable*, *Disable*, or *Disconnect* a relay. Whether a relay can be connected remotely is controlled by the *Connect* checkbox.

Using these setting almost any configuration of relays can be configured, whether internal or external. The example of Figure 16-1 is for a Mk7C with an internal disconnect relay, and an external load control relay switched by a pulsing output.

The use of pulsing outputs to control relays and indicate the state is covered in Table 13-1 on page 13-5, using the *Relay* option.

Broadcast Settings - Comms Group allows this relay to be put in part of a communications group. This is to allow splitting up groups of meters in an area, so a single broadcast command can affect appropriate groups of meters. 0 indicates no group, and the range of groups is 1 to 127.

Load Limiting configures the parameters for the load limiting functions. These allow the load through the meter to be limited, and to disconnect a customer if the limit is exceeded for a time. They only become active when a load control command is active for the relay (See Table 16-3).

Load Limiting support is an optional edition. The firmware edition must have the load limiting feature for the load limiting settings to be enabled.

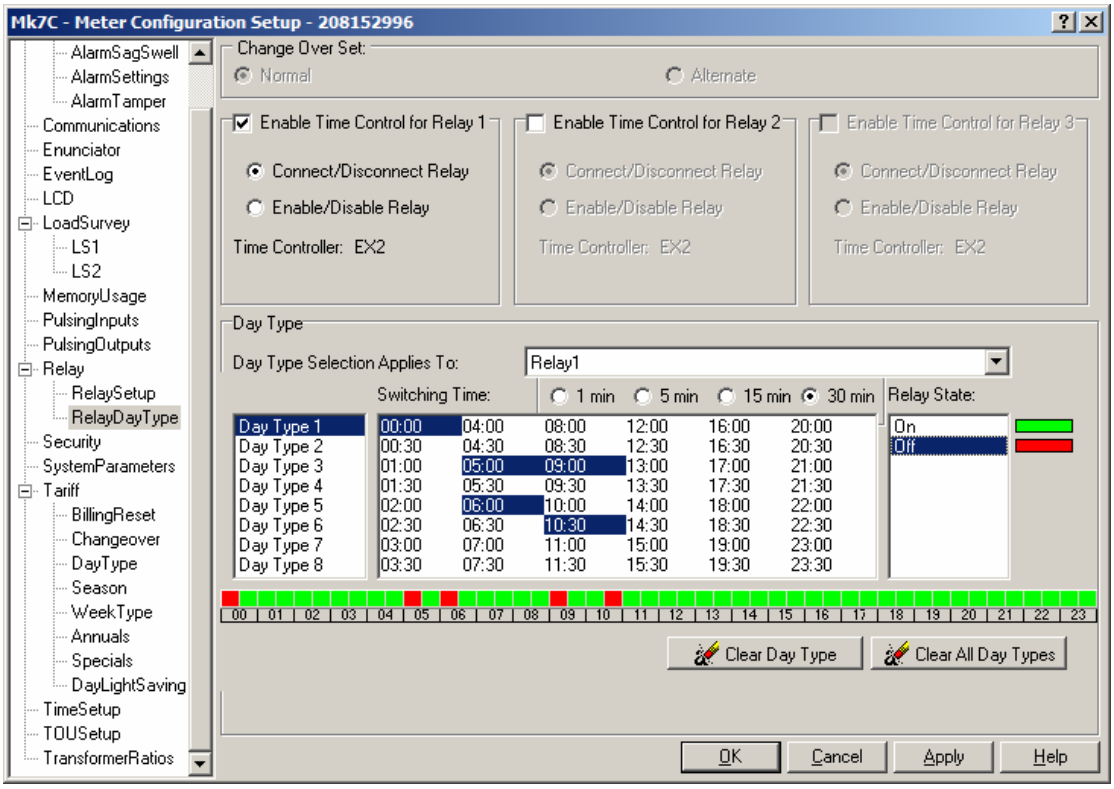
The *Source* sets what quantity is measured. The Source can be either W, var, VA, or current, using either a single phase/element or the maximum of all phases (I total, W total, VA total).

