

Cashpower Prepayment Metering  
**PLC Customer Interface Unit**  
User Guide for FIELD TECHNICAL STAFF



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# 1 Abbreviations

LCD Liquid Crystal Display

LED Light Emitting Diode

PLC Power Line Carrier

STS Standard Transfer Specification (open prepayment standard)

## 2 Customer Interface Unit Overview

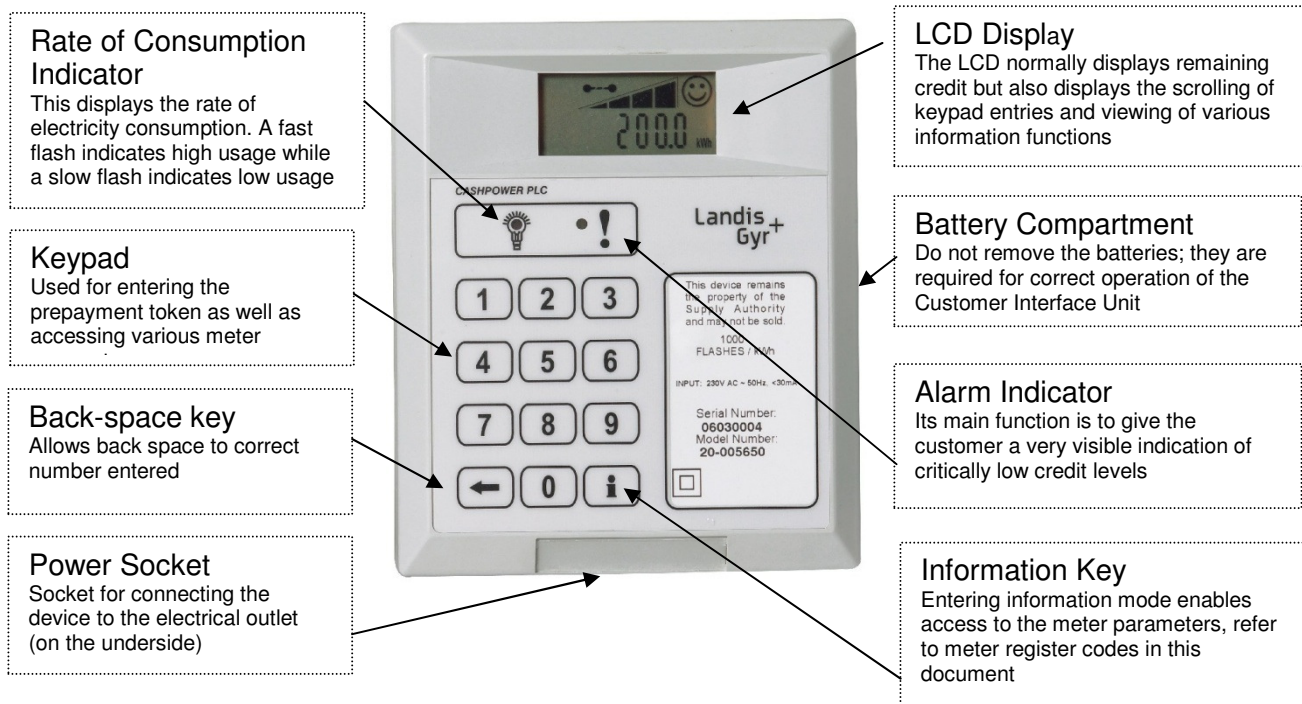


Figure 1: The PLC Customer Interface Unit

### 2.1 Keypad

The 12-key keypad enables the entry of vouchers and the accessing of various information functions. Key-presses are acknowledged with an audible beep.

### 2.2 Liquid Crystal Display (LCD)

The LCD normally displays remaining credit but also displays the scrolling in of keypad entries and viewing of various information functions.

### 2.3 Rate of Consumption Indicator (Rate LED)

A red rate of consumption LED provides a visual indication of instantaneous power consumption. Note: The rate LED on the customer interface unit is not a reference output and cannot be used for verifying the associated meter's metrological accuracy.



Its main function is to give a very visible indication of energy usage i.e. a fast flash rate signifies high usage.

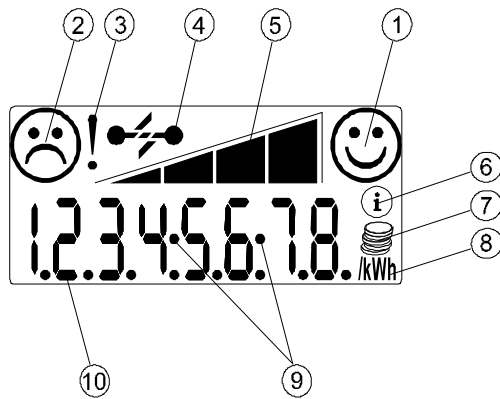
### 2.4 Alarm Indicator

A yellow alarm LED indicator duplicates the alarm indication on the LCD. Its main function is to give the customer a very visible indication of critically low credit levels

