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# ENCORE 300 SERIES

## INSTALLATION AND OPERATING INSTRUCTIONS

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A307G09

### **IMPORTANT SAFETY INFORMATION**

This product is to be used to measure electrical quantities only when mounted in instrument panels, and is to be installed only by trained electricians and technicians.

Before energising the meter ensure that no stray strands of wire are present outside the connector blocks. As the Encore case is made from aluminium each meter must be connected to a good earth, using the stud provided.

Each Encore must be protected by fuses or voltage isolating links in each voltage circuit (see Section B). There are no user-serviceable or installer-serviceable parts inside. Removing the cover with power applied exposes potentially hazardous voltages.

Under no circumstances should the CT connections to the meter be disconnected while current is flowing in the primary circuit of the external CT. The CT connector is provided with retaining screws to reduce the possibility of accidental disconnection.

Encore meters contain a lithium battery that must be disposed of in a suitable manner at the end of the meter's life.

#### **CE MARKING DECLARATION OF CONFORMITY**

Encore meets standard BS EN 610336:1997, and therefore conforms to EU Directive 89/336/EEC 'EMC Directive' as amended by 92/31/EEC and 93/68/EEC.

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### **SECTION A: INSTALLATION**

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1. The meter fits into a DIN 96 square cut out (92 mm x 92 mm).
2. Remove the thumbscrews, then slide out the securing brackets from the rear panel.
3. Place the meter through the panel cut-out, then slide the securing brackets back into the slots on each side of the meter.
4. Tighten the thumbscrews so that the securing brackets bear on the rear of the panel into which the meter has been placed.
5. The current and voltage connectors are designed for cables up to 2.5 mm<sup>2</sup>, but can accept cables up to 4 mm<sup>2</sup> so long as the overall diameter is no greater than 5.0 mm. The pulsed output connector can accept cables up to 1.5 mm<sup>2</sup>.

**Excessive force can damage the meter. The thumbscrews only need to be 'finger-tight' to hold the meter in place.**

#### **Notes:**

1. For a 4-wire installation (Fig 2) the neutral must be connected, otherwise the meter will not function.
2. For a 3-wire installation (Figs 1 & 3) a single-phase unity power factor load will be reported as having power factor 0.866.
3. It is acceptable to common the 'S2' leads from the CT secondary terminals and connect them to earth.
4. The meter will automatically detect several types of connection fault (see Section C).

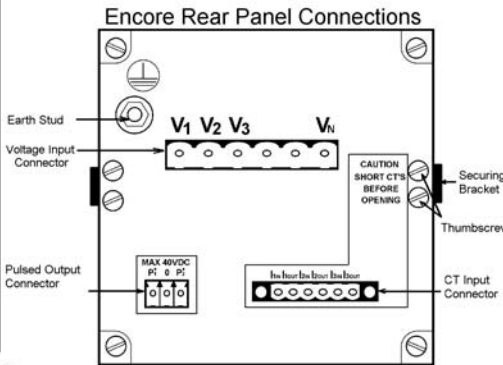
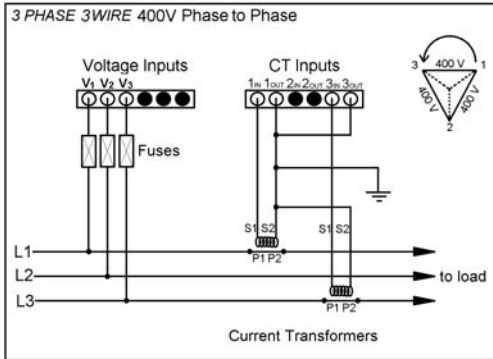
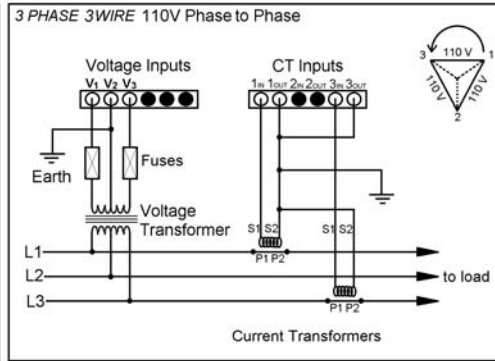
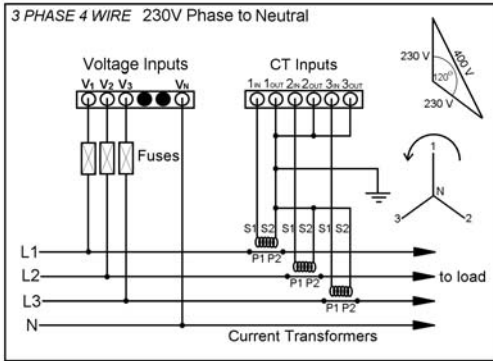
## SECTION B: REAR PANEL CONNECTIONS AND WIRING CONFIGURATIONS

The ENCORE Part Number indicates the wiring configuration and the voltage.

