

P450 In Home Energy Monitor

Master User Manual



Revision History

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Subject to change without notice

Landis+Gyr

1 Lysander Drive,
Northfields Industrial Estate,
Market Deeping,
Peterborough,
PE6 8FB
UK
www.landisgyr.com

contact:

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1 Introduction

1.1 Scope

This user manual applies to the P450 In Home Energy Monitor (P450 IHEM) device. It is to be used to understand the functionality and operation of the product.

1.2 Purpose

This manual contains a full description of the product's functionality. This includes:

- Characteristics, construction and functionality of the product.
- Information about possible dangers, their consequences, and measures on how to prevent them.
- A detailed description of the tasks to be performed during the entire life-cycle of the product (installation, commissioning, operation, maintenance, and disposal).

1.3 Target group

The contents of this user manual are intended for technically qualified personnel of energy supply companies responsible for system planning, installation and commissioning, operation, maintenance, decommissioning and disposal of smart metering products.

It is also intended for technical authors concerned with writing any end user facing (consumer) versions of the product user manual.

1.4 Intended use and installation

The P450 IHEM is intended for deployment in a residential environment.

There are no user serviceable parts within the product and the product must be returned to the manufacturer or an authorized partner for repair and/or maintenance. There are no permissible adjustments to the products installation procedure or operation outside those covered by the detailed operational instructions contained within this document.

If the equipment is used in a manner not specified by the manufacturer the protection provided by the equipment may be impaired.

2 Safety Information

Attention is drawn to text of specific importance or with relevance to safety instructions using the text and pictographs below:



Definition of Danger

This symbol is used to indicate a possibly dangerous situation which could result in severe physical injury or a fatality.



Definition of Warning

This symbol is used to indicate a possibly dangerous situation which could result in minor physical injury or material damage.



Definition of Note

This symbol is used to indicate general details and other useful information.

2.1 Responsibilities

The owner of the product – normally the utility – is responsible that all persons engaged on work with the product:

- Have read and understood the relevant sections of the user manual.
- Are sufficiently qualified for the work to be performed.
- Strictly observe the safety regulations and the operating information in the individual chapters.

The owner of the product bears responsibility for the protection of persons, prevention of material damage and the training of personnel (Landis+Gyr provides training courses for this purpose on specific equipment; please contact the relevant agent if interested).

2.2 Safety regulations and mandatory text



The following text regarding safety must be included in any and all end user facing (consumer) derivatives of this master user manual:

2.3 Mandatory text for all P450 IHEM user manuals

Please take the following precautions to ensure the P450 IHEM functions correctly and is not damaged:

- Do not install the P450 IHEM in bathrooms or any other locations with high humidity.
- Do not install the P450 IHEM in direct sunlight.
- Use only the supplied power adapter.
- Never operate the P450 IHEM using a damaged power supply or lead. If the power supply or lead is damaged – replace with an approved replacement part.
- The socket-outlet shall be installed near the equipment and shall be easily accessible
- Do not overload the power outlet by adding double adapters or by using multiple multi-way sockets off one power outlet.
- Do not expose the P450 IHEM to moisture, chemicals, or any other liquids. Clean the P450 IHEM using a soft dry cloth.
- Do not open the P450 IHEM. There are no user serviceable parts inside; access by authorized personnel only.
- Supervise young children when using the P450 IHEM.

2.4 FCC information

FCC ID: ROV-P450IHEM

The P450 IHEM device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) The P450 IHEM device may not cause harmful interference. and (2) The P450 IHEM device must accept any interference received, including interference that may cause undesired operation.

The P450 IHEM device complies with FCC OET Bulletin 65 radiation exposure limits set forth for an uncontrolled environment.

Pursuant to FCC 15.21 of the FCC rules, changes not expressly approved by Landis + Gyr, Inc. might cause harmful interference and void the FCC authorization to operate the P450 IHEM device.

2.5 Other mandatory text



The following regulatory text must be included in any and all end user facing (consumer) derivatives of this master user manual:

DRAFT

2.6 Regulatory text for all P450 IHEM user manuals

This equipment has been tested and conforms to the following standards:

RADIO: ETSI EN 300 328 v.1.7.1 (2006-10)

EMC: ETSI EN 301 489-17 v.2.1.1
ETSI EN 55022:2006 + A1:2007
ETSI EN 55024:1998 +A1:2001

SAFETY: EN60950-1: 2006 2nd edition
IEC60950-1: 2005 2nd edition

Declaration of Conformity

We

Name: Landis + Gyr

Address: 1 Lysander Drive,
Northfields Industrial Estate,
Market Deeping,
Peterborough, PE6 8FB
United Kingdom

Declare that the product

Product Number: 5277

Product Name: ecoMeter P450

Is in conformity with R&TTE Rules.

This equipment complies with the essential requirements for the Radio Equipment and Telecommunications Terminal Directive 199/EC.



Help Landis + Gyr to protect the environment. Please take time to dispose of your equipment properly. Please do NOT dispose of this product with your other household or municipal waste. Please take the product to an electronics recycling centre, or return it to us for proper disposal.1

3 Getting Started

3.1 Joining the smart energy network

The P450 IHEM will need to be joined to a ZigBee Smart Energy network that includes at least one ZigBee Smart Energy Certified Metering Device to receive and display energy consumption data.

The routine for joining is very simple:

If the P450 IHEM determines it is in an un-joined state when it powers on it will scan to find ZigBee Smart Energy networks available for joining. When an internal list of available networks opens for joining has been compiled; the P450 IHEM will attempt to join each in turn. Only the network that has been instructed to allow that specific P450 IHEM to join will permit joining; successful joining therefore requires registration of the P450 IHEM device with the Utility.

Registration of the P450 IHEM device with the utility could be an end user driven process as described immediately below or may alternatively be part of an integrated commissioning process applicable to a wider smart meter installation as described further below.

3.1.1 Consumer controlled joining

If an end user is expected to register the P450 IHEM with the utility themselves the steps below need to be described or elaborated in any end user literature provided to them:

1. To register the P450 IHEM with your utility contact your energy supplier at the contact point they have provided (web portal or telephone line) with the **Installation Code** and **MAC** address to hand. You will find the **Installation Code** and **MAC** address on the product packaging and on the label in the battery compartment of the P450 IHEM. You may need to remove the battery compartment cover if you have already fitted it as the label is in that recess.
2. After communicating your product **Installation Code** and **MAC** address to your energy supplier; return to the P450 IHEM and connect to the mains. This will initiate a join to the Smart Energy network. Your energy supplier will do the rest and your P450 IHEM will join the Smart Energy network shortly. When it has joined the network the P450 IHEM will display the home screen.

3.1.2 Installer controlled joining

If an installer is expected to commission the P450 IHM the steps below need to be followed.

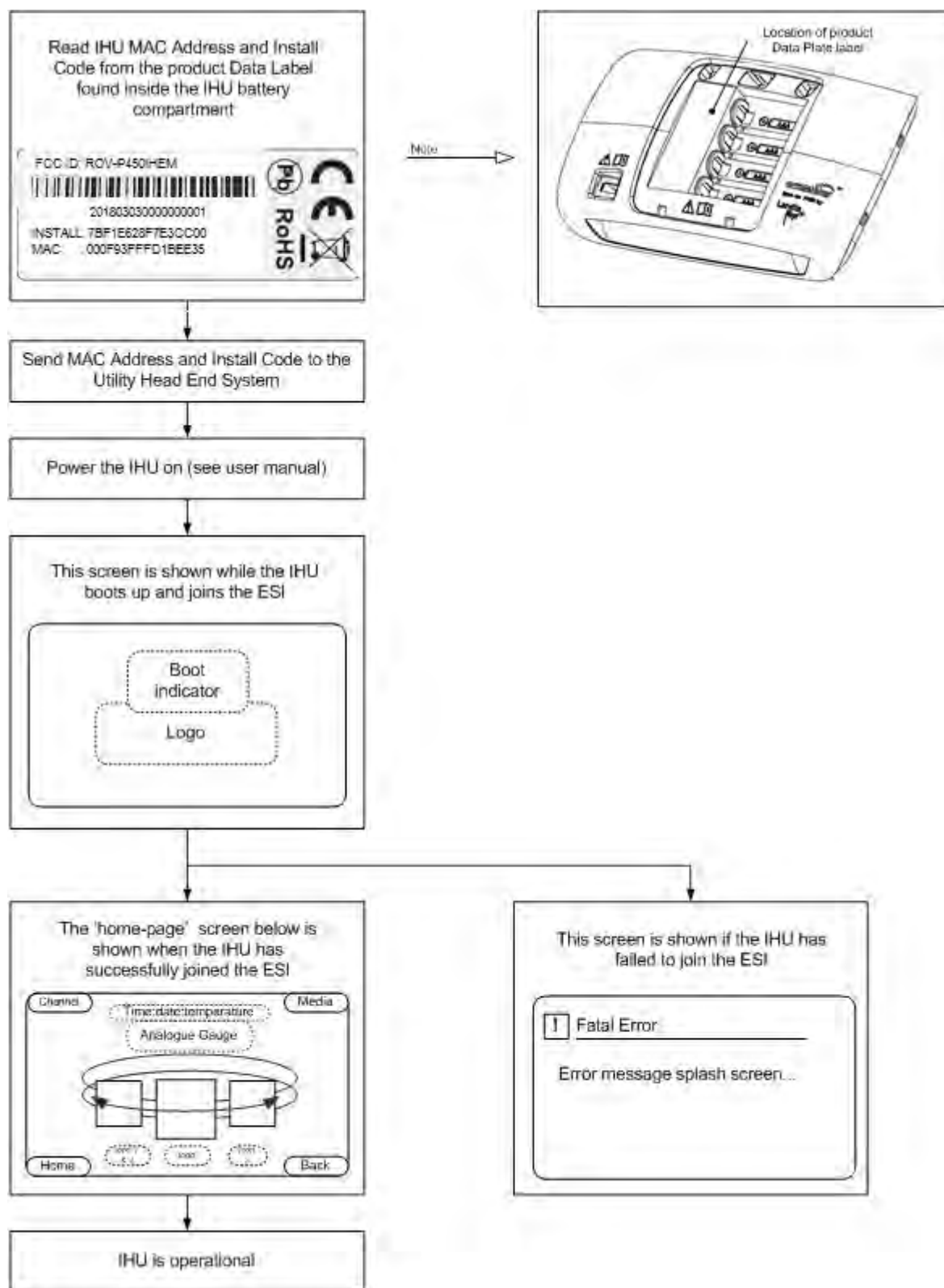


Figure 1P450 IHM Installer Controlled Joining Sequence

4 User Interfaces

4.1 Look and feel

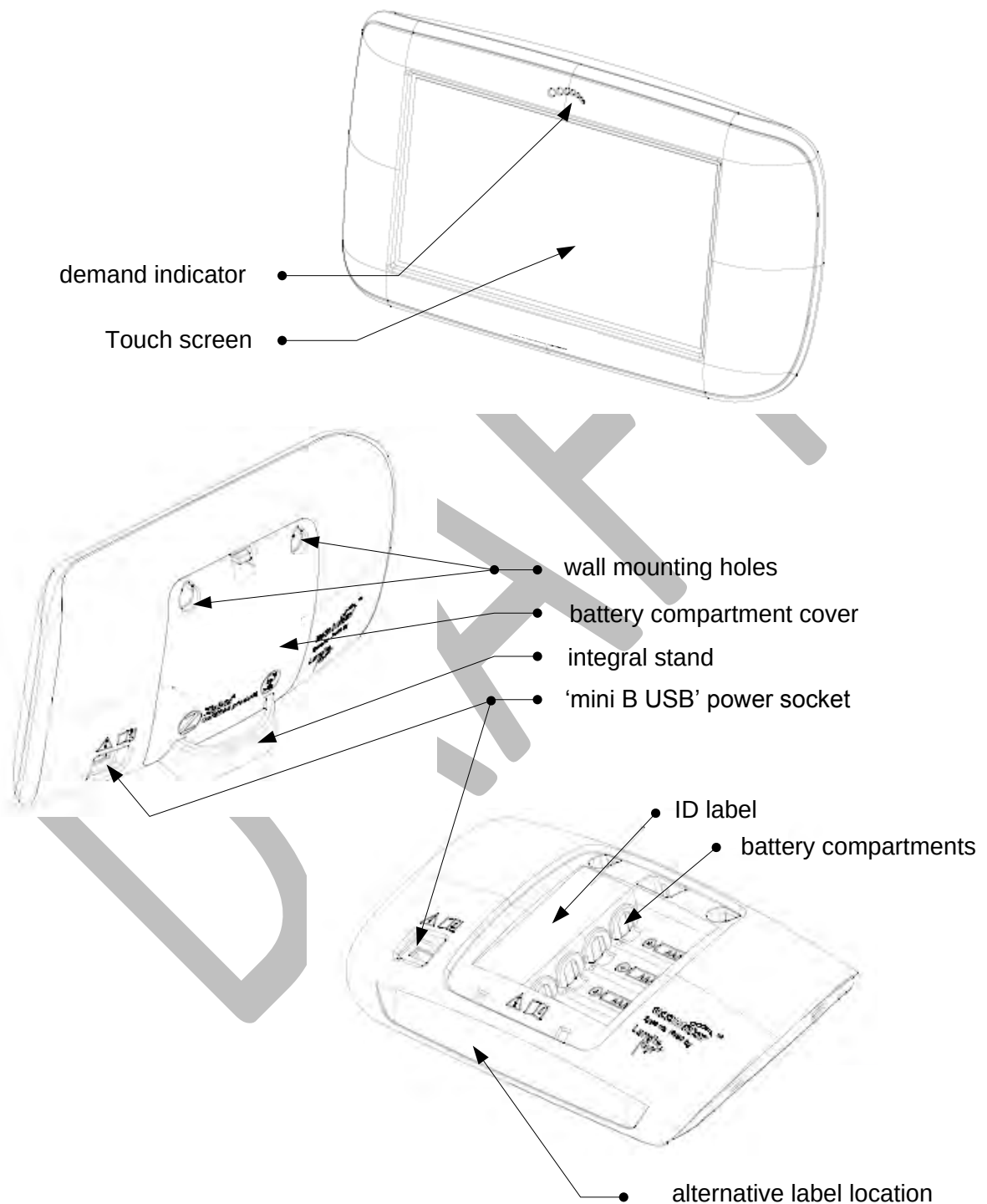


Figure 2 P450 IHEM Look and Feel Images

4.2 Power supply

The P450 IHEM should only be powered from the mains using the 5V switch mode power supply with which it is supplied.

4.3 Touch screen

The P450 IHEM uses a colour touch screen display. The touch is of the resistive type.

4.4 Battery management

The P450 IHEM can be powered temporarily using 4 x Alkaline AAA (LR03) batteries.

If the P450 IHEM is powered by batteries and no buttons are pressed the batteries will last a period of 72hours.

If the P450 IHEM is powered by batteries and buttons are repeatedly pressed the batteries will last approximately 1 hour.

4.5 Demand indicator

The front view of the product shows an in-mould light-bar feature. This feature is active always; it both pulses and changes colour.

The light-bar changes colour to indicate the current instantaneous load. The logic is: green indicates low load, amber a higher level of demand and red higher still.

This functionality is very simply illustrated below:

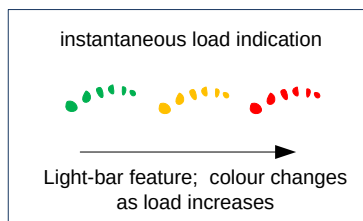


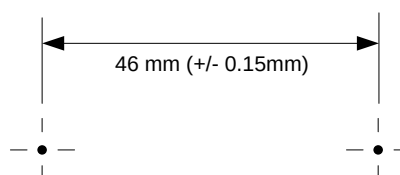
Figure 3 Instantaneous Light Bar Operation

4.6 Wall mounting

The P450 IHEM may be wall mounted using two screws (not supplied). The screws used should be suitable for the material of the wall with which they will be used.

The maximum screw head size is 5mm.

The spacing for the screws is as:



4.7 P450 IHEM overview

The following section provides an introduction and high-level view of the P450 IHEM and its features.



Figure 4 High-level P450 IHEM Overview

1. **Select language**
 - Switch between default and alternative language (typically English and Spanish)
2. **Power Status Indicator**
 - Denotes the meter contactor status
3. **Demand Energy Indicator**
 - Show instantaneous energy consumption
4. **Date and time**
 - Current date and time information
5. **Data view (\$ or kWh)**
 - Switch the displayed data between cost and usage
6. **Menu option shortcut**
 - Shortcut to menu item
7. **Analogue and target gauge**
 - Gauge representation of performance and usage
8. **Supply icon**
 - Denotes mains/battery power status
9. **Signal icon**
 - Denotes communication strength
10. **Message icon**
 - Notification of new message arrival
11. **Menu shortcut option**
 - Shortcut to the main menu items
12. **Carousel display information**
 - Display of information for cost and usage data

5 GUI architecture described

The GUI architecture in the following examples provide a high-level overview of the display screens and their primary purpose.