## 3 Customer Interface Unit Indications

### 3.1 LCD Layout (what the icons mean)

The LCD is designed to give a clear and unambiguous visual indication of important meter functions by means of language-independent pictograms:



- 1 - Happy face
- 2 - Sad Face
- 3 - Alarm indicator
- 4 - Contactor status indicator
- 5 - Remaining credit indicator
- 6 - Information mode indicator
- 7 - Credit metering mode indicator
- 8 - Power (kWh) function.
- 9 - Time display
- 10 - Eight X 7 segment digits

Figure 2: Display Icons



The decimal points of the two left-most display digits, besides their normal function, are also used to indicate the reception and transmission of valid PLC data.

### 3.2 Typical Operational Displays

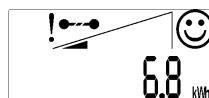
#### Normal Operation



Display shows *remaining credit* (kWh).

Contactor is closed and consumption *rate* indicator flashes at a rate proportional to the power being used.

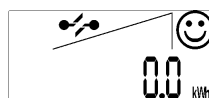
#### Low Credit Warning



Credit running low.

More credit must be purchased to avoid disconnection of the electricity supply.

#### Zero Credit



No credit and supply disconnected.

#### Credit Metering Mode



Display shows *total units* used (kWh).

Contactor is closed and consumption *rate* indicator flashes at a rate proportional to the power being used.

### 3.3 Happy and Sad Faces

These two icons are used in combination to give a quick visual indication of good and bad status. For example:

- If the meter is operating normally, the happy face will be on
- If it is tampered, the sad face will come on.
- Similar responses apply during entry of the prepayment voucher e.g. entering an invalid voucher will result in the sad face flashing for a short period of time.



Note that an out of credit condition is not considered to be a 'bad' status and the happy face will be on.

---

### 3.4 Alarm Indicator

This is a 'low credit' warning indicator that turns on if the current credit register value is greater than zero, but less than half the low credit level. Under these conditions it is displayed in conjunction with the smallest credit wedge icon.

### 3.5 Contactor Status Indicator

This icon indicates the status of the load-switch.:

- If it is closed, electricity is supplied to the customer.
- If it is open, the customer's electricity supply is disconnected.



Under normal operating conditions e.g. with the meter in credit, the load switch will be closed. It will open when credit expires.

---

### 3.6 Remaining Credit Indicator

This 4-segment 'wedge' provides a quick visual indication of the remaining credit in the meter and functions as follows:

- All four credit wedge icons are displayed if the value in the credit register is above the preset high credit level.
- The three smallest wedge icons are displayed if the value in the credit register is somewhere between the preset low credit level and high credit level.
- The two smallest wedge icons are displayed if the value in the credit register is somewhere between the preset low credit level and half of that level.
- The smallest wedge icon is displayed if the value in the credit register is somewhere between zero and half of the preset low credit level.
- All the credit wedge icons will be off when the meter runs out of credit (zero or negative values).

### 3.7 Information Mode Indicator

This icon turns on in response to pressing the information key on the keypad. It indicates that the meter is in information mode and the contents of various registers can be viewed.



Note that the information mode automatically times out after a period of 1 minute in the absence of any further interrogation.

---



### 3.8 Credit Metering Mode Indicator

This icon is displayed in conjunction with the kWh indicator to indicate clearly when the meter is operating in credit metering mode.

### 3.9 Power (kWh) Indicator

This icon is ON whenever the displayed units represent power (kWh). It applies to both the normal meter operating mode as well as when viewing registers via the information mode.



The power (kWh) icon will also flash on and off if no measurable energy is being consumed.

---

### 3.10 PLC Communication Data Indicator

Reliable power line carrier communication is important to overall performance of the PLC prepayment system. Due to the variable nature of the medium (noise and attenuation from a variety of appliances connected to the AC mains supply), it is useful to have a visual indication of the communication functions i.e. when data is being received or transmitted.

The customer interface unit and meter will communicate at regular intervals:

- To ensure that the customer interface unit is regularly updated with changes that may be occurring at the meter e.g. changes in the credit level due to energy being consumed.
- To transfer data entered at the customer interface unit e.g. a credit voucher, to the meter.

Whenever a valid communication interchange takes place, a visual indication is given on the LCD by briefly flashing the decimal points of the two left-most display digits. When a customer interface unit or meter is receiving data, the left-most decimal point is flashed. When it is transmitting data, the second decimal point is flashed.



Note that the data indication will always be the inverse of the decimal point status. If the decimal point is permanently ON for a particular numeric display, the data indication will result in it flashing OFF briefly.