Check that the ENCORE voltage inputs match the installation before connections are made.

Part Number: EN3 nn 0[x]n

1	= 110V P-P 3P, 3W CT/VT connected
2	= 230V P-N 3P, 4W CT connected
3	= 400V P-P 3P, 3W CT connected



Fuses or voltage isolating links should be fitted in the positions shown.

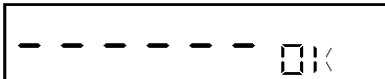
CT shorting links should also be fitted to enable the meter to be moved without having to completely shut-down the supply.

## SECTION C: DIAGNOSTIC CHECKS

Encore meters continuously monitor voltage, current and phase angle for each phase, enabling a number of fault conditions to be detected during normal operation and also when the meter is first installed. Each time power is applied a full range of checks are performed, during which time the LCD panel shows a 'test pattern', giving the opportunity to check that all the segments are functioning.



Test Pattern; all segments illuminated.



Diagnostic Checks OK; no faults found.



Phase missing; any phases below 20% nominal voltage are indicated by 1, 2 and 3 for L1, L2 and L3 respectively. 3-phase 4-wire meters can operate so long as any one or more phases and neutral are present. 3-phase 3-wire meters require L2 and either L1 or L3 to be present.



Phase reversed; indicates any phases with a CT connected with incorrect polarity. Encore models EN302, 303 and 304 (except 60Hz models) compensate for reversed CT connections for energy measurements, however instantaneous power values are incorrectly determined on model EN304 if any CTs are reversed. This test is not performed if the current is below 10% of the rated value.



Phase angle incorrect; this is shown if the angle between any two connected phases is outside  $\pm 10^\circ$  degree limits, or if the phase sequence is reversed.



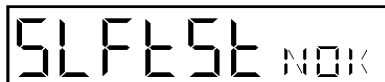
Over Voltage; this is displayed if any of the connected voltages exceeds 130% of the nominal value.



Unbalanced Voltage; this is determined dynamically if any voltage is outside the  $\pm 10\%$  band centred on the mean value of the three phases.

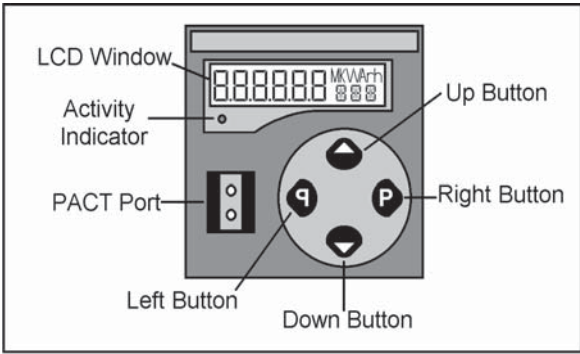


Low Power Factor; this is displayed if the average power factor is less than 0.5.



Self-Test Failure; this display is shown if the meters fails its diagnostic checks. The meter should be returned to the supplier for repair.

## SECTION D: ENCORE FRONT PANEL FEATURES



The LCD window is used to display metering data, configuration settings and diagnostic information.

The Activity Indicator flashes at a rate proportional to the consumed active power (kW import).

The PACT port can be used to access instantaneous electrical parameters using PRI or third party software.

The push buttons are used to select display items, change meter configuration, and to select different operating modes.

### Normal Operation

The parameters that can be displayed by Encore are grouped in 'pages', the content of which varies between different models (see Section F). The *left* and *right* buttons are used to select which page is to be shown. The right button moves to the 'next' page; the left button returns to the 'previous' page. The *up* and *down* buttons are used to scroll through the current page.

### Set-Up Mode

Various configuration items can be changed to match the Encore to a particular installation. The items that can be altered vary according to the model (see Section F). Holding in the *up* and *down* buttons together for five seconds accesses 'Set Up' mode. The LCD counts down from 5 to 0 before 'Set Up' mode is engaged (See Section E).

### Resetting Maximum and Minimum Values

Encore meters continuously monitor the maximum and minimum values observed for various electrical parameters (see Section G). The maximum and minimum values can be reset by holding in the *up* and *right* buttons together for five seconds. The LCD counts down from 5 to 0 before resetting the values.