Limit sets the maximum allowed for that quantity. The load limiting load control command specifies a limit as a percentage of this settting. This allows customers to have different allowed loads in a load control situation, while allowing the same load control command to be set out as a broadcast (eg limit all customers to 50% of there nominal load). The maximum value of the limit is restricted by sensible maximums for the quantity – eg current on a 100A Imax meter is limited to 110A.

Duration sets the time in seconds that the source must be over the limit for before it is deemed an overload and the load is disconnected. The range is 0 to 4095 seconds (68.25 minutes). The limit is tested once per second, based on a reading over 5 cycles.

Relay Time Control

The relays can use the abilities of the TOU calendar system to control relay switching times. The RelayDayType page controls this feature as shown in Figure 16-2.



- Figure 16-2 RelayDayType page

Enabling time control for a relay allows it to be controlled by the calendar of the meter, in the same way the rates are controlled. The EX2 TOU group is used for this purpose.

The relay can be controlled either as a Load relay, or a Main relay. As a Load relay, the calendar will connect and disconnect the relay when the switching time changes from off to on, or on to off. If the relay state is changed between switching times, it will

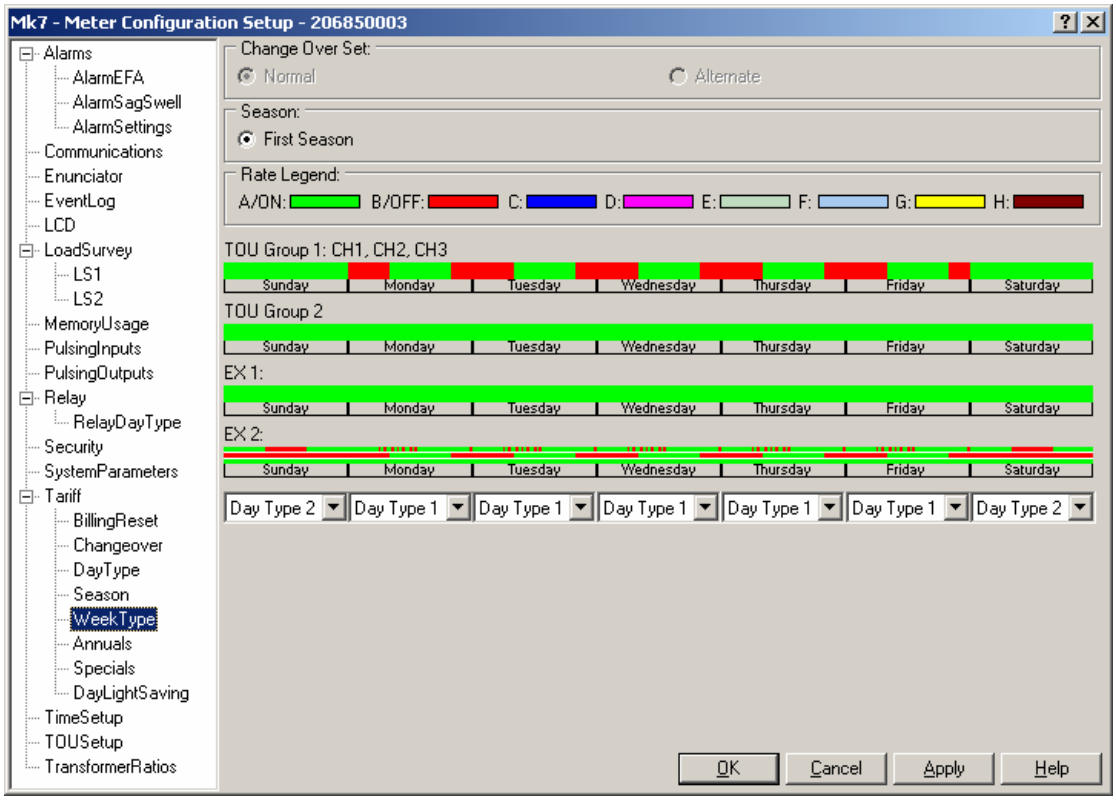
remain in that state until the next switching state change. This allows for the connect button to function as a type of boost button.