The examples address the Prepayment and the Credit operation and configuration of the P450 IHEM.

The actual screens available in any given configuration will depend on the meter product set and meter product configuration in use. The following examples detail the functionality that is available in in both modes of operation.

5.1 Credit architecture

The Credit mode architecture consists of 8 main operational functions, detailed as

- History Function
- Help Function
- Message Function
- Settings Function
- Budget Function
- Price Function
- Usage Function
- Generation Function

The home screen (or carousel) can show alerts and notifications to the user, and supports a fall back to sleep mode where the screen will condense the displayed data, and enter a mode where the screen will appear to be switched off.

An example of the credit architecture can be seen in the following image.

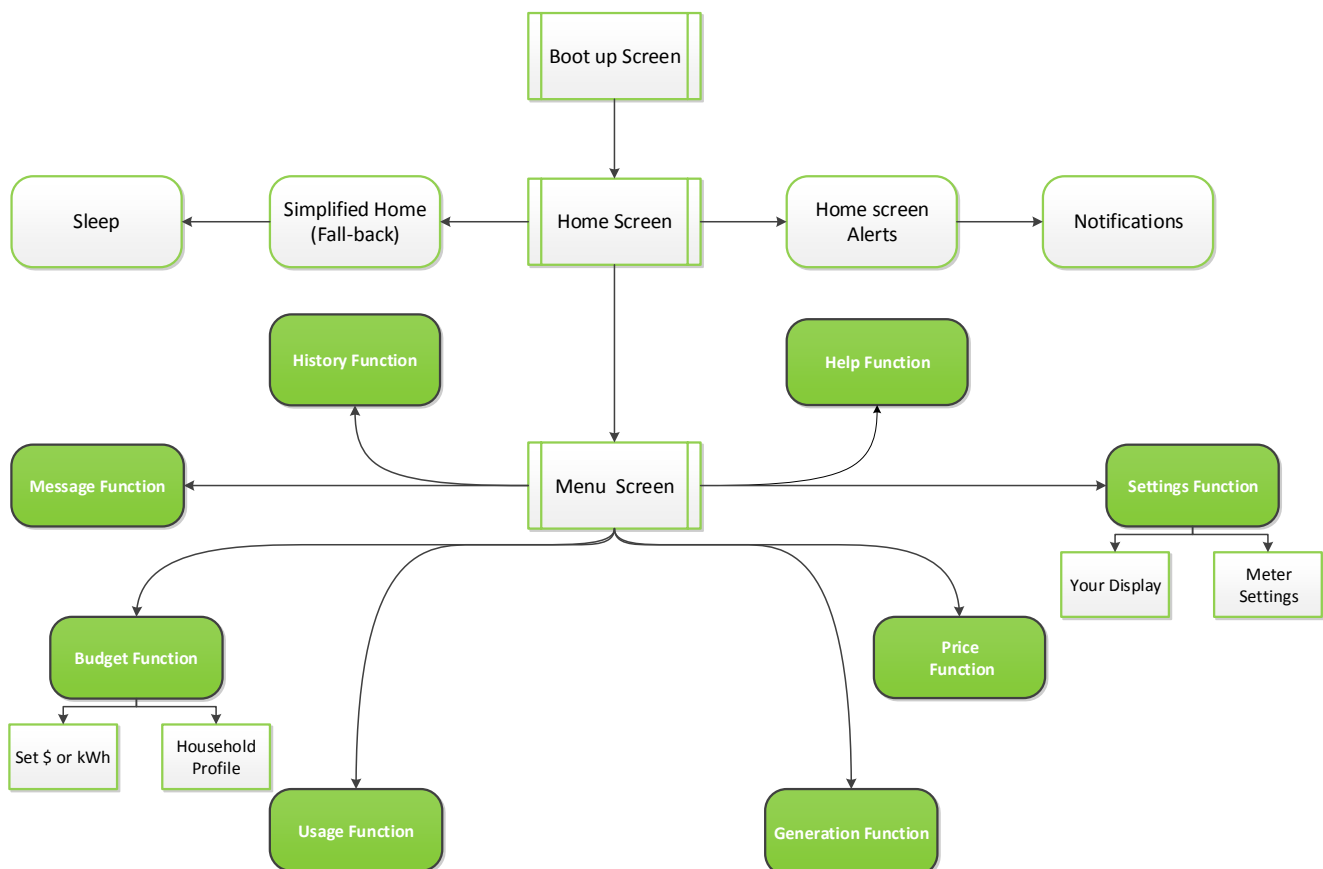


Figure 5 Example of High-Level Credit GUI Architecture

5.2 Prepay architecture

The Prepay mode architecture consists of 8 main operational functions, detailed as

- History Function
- Help Function
- Message Function
- Settings Function
- Budget Function
- Price Function
- Usage Function
- Prepay Function

The home screen (or carousel) can show alerts and notifications to the user, and supports a fall back to sleep mode where the screen will condense the displayed data, and enter a mode where the screen will appear to be switched off.

An example of the prepay architecture can be seen in the following image.

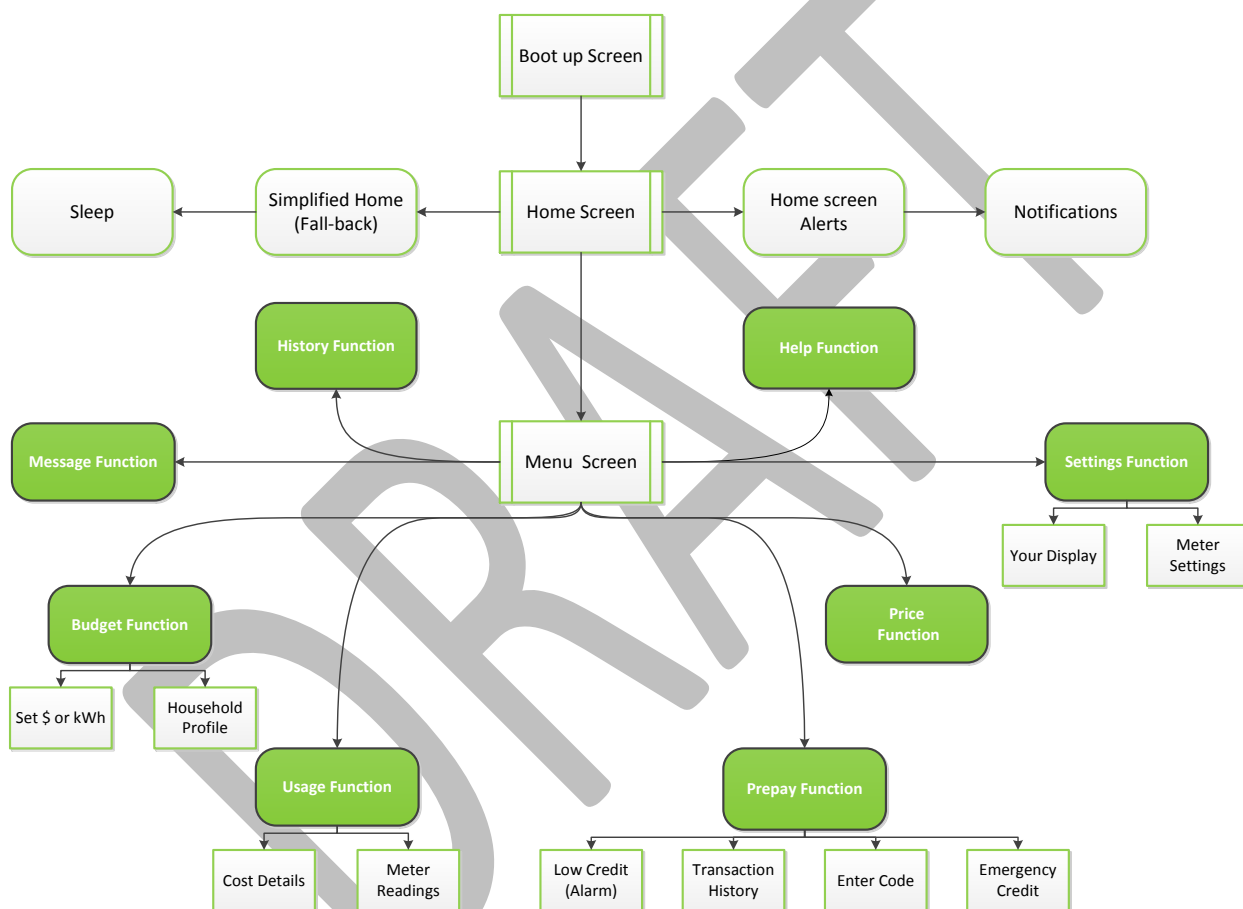


Figure 6 Example of High-level Prepay GUI Architecture

6 Using your P450 IHEM

6.1 Boot-up sequence

A simple screen including the utilities logo and an activity counter is shown while the P450 IHEM boots up. Following boot up the P450 IHEM display proceeds to the home screen.

The boot up screen can be seen in the following example.



Figure 7 P450 IHEM Boot-Up Screen

6.2 Operation mode

The operation of the P450 IHEM and the information displayed is dependent on the mode of operation that has been configured for the P450 IHEM. The P450 IHEM supports two operational modes; Credit and Prepayment. This document will detail the functionality for both modes of operation and will denote any areas where the functionality differs.

6.3 Home screen

The P450 IHEM Home screen is used to display the most important and relevant items regarding energy usage, consumption, and cost of consumption.

It includes the key items:

- Cost/Consumption of use now
- Cost/Consumption so far today
- Days Remaining
- Credit Remaining
- Consumption/Cost as a proportion of a personal budget (target)

They are additionally displayed as both quantitative (numerals) and qualitative (gauges) items.

The home screen also includes the items and indicators:

- Language change
- Supply status
- Time and date
- Unread message present in the in-box

- Mains or battery power in use indicator
- HAN signal strength indicator
- Home screen alerts

A typical home screen view can be seen in the following example.

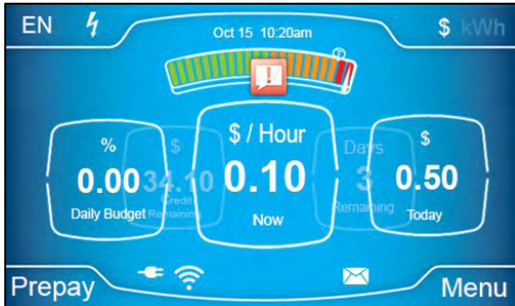


Figure 8 Home Screen Example

6.4 Home screen main elements: carousel

The main feature of the home screen user interface is the centre 'carousel' arrangement of key display items.

The centre framed display item is changed by using a left or right swipe or selection gesture on the carousel screen.

This GUI functionality is shown in the wireframe diagram below.

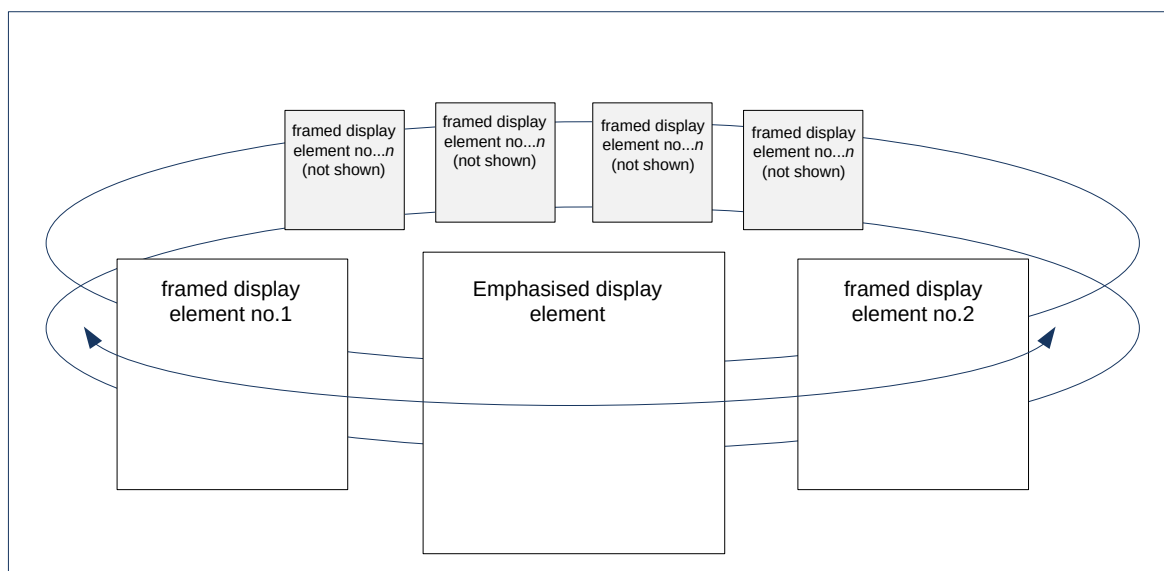


Figure 9 Carousel Operation

The centre framed display item is emphasised over the other displayed items and is also reinforced by an analogue gauge representation of the same information.

6.5 Home screen carousel layout

The home screen as mentioned in the previous section operates in a similar manner to a carousel; the typical display layout for the carousel in the following examples.

6.5.1 Carousel operation prepayment – Cost mode

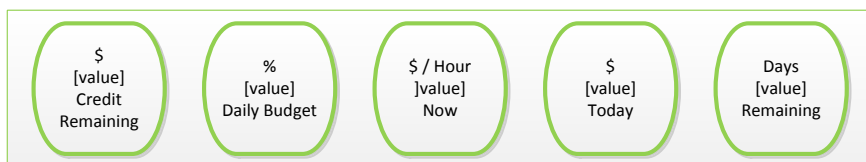


Figure 10 Carousel Operation Prepayment: Cost Mode

6.5.2 Carousel operation prepayment – Usage mode

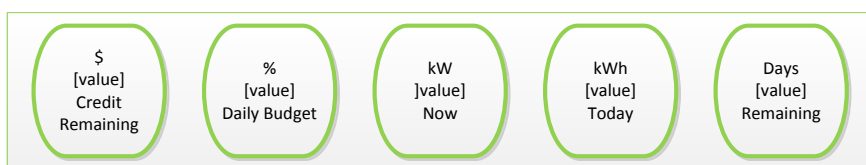


Figure 11 Carousel Operation Prepayment: Usage Mode

6.5.3 Carousel operation prepayment – Accumulated debt, cost mode

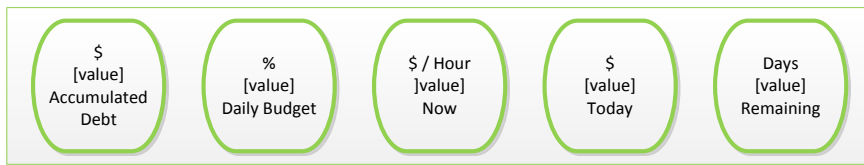


Figure 12 Carousel Operation Prepayment: Accumulated Debt Cost Mode

6.5.4 Carousel operation prepayment – Accumulated debt, usage mode

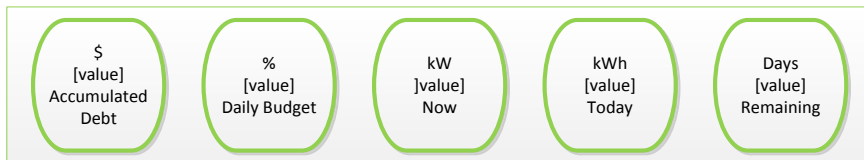


Figure 13 Carousel Operation Prepayment: Accumulated Debt Usage Mode

6.5.5 Carousel operation – Credit mode

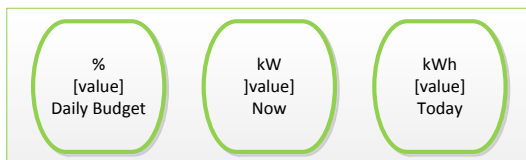


Figure 14 Carousel Operation Credit Mode

6.6 Analogue gauges

There are at least two different analogue gauges for use with the centre display; the one used is appropriate to the framed display selected by the user.

The centre framed display element is reinforced by a qualitative indicator (analogue gauge) of the same basic information.

6.6.1 Accumulation

The analogue gauge below is used to reinforce the display of any accumulating quantity and display of consumption status relative to budget.

The gauge may be represented like this:



Figure 15 Analogue Gauge Example

The gauge 'fills up' left to right revealing coloured segments as it does so.

The segments are an analogue indication of accumulating and accumulated quantity relative to the target (budget) set for that day.

Operation of the analogue gauge is defined as:

- Green segments indicate accumulation is less than target so far; or quantity accumulated so far is acceptable
- Amber segments indicate target value is being approached; or quantity accumulated so far requires attention (control)
- Revealed red segments are used to indicate the target has been exceeded; or quantity accumulated is high.

The gauge retains the same appearance regardless of whether the framed display item beneath it is the *% consumed of today's target* or an accumulating monetary values or kWh values.

6.6.2 Instantaneous

This specific analogue gauge accompanies and reinforces the framed display of any instantaneous (rate of usage) value. This framed display element may be: \$/hour / now and Watts or kW/ now.