---

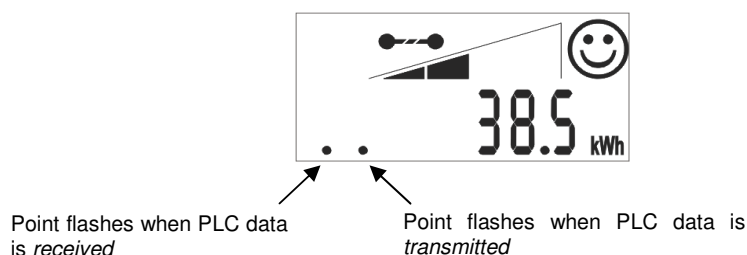


Figure 3: LCD display showing communication indicators

## 4 Meter Operation - Prepayment Mode

### 4.1 General

In this section the features and functionality of the prepayment meter are described while all display and control functionality relates to the customer interface unit, as the meter does not have a keypad

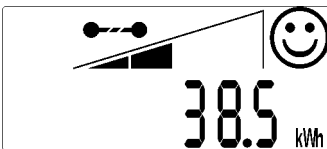


All *processing* of prepayment vouchers, load control etc. is carried out at the meter.

---

### 4.2 LCD Functions - During Normal Operation

During normal operation, with the customer interface unit plugged into an electrical socket outlet and switched on, the LCD provides the following functions:



- Displays the *current credit* register value to a resolution of 0.1 kWh.
- Permanently displays the credit wedge outline.
- Displays any combination of the credit wedge icons (0 to 4 segments depending on the actual current credit level in the meter).
- Displays the happy face icon, irrespective of the credit register value.
- Displays the contactor status icon in either the closed or open position, depending on whether the meter is in or out of credit.
- The decimal points of the two left-most display digits will flash alternately at regular intervals (maximum of 5 minutes), to indicate the reception and transmission of valid data.

### 4.3 Entering Prepayment Vouchers via the Keypad

Prepayment vouchers are entered into the meter by keying in the numbers printed on the credit voucher via the keypad. The numbers entered are displayed on the LCD as they are being entered and scroll from right to left, with a decimal point displayed at every fourth digit for ease of viewing.

Visual feedback is provided by flashing the happy face icon with each key press, audible feedback is provided by a 'beep' on each key press.



Incorrect entries can be corrected with the backspace key, which removes the rightmost digit on the LCD with each press. Two backspace key presses in quick succession will clear the entire entry.

---

Acceptance of a valid prepayment voucher is automatic. Once a complete voucher has been entered, the customer interface unit locks the keypad and proceeds to transmit the voucher number via the PLC communication channel to the meter for processing.

Whilst the transmission is in process, the LCD displays a 'busy' indication - a set of bars scrolling continuously from left to right.

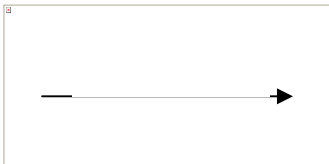
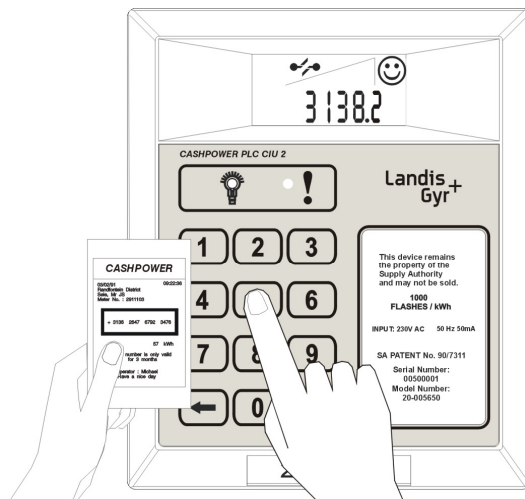


Figure 4: Display showing scrolling bars

On receipt of the prepayment voucher, the meter processes it and, when complete, submits the result back to the customer interface unit. Depending on the result, the customer interface unit displays one of the sequences. Again, depending on what sequence is invoked, the keypad could remain locked for a variable period of time i.e. it will not respond in any way to further key presses.

An incomplete voucher entry will be timed-out after 30 seconds; where after the customer interface unit reverts to normal operation.

### 4.4 Entering vouchers via the keypad at the customer interface unit



#### 4.4.1 Typical Results Displayed

- ☹️ ☺️
 Normal operating mode *(Includes zero credit and supply disconnected)*
- ☀️ ☺️
 Number not recognized by meter
- ☹️ ☀️
 Number already used
- ☀️ ☺️
 Not enough digits entered *(30-second timeout)*
- ☹️ ☺️
 Meter tampered – call for service
- ☹️ ☺️
 Call for service
- ☹️ ☹️ ☹️ ☺️ ☺️ ☺️
 Number expired
- ☐
 Call for service

## 4.5 Prepayment Voucher Processing

Depending on the type of voucher entered into the meter, it will result in one of the display sequences described below. Note that with the exception of an 'incomplete voucher' - the customer interface unit only displays these sequences on receipt of a valid response from the meter.