As a Main relay, the calendar will enable and disable the relay. In this way the times that the relay may be connected and disconnected can be controlled. An example usage would be a holiday house which only allowed electricity to be turned on during weekends.

The type of operation can be selected separately for each relay, and each relay's switch times operate completely independently. In the Day Type section, the relay to edit times for is selected. In a similar way to programming rates, switching times for the 8 different day types can be programmed. The difference is that there is only an on and an off state. The 'Tariff Calender Setup' section starting on page 8-10 covers the options in greater detail.

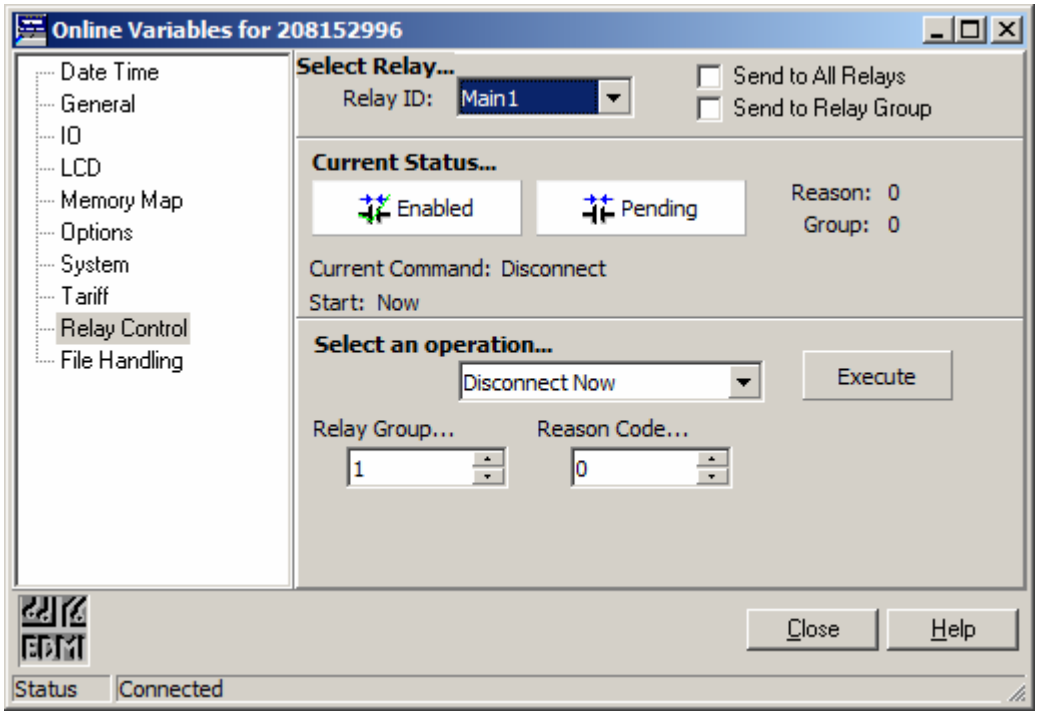
The Week Type, Annuals, Specials, Seasons and Change Over Set configuration all affect the choice of daytype as for normal TOU rate switching.

The relay switching times show up in the EX2 row on the *WeekType* configuration page (Figure 16-3). The three bands show relay 1, 2, and 3. Do not use the DayType page to edit the EX2 group, as it is not spit into individual relays.



- Figure 16-3 Week Type page showing Relay settings

Online Control



- Figure 16-4 Relay Control page

The *Screens→ Online Variables→ Relay Control* page allows direct control of the meter relays, providing that appropriate permission is given.

The relay to control is selected from the *Relay ID* field. To send a command to any relay in a specific group check the *Send to Relay Group* checkbox, and select the group with the command. To send a command to all relays check the *Send to All Relays* checkbox.

Current Status shows the current state of the relay. *Current Command*, *Reason*, *Group*, and *Start* show the current command, or the last command if no new command has been received.