The gauge may be represented like this:



Figure 16 Analogue Gauge

The gauge segments may move left *and* right into the green, amber and red areas.

When an electricity quantity is on display the status of this gauge will be directly related to the traffic light light-bar above it.

Example:

- The gauge will be in the green area when the light-bar feature is illuminated green,
- The gauge will show amber segments when the light-bar is illuminated amber
- The gauge will show red segments when the light-bar is illuminated red.

6.7 Home page soft keys

The home screen additional contains 4 soft keys:

- Channel Toggle
- Media Toggle
- Shortcut to Menu Item
- Access to Main Menu

These 4 keys are arranged in the 4 display corners as shown below:

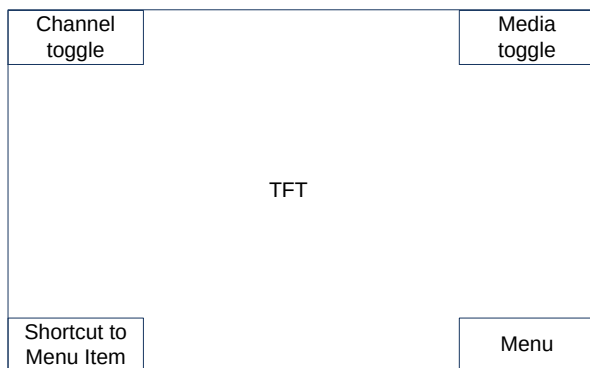


Figure 17 P450 IHEM Soft Key Layout

6.8 Channel toggle

The channel toggle allows the user to define the language of operation and denote the supply status for the customer's smart electricity meter.

6.8.1 Language button

The language button denotes the current language that is in use. For example, if the operational language is set to English it will display EN. Should the language be changed to an alternative language such as Spanish it will display ES.

Selecting the language button will change the operational language of the P450 IHEM to the set-alternative language.

6.8.2 Supply status

The supply status indicator acts as a visual representation to the user of the supply connection status to the customer property. The possible status settings for the icon are detailed below.

- Solid Icon – Denotes that the meter contactor is closed, and that supply is connected
- Un-lit Icon – Denotes that the supply has been disconnected and the meter contactor is open.
- Solid Icon – Denotes that the supply is armed or ready to be reconnected and requires the user to reconnect power
- Solid Icon with Solid Square – Denotes that Emergency Credit is in Use

6.9 Media toggle

The media toggle active area allows the user to define between cost and usage information. The active selection will be highlighted and the displayed information within the P450 IHEM and will be representative of the option selected.

NB: Note that in credit operation mode that the \$ Cost option will be disabled.

In the home screen, all framed display items are switched by this button i.e.

Cost Information

\$/hour now

\$ so far today

% of today's target (\$ based)

Usage information

kW now

kWh so far today

% of today's target (kWh based)

The media toggle selection is also representative of the functionality that is shown within the P450 IHEM and will define how information is displayed in the following operation functions:

- History function
- Budget function – Select budget option (day, week, month)

6.10 Shortcut options

The shortcut button allows quick access to P450 IHEM functionality from the home screen, rather than using the Main Menu for access. Two shortcut options are supported based on mode of operation.

6.10.1 Prepay shortcut

When in prepayment mode the viewing of prepayment information is possible from the home screen. The left-hand bottom corner active area functions as a shortcut button to the prepayment suite of screens.

6.10.2 Price shortcut

When in credit mode the viewing of price information is possible from the home screen. The left-hand bottom corner active area functions as a shortcut button to the price suite of screens.

6.11 Main menu

The main menu can be accessed from the bottom right corner of the home screen. On selection of a 'Menu' item a new screen is displayed where the user can select the functionality that is supported by the P450 IHEM. The P450 IHEM will display the menu based on the mode of operation configured. Examples of each of the menus can be seen in the next section.

6.12 Main menu prepayment operation

Where the P450 IHEM is in prepayment mode, the P450 IHEM will display the following menu options to the user on selection.

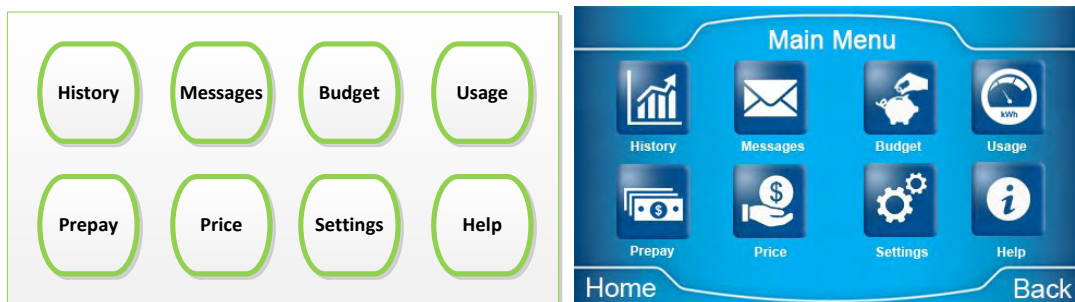


Figure 18 Prepayment Main Menu Items

On selection of any of the displayed items the P450 IHEM will display the suite of screens associated with the selected item.

6.13 Main menu credit operation

Where the P450 IHEM is in credit mode, the P450 IHEM will display the following menu options to the user on selection.

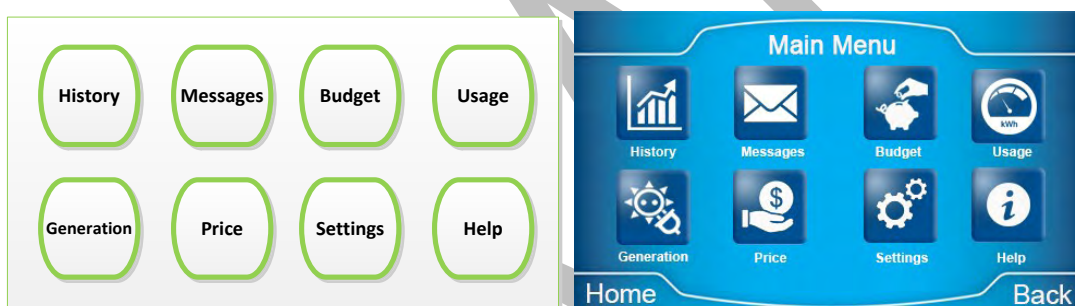


Figure 19 Credit Main Menu Items

On selection of any of the displayed items the P450 IHEM will display the suite of screens associated with the selected item.

6.14 Home screen simplified representation and sleep mode

To minimise 'self-consumption' and periods of non-use the P450 IHEM is preconfigured to simplify its display representation after a period and enter a sleep mode.

The first stage in the sleep mode is to simplify the home screen representation to the single central emphasised display item. This will occur after **xxx** minutes of none use.

The second stage in the product's transition to sleep mode is to suppress the entire main display informant and indicate energy usage using only the traffic light light-bar feature. This will occur after a further **xxx** minutes of none use.

The first stage of sleep mode screen can be seen in the following example.

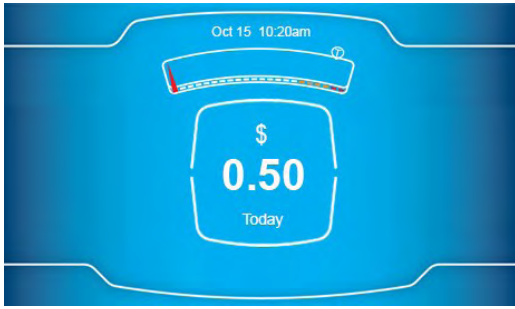


Figure 20 Example of P450 IHEM entering 1st Sleep Mode

The P450 IHEM will exit either of the sleep modes on interaction with the display. Selecting the display screen will make the P450 IHEM enter its typical operational mode, and will display the carousel in the configuration as last selected by the user.

6.15 Battery mode operation

Where the P450 IHEM is operating on battery power the display will remain blank until the user chooses to select a display, where the P450 IHEM display will become operational. After **X** minutes of non-use, the P450 IHEM will fall directly into the final sleep mode, therefore bypassing the 1st sleep mode detailed in the previous section.

6.16 Home screen alerts and notifications

The home screen supports several alert and customer notifications, these are used to inform the user of impending issues, states of operation or warnings for the user to acknowledge and manage accordingly. This section provides a brief overview of each function; further information can be found in the Alerts and Notifications section of this document.

6.16.1 Home screen alerts

Home screen alerts are used to inform the user of impending change or status management issue. The home screen alert will be shown as a red Information icon displayed within the gauge area of the home screen.

On selection of the alert icon typically a splash screen will be shown to indicate and identify the purpose of the alert.

An example of the home screen alert icon can be seen in the following image.

Additionally, an impending price change is indicated above the menu shortcut. The home screen alert icons can be seen in the following example.

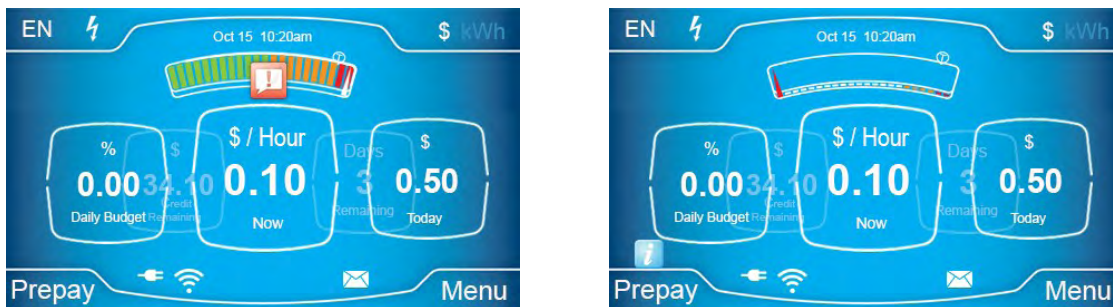


Figure 21 Home Screen Alert Icon Examples

6.16.2 Notifications

Notifications are used to inform the user of issues associated with the P450 IHEM such as power status, and operational warnings. Notifications are displayed to the user typically as a splash screen to indicate and identify the purpose of the notification. The notification screen can be seen in the following example.

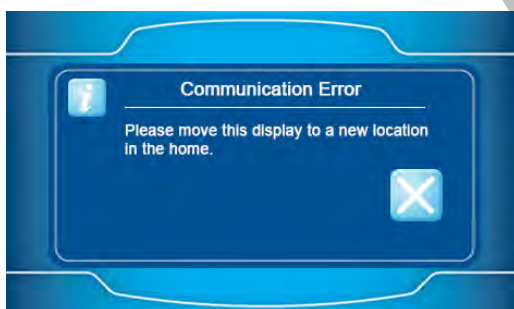


Figure 22 Notifications Splash Screen

7 History Function

7.1 History overview

The History function enables the user to view historical data associated with their usage and cost. The suite of screens associated with the History function can be seen in overview below:

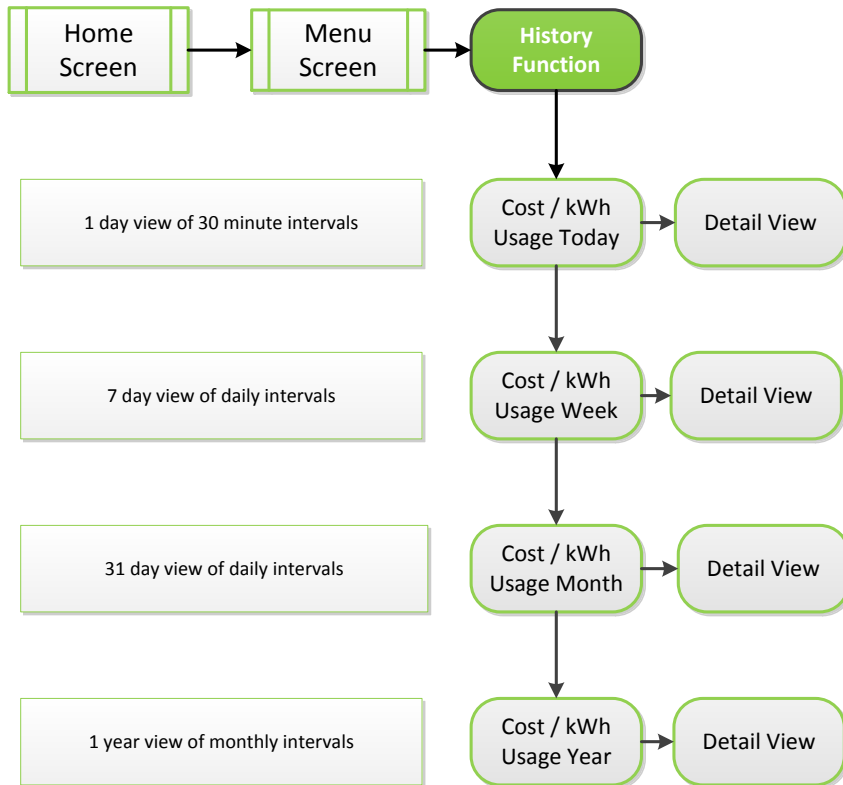


Figure 23 History Function Layout

The key displays in this suite are:

1. Daily views of half hourly profiles
2. Weekly views of daily profiles
3. Monthly views of daily profiles
4. Annual views of monthly profiles

Each of these 4 screen views be a simple bar graph profile and as a bar graph profile with detailed analysis superimposed. Further explanation of operation can be seen in the following section.

7.2 History function operation

On selection of the History function from the Main Menu the P450 IHEM will show the Day View screen. The following section details the features and operation of the history function.

7.3 History function screen overview

The layout and operation of the History screen be seen below.

1. Description of the profile on view
2. Scroll left navigation (period)
3. Zoom out navigation
4. Return to home page
5. Date on view
6. Back to previous screen navigation
7. Zoom in navigation
8. Scroll right navigation (period)
9. Media toggle (cost or Usage)
10. Detail view switch

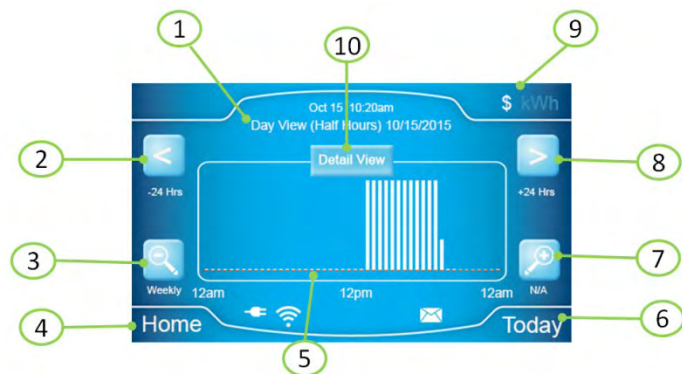


Figure 24 Example of History Screen Layout

7.3.1 Description of the profile on view

Text based title for the profile describing what the user is viewing

7.3.2 Scroll left navigation

Increments of the period on view (i.e. in the 24-hour view in 24-hour increments, in the weekly view of days in weekly increments) this button navigates the viewer backwards in time; i.e. to previous days or weeks etc.

7.3.3 Zoom out navigation

This button navigates the user to the next 'less granular' period; i.e. from daily view of half hourly data it navigates to weekly view of daily data.

7.3.4 Return to home page

Returns the user to the first level homepage /carousel screen

7.3.5 Data on view

This displays the core data that the user is interrogating

7.3.6 Back to previous screen navigation

This button takes the user to the previous screen viewed

7.3.7 Zoom in navigation

This button is the inverse of 'zoom out'. It navigates the user to the next 'more granular' period; i.e. from weekly view of daily data it navigates to daily view of half hourly data. At the daily view of half hourly data it is marked N/A as there is no more granular view to navigate to.

7.3.8 Scroll right navigation

If a user has scrolled backwards in time using the left scroll icon, then this button returns them in the same time increments to the most current period.

7.3.9 Media toggle

This allows the user to switch the data view between Cost and Usage.

7.3.10 Detail view

Selecting this icon superimposes another deeper level of detail over the same channel, quantity, and period of history on view.

7.3.11 Simple view operation

Simple view operation provides an overview of the selected cost or usage screen.

Here the user can perform the following:

- Amend the data view period by using the chevron icons
- Amend the period displayed by selecting the magnify + or – icons
- Select the Detail icon to view more granular data for the displayed period.

The simple view screen can be seen in the following example.

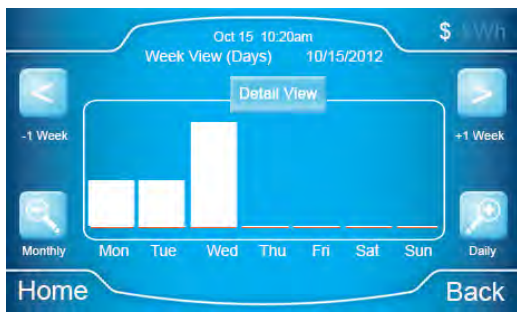


Figure 25 Simple View Screen

7.3.12 Detail view operation

Detail view operation provides the user with a more granular view of the data displayed for the selected period. The detailed view is accessed via the selection of the Detail View button on the simple screen.