Because there can be some delay in the PLC communication between the customer interface unit and the meter, the sequences are always preceded by the scrolling 'busy' display

---

### 4.5.1 Incomplete Voucher

A voucher entry is timed out if no key is pressed for more than 30 seconds. On time-out:

- The voucher number is cleared off the display.
- The remaining credit is displayed.
- The happy face icon is turned on.
- The sad face icon is flashed for 10 seconds.

### 4.5.2 Complete Voucher

If a complete voucher is entered, the meter:

- Locks the keypad.
- Proceeds to process the voucher number.
- Once the voucher has been processed, the meter:
- Displays the remaining credit.

### 4.5.3 Voucher Accepted

The running ladder pattern on the credit wedge is displayed.

### 4.5.4 Incorrect Voucher

If the voucher is rejected, the following will be displayed:

- The happy face icon is turned off.
- The sad face icon is flashed for the reject time.



The reject function is included to discourage the entry of random numbers in an attempt to defraud the meter. The reject time will eventually settle at a maximum time of approximately 82 seconds.

---

### 4.5.5 Duplicate Voucher

If the voucher is rejected because it has previously been entered i.e. a duplicate voucher:



Both the happy face and sad face icons are flashed simultaneously for 5 seconds.

---

## 5 Customer Interface Unit Operation

### 5.1 General

The customer interface unit effectively acts as a remote display and keypad for the meter. It does not implement any voucher decryption. The customer interface unit is a self-contained device that implements its own battery-backed power supply and PLC communications and it does have specific functionality that is of importance to the customer e.g. the indication of alarms for low credit or low battery conditions, communication to the meter etc.

### 5.2 Connection to the Mains Supply



For the customer interface unit to function correctly, it must be permanently connected to the customer's AC mains supply.

---

Each customer interface unit is supplied with a standard mains power cord that may be plugged into any convenient socket outlet in the customer's premises.

It is equally important that the supply remains switched on at all times for the following reasons:

- It allows the remaining credit level and energy consumption rate to be seen.
- In the event of credit expiring, the meter will disconnect the customer's electricity supply and also the mains supply to the customer interface unit.

To cater for the disconnection of mains power due to expiry of credit, the customer interface unit is fitted with batteries to enable supply reconnection after entering a valid credit voucher.



To avoid confusion under this supply disconnected condition, it is critical that the customer interface unit remains connected to the mains socket outlet, with the outlet switch in the on position to allow PLC communications back to the meter via the electrical wiring of the house.

---

### 5.3 Batteries

Although the customer interface unit is normally connected to the customer's mains power supply - it needs to have an alternate power source in the event of credit expiring and the meter disconnecting the load.

Each customer interface unit is provided with a pair of 1.5V, AA sized, leak proof, alkaline cells.

Whenever the customer interface unit is disconnected from the mains supply, it continues to operate for another 30 seconds, at which point it stores the last known meter status before entering into power-save mode to conserve battery energy.



The Customer Interface Unit may be woken up at any stage by pressing and holding the information key on the keypad for a period of 3 seconds.

---



Ensuring the availability of a reliable battery supply is extremely important. A clear and timeous warning is displayed if the battery capacity is getting low. Batteries must be replaced as soon as possible to avoid inconvenience.

---



Figure 5: LCD showing LOW Battery indication

## 5.4 Commissioning

Unlike the meter, the customer interface unit does not have a dedicated reference number and it is possible to use any customer interface unit with any meter.

---



Before it can be used with a particular meter, it is necessary to 'link' the customer interface unit with its associated meter to ensure that the correct device is being addressed.

---

This process is known as commissioning the customer interface unit. Commissioning only needs to be done once, typically at the time of installation, and there is no need for the customer to be aware of the process.

To simply the commissioning process, new customer interface units are delivered in a decommissioned mode. Immediately on powering up it will present with the following display.

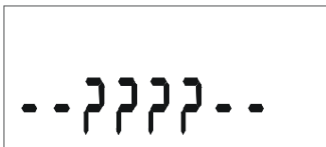


Figure 6: LCD showing that the meter is decommissioned

(If the meter is not ready for commissioning, it will be necessary to decommission the meter first, details of how to do this are in the next section of this document)

The commissioning process is as follows:

- Enter the complete 11 digit meter number after which a second beep is heard.
- The scrolling busy display is shown
- The meter number label is supplied with the packing kit of the meter and must be affixed to the customer interface unit at the time of installation for future reference.

If the process is successful and the meter responds, the customer interface unit beeps once and the current meter status is displayed. The customer interface unit is now commissioned.



**Error 30** - The commissioning process will fail if no communication with the target meter is established. This could take a couple of minutes due to multiple communication retries. The customer interface unit will then briefly display this communication error fault code before reverting to the decommissioned display (????).

---



**Error 40** - It is important to ensure that batteries are fitted in the customer interface unit before commissioning can take place. If the batteries have been removed or are very flat, commissioning will not be successful and an error 40 message displayed.