Clicking on the Enabled/Disabled or Connected/Disconnected buttons will send a command to change the state. Pending will be shown if the relay needs time to charge.

The relays are controlled by commands, and each relay can have one command queued up to occur, as shown in the Current Status panel. The *Select an operation* part of the screen allows various commands to be given to the relay.

If the *Relay Group* is other than 0 then only those relays with that group will listen to the command. The *Reason Code* is a number from 0 to 255 which can be used to indicate why the command is issued. For instance, 1 could mean 'non-payment', and 2 could mean 'customer moving out'.

The available commands are listed in Table 16-3. Note that the remote commands allowed are controlled by the *Control Used* setting on the *Relay* configuration page.

Command	Description
Connect Now	The relay will be connected immediately if it is enabled.
Connect Later	A time is given, and at that time the relay will be connected if it is enabled.
Enable Now	The relay will be enabled immediately.
Enable Later	A time is given, and at that time the relay will be enabled.
Disconnect Now	The relay will be disconnected immediately.
Disconnect Later	A time is given, and at that time the relay will be disconnected.
Disable Now	The relay will be disabled immediately, which will also cause a disconnection if the relay is connected.
Disable Later	A time is given, and at that time the relay will be disabled, which will also cause a disconnection if the relay is connected.
Load Control %	A start and stop time is given, and a load percentage. During this period if the meter load goes above the indicated percentage of the limit then the relay will be disconnected. EziView 4.04 does not support the setting of the limit.
Load Control On->Off Period	A start and stop time is given, and during this time the load is kept off.
Load Control Off->On Period	A start and stop time is given, and during this time the load is kept on.

- Table 16-3 Relay Commands

Once the command and parameters are set, clicking the *Execute* button sends the command.

LCD, Button and LED Interface

These form an interface for an end user to interact with the relays. They allow the state to be displayed, and the relay to be connected and disconnected.

Pressing the 'Connect' button for a second will connect any relays which are disconnected but enabled, providing this is enabled by the setup (Table 16-2). The LCD will show 'CONNECT' for a brief period as feedback to the user.

Pressing the 'Connect' button and the 'Select' button together for a second to disconnect (but not disable) any relays which are connected, providing this is enabled by the setup (Table 16-2). The LCD will show 'DISCONNECT' for a brief period.

LED's and enunciators may be configured (Outputs and Enunciators, page 13-1) to indicate if a specific relay is connected or disconnected. They can also indicate the state - on if the relay is connected, off it is disconnected, or flashing if the relay is enabled but disconnected.

A Vendor Name and Number to contact for reconnection of supply can be automatically displayed when the main relay is disconnected by setting them on the *SystemParameters* page (System Parameters, page 6-11).