On selection of the detail screen the user can view the recorded value (cost or kWh) for each displayed period by moving the displayed cursor to the required period. The colour displayed behind the chart is used to display a visual indication of the target or budget level appropriate to the period. The detail view screen can be seen in the following example.

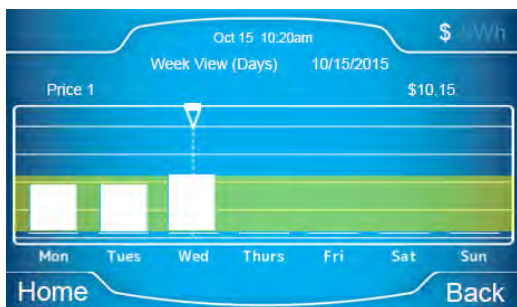


Figure 26 Detail View Screen

7.4 Day view operation

The following details the operation of the day view history option.

7.4.1 1-day view of 30-minute intervals (simple)

The Day view simple screen displays the following data:

- Data shown is from 30-minute interval capture period
- The data is displayed over a 24-hour time frame
- The view is made up of a 48-bar histogram showing consumption.
- Histogram data displayed can be made to represent Cost or kWh by using the 'media toggle'.
- The 24-hour view can be stepped backwards up to 30 days.

The day view simple operation screen can be seen in the following example.

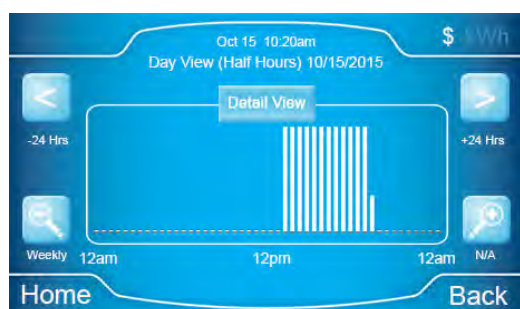


Figure 27 Day View Screen (simple)

7.4.2 1-day view of 30-minute intervals (detailed)

The Day view detail screen displays the following data:

- The data shown is from the 30-minute interval capture period
- The data is displayed over a 24-hour time frame
- The view is made up of a 48-bar histogram showing consumption.
- Histogram can be made to represent cash or kWh by using the 'media toggle'.
- 24-hour view can be stepped backwards up to 30 days.
- The pointer can be moved across the displayed data points
- Value of selected data point is displayed to the user

The day view detailed operation screen can be seen in the following example.

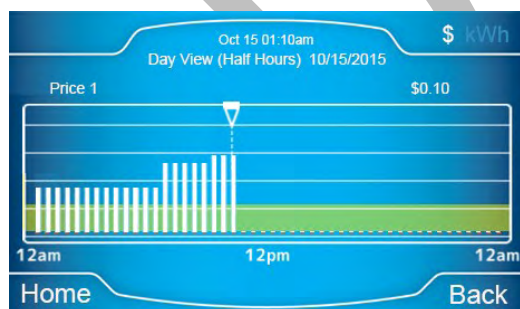


Figure 28 Day View Screen (detailed)

7.5 Week view operation

The following details the operation of the week view history option.

7.5.1 7-day view of daily intervals (simple)

- The data shown is from 1-week total values
- The view is made up of a 7-bar histogram showing consumption.

- Histogram can be made to represent cash or kWh by using the 'media toggle'.
- 7-day view can be stepped backwards up to 90 days.

The week view simple operation screen can be seen in the following example.

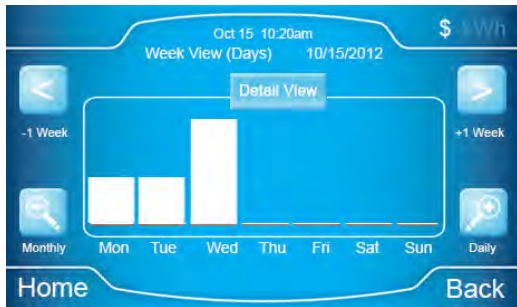


Figure 29 Week View Screen (simple)

7.5.2 7-day view of daily intervals (detailed)

- The data shown is from 1-week total values
- The view is made up of a 7-bar histogram showing consumption.
- Histogram can be made to represent cash or kWh by using the 'media toggle'.
- 7-day view can be stepped backwards up to 90 days.
- The pointer can be moved across the displayed data points
- Value of selected data point is displayed to the user

The week view detailed operation screen can be seen in the following example.

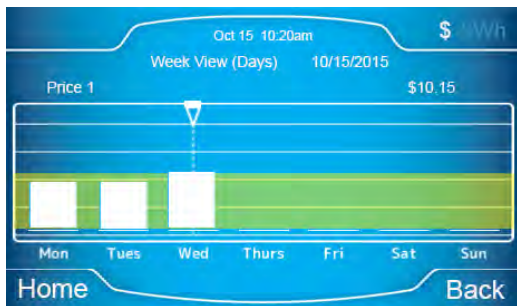


Figure 30 Week View Screen (detailed)

7.6 Month view operation

The following details the operation of the month view history option.

7.6.1 31-day view of daily intervals (simple)

- The data shown is from 1 month's total values
- The view is made up of a 31-bar histogram showing consumption.
- Histogram can be made to represent cash or kWh by using the 'media toggle'.
- 31-day view can be stepped backwards up to 90 days.

The month view simple operation screen can be seen in the following example.



Figure 31 Month View Screen (simple)

7.6.2 31-day view of daily intervals (detailed)

- The data shown is from 1 month's total values
- The view is made up of a 31-bar histogram showing consumption.
- Histogram can be made to represent cash or kWh by using the 'media toggle'.
- 31-day view can be stepped backwards up to 90 days.
- The pointer can be moved across the displayed data points
- Value of selected data point is displayed to the user

The month view detailed operation screen can be seen in the following example.

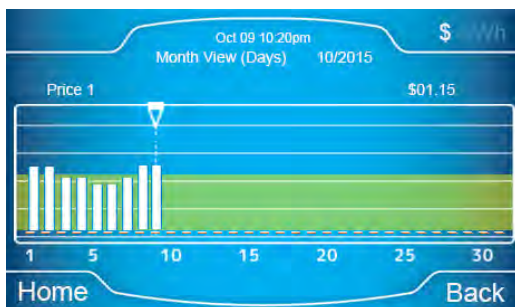


Figure 32 Month View Screen (detailed)

7.7 Year view operation

The following details the operation of the year view history option.

7.7.1 1-year view – 12 months (simple)

- The data shown is from 12 monthly total values
- The view is made up of a 12-bar histogram showing consumption.
- Histogram can be made to represent cash or kWh by using the 'media toggle'.
- Year view can be stepped backwards to previous year.

The year view simple operation screen can be seen in the following example.

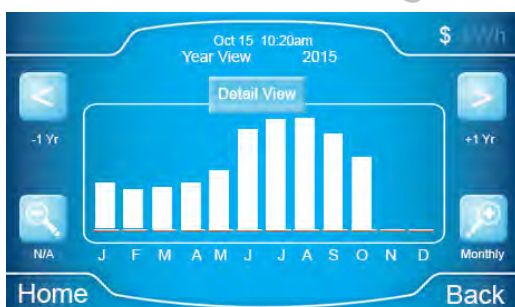


Figure 33 Year View Screen (simple)

7.7.2 1-year view – 12 months (detailed)

- The data shown is from 12 monthly total values
- The view is made up of a 12-bar histogram showing consumption.
- Histogram can be made to represent cash or kWh by using the 'media toggle'.
- Year view can be stepped backwards to previous year.
- The pointer can be moved across the displayed data points
- Value of selected data point is displayed to the user

The year view detailed operation screen can be seen in the following example.

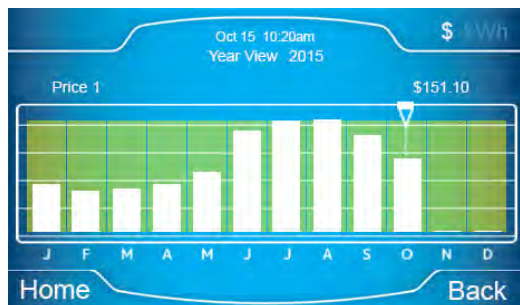


Figure 34 Year View Screen (detailed)

8 Messages Function

8.1 Message function overview

The Message function allows the Utility to provide the user with Information Messages.

The messages screen structure is shown in overview below.

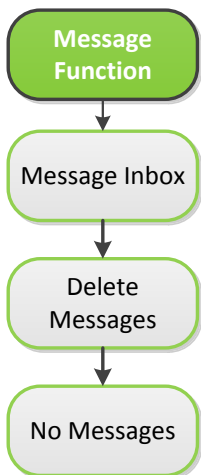


Figure 35 Messages Function layout

8.2 Message alert

If the P450 IHEM receives a message from the utility the message alert icon on the home screen is illuminated.

NB. An unread message in the message inbox also illuminates the message icon on the home screen

8.3 Message inbox

As shown above the message inbox is navigated to from the message icon at the menu screen. The message inbox can contain up to 20 messages.

The message inbox is scrollable to view all messages. A message is opened by pressing it.

The message inbox screen can be seen in the following example.



Figure 36 Messages Inbox

8.4 Message content

The message may be up to 360 characters long. The message content is scrollable if it is larger than can be displayed in a single view. The message content screen can be seen in the following example.



Figure 37 Message Content

8.5 Message delete

After reading the message it may be deleted. The delete button is in the top right-hand corner of the message content screen (See message content image).

Messages can also be deleted from the Messages inbox; this can be accessed from the top left-hand corner of the message content screen (See message inbox image).

A deleted message is removed from the message inbox. A message that is not deleted remains in the message inbox until overwritten. The delete message screen can be seen in the following example.

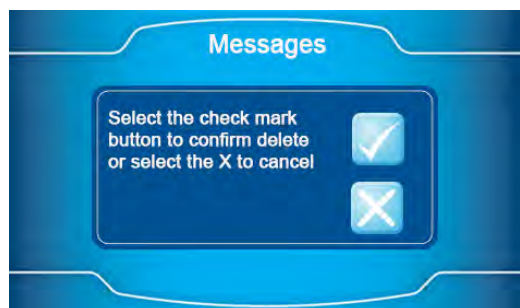


Figure 38 Delete Message Notification

8.6 No messages

If no messages are present in the P450 IHEM then the following notification is displayed when the user accesses the messages function. The no messages screen can be seen in the following example.

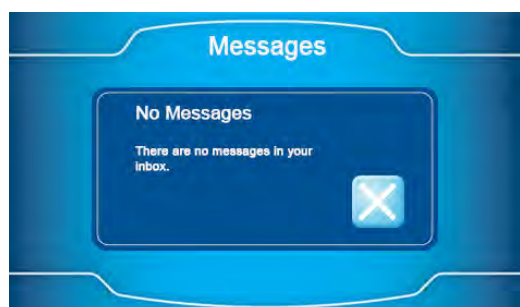


Figure 39 No Messages Notification

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9 Budget Function

9.1 Budget function overview

The Budget function provides the user with an option to set a budget program to enable energy management.

By setting a budget the P450 IHEM will show the consumer how they are performing against the budget set.

Budget performance information is shown in both the Carousel items and the Analogue Gauges shown in the Home Screen.

The budget can be set using two options;

- Specify values – Usage or Cost amount defined per Day, Week, or Month
- via the completion of a series of user questions

The budget screen structure is shown in overview below.

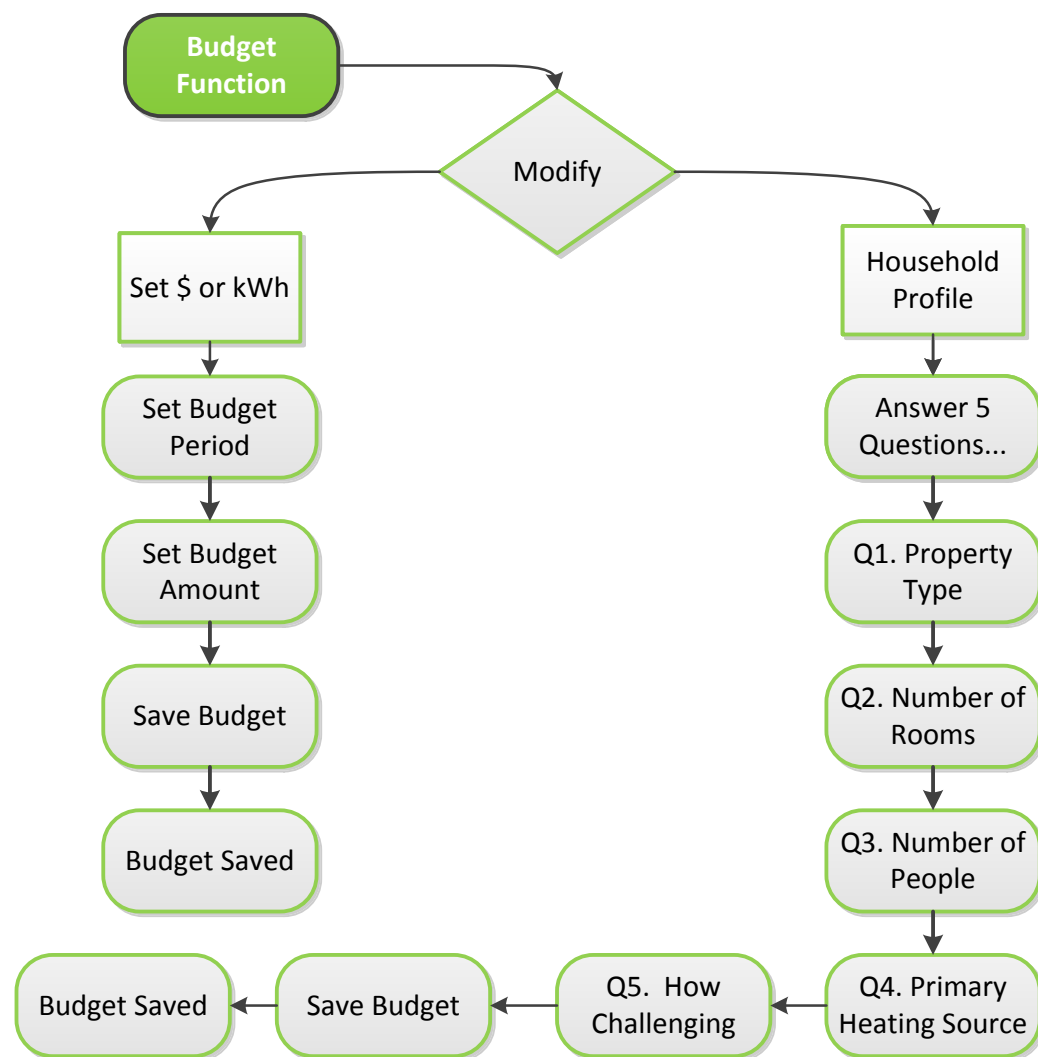


Figure 40 Budget Function layout

9.2 Current budget settings

Selecting the Budget icon from the Main Menu screen navigates the user to the Budget summary screen. The budget summary screen displays the setting that was previously applied by the user.

The budget target is displayed per the period the user used when they were last set:

1. If the user set them as a quantity per/day they are displayed here as a quantity per/day
2. If the user set them as a quantity per/week they are displayed here as a quantity per/week
3. If the user set them as a quantity per/month they are displayed here as a quantity per/month
4. If the user set them using the user questionnaire they are displayed as a quantity per/year

If the budget is in a factory default state and the user has not yet personalised them they are shown as a quantity per/year

Pressing a 'modify' key will navigate the user to the next screen. The budget screen can be seen in the following image.



Figure 41 Your Budget Screen

9.3 Setting targets: choose method

There are two routes a user may follow to set a budget value;

- Route 1 setting a time (either monetary or usage) based target
- Route 2 creating a user profile type target based on a few simple questions.

The choose budget option screen can be seen in the following image.

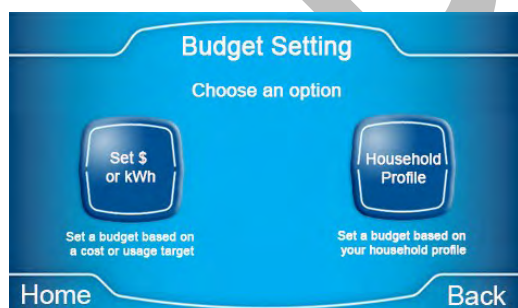


Figure 42 Choose Budget Option Screen

9.4 Setting a time or money based target

On accessing the Set Budget screen, the user can define whether the budget is monetary, or usage based by selecting the desired option from the media toggle in the top right-hand area of the screen.

NB: In Credit operation, only the kWh option is shown to the user.

9.4.1 Set budget

The next screen presents the user with three options from which to select the period over which the target should be set:

1. Cost or Usage per day
2. Cost or Usage per week
3. Cost or Usage per month

Pressing the appropriate key will select the desired period. The set budget option screens (cost/usage) can be seen in the following images.