---

A configurable option at the time of manufacture can be set such that on successful commissioning the meter opens the load switch for a period of 10 seconds. This to give a positive indication that the correct meter is connected to the customer's premises.



Caution may need to be exercised with this procedure because the brief power interruption could cause appliances such as refrigerators and air conditioners to trip. Also note that this contactor opening function would not occur if the meter was, for example, out of credit, and the contactor already open.

---

It is possible to terminate the communication retries at any stage by pressing and holding the backspace information key.

If, at any stage, it is required to connect the customer interface unit to another meter, it will be necessary to first decommission it.

Once commissioned, the customer interface unit will communicate as required with its associated meter.

## 5.5 Decommissioning

In order to decommission a customer interface unit, it does not have to be in communication with a meter, nor does it need to be connected to the AC mains supply (it can be done under battery power).

The process of decommissioning is as follows:

- Press the information key continuously for 5 seconds until a second beep is heard.
- Enter the code 456.
- The currently commissioned meter number stored in the customer interface memory is displayed.
- Enter the digit 0 eleven times.
- On the eleventh digit entry, one beep will be heard and the display reverts to (????).
- The customer interface unit is now decommissioned.

## 5.6 Audible Low-Credit Alarm

This function is provided to give customers the option of having a timeous audible warning that credit is low and disconnection of the electricity supply could occur soon.

The default factory setting of this function is enabled. If required, the customer can change it at any stage as follows:



Press and hold key '0' on the keypad for 5 seconds. At the end of this period the buzzer beeps twice (alarm disabled) or once (alarm enabled).

---

The mode can be toggled any number of times and the currently selected mode setting is retained even if power is removed from the customer interface unit.

The alarm is sounded when the remaining credit level in the meter reaches half of the low credit level. At the same time, the alert icon is displayed on the LCD and the alert LED starts to flash.

Pressing any key on the keypad will silence the alarm but the alert indications will continue to be displayed.

## 5.7 LCD Backlighting

The LCD backlighting turns on whenever keys on the keypad are pressed. It is possible to select backlighting to be permanently on, or only on for 30-second periods following a key press.



Press and hold key '1' on the keypad for 5 seconds. At the end of this period the buzzer beeps once (backlighting disabled) or twice (backlighting enabled).

---

Note that the currently selected mode setting is retained even if power is removed from the customer interface unit.

## 5.8 Operation on AC Mains Supply



Whenever the AC mains supply is connected to the customer interface unit, it will automatically display the current meter status.

---

To minimise the amount of PLC communication on the network, only significant changes in status at the meter are immediately updated to the customer interface unit.

For example, the remaining credit display will only be updated when a significant digit changes. However, should an event such as a low credit alarm be activated, the customer interface unit will be notified immediately. Other functions that could change significantly in relatively short periods of time e.g. the flash rate of the rate LED in response to changes in the customer's load, have algorithms that progressively throttle the data update rate if they occur too frequently.

Whenever an update occurs e.g. a change in the flash rate of the rate LED, all display data is simultaneously updated. If there is little activity at the meter e.g. a steady load, data updates to the customer interface unit will only occur at 5-minute intervals. This is the maximum update time.



Credit vouchers may be entered in the usual way at any time, as can the accessing of the various information functions.

In the event of no update being received from the meter after a period of 1 hour, the customer interface unit will automatically request an update.



If the Customer Interface Unit fails to get a response from the meter, it will display the communications failure error message (---30---). If at any stage after this, communication with the meter is re-established, normal operation resumes.

---

## 5.9 Operation on Internal Battery Supply

The customer interface unit will be required to operate on battery power under two conditions:

- Meter out of credit (and the load disconnected).
- A general power failure

From the customer's point of view, it is not possible to differentiate between a general power failure condition and an out of credit condition – in both cases the AC mains supply is not available.

Whenever the customer interface unit is disconnected from the mains supply, it continues to operate for another 30 seconds, at which point it stores the last known meter status before entering into power-save mode to conserve battery energy.



When in the power-save mode, the customer interface unit is completely switched off and there is no display or background activity. It may be woken up at any stage by pressing and holding the information key on the keypad for a period of 3 seconds.

---



On 'waking up', it will display the last known meter status. If the display indicates a zero credit condition and the contactor status as open, it is clear that the meter is **out of credit** and a new credit voucher will have to be entered in order to restore power. If, however, the display shows the contactor in the closed position and some amount of credit still available, it can be safely assumed that there is a **general power failure**.

---

Having 'woken up' and displayed the information as indicated above, the customer interface unit automatically proceeds to interrogate the meter for an updated status.

Depending on the prevailing status, this will result in any one of the following responses:

- If there has been any change in the meter status, it will be reflected on the display.
- If there is a general power failure, the meter will not be able to respond i.e. there will be no communication possible with it. Under these conditions, the customer interface unit will evaluate the last known status of the meter contactor and do one of the following:
  - If the contactor indicates closed, it will assume a power failure, retain the existing display information and enter into power-save mode after 30 seconds.