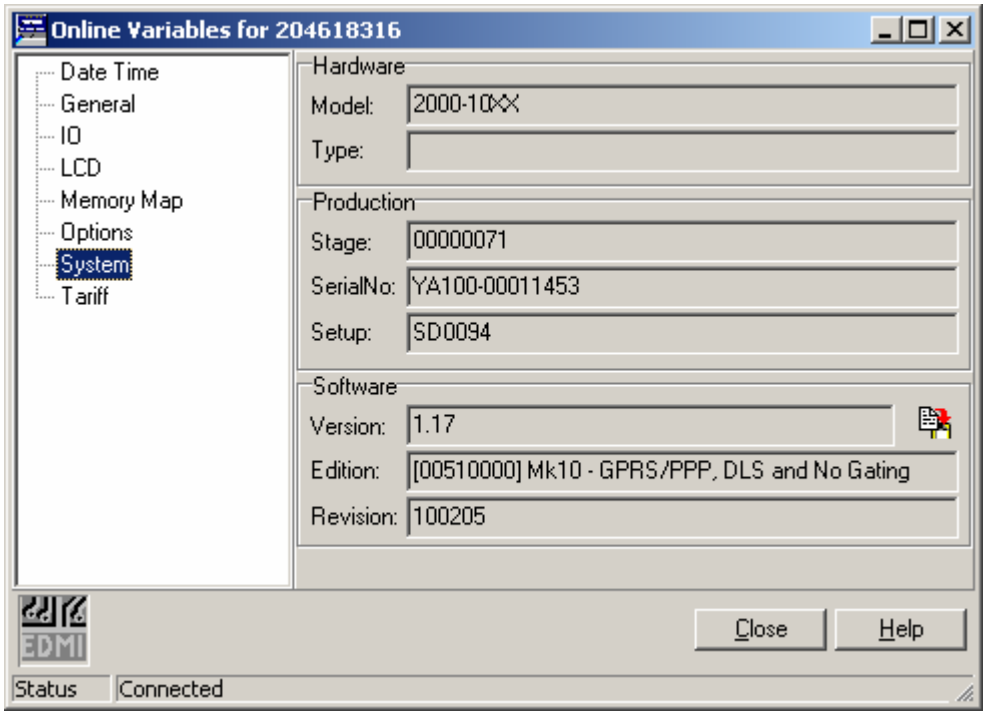
Intentionally Left Blank

Appendix

A

Upgrading Firmware

The meter allows its internal software (firmware) to be upgraded in the field. This allows support of new features or allows alternative features to be installed, while retaining the investment in hardware.



- Figure A-1 System information

While connected to a meter the *Screens→ Online Variables→ System* screen (Figure A-1) shows information about the meter. The *Hardware* and *Production* sections display information used to track the meter during production. The *Software* section gives the version of firmware currently installed (in this case 1.17). The *Edition* indicates if this is a particular edition of the firmware, such as a Chinese language edition. The edition is shown in hexadecimal (eg [00D10000]) and with a description if available. The revision is an internal tracking number.

New versions of firmware are released from EDMI as a small file which can be loaded into the meter using EziView. Upgrading a meter does not destroy data in the meter, nor will it affect the calibration of the meter.

Editions

Editions allow multiple builds of the same firmware version to be released. Each edition tailors the functionality available to support certain applications. For instance support for GPRS communications may be omitted in one edition to make room for a different protocol.

The edition code is represented as a hexadecimal number, eg D10000. Each part of the edition code represents a different feature. The bottom 4 digits are related to a hardware platform (eg the Mk10 and the Mk7 are different) – in this case, only the edition designed for your hardware may be used. The top digits (up to 4) are for software functionality (such as supporting certain communication protocols) – different editions can be loaded into the same meter, as long as the hardware part of the edition matches. The edition code and the version uniquely identify the firmware.

Firmware is released in two formats. The older format is a separate release file for each edition. In this case the filename looks like "mk10_(0xd10000)_v119.rel". This is firmware for the Mk10, version 1.19, edition d10000.

There is a newer format in which there is a single file that contains all editions for a meter type. The filename looks like "mk10_v119.rel", which is a Mk10 release of version 1.19. This can make it simpler to distribute new firmware versions, and is the much preferred method as it includes extra safeguards against loading a version into the meter that does not match the hardware.