Figure 43 Set Budget Option Screens

9.4.2 Set budget amount

The next step in the sequence asks the user to select the cash value amount. The target amount is incremented up with a right-hand increase button. The target amount is decremented with a left-hand decrease button. The table below details incremental amounts for each of the budget options.

Budget Type	\$ increment values per button press	kWh increment values per button press
Per Day	\$0.25	1 kWh
Per Week	\$1.00	5 kWh
Per Month	\$5.00	10 kWh

Figure 44 Table of Budget Increment Amounts

When the desired amount is reached the 'continue' key should be pressed to progress. The set budget value screen can be seen in the following example.



Figure 45 Set Budget Amount Screen

9.4.3 Target confirmation

A target settings summary is shown following the 'save' action described above.

Closing this view returns the user to the top of the time and money based 'Specify Targets' route. The budget saved screen can be seen in the following image.



Figure 46 Budget Saved Screen

9.5 Setting a target based on a user profile

An alternative mode to setting a personalised target is to select the 'Household Profile' route as described in the section 'Setting targets: Choose Method'.

9.5.1 Answer 5 questions

After pressing the Household Profile button, the user is navigated to a series of questions about their home and family size. At the end of this process electricity based targets are calculated and set. The household profile screen can be seen in the following image.



Figure 47 Answer 5 Questions Screen

9.5.2 User profile question 1 – Property type

The first question posed to the user is 'What type of property do you live in?' One of the four options offered should be selected. On selection, the choice is highlighted.

Options available are: Apartment, Single Family Home, Town home/Combo and Manufactured Home. The user should now press 'next' to continue.

The property type screen can be seen in the following image.



Figure 48 Property Type Screen

9.5.3 User profile question 2 – Number of rooms

The second question posed is 'How many rooms are in your property?' One of the four options offered should be selected. On selection, the choice is highlighted. The user should now press 'next' to continue.

The how many rooms screen can be seen in the following example.



Figure 49 Number of Rooms Screen

9.5.4 User profile question 3 – Number of people

The third question posed is 'How many people live in your property?' One of the three options offered should be selected. On selection, the choice is highlighted. The user should now press 'next' to continue.

The number of people screen can be seen in the following example.

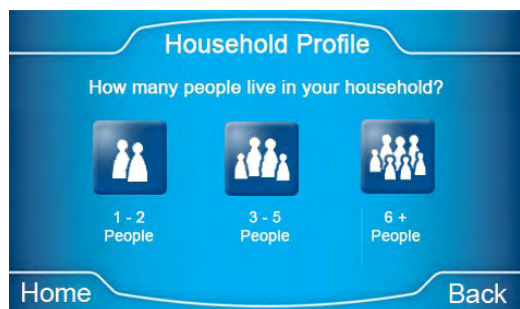


Figure 50 Number of People Screen

9.5.5 User profile question 4 – Primary heating source

The fourth question posed is 'What's the primary heating source in your household?' One of the two options – gas or electricity should be selected. On selection, the choice is highlighted. The user should now press 'next' to continue.

The primary fuel screen can be seen in the following example.

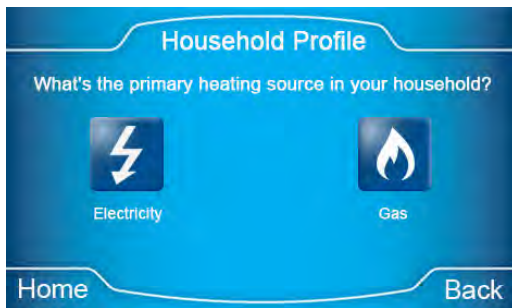


Figure 51 Primary Heating Screen

9.5.6 User profile question – How challenging

The final question posed is 'How challenging do you want your target budget to be?' One of the three options – very challenging, moderately challenging, simple challenge, should be selected. On selection, the choice is highlighted. The user should now press 'next' to continue.

The how challenging screen can be seen in the following example.



Figure 52 Challenging Screen

9.5.7 Household profile targets

After completing the five questions the user is presented with summaries of the calculated targets.

The user can step backwards thru the screens and questions above to amend any answers.

Otherwise the targets should be saved by pressing the 'save' key on the screen. The summary screen can be seen in the following example.



Figure 53 House Profile Summary Screen

9.5.8 Household targets saved

On saving the targets the calculated values are seasonally adjusted before being applied.

Seasonally adjusting the targets in this way prevents the user being given false reassurances for under achieving the target during the summer months only to find that over a full year the target is unachievable.

9.5.9 Target confirmation

A target settings summary is shown following the 'save' action described above.

Closing this view returns the user to the top of the time and money based 'Specify Targets' route. The budget saved screen can be seen in the following example.



Figure 54 Budget Saved Screen

10 Usage Function

10.1 Usage function overview

The Usage function provides the consumer with details on the amount of money that they have spent and their meter reading values.

The Usage screen structure is shown in overview below.

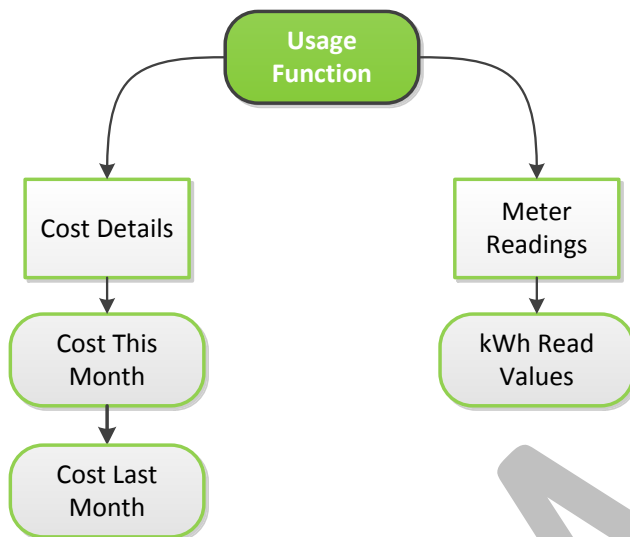


Figure 55 Example of Usage Screen Structure

Selecting the Usage icon from the Main Menu screen navigates the user to the Usage Menu screen. On accessing the usage menu function two options are displayed to the user.

- Cost
- Meter Readings

The usage menu screen can be seen in the following example.

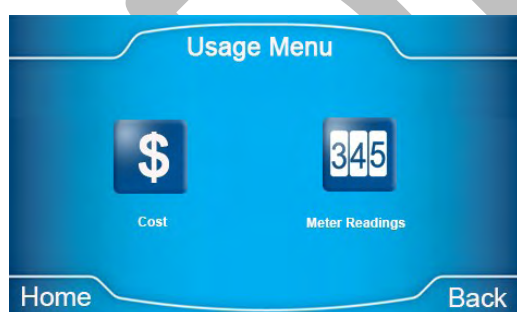


Figure 56 Usage Menu Screen

10.2 Cost details

Selecting the Cost Details icon from the Usage Function screen navigates the user to the Cost screen. On accessing the cost details function two options are displayed to the user.

- Cost This Month
- Cost Last Month

The Cost Details screen can be seen in the following example.



Figure 57 Cost Details Menu

10.2.1 Cost this month

The Cost This Month screen is selected from the cost details screen. On selection of the option a new screen is displayed detailing how much the user has spent during the current calendar month. The cost this month screen can be found in the following example.



Figure 58 Cost This Month Screen

10.2.2 Cost last month

The Cost Last Month screen is selected from the cost details screen. On selection of the option a new screen is displayed detailing how much the user spent during the last calendar month. The cost last month screen can be found in the following example.

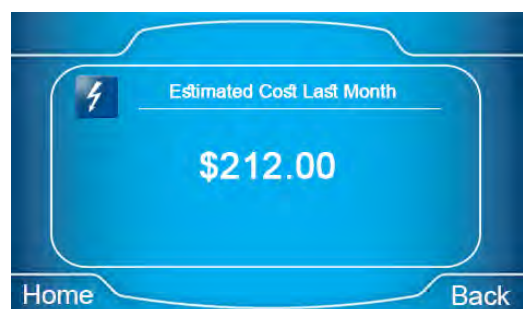


Figure 59 Cost Last Month Screen

10.3 Meter readings

Selecting the Meter Readings icon from the Usage Function screen navigates the user to the meter readings screen. On selection of the icon the P450 IHEM will display the meter readings function. From this screen the user can view the total kWh value for each supported rate registered in the meter. Using the up and down arrows the user can view additional supported registers not shown in the screen.

NB: When in Credit Mode the Usage Menu will only show the Meter Readings screen. The Cost function will be suppressed from the customer view.

The meter readings screen can be found in the following example.

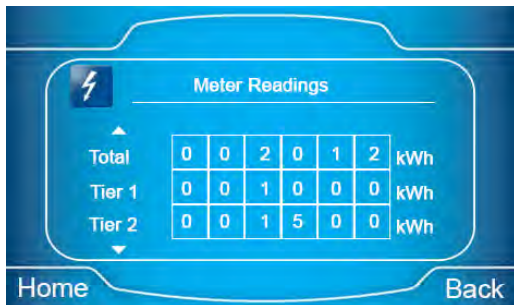


Figure 60 Meter Readings Screen

11 Prepayment Function

11.1 Prepayment function overview

The P450 IHEM supports the management of Prepayment functionality via the Prepay menu function.

Within the Prepay function the following options are supported:

- Transaction History
- Low Credit Alarm
- Code Entry
- Emergency Credit

The Prepay screen structure is shown in overview below.

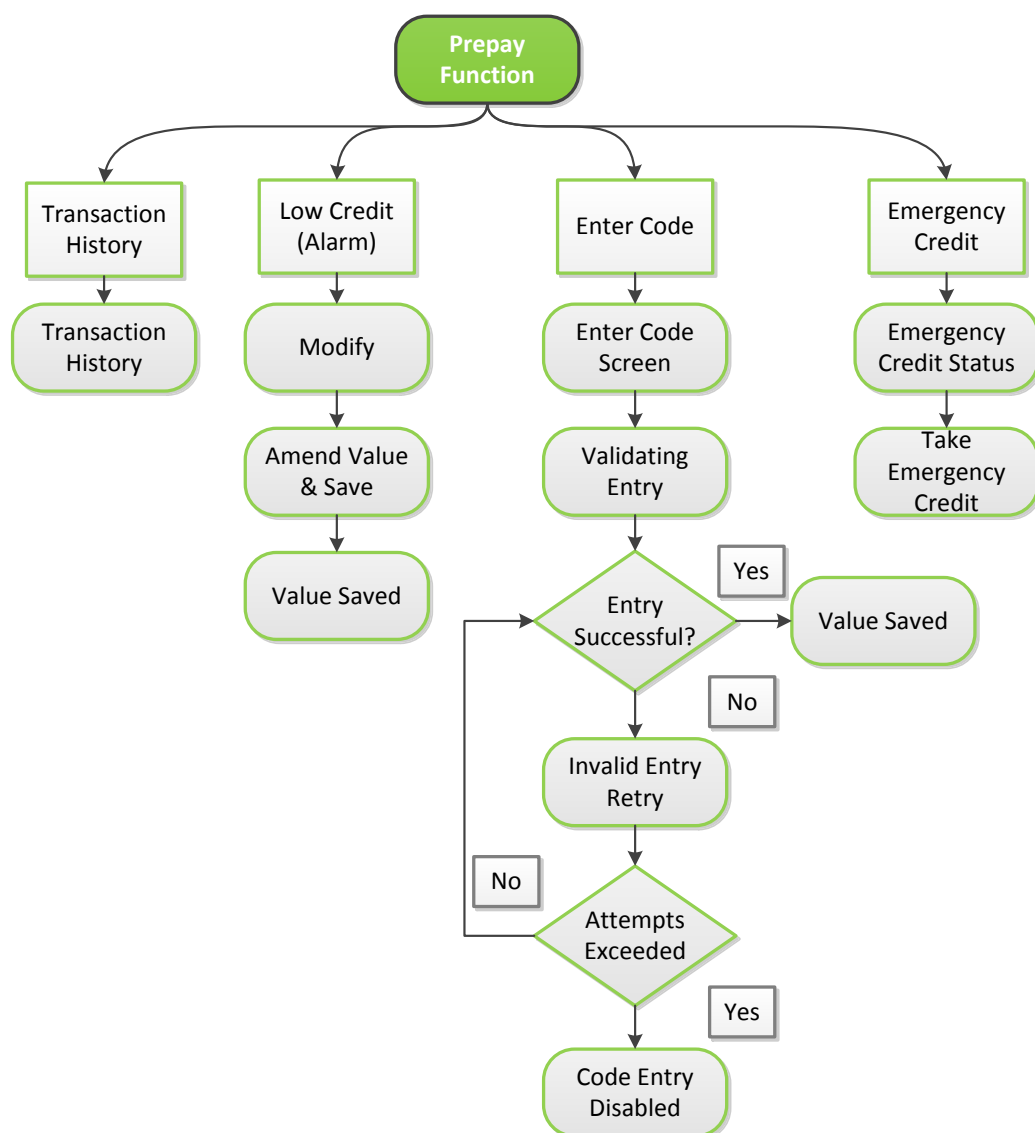


Figure 61 Example of Prepayment Screen Structure

11.2 Prepay menu

Selecting the Prepay icon from the Main Menu screen navigates the user to the Prepay Menu screen.

On accessing the prepay menu function the following options are displayed to the user.

- Transaction History
- Low Credit (Alarm)
- Enter Code
- Emergency Credit

The prepay menu screen can be seen in the following example.

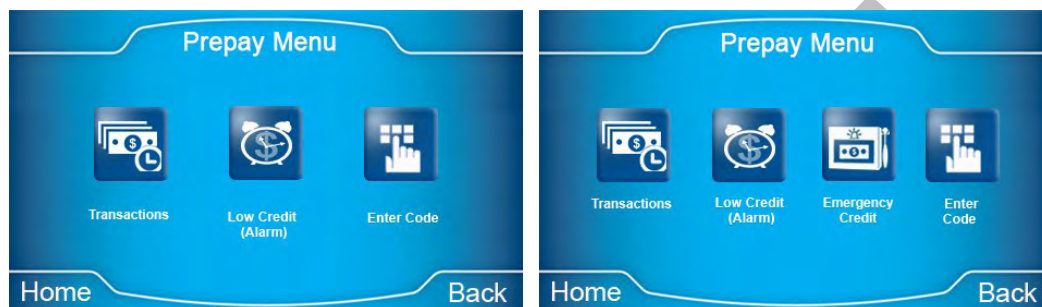


Figure 62 Prepay Menu Screens

11.3 Transaction history

The Transaction History function is selected from the prepay menu screen. On accessing the transaction history screen the user is presented with the transaction details for the last five purchases that have been made.

The transaction history screen displays the date and time of each transaction, the amount of the transaction and the payment code associated with the transaction.

The payment code is a 20-digit code that is issued at time of purchase and can be used as a back mechanism for applying a payment to the meter should the payment not arrive due to a major outage.

The user can view the transactions present on the P450 IHEM by selecting the next arrow shown in the top right-hand corner of the display.

The transaction history screen can be seen in the following example.

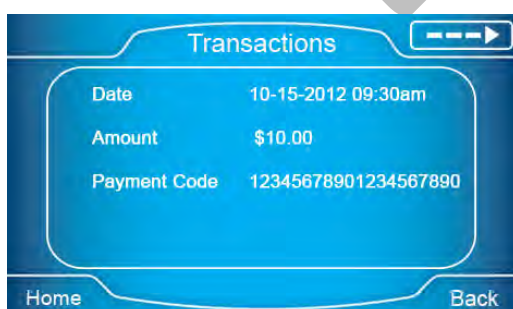


Figure 63 Transaction History Screen

If no transactions have been made or exist in the meter, then the P450 IHEM will display a pop up message to notify the user. An example of the no transactions screen can be seen in the following example.



Figure 64 No Transactions Screen

11.4 Low credit alarm

The Low Credit Alarm function is selected from the prepay menu screen. On accessing the low credit alarm screen the user is presented with the current low credit alarm alert value.

The low credit alarm is a mechanism to alert the user when the remaining credit falls below a defined threshold value. The default alarm value set by the utility may not suit the lifestyle of the user, so the user has the option to set their own low credit alarm value.

NB: The low credit alarm value cannot be set lower than the utility configured value.

The low credit alert screen can be seen in the following example.

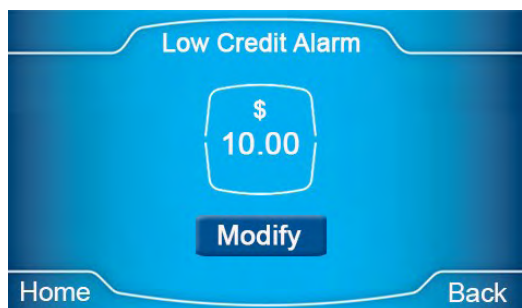


Figure 65 Low Credit Alarm Screen

The user can change the low credit alarm value by selecting the Modify button. On selection of the modify button a new screen is displayed. By using the Increase and Decrease button the user can select the new desired alarm value. The low credit modify screen can be seen in the following example.