### Billing Operation for Tariff Rate and Maximum Demands

Encore 305 models include time of use (TOD) rate and maximum demand (MD) functions (see Section E3). A billing operation can be performed on these registers by holding in the left and right buttons together for five seconds. This causes the contents of the rate and MD registers to be copied to their corresponding billing registers; the MD registers are then reset.

**Special Note: Encore meters are not approved by Ofgem for billing purposes, therefore any financial significance attached to metering data derived from an Encore is not enforceable in UK law.**

## SECTION E1: SET UP MODE

All Encore meters are supplied with factory settings that may need to be altered to suit a particular installation. The model and the wiring configuration determine the parameters that can be changed, as shown in the table right:



Configuration Parameter	Encore Model
Primary Current	All models.
Primary Voltage	HV models only; 3-Phase 3-Wire 110 V p-p
TOD Configuration; number of rates and times	EN 305 only.
Pulse Parameter	EN 305 only.
Pulse Width	EN 301, 303, 304 and 305.
Pulse Value	EN 301, 303, 304 and 305.
Favourites Page	All models.

The configuration of the meter may be changed by following the sequence below:

1. With power applied to the meter hold in the *up* and *down* buttons together for five seconds. The display indicates that 'Set Up' mode has been selected, then counts down from 5 to 0, as shown in the right hand section of the LCD. The buttons must be released when the count-down reaches zero.
2. Header displays are used to differentiate between the parameters that can be altered. The *right* button is used to move on to the next commissioning item. Note that this process only works in strict sequence; it is only possible to go back and alter a parameter by re-entering set up mode by holding in the *up* and *down* buttons.

The header displays for the various configuration parameters are shown below:

Primary Voltage. (HV models only).	Primary Current.	Number of TOD rate registers. (Model EN305 only).	End time of indicated TOD rate register.
Output pulse parameter. (selectable on EN305 only).	Output pulse width. (EN303, 304 and 305).	Output pulse value. (EN303, 304 and 305).	Favourites Page.

Pressing the *down* button selects the parameter currently being displayed, and resets it to the factory default. The *right* button moves on to the next one in the sequence.

**SPECIAL NOTE: Pressing the down button while any of the above headers is being displayed causes the related parameter to be reset to the factory default value. It is best to use the Configuration Displays in Page 7 (see Section F) to check the set up.**

## SECTION E2: CHANGING PRIMARY CURRENT AND VOLTAGE SETTINGS

Pressing the *down* button while the display is showing the primary current or primary voltage header resets the parameter to its default value (e.g. 5 A primary current for an EN303025). The required value can then be set by pressing the *down* arrow to increase it or the *up* arrow to decrease it. When the required value has been entered press the *right* button to commit it to memory.

**SPECIAL NOTE:** Do not attempt to configure primary current or voltage values on Encore meters that have been 'factory set' to values that cannot be accessed in 'set up mode' (e.g. 225 A, 10 kV).



To change the primary current press the *down* button while this display is showing.

The primary current is then reset to the default value (5 A for an Encore with 5 A CT inputs).



Pressing the *down* button increases the primary current in 5 A steps up to 100 A, then 10 A steps up to 200 A, then 50 A steps up to 2000 A, then 100 A steps up to 9900 A.



Pressing the *up* button decreases the primary current, using the same steps given above.



Pressing the *right* button causes the selected primary scaling value to be committed to memory. This takes around five seconds, due to the complex calculations involved, during which time the Encore flashes the following message on the display:



For VT connected meters a similar process can be used to set the primary voltage to one of the following values: 110 V, 1.1 kV, 2.2 kV, 3.3 kV, 6.6 kV, 11 kV, 13.2 kV, 16.5 kV, 22 kV, 24 kV, 33 kV, 36.3 kV, 66 kV, 110 kV, 132 kV, 145.2 kV, 220 kV. Note that both primary current and primary voltage need to be set for VT connected meters; entering 'set up mode' for voltage resets the current value to default.

Encore automatically moves on to the next commissioning setting (e.g. pulse width) when the value has been stored in memory.