- If the contactor indicates open, it will display the communications error (---30---) after 30 seconds and shut down again. Note that this will now be the default display whenever the customer interface unit is again 'woken up'. It will only be cleared once AC power has been restored and communication with the meter re-established.
- In the absence of any further key-presses, the customer interface unit will enter into the power-save mode again after 30 seconds.

A credit voucher may be entered under battery power in the normal way, after the customer interface unit has been 'woken up' as described above.

## 6 Information Functions

Pressing the information key toggles the meter into information mode (the information icon on the LCD turns on and all digits display =====). The contents of various registers can now be viewed by entering the appropriate, 3-digit register code.



Once in information mode, toggling between different registers may be done on an ongoing basis by entering the appropriate 3-digit code i.e. the information key does not have to be pressed again.

To exit the Information mode, press the information key or, in the absence of any other key presses, it will automatically return to the normal display after a period of 1 minute.

### 6.1 Information Register Functions

Info Register Number	Function
<a href="#">000</a>	Meter number
<a href="#">001</a>	Instantaneous power
<a href="#">002</a>	Current credit register
<a href="#">003</a>	Total units counter
<a href="#">006</a>	Current 24 hr. consumption
<a href="#">007</a>	Previous 24 hr consumption
<a href="#">008</a>	Current 30 day consumption
<a href="#">009</a>	Previous 30 day consumption
<a href="#">012</a>	Low credit level
<a href="#">013</a>	High credit level
<a href="#">014</a>	Power limit level
<a href="#">024</a>	Extended meter number (STS only)
<a href="#">031</a>	Meter (fixed) state register 0
<a href="#">033</a>	Meter (fixed) option register 0
<a href="#">035</a>	Meter (changeable) option register 0
<a href="#">037</a>	Meter (display) state register 0
<a href="#">048</a>	Software version number
<a href="#">050</a>	Power-fail counter
<a href="#">053</a>	Last voucher ID in time format (STS only)
<a href="#">054</a>	Last voucher ID in date format (STS only)
<a href="#">055</a>	Last credit voucher ID
<a href="#">056</a>	Value of last credit voucher entered
<a href="#">057</a>	Key revision and key type
<a href="#">058</a>	Tariff index
<a href="#">059</a>	Current credit register (10 Wh resolution)
<a href="#">060</a>	SGC register (STS only)
<a href="#">061</a>	Total units counter (10Wh resolution)

## 6.2 Meter Number (Register 000)

The meter displays the unique identity number personalised at the time of manufacture. It must match the number printed on the meter's front panel label. NB: This number excludes the manufacturer code ("07" in the case of Cashpower meters manufactured in South Africa), check-digit (last digit of the serial number label) and leading zeros of the meter number. For example, meter number 07 0286 6860 1 will be displayed as 286 6860.

## 6.3 Instantaneous Power (Register 001)

The meter displays the instantaneous power being consumed by the connected load.

NB: Only one power reading will be displayed at a time i.e. the reading will not automatically be updated after the initial value displayed. To get another update, the 3-digit register code 001 must be entered again.

## 6.4 Current Credit Register (Register 002)

This register stores the remaining credit in the meter.

## 6.5 Total Units Counter (Register 003)

The meter displays the total kWh consumed since the meter was put into service.

## 6.6 Current 24-Hour Consumption (Register 006)

The meter displays the number of hours into the current 24-hour period, followed by the consumption (kWh) during this period. By pressing the backspace key twice in rapid succession, the hour counter and consumption value is reset to zero and a new cycle commences using this as the reference time. Note: This does not affect the previous 24-hour period statistic or either of the 30-day statistics.

## 6.7 Previous 24-Hour Consumption (Register 007)

The meter displays the previous 24-hour period consumption (kWh).

## 6.8 Current 30-Day Consumption (Register 008)

The meter displays the number of days into the current 30-day period, followed by the consumption (kWh) during this period. By pressing the backspace key twice in rapid succession, the day counter and consumption value is reset to zero and a new cycle commences using this as the reference date. Note: This does not affect the previous 30-day period statistic or either of the 24-hour statistics.

## 6.9 Previous 30-Day Consumption (Register 009)

The meter displays the previous 30-day period consumption (kWh).

## 6.10 Low Credit Level (Register 012)

The meter displays the level at which the lower two credit wedges on the LCD come into operation.

## 6.11 High Credit Level (Register 013)

The meter displays the level at which the upper two credit wedges on the LCD come into operation.

## 6.12 Power Limit Level (Register 014)

The meter displays the power level (in either Amps or Watts) at which the load switch will be opened, causing the supply to the customer to be interrupted.