Figure 66 Modify Low Credit Alarm Screen

Once the value has been set the user should select the Save button to where the new value will be saved to the P450 IHEM. Once the new value has been saved a confirmation screen will be displayed to confirm the action and the associated value. The low credit new value saved screen can be seen in the following example.



Figure 67 New Low Credit Alarm Saved

11.5 Enter code

The Enter Code function is selected from the prepay menu screen. On accessing the enter code screen a key pad entry screen is shown to the user. From this screen the user can enter the 20-digit code details for the following:

- Payment Code
- Global Code
- Customer Emergency Code

The enter code screen can be seen in the following example.

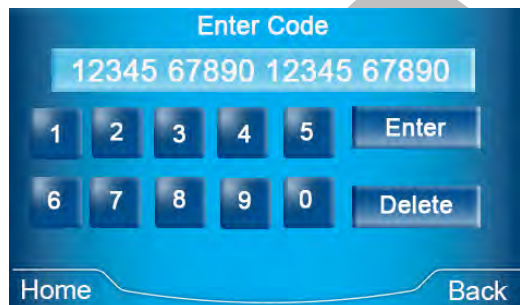


Figure 68 Enter Code Screen

11.5.1 Payment Code

When a Prepayment transaction has failed to reach the meter, it will be possible to enter a prepayment vend code at the P450 IHEM. This will typically be the 20-digit code that is on the customer receipt issued at the time that the transaction was performed.

11.5.2 Customer emergency code

The Customer Emergency Code provides a back-up feature if there are device issues or a customer is unable to purchase additional credit. The principle of an emergency code is to ensure that the customer has power. Whilst an emergency code is active the customer will not disconnect.

Customer specific emergency codes will only work for the selected meter. The duration that the code will last can be defined by the utility with the duration selectable between 1-127 days. A customer

code is date dependent in that if the code is not activated on issue it will only work for the number of days remaining associated with the defined duration.

11.5.3 Global emergency code

The Global Emergency Code provides a back-up feature if there are networking infrastructure issues. The principle operation is the same as the customer emergency code in that it will not disconnect the customer whilst it is active.

The duration of the code entered is dependent on the period that has been defined by the utility and the code that has been activated in the meter.

11.6 Code entry process

The user should use the key pad on the code entry screen to apply a 20-digit code.

If the user has entered an incorrect value, then the Delete button can be selected to remove the incorrect value. Once all 20 digits have been entered the Enter key is enabled.

At this point the user should select the enter key to offer the code to the electricity meter.

11.6.1 Code Validation

When a code is offered to the meter the P450 IHEM displays a Validating Code screen which will be displayed until the validation process is completed.

NB: It can take up to 1 minute to complete the processing of a code request

The validating code screen can be seen in the following example.



Figure 69 Validating Code Screen

Once the validation has been completed by the meter it will return either a Success or Invalid notification to the user.

11.6.2 Successful validation

The P450 IHEM will display a success message based on the type of code that has been applied. If a payment code has been successfully applied, then the P450 IHEM will display the following screen.

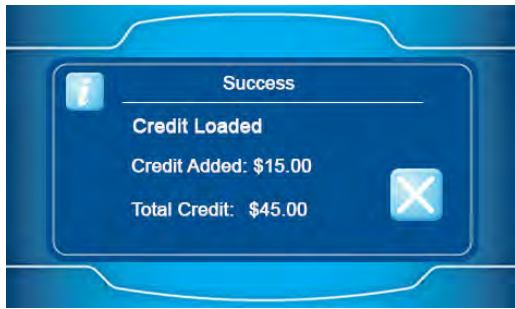


Figure 70 Success Credit Loaded Screen

If an emergency code has been successfully applied, then the P450 IHEM will display the following screen.

NB: If the utility chooses to send out a new Low Credit Alarm value then it will overwrite any customer entered values.



Figure 71 Code Entry Successful Screen

11.6.3 Invalid code

If the validation performed at the meter identifies that the code entry is invalid, then the P450 IHEM will display the following screen.



Figure 72 Invalid Code Entry Screen

11.7 Code entry lockout mechanism

The P450 IHEM supports a code entry mechanism which will stop misuse of the code entry screen for payment and emergency code support. The following section details the operation of the lock-out mechanism.

11.7.1 10-minute lock out

The P450 IHEM will allow the user 3 attempts to enter a code during a 5-minute time frame before the first lock out mechanism is applied.

Once the 3 failed attempts have been performed the P450 IHEM will disable access to the code entry screen for 10 minutes.

The lock out will be displayed on the P450 IHEM in a visual message stating: 'Code entry is disabled Try again in 10 minutes'. This can be seen in the following example.

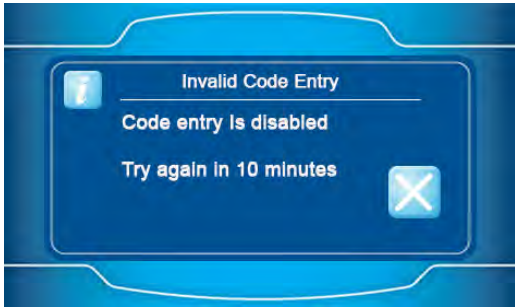


Figure 73 Code Entry Disabled for 1 Minute

Once a lock out message has been displayed the user can still operate all other functionality of the P450 IHEM except the code entry screen.

If the user attempts to re-access the code entry screen the previously displayed message will be shown to the user once again.

The message will not be updated or cleared from the screen until the defined lock out period has finished.

11.7.2 1 hour lock out

If the user again attempts to enter a code after the end of the first lock out period, then the P450 IHEM will allow 3 further attempts during a 1 hour time frame to enter the correct code before the second lock out mechanism is applied.

Once the 3 further failed attempts have been performed the P450 IHEM will disable access to the code entry screen for 1 hour.

The lock out will be displayed to the meter in a visual message stating: 'Code entry is disabled Try again in X minutes' (duration remaining on attempt to enter code). This can be seen in the following example.

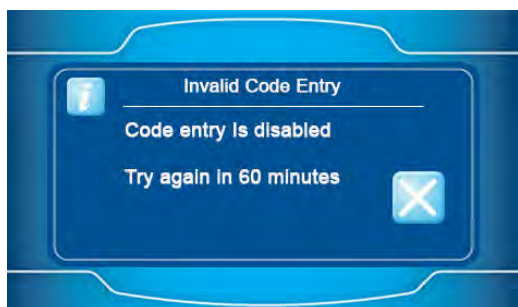


Figure 74 Code Entry Disabled for 1 Hour

11.7.3 24-hour lock out

If the user again attempts to enter a code after the end of the second lock out period, the P450 IHEM will enter a period where 3 final attempts to enter the correct code will be allowed during a 24-hour time frame before the final lock out mechanism is applied.

Once the 3 further failed attempts have been performed the P450 IHEM will disable access to the code entry screen for 24 hours.

The lock out will be displayed to the meter in a visual message stating: 'Code entry is disabled Try again in X hours X minutes' (duration remaining on attempt to enter code). This can be seen in the following example.

At the end of the 24-hour period the lock out mechanism is reset and will again operate as defined in examples 1, 2 and 3 again.

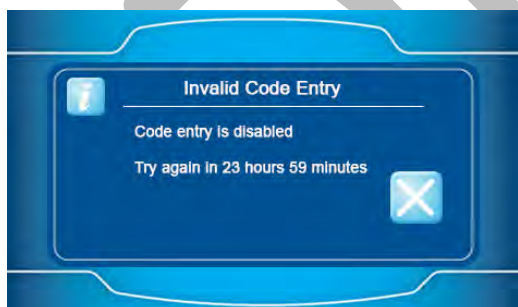


Figure 75 Code Entry Disabled for 24Hours

NB: To mitigate any potential over use of the lock out mechanism the P450 IHEM will automatically lock out the user for 24 hours after 10 failed attempts in any one day are registered in the P450 IHEM.

11.8 Emergency credit

The Emergency Credit function is selected from the prepay menu screen. On accessing the emergency credit screen, the user is presented with the emergency credit status screen. The screen

displays the emergency credit value that can be applied, and the current emergency credit status. Selection of the button will then show confirmation of the status.

The emergency credit statuses supported by the P450 IHEM are defined as:

- Emergency Credit Available
- Emergency Credit Selected
- Emergency Credit in Use
- Emergency Credit Exhausted
- Emergency Credit Unavailable

The emergency credit screen can be seen in the following example.



Figure 76 Emergency Credit Status Screen

11.8.1 Emergency credit available

After selection of the status button where emergency credit is available to the user a notification screen is displayed to confirm whether the user wishes to enable emergency credit.

Should the user not wish to activate the feature then the X button should be selected, the P450 IHEM will then return the user to the status screen.

Should the user wish to invoke emergency credit then the check mark should be selected. The emergency credit screen can be seen in the following example.

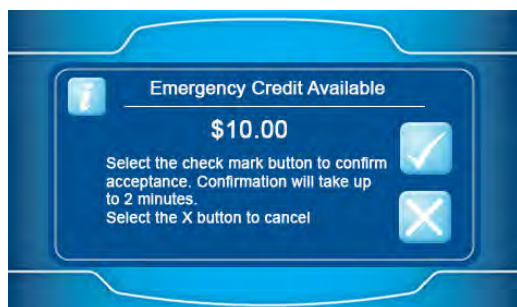


Figure 77 Emergency Credit Available Screen

11.8.2 Emergency credit successfully taken

Where emergency credit has been accepted by the meter, a notification is displayed to the user to show that it has been taken, this is typically displayed after acceptance to invoke emergency credit. The emergency credit taken screen can be seen in the following example.



Figure 78 Emergency Credit Used Screen

11.8.3 Emergency credit selected

Where emergency credit has been taken, but is not yet being used by the meter, the emergency credit status is shown as selected. On selection of the status button the notification screen will detail that emergency credit is already taken.

An example of the selected status and accompanying notification can be seen in the following example.

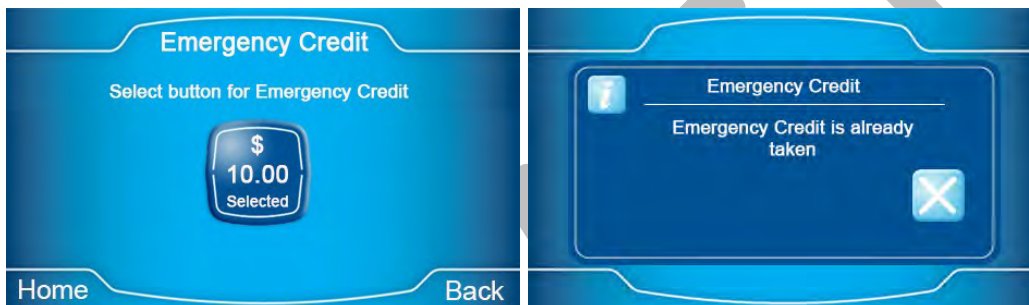


Figure 79 Emergency Credit Selected Status and Notification

11.8.4 Emergency Credit in Use

Once emergency credit starts to be used by the meter, the emergency credit status will be shown as in use. On selection of the status button the notification screen will detail that emergency credit is already taken.

An example of the in-use status and accompanying notification can be seen in the following example.

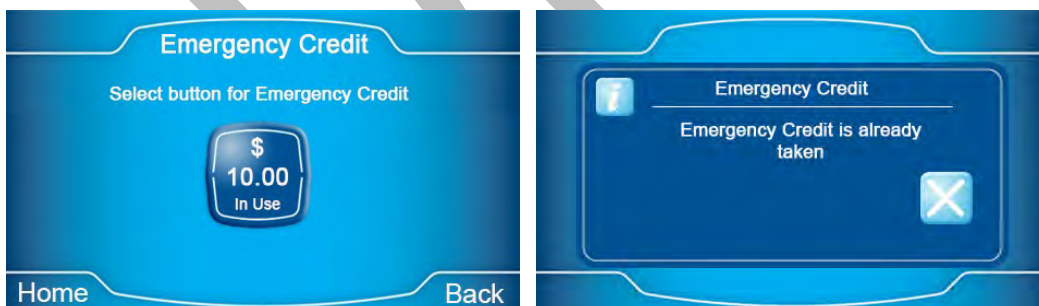


Figure 80 Emergency Credit in Use Status and Notification

11.8.5 Emergency Credit Exhausted

When all emergency credit has been used the emergency credit status will be shown as exhausted. On selection of the status button the notification screen will detail that emergency credit is exhausted.

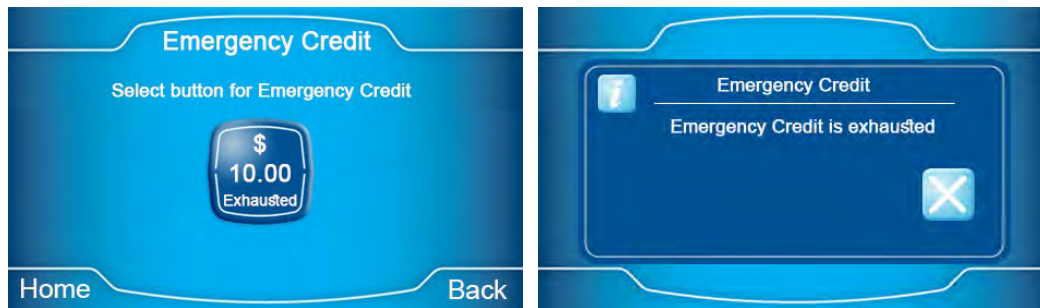


Figure 81 Emergency Credit Exhausted Status and Notification

11.8.6 Emergency Credit Unavailable

Where the meter credit is above the emergency credit available threshold the emergency credit status will be set to unavailable. On selection of the status button the notification screen will detail that emergency credit as unavailable.

An example of the unavailable status and accompanying notification can be seen in the following example.

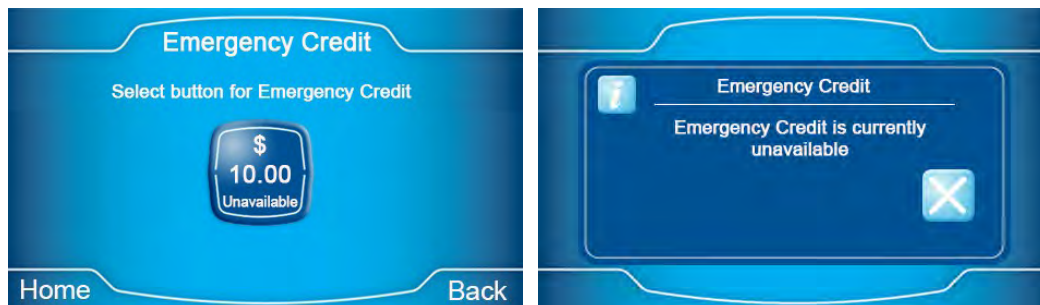


Figure 82 Emergency Credit Unavailable Status and Notification

12 Price Function

12.1 Price function overview

The Price function of the P450 IHEM enables the user to view information associated with their assigned price plan.

The price screen structure is shown in overview below.

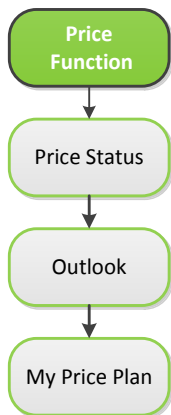


Figure 83 Example of Price Screen Structure

The user may interrogate tariff details; navigating from either the main menu or from the tariff shortcut in the lower left-hand corner of the home screen (when in Credit Mode of operation).

12.2 Price change alert

The approach of an impending price change (boundary) is by means of a blue alert icon associated to the lower left-hand corner of the home screen. Selecting on the icon will direct the user to the Price Status screen.

In the case of a Time of Use price structure the alert notification will be issued 15 minutes before the price change is to occur.

In the case of a Block price structure the alert notification will be issued where only 15kWh are remaining in the current block before the price change is to occur.

12.3 Price status

The first display in the suite of price related screens is the price status or price now and next screen which can be seen in the following example.

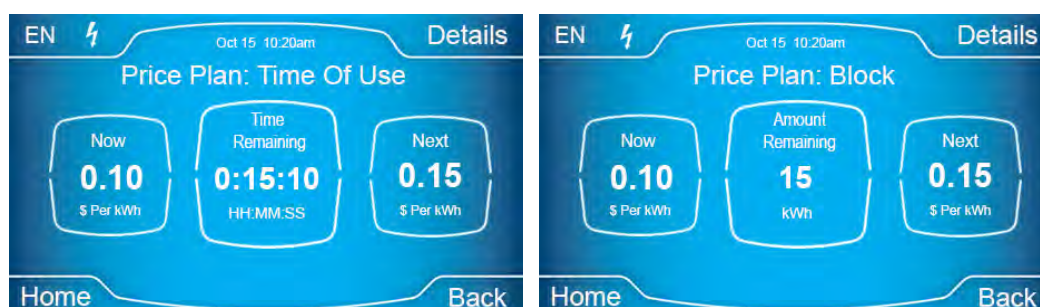


Figure 84 Price Status Screen

The elements that make up this screen are:

1. Details of the currently active rate.
2. Countdown timer to the next rate change
3. Details of the next active rate
4. Navigation to the next tariff screen in the sequence (via the Outlook button)

In this screen, the cost per unit and the frame around the other rate specific information will be expressed in a colour. 'Low' rates will be framed in green and 'high' rates in red.