## SECTION E3: CHANGING TOD TIMES (EN305 ONLY)

Model EN305 Encore meters can be configured with up to 8 time-of-use (TOD) zones for energy and maximum demand operation. For each zone three separate energy registers (kWh, kVAh and kVAh) and two separate maximum demand registers (kW and kVA) are automatically set up. When a billing operation is performed the contents of the energy and maximum demand registers are copied into the corresponding 'billing' registers. The billing registers are 'frozen' at their new values until the next billing operation occurs. Energy registers are never reset; they continue to increment within the current billing period from the value attained when billing occurs. Maximum demand registers for the current billing period are reset as part of the billing operation. The time reference in the Encore is set at manufacture to GMT (standard time) with no adjustment for BST (daylight saving time), and is backed up by battery when the meter is not connected to mains voltage. The shelf-life is in excess of two years. There is no drain on the battery when the meter is connected to mains voltage.

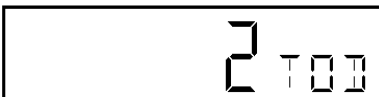
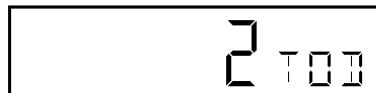
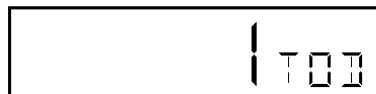


To set up the number of TOD zones and their timings press the *down* button while this display is showing in Set Up mode.

Successive press of the *down* button increase the number of TOD zones, up to a maximum of eight.

(Note: Pressing the *up* button reduces the number of TOD zones).

*This example shows a two-rate 'day and night' tariff being set up, where Rate 1 is active from midnight to 7 am, and Rate 2 from 7 am to midnight.*



When the required number of TOD zones has been selected, press the *right* button to commit the number to memory and move to the next Set Up stage.



To adjust the end times for the selected TOD zones press the *down* button while this display is showing in Set Up mode.

Successive press of the *down* button increment the end time for the indicated TOD zone by fifteen minutes. (The *up* button decrements time). Time zones can therefore only begin and end on the hour, quarter-hour or half-hour. The meter automatically sets the end time of the highest numbered zone to midnight.

When the end time for the second-highest numbered zone has been selected press the *right* button to commit the settings to memory and move on to the next Set Up stage.



## SECTION E4: PULSED OUTPUT PARAMETER SELECTION (EN305 ONLY)

Encore EN305 meters are fitted with two solid-state volt-free pulsed outputs for the purpose of indicating the passage of energy to external devices such as building management systems. Model EN301, 303 and 304 meters have a single pulsed output fixed at manufacture to indicate consumed active energy. Model EN305 meters are configured at manufacture with output 1 set to indicate consumed active energy (import kWh) and output 2 set to indicate apparent energy (kVAh). The pulse width can be set to either 80 or 240 ms (see Section E4). The value of each pulse (units per increment) is determined by the rated power setting of the meter and the multiplier setting (see Section E5).

Output pulse parameters can be selected when the Pulse Channel header is displayed. Output pulses can be set to consumed active energy (import kWh), generated active energy (export kWh), apparent energy (kVAh), lagging reactive energy (import kvarh) or leading reactive energy (export kvarh).



To change the output pulse parameter selection for output 1 press the *down* button while this display is showing.

Press the *right* button to select kWh consumed.



Or press the *down* button then the right button to select kWh generated.



Or press the *down* button again then the right button to select kvarh consumed.



Or press the *down* button again then the right button to select kVAh generated.



Or press the *down* button again then the right button to select kvarh generated.



To change the output pulse parameter selection for output 2 press the *down* button while this display is showing. The selection is made in the same way as for output 1.

## SECTION E4: CHANGING PULSE WIDTH

Encore EN301, 303 and 304 models are fitted with a volt-free pulsed output that emits pulses to indicate consumed energy (kWh). Encore EN305 models have two configurable outputs set by factory default for consumed energy (kWh) and apparent energy (kVAh). The pulse width may be set to either 80 ms or 240 ms by pressing *the down* button when the Pulse Width header is shown on the display:



To change the pulse width press the *down* button while this display is showing.

Press the *right* button to select 80 ms pulse width.



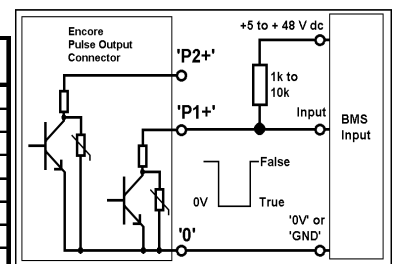
Or press the *down* button then the *right* button to select 240 ms.



## SECTION E5: CHANGING PULSE VALUE

At any given primary scaling of an Encore there are four alternative pulse values. The pulse value determines the 'units per pulse' for each pulse seen across terminals P1+ and 0 (also P2+ and 0 for Encore 305) on the output connector. The table below indicates the choices at various power levels. For Encore 305 the same principle is extended to the pulsed output between P2+ and 0.