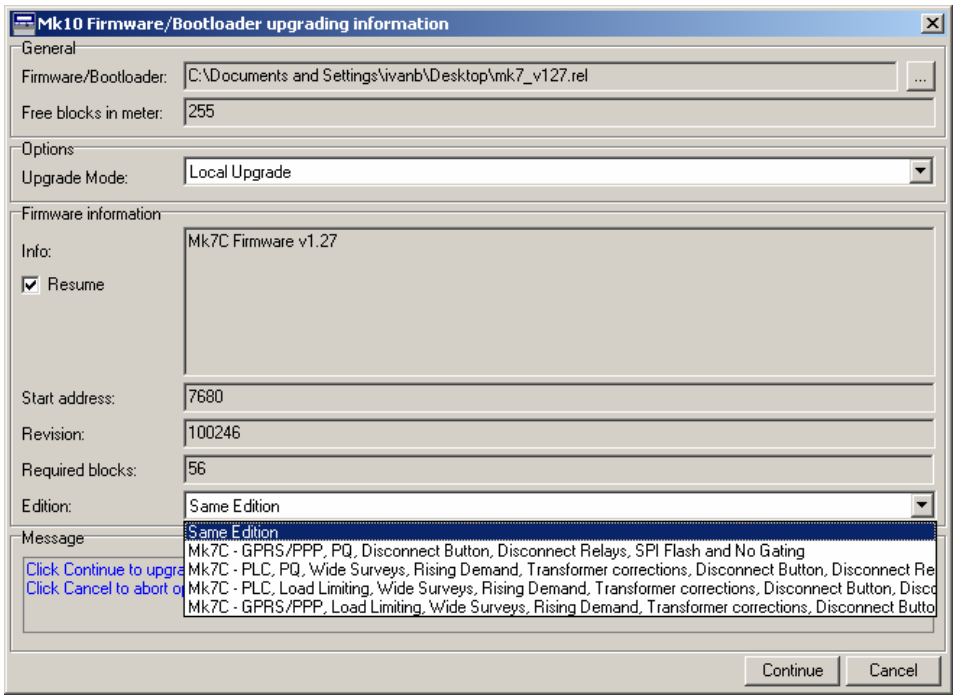
There are two ways to upgrade the firmware – locally and remotely. Locally is faster and does not use extra memory, while remotely is the only way to upgrade a meter via the modem port or remotely.

Local Upgrade

This mode of operation can only be used when connected locally to the meter using the optical port. During the upgrade process the meter will stop for around a minute while the new firmware is uploaded.

On screen of Figure A-1 there is a small icon next to the version that looks like  . If this icon is not present, EziView is most likely in standard mode. Go to the *Tools* → *Options* → *General* page. The *Level* setting needs to be set to *Advanced*, rather than *Standard*.

Clicking the  icon will bring up a section dialog to allow a firmware release file to be selected, generally with a filename extension of REL. Clicking *Open* will progress to an information screen (Figure A-2) that allows some details of the upgrade to be selected.

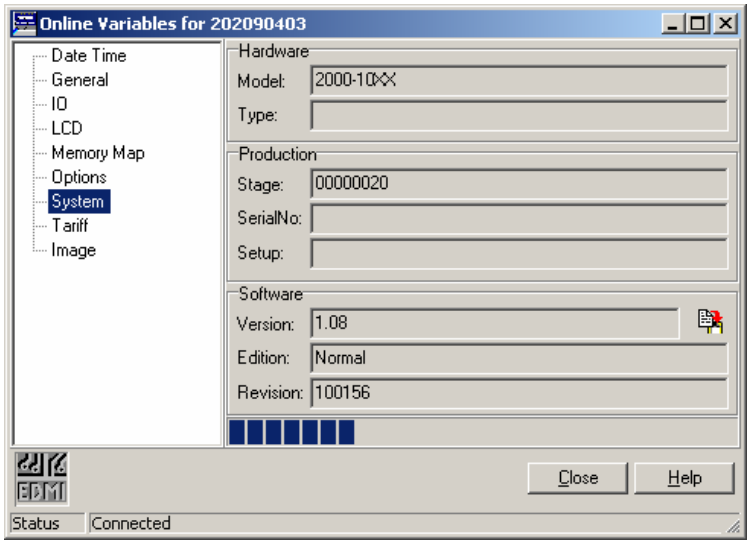


- Figure A-2 Upgrading information

The *Upgrade Mode* should be set to *Local Upgrade* in this case. In this mode the *Resume* option has no effect. The *Info* window gives some information about the version that is to be loaded into the meter.

The *Edition* setting allows different editions of the firmware to be loaded into the meter. In versions of EziView before v4.03 only the same edition as is in the meter can be chosen. Versions of EziView 4.03 and after allow different editions for the same hardware to be selected.