12.4 Price outlook

The next display in the price sequence is Price Outlook. This is the main viewer of price parameters and details.

The main elements on view are:

1. Usage profile color highlighted depending on rate price.
2. Rate and Price indication
3. Navigation to the next tariff screen in the sequence

The outlook screen can be seen in the following example.

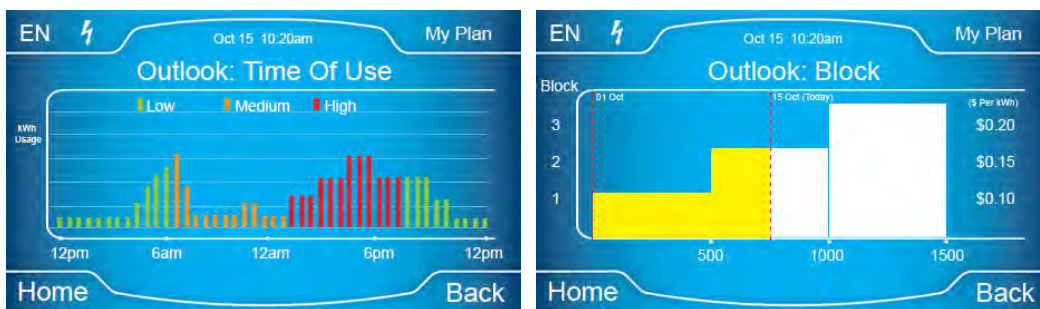


Figure 85 Price Outlook Screen

12.4.1 Usage profile

The usage profile shown in the outlook screen is based on the profiled usage information described in the history section.

Profiled usage is re-shown here and associated to the price information. The combination creates actionable information for the user; i.e. clear examples of peaks in usage (shown in the profile) with amber or red rate periods overlaid to suggest or prompt voluntary peak shifting from customer behavioural change.

12.4.2 Rate indication

The green, amber, red labelling scheme is used to describe individual Time of Use rates within a Price. 'Low' rates are shown in green, 'transition' or 'mid' rates in amber and 'high' tariffs in red; this will use the same logic and identification as the tariff status screen.

In the case of the block price the block and cost per kWh can be seen in the axis of the displayed blocks used.

12.5 My plan

The final screen in the price set of screens is a descriptive view of the price in use and all its components. This screen may also display any standing charge information. My plan screen can be seen in the following example.



Figure 86 My Price Plan Screen

13 Settings Function

13.1 Settings function overview

The Settings function allows the user to manage how the P450 IHEM appears to them, and to view key information associated with the operation of the P450 IHEM.

The settings screen suite is shown in overview below.

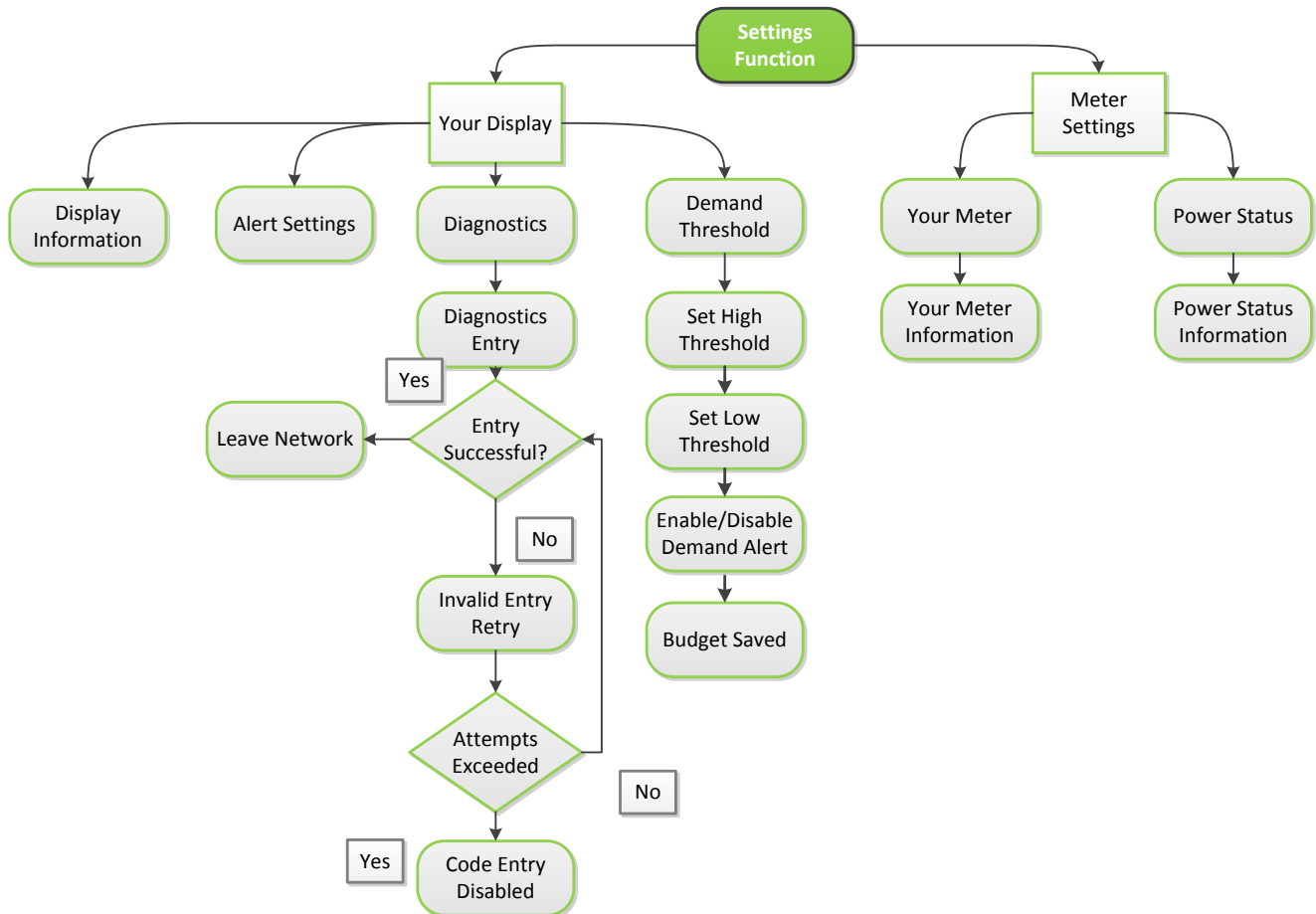


Figure 87 Example of Settings Screen Structure

13.2 Settings menu

Selecting the Settings icon from the Main Menu screen navigates the user to the Settings Menu screen. On accessing the settings menu function the following options are displayed to the user.

- Your Display
- Meter Settings

The settings menu screen can be seen in the following example.

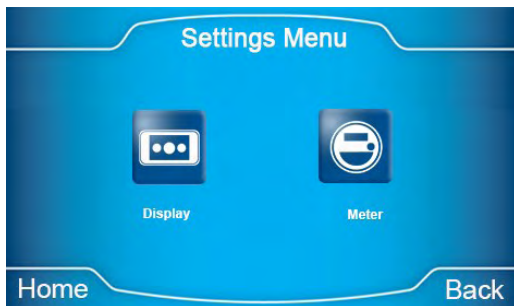


Figure 88 Settings Menu Screen

13.3 Display settings

Selecting the Display key navigates the user to the second level menu with the option to select the following options:

- Display Information
- Alert Settings
- Diagnostics
- Demand Threshold

The Display Settings menu screen can be seen in the following example.



Figure 89 Display Settings Menu Screen

13.3.1 Your display information

Selecting the Your Display Information button prompts the display of P450 IHEM details such as:

- Model Name
- Manufacturer Name
- Serial Number
- Firmware
- Installation Code
- MAC Address

The display information screen can be seen in the following example.



Figure 90 Your Display Information Screen

13.3.2 Alert settings

From the Alert Settings button the user can define how the audio tones are used to alert the user to either:

1. Incoming messages from the utility
2. That a usage target has been reached and exceeded
3. That a notification has been initiated

The user can define whether the alert features are enabled or muted, both of which can be managed separately. The audio alerts screen can be seen in the following example.

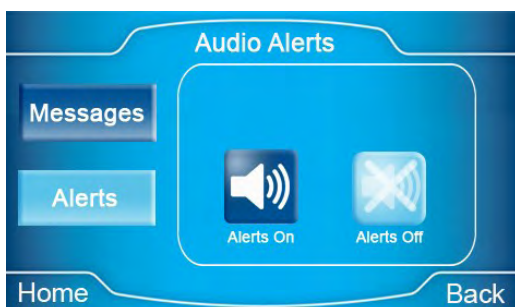


Figure 91 Audio Alerts Screen

13.3.3 Diagnostics

Selecting the Diagnostics button from the Your Display Settings screen will display a key pad for diagnostics entry. The purpose of this suite is to remove the P450 IHEM from the ZigBee network, where it will un-pair the P450 IHEM from the Electricity Meter. This screen is for engineering access only, and is protected by a utility defined 4-digit code. On correct code entry, the user will be directed to the Diagnostics screen.



Figure 92 Diagnostics Code Entry Screen

On successful code entry, a screen is displayed to the user to confirm the action to leave the P450 IHEM from the ZigBee network and therefore stop communication with the Electricity Meter.

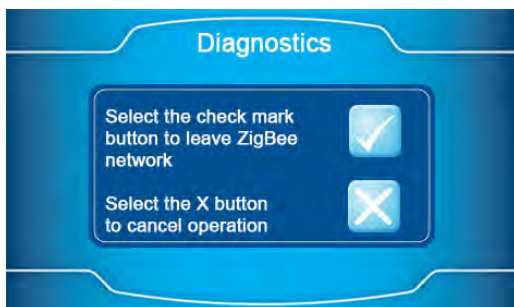


Figure 93 Diagnostics Leave Network Screen

Need to show the leave network sequence -

13.3.3.1 Diagnostics 24-hour lock out

The diagnostics screen supports a code entry mechanism which will stop misuse of the code entry. If the user again attempts to enter 3 invalid codes, then the P450 IHEM will disable access to the code entry screen for 24 hours.

The lock out will be displayed to the meter in a visual message stating: 'Code entry is disabled Try again in X hours X minutes'. This can be seen in the following example.

At the end of the 24-hour period the lock out mechanism is reset.



Figure 94 Code Entry Disabled for 24Hours

13.3.4 Demand threshold

Selecting the Demand Threshold button navigates the user to the second level menu where the user can configure the Demand Threshold and Demand Alert settings for the P450 IHEM operation. The demand threshold settings are used to manage how the demand energy indicator manages instantaneous usage.

The demand alert setting allows the user to enable an audio and visual alert to identify that the instantaneous usage has risen above the high threshold value.

The following section details the configuration and management of both functions.

13.3.5 Demand threshold modify values

On selection of the demand threshold icon the user is directed to the demand threshold modification screen.

The screen displays the current Low and High threshold values, selection of the Modify button will allow the user to amend the set values, selecting the Continue button will bypass these screens and direct the user the Demand Alert screen.

The demand threshold modify screen can be seen in the following example.

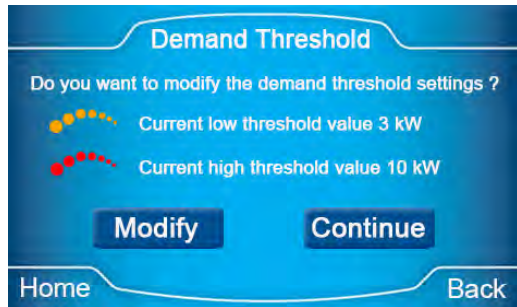


Figure 95 Demand Threshold Modify Screen

13.3.6 Amend low-high threshold values

The user can define the High and Low threshold values; explanation of their operation can be seen in the example below.

- **Below Low Threshold Value = less than 3kW**
 - When the instantaneous usage is below this value the demand energy indicator will be shown in Green.
- **Above Low Threshold Value = greater than 3kW less than 10kW**
 - When the instantaneous usage is above the low threshold value but below the high threshold value the demand energy indicator will be shown in Amber.
- **Above High Threshold Value = greater than 10kW**
 - When the instantaneous usage is above this value the demand energy indicator will be shown in Red.

On selection of the Modify button the user is directed to the Low Threshold screen.

From this screen the user can view the current low threshold setting, and use the Increase and Decrease buttons to amend the setting value.

The button increments are in 0.5kW values.

Once the required value has been defined the continue button should be selected. The low threshold value screen can be seen in the following example.



Figure 96 Low Threshold Modify Screen

From the Continue button the user is directed to the High Threshold screen.

From this screen the user can view the current high threshold setting, and use the Increase and Decrease buttons to amend the setting value.

The button increments are in 0.5kW values. Once the required value has been defined the continue button should be selected. The high threshold value screen can be seen in the following example.



Figure 97 High Threshold Modify Screen

13.3.7 Demand alert management

The Demand Alert function allows the management of an audible and visual alert that notifies the user when their instantaneous demand has exceeded the high threshold level.

By default, the function is disabled, so on first access to the screen the user will be asked whether they wish to enable the function or not.

Selecting the Continue button will keep the setting in its current state and direct the user to the Settings Saved notification.

If the user wishes to utilise the demand alert functionality, then the Enable button should be selected. In a case where the functionality is in use, and the user wants to disable the operation then the Disable button should be selected.

Examples of both demand alert options can be seen in the following images.



Figure 98 Demand Alert Management Screens

Following the selection of the Enable/Disable or Continue buttons the user is directed to a Settings Saved notification screen. On selection of the X button the P450 IHEM will direct the user back the Settings Menu. The settings saved notification screen can be seen in the following example.

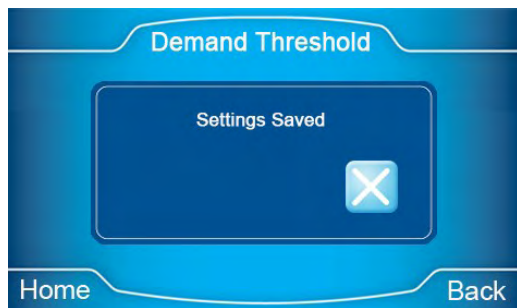


Figure 99 Demand Alert Management Settings Saved Screen

13.4 Meter settings

Selecting the Meter Settings key navigates the user to the second level menu with the option to select the following options:

- Your Meter Information
- Power Status

13.4.1.1 You meter information

Selecting the Your Meter Information button prompts the display of the Electricity Meter details for the paired energy meter and includes:

- Model Name
- Manufacturer Name
- Serial Number
- Firmware
- Installation Code
- MAC Address

The your meter information screen can be seen in the following example.



Figure 100 Your Meter Information Screen

13.4.1.2 Supply Status

Supply Status is a screen that shows the status of the contactor disconnect in the electricity meter.

This allows the user to differentiate between a power outage (power cut) and a more specific power disconnection to that specific property (i.e. running out of credit). The supply status screen can be seen in the following example.

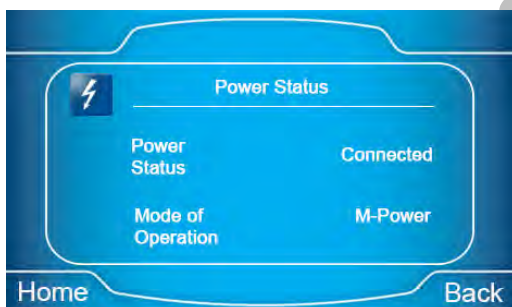


Figure 101 Power Status Screen

14 Help Function

14.1 Help function overview

The Help function allows the user to view utility contact information, and provides a reference point for the user should they need to contact the utility.

The help screen suite is shown in overview below.

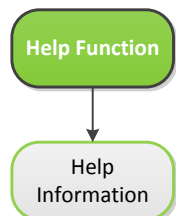


Figure 102 Example of Help Screen Structure

14.1.1 Supplier Contact

Selecting the Help icon from the Main Menu screen navigates the user to the Help screen. On accessing the help screen the user is displayed with the utilities contact details. The help screen can be seen in the following example.



Figure 103 Help Screen

15 Generation Function

Needs SRP wording

15.1 Generation function overview

The Generation screen is shown only in a Credit configuration and if the customer is set up with Energy Generation capabilities. The screen will show the user the amount of Energy that has been sent back to the utility over the current day in kWh

The generation screen suite is shown in overview below.

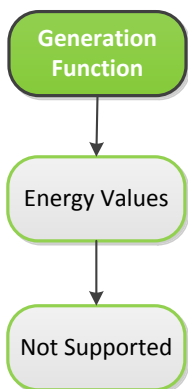


Figure 104 Example of Generation Screen Structure

15.1.1 Generation to Grid

Selecting the Generation icon from the Main Menu screen navigates the user to the generation screen. On accessing the generation screen the user is displayed with the amount of energy that has been sent back to the utility displayed in kWh. The generation screen can be seen in the following example.