### 6.13 Extended Meter Number (Register 024)

The 'extended meter number' displays the 'missing' three digits of an (STS only) meter number in the format '07- - - - n' where:

07 is the manufacturer code (07 for South African manufactured Landis+Gyr meters).

n represents the check digit.

### 6.14 Meter (Fixed) State Register 0 (Register 031)

The meter displays the state in which the meter currently is. Note that these values are stored in the meter's EEPROM and will be maintained even if the meter is powered down:

Meter (Fixed) State Register 1	
Display	Function (bracketed values apply for bit set to 1)
1xxx xxxx	Contactant inhibit (power limit lockout mode – 30 minutes)
x1xx xxxx	Significant reverse energy metered
xx1x xxxx	Credit-metering enabled
xxx1 xxxx	Meter decommissioned
xxxx 1xxx	Meter NOT initialised (default key)
xxxx x1xx	Meter in power limit trip (30-seconds)
xxxx xx1x	Meter out of credit
xxxx xxx1	Meter tampered

### 6.15 Meter (Fixed) Option Register 0 (Register 033)

The meter displays functions personalised into the meter at the time of manufacture. They cannot be subsequently changed via a voucher:

Meter (Fixed) Option Register 0	
Display	Function (bracketed values apply for bit set to 1)
1xxx xxxx	Not used
x1xx xxxx	Not used
xx1x xxxx	Not used
xxx1 xxxx	Do not open (open) the meter contactor when commissioning a customer interface unit
xxxx 1xxx	Not used
xxxx x1xx	Disable (enable) creep detection
xxxx xx1x	Don't display (do display) negative credit
xxxx xxx1	(Enable) STS

## 6.16 Meter (Changeable) Option Register 0 (Register 035)

The meter displays the functions personalised at the time of manufacture. These functions can be subsequently changed via a voucher:

Meter (Changeable) Option Register 0	
Display	Function (bracketed values apply for bit set to 1)
1xxx xxxx	Not used
x1xx xxxx	Not used
xx1x xxxx	Tamper detect sensing switch (enabled)
xxx1 xxxx	Don't tamper (do tamper) on significant reverse energy
xxxx 1xxx	(Disconnect) load switch on power fail
xxxx x1xx	Amps (Watts) power limit display
xxxx xx1x	Automatic (non-automatic) contactor closing after power limit trip
xxxx xxx1	Display credit register or (display total register) on meter as default display

## 6.17 Meter (Display) State Register 0 (Register 037)

The meter displays various states that are determined each time the meter starts up or that occur during normal operation. They are not stored in EEPROM:

Meter (Display) State Register 0	
Display	Function
1xxx xxxx	Meter out of (in) creep lock
x1xx xxxx	Not used
xx1x xxxx	Not used
xxx1 xxxx	Tamper detect sensing switch state (open)
xxxx 1xxx	No EEPROM (EEPROM) error detected
xxxx x1xx	Not used
xxxx xx1x	50 (60) Hz mains frequency detected
xxxx xxx1	Not used

## 6.18 Software Version Number (Register 048)

The meter displays the software version number masked into the microprocessor.

## 6.19 Power-Fail Counter (Register 050)

The meter displays the number of power failures that have occurred. This register is cleared with the entry of a tamper reset voucher

## 6.20 Last (STS only) Voucher ID in Time Format (Register 053)

The meter displays the time of issue of the last credit voucher entered.

## 6.21 Last (STS only) Voucher ID in Date Format (Register 054)

The meter displays the date of issue of the last credit voucher entered.

## 6.22 Last Voucher Entered (Register 055)

For STS meters, the voucher identifier is displayed (0 – 16777215) i.e. number of minutes elapsed since 01:01:1993.

## 6.23 Value of Last Voucher Entered (Register 056)

The meter displays the value (kWh) of the last CTN entered.

## 6.24 Key Revision and Key Type (Register 057)

Refer to the STS specification

## 6.25 Tariff Index (Register 058)

The tariff index of the meter must match the tariff index that has been linked to the meter in the vending system



If the tariff index in the meter and the vending system do not match, the meter will not accept the vouchers entered.

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## 6.26 Current Credit Register - 10Wh Resolution (Register 059)

The meter displays the value of the credit register with a resolution of 0.01kWh. The most significant digit of the display (if in use) will be “pushed” off the display in this mode.

## 6.27 Supply Group Code (SGC) Register (Register 060)

This register will contain the initial SGC value, personalised at the time of manufacture.



Once a successful STS meter key-change has been performed, the information is no longer valid and is, therefore, cleared. This option gives a quick indication of whether a key-change has been performed on the meter.

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## 6.28 Total Units Counter - 10Wh Resolution (Register 061)

The meter displays the value of the total units register with a resolution of 0.01kWh. The most significant digit of the display (if in use) will be “pushed” off the display in this mode.

## 7 Power Line Carrier (PLC) Communication Considerations

The AC mains supply is subject to many forms of interference and attenuation that can affect the performance of PLC communication.