Clicking *Continue* will start the upgrade process – a progress bar will be displayed after a few seconds (Figure A-3)



- Figure A-3 Local upgrade progress

The process will take approximately 80 seconds for standard processor meters, 160 seconds for enhanced processor meters. During this time the meter is not recording any energy, and the clock is stopped. The LCD will show "Erasing" then "Loading" during the process. Once the upgrade is complete the clock should be set to account for the "gap" in time (EziView will generally do this automatically). The *Software* fields will update to show the new version of the meter.

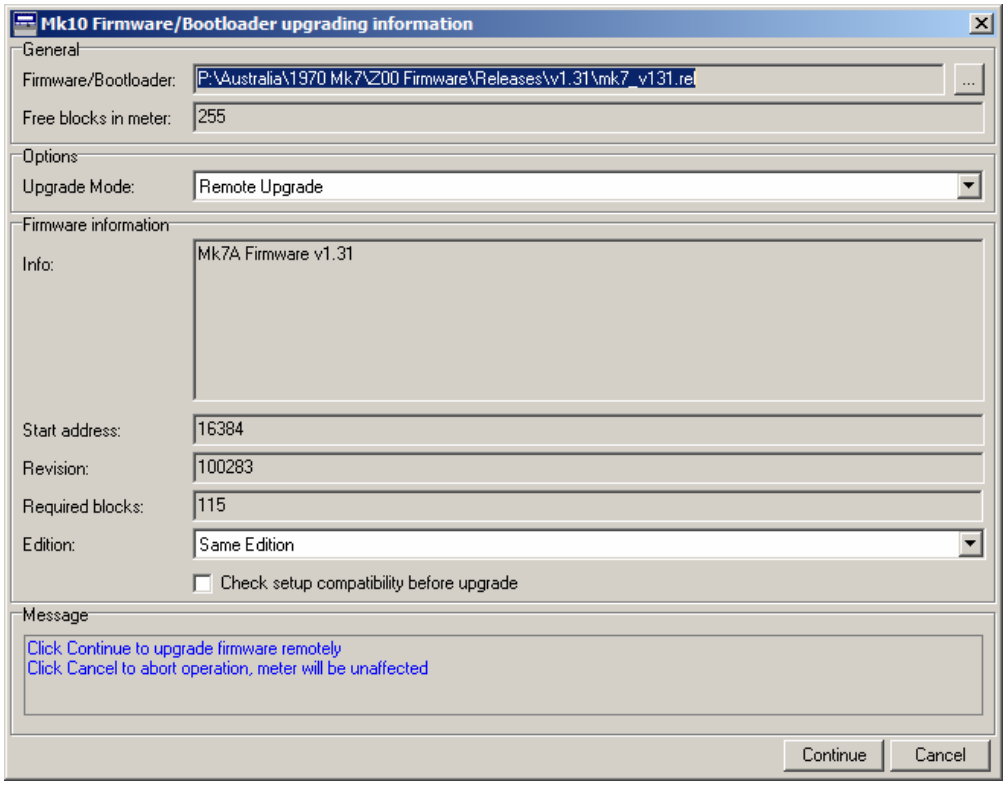
Do not break communications during the upgrade process!

If the upgrade is interrupted (e.g. communication is lost) the meter will show a message such as "boot 2.0 Error", or "bl35 Error" on meters with 4 or 5 id digits (Mk7, Mk10D). This indicates that the meter cannot start due to an error in the firmware image (caused by an incomplete loading). If this happens please contact EDMI for a program to recover from this situation.

Remote Upgrade

This method works by first uploading the new firmware into spare memory on the meter. Once complete the meter then upgrades itself from the image. This method can be used remotely as the meter will not be left in a non-working state if communications are lost.

Follow the steps as per a local upgrade ("Local Upgrade" page A-2) until the *Upgrading Information* screen is displayed (Figure A-4).