Figure 105 Generation to Grid Screen

15.1.2 Generation not Supported

If the user is not set up to operate as a generation customer, then on access of the generation icon from the main menu the user is displayed a notification to inform them of the status. The generation not supported screen can be seen in the following example.

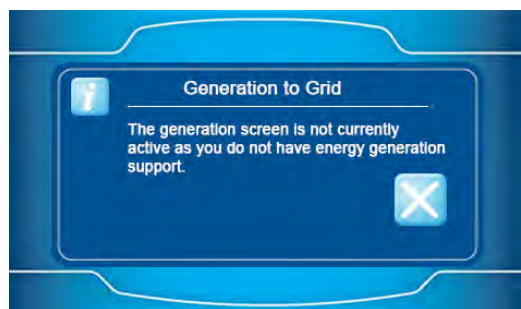


Figure 106 Generation not Supported Screen

16 Alerts and Notifications

16.1 Alerts and notifications overview

The P450 IHEM supports a number of general notifications that are displayed via splash screen. It also supports Home Screen Notifications which are identified by a Red or Blue icon in the home screen. Notifications are also used in disconnect and reconnect operation. The following section details the supported alerts and notifications.

16.2 General alerts and notifications

A number of general alerts are supported regardless of operating mode, and include the following;

- Error
- Communication error
- Low battery
- New message
- Power up
- Supply status

16.2.1 Error

Should a fatal error occur at any time a simple splash screen expressing an error condition will be shown.

Fatal errors include (but are not limited too):

1. Failure of the operating system to boot
2. Failure of the P450 IHEM to find a legitimate ZigBee SEP network
3. Failure of the P450 IHEM to find the time on a legitimate ZigBee SEP network

The error screen can be seen in the following example.



Figure 107 Error Notification Screen

16.2.2 Communication error

If the P450 IHEM cannot establish communication with the Electricity Meter during the Bind/Pairing process or in general operation where communication has become lost, then the P450 IHEM will show a communication Error message. The message will request that the P450 IHEM is moved to a new location and will also display a connect button. On selection of the connect button the P450 IHEM will attempt to re-establish communication with the Electricity Meter.

The communication error screen can be seen in the following example.



Figure 108 Communication Error Notification Screen

On selection of the Connect button the P450 IHEM will then go into a search process to re-establish communication with the Electricity Meter. During this time the P450 IHEM will show a searching screen with a supporting message that it may take up to 3 minutes to complete the connection process.

An example of the attempting to establish communication screen can be seen in the following image.



Figure 109 Searching Meter Screen

Once communication has been re-established the P450 IHEM will return to the Home Screen. If communication cannot be established then the P450 IHEM will return to the Communication Error screen where the user will be advised to try another location, and to select the connect button.

This process can be repeated up to five times, after the fifth attempt the P450 IHEM will display a message stating that no response has been received from the meter, and that the customer should contact the utility.

The screen also contains a connect button to attempt further retries, and an Admin button which on selection would direct the user to the unbind screen. This should only be accessed by service engineers or customer service persons to perform an unpairing of the meter and P450 IHEM as part of further detailed process management.

An example of the No response received screen can be seen in the following image.



Figure 110 Cannot Establish Communication Screen

Selecting the Admin button will direct the user to the code entry screen where the user will be asked to enter a 4-digit code to unbind the P450 IHEM from the meter. The operation of the Code entry screen is detailed in section 13.3.3.

16.2.3 Low battery notification

The Low Battery notification will be shown when the P450 IHEM is operating on battery power and the remaining battery power level falls below 10% of its remaining life. If this notification is seen, then the user should fit new batteries to the P450 IHEM.

The low battery screen can be seen in the following example.

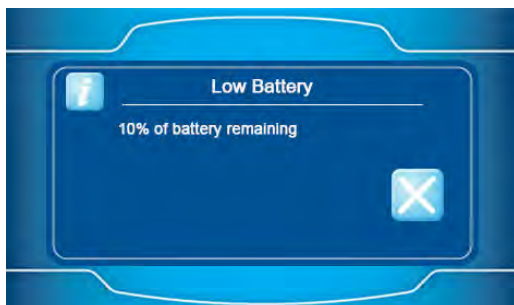


Figure 111 Low Battery Notification Screen

16.2.4 Power up notification

When the P450 IHEM is powered up; as part of the power up process a notification screen will be displayed showing the Utility Supplier details. The screen will only be displayed for a few seconds before the power up sequence is completed.

The power up screen can be seen in the following example.



Figure 112 Power up Notification Screen

16.2.5 Supply status

The supply status indicator acts a visual representation to the user of the supply connection status to the customer property. The possible status settings for the icon are detailed below.

- Solid Icon – Denotes that the meter contactor is closed, and that supply is connected
- Un-lit Icon – Denotes that the supply has been disconnected and the meter contactor is open.
- Solid Icon – Denotes that the supply is armed or ready to be reconnected and requires the user to reconnect power
- ~~Solid Icon with Solid Square~~ – Denotes that Emergency Credit is in use

The supply status screen can be seen in the following example.



Figure 113 Supply Status Icon

16.2.6 New message alert

Should a new customer message be received by the P450 IHEM, then a message notification icon will be displayed in the bottom of the P450 IHEM screen. Once the new message(s) have been read the icon will no longer be displayed.

The new message alert screen can be seen in the following example.

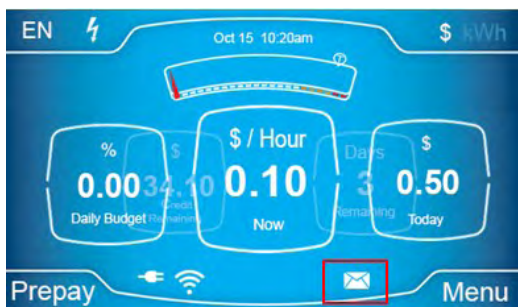


Figure 114 New Message Alert Icon Screen

16.2.7 Lost communication icon

Should the P450 IHEM lose communication with the electricity meter, then the Communication icon will display its operation in the following manner.

- Approx. 25 seconds after losing communication with the meter 1 indicator will disappear
- A further 15 seconds after losing communication with the meter a second indicator will disappear
- A further 15 seconds after losing communication with the meter a third indicator will disappear
- A further 25 seconds after losing communication with the meter the communication icon will be greyed out and will show a red line through the communication icon

An example of the lost communication icon can be seen in the following example.

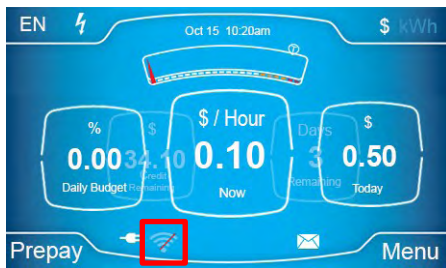


Figure 115 Lost Communication Icon

16.3 Home screen alerts

The Home Screen Alert function is used to provide a visual identifier to the user that an action that requires their attention is about to or has occurred.

16.3.1 Red alert icon

Where the P450 IHEM has an action or alert that the user needs to be made aware of an alert icon will be displayed on the home screen.

Selecting the Alert Icon will display a splash screen detailing the alert content.

Red alert notifications can be seen for the following issues:

- Low credit status
- Power disconnected
- Connection refused
- Demand alert
- Successful credit applied
- Disconnected purchase power
- Emergency credit available

The red alert notification screen can be seen in the following example.

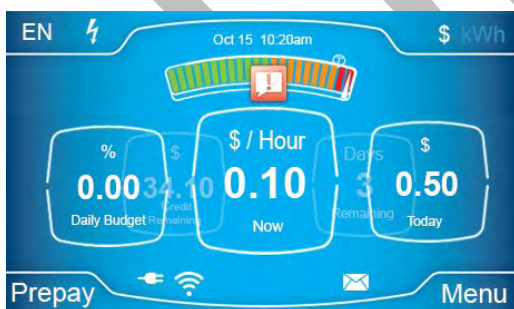


Figure 116 Red Alert Notification Screen

16.3.2 Low credit status

When the remaining credit falls below the configured Low Credit Alert value a red warning icon is displayed on the P450 IHEM home screen to identify to the user that meter status. The icon remains displayed until it is selected by the user.

Once selected by the user a splash screen will be displayed denoting the reason for the alarm and the status. On selecting the close button, the splash window is closed, and alert icon is removed and the home screen.

The icon will only return once the meter has gone above and subsequently below the low credit threshold level.

The low credit notification screen can be seen in the following example.

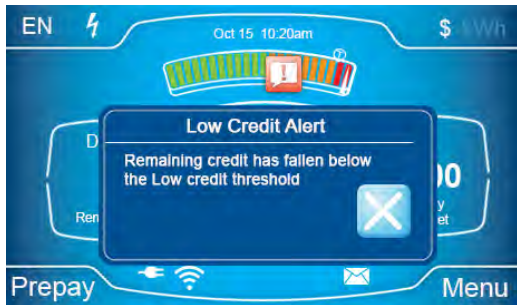


Figure 117 Low Credit Notification Screen

16.3.2.1 Power disconnected

Where the meter has been disconnected from power for something other than running out of credit then the P450 IHEM will display a notification of the power status and to contact the utility.

The power disconnected notification screen can be seen in the following example.



Figure 118 Power Disconnected Notification Screen

16.3.3 Connection refused

If line side voltage or utility driven disconnect is detected at the meter, then the user will see a message on the P450 IHEM display informing them that the required action cannot be completed at this time and to contact customer service.

If the power is disconnected and the message 'Connection Refused contact utility' has been acknowledged and closed by the user, the red alert icon will remain displayed on the home screen until the issue has been resolved.

Selecting the red alert icon will display the 'Connection Refused contact utility' once more.

The connection refused notification screen can be seen in the following example.

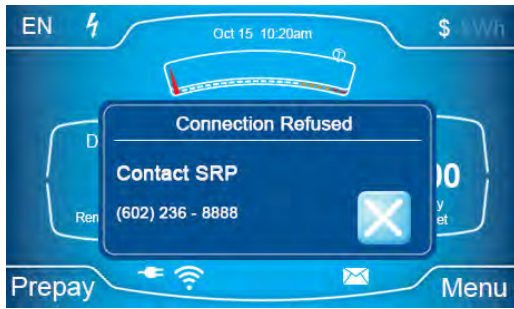


Figure 119 Connection Refused Notification Screen

16.3.4 Demand alert

When the P450 IHEM is in Credit operation it is possible for a Demand Threshold Alert to be set. The alert is activated when the user starts to consume energy from the utility grid and the consumption exceeds the configured alert threshold.

Selecting the icon displays a splash screen detailing that the threshold value has been exceeded and details the currently active threshold setting (low, medium, or high usage).

The icon will remain displayed until the user selects the icon, or the consumption falls below the threshold value.

On selecting the close button, the splash window is closed, and alert icon is removed and the home screen.

The icon will return the next time that the user consumption exceeds the configured alert threshold.

The demand alert notification screen can be seen in the following example.

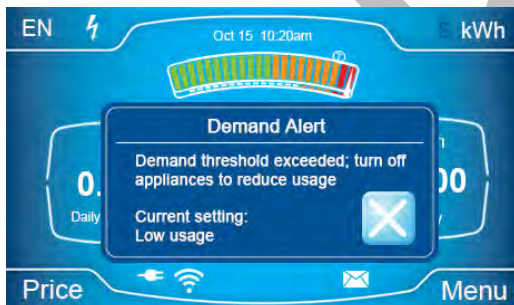


Figure 120 Demand Alert Notification Screen

16.3.5 Successful credit applied

When the P450 IHEM receives a payment via a remote operation, and the user has selected to allow the supply control switch to close at point of sale, then the Credit Loaded screen will be displayed on the home screen once the payment information has arrived at the P450 IHEM.

The user should select the close button to remove the Credit Loaded splash screen.

The successful credit notification screen can be seen in the following example.

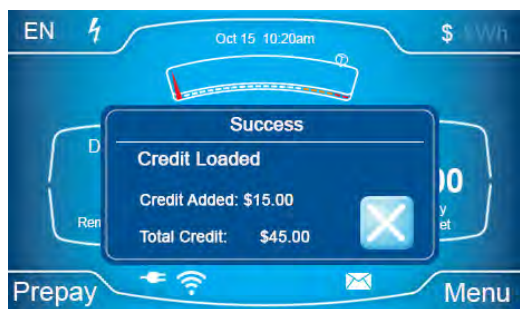


Figure 121 Successful Credit Applied Notification Screen

16.3.6 Disconnected purchase power

Where the meter has run out of credit and the power has been disconnected and the user powers up the P450 IHEM under battery operation, the display will inform the user that they need to purchase power for reconnection. The screen will be displayed until power has been purchased and attempted to be applied to the meter.

The disconnected notification screen can be seen in the following example.

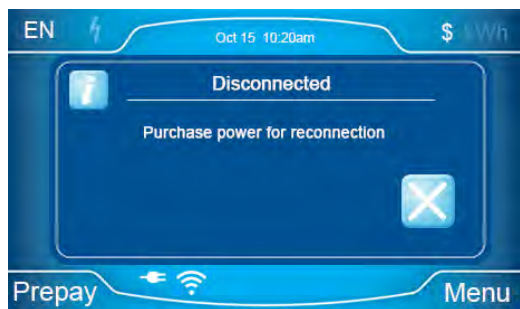


Figure 122 Disconnected Purchase Power Notification Screen

16.3.7 Emergency credit available

The Emergency Credit Available notification when displayed will allow the user to take the available Emergency Credit amount.

The Tick and Cross box allow the user to either implement the action or cancel the request

P450 IHEM will revert to emergency credit on completion of action.

The emergency credit available notification screen can be seen in the following example.

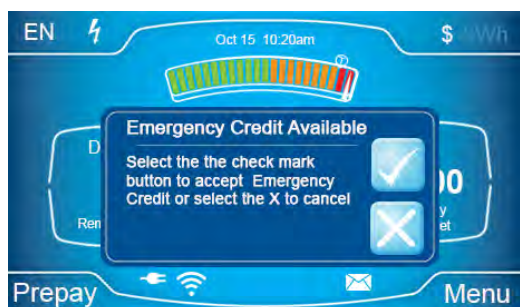


Figure 123 Emergency Credit Available Notification Screen

16.3.8 Blue alert icon

Where a Price/Rate change is imminent the P450 IHEM will display a Blue Information, icon will be displayed in the bottom left hand corner of the display.

This icon is displayed where TOU time remaining is less than 10 minutes, or if the BLOCK usage has less than 15 unit remaining.

Selecting the icon displays a splash screen detailing that a price change is imminent. Directs the user to the Price screen where the current price/kWh time remaining at current price, and next price/kWh amount is displayed.

If the user does not select the icon, then it will be removed once the new price becomes operational.

On selecting the close button, the splash window is closed, and alert icon is removed and the home screen.

The icon will return when the next price change is due to occur.

The blue alert notification screen can be seen in the following example.

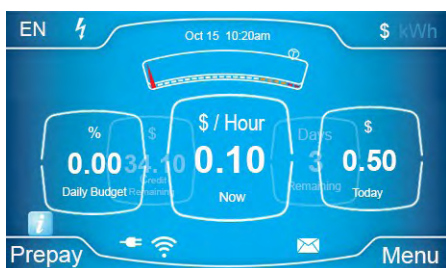


Figure 124 Blue Alert Icon Notification Screen

16.4 Contactor status alerts

The P450 IHEM supports two contactor status alerts that allow the user to manage reconnection of the meter via the P450 IHEM display. These are defined as:

- Credit loaded select connect button for power
- Power disconnected select connect button for power

16.4.1 Credit loaded select connect button

Where the customer has requested that they reconnect power on receipt of payment, and the contactor is in an open state on the meter.

This message would appear under battery power.

Once the connect button has been selected the user will see a payment processed message along with a reconnection message.

The credit loaded connect screen can be seen in the following example.



Figure 125 Credit Loaded Connect Notification Screen

16.4.2 Power disconnected select connect button

Status to inform the customer to reconnect the power after a utility initiated disconnect has been performed. **GOT TO HERE ISH**

The power disconnected select connect screen can be seen in the following example.

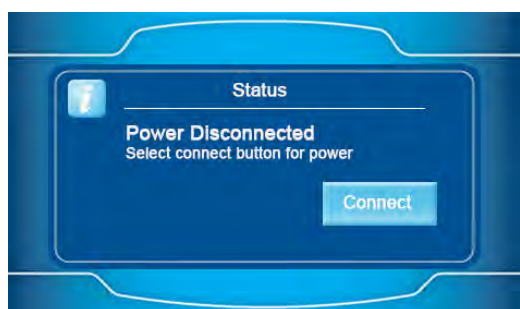


Figure 126 Power Disconnected Select Connect Notification Screen

17 Disposal Management

DRAFT

18 Data sheet