To help overcome problems, both the customer interface unit and meter implement multiple 'retries' of messages as necessary. This will be most noticeable at the customer interface unit, where there could be significant delays before a response to an action is seen (scrolling display and the keypad effectively 'locked'). Typically there should be a less than 1-second response time to any request. Lengthy delays (up to 2 minutes) on a regular basis would indicate a poor communications environment.

Care must be exercised to ensure that a suitable location for the customer interface unit has been chosen so as to guarantee reliable communications with the meter on an ongoing basis. Once a meter has been successfully 'commissioned', it is unlikely that communications should fail.



In the event of a communications failure, the customer interface unit will display an error message (---30---

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### 7.1 Actions in the event of an error 30 message

- If a communications error message occurs during the commissioning process, ensure that the correct meter number has been entered during the commissioning process (there is no differentiation between a communications failure resulting from loss of signal and a meter not responding because it has been incorrectly addressed).
- Unplug appliances adjacent to the customer interface unit.
- Plug the customer interface unit into an alternative power outlet socket inside the customer's premises.
- Systematically disconnect other household appliances that are plugged in and switched on to see if any one in particular is causing a problem.



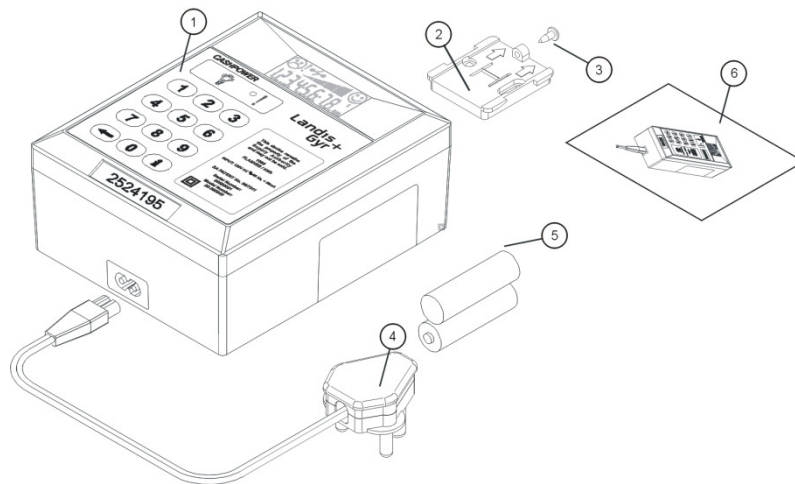
Occasionally, faulty electrical circuits can generate a lot of interference that disrupts communications. Isolate as many circuits as possible to try and determine the source of the interference. In some instances, the use of a PLC filter might be required. Consult the supplier of your electricity meter or your local utility.

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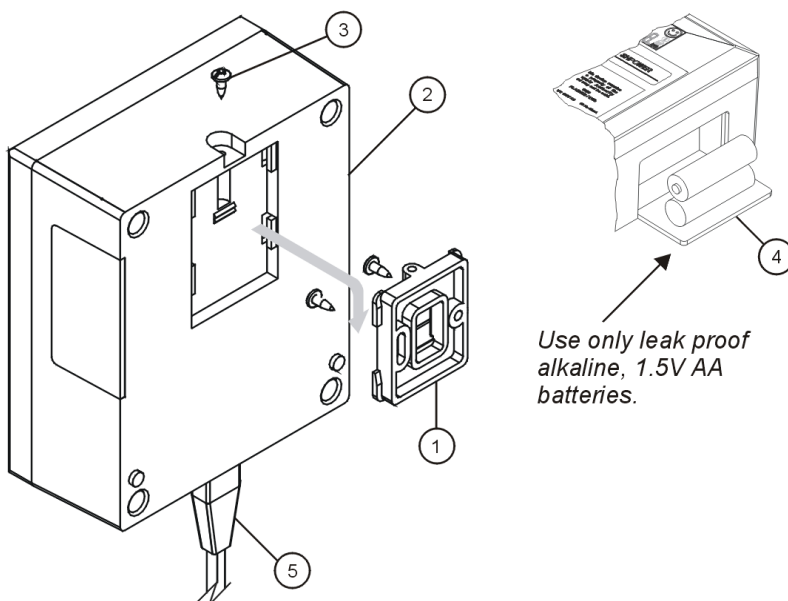
## 8 Customer Interface Unit Installation

The device is supplied as shown below.



- 1 Interface Unit
- 2 Mounting Clip
- 3 Locking screw
- 4 AC power cord
- 5 2 x AA batteries
- 6 Instruction card

Choose a convenient location close to an AC supply outlet socket (maximum of 1m). The display should be clearly visible and the keypad easy to operate.



1. Fix mounting clip to wall with suitable size screws (not supplied)
2. Slide unit onto clip as shown
3. Secure into place with locking screw
4. Insert batteries with polarity as shown
5. Fit power cord and plug into an AC outlet