- Figure A-4 Remote upgrade information page

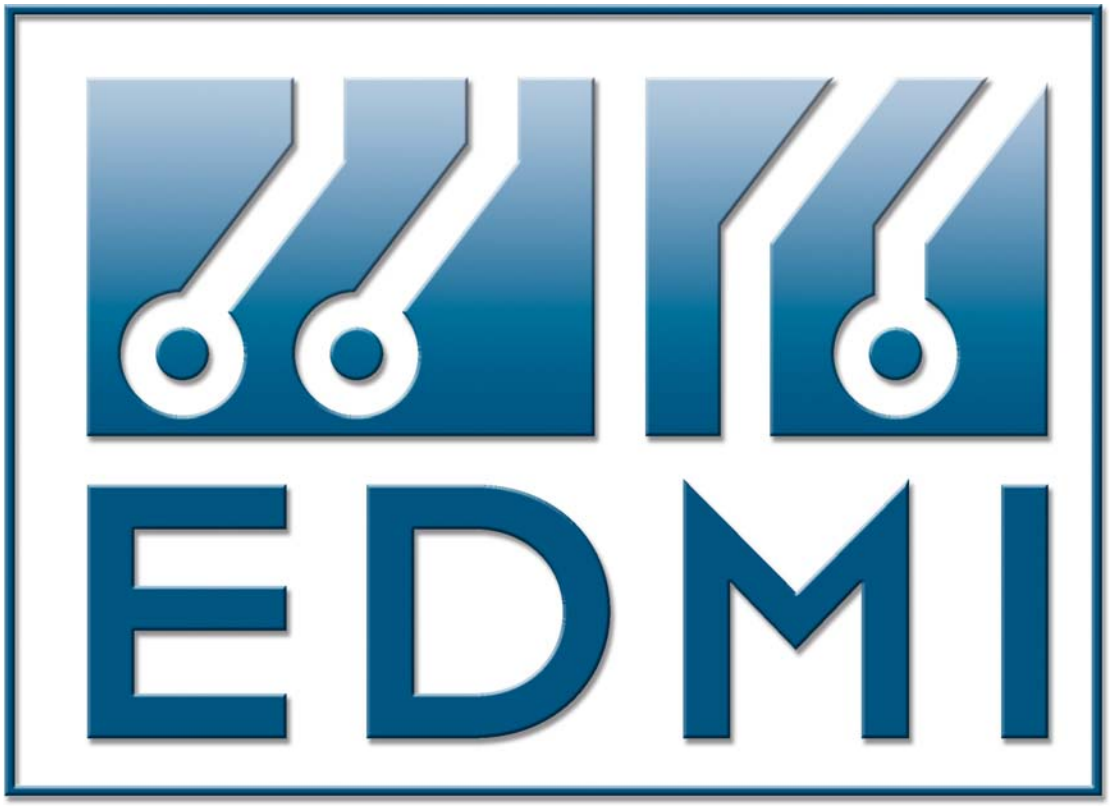
Select the *Upgrade Mode* as being *Remote Upgrade*. There must be at least 56kB of available EEPROM memory to fit the image (56 *blocks*), which translates to 57344 bytes. For enhanced processor meters 115kB must be available. The free blocks in the meter and the required blocks are both shown on this screen. See the section "Reserved EEPROM" on page 4-4 for more information.

Resume Mode is an option to allow the firmware upload to resume where it left off, useful if the communications link to the meter is unreliable. It should only be used if upgrading from version 1.18 or later firmware.

Enabling the *Full Duplex* transmission mode in the *Site Properties→Advanced* page (Figure 2-13) can speed up transfer dramatically over a GSM modem by streaming the data - it overcomes much of the lag involved. This should not be used on 2-wire 485 connected meters, or meters located behind gateway meters.

Clicking *Upgrade* will start the process. EziView first uploads the image to the meter, during which time the meter operates normally. This can take some time, several minutes at least. When the upload is complete, the meter stops normal operation (including energy measurement), checks the image, and reprograms itself. The LCD will show the progress, this takes around 50 seconds (66 seconds for enhanced processor meters). If power or communications is lost at any time the meter will either abort the upgrade (if the programming stage had not been reached), or complete the upgrade when power returns.

Note that during the reprogramming process the clock will stop for approximately 50 seconds (66 seconds for enhanced processor meters), so the clock should be set after the upgrade has completed.


EDMI