Power Range (At primary scaling)	Pulse value with x1 multiplier	Pulse value with x10 Multiplier	Pulse value with x100 multiplier	Pulse value with x1000 multiplier
1 W to 555 W	1 Wh	10 Wh	100 Wh	1 kWh
556 W to 5.55 kW	10 Wh	100 Wh	1.0 kWh	10 kWh
5.56 kW to 55.5 kW	100 Wh	1.0 kWh	10 kWh	100 kWh
55.6 kW to 555 kW	1.0 kWh	10 kWh	100 kWh	1 MWh
556 kW to 5.55 MW	10 kWh	100 kWh	1 MWh	10 MWh
5.56 MW to 55.5 MW	100 kWh	1 MWh	10 MWh	100 MWh
55.6 MW to 555 MW	1.0 MWh	10 MWh	100 MWh	1 GWh
556 MW to 5.55 GW	10 MWh	100 MWh	1 GWh	10 GWh



The power level for a given installation can be determined by multiplying together the primary voltage and current for each circuit. Note that a three-phase meter with only one or two phases connected is treated as if all three phases were connected for these purposes.

Example: 230 V 3-phase 4-wire meter with 200 A CT primary scaling.

Power rating = 230 V x 200 A x 3  
 = 138,000 W  
 = 138 kW

**An external wetting voltage 5 to 48 V dc is required for the pulsed output. Up to 100 mA can be switched. As the output is open-collector type the common '0' connection must be taken to a less positive point than 'P1+' (and 'P2+' for 305).**



To change the pulse value press the *down* button while this display is showing. The options available are determined by the power rating as given in the table above. This example is for a 3p 4w 230 V Encore with 200 A primary current (138 kW power rating).

Press the *right* button to select x1 multiplier



Or press the *down* button then the *right* button to select x10 multiplier



Or press the *down* button again, then the *right* button to select x100 multiplier



Or press the *down* button again, then the *right* button to select x1000 multiplier



## SECTION E6: CONFIGURING THE FAVOURITES PAGE

The metering information provided by Encore meters is grouped together in 'pages' which can be accessed using the four buttons on the front panel (see Section D). A special feature is provided by which the user can program a page of 'favourite' displays that can be readily accessed with the minimum of keystrokes. The Favourites Page is programmed from within 'Set Up' mode and enables up to 40 displays to be 'copied' from the default pages and 'pasted' in the order required. When programmed, Favourites Page appears as 'Page 1' in the sequence available when navigating using the *left* and *right* buttons.

From Set Up mode press the *right* button until the Set Favourites Page header is shown, then press the *down* button. This clears the Favourites Page ready to enter new displays.

Use the *right* and *down* buttons to navigate through the available display items. The display flashes to indicate that the meter is in the correct mode for setting up the Favourites Page.

Use the *left* button to add the current display to the Favourites Page. The display stops flashing to indicate that the item has been added.

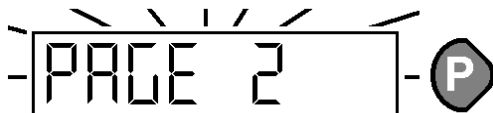
Repeat this process until all the required items have been added, or until the maximum of 40 has been reached. Finally, hold in the *up* and *down* buttons together momentarily to exit 'Set up' mode. Alternatively keep pressing the right button until the header for 'Page 1' is displayed continuously (not flashing).

*Example: Adding the display for Phase L1 to Neutral Voltage*

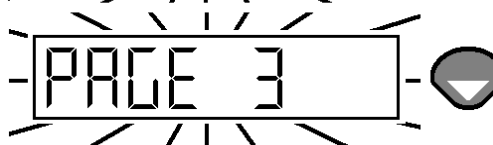


To configure the Favourites Page press the *down* button while this display is showing.

Any existing entries in the Favourites Page are cleared, and then the header for Page 2 is displayed, flashing.



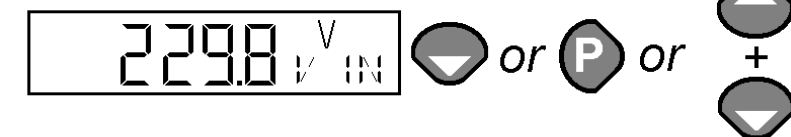
The display for phase L1 to neutral voltage is found in page 3, so the *right* button needs to be pressed to move to the Page 3 header.



Press the *down* button to start scrolling through the available displays in Page 3.



Scrolling through Page 3 with the *down* button brings up the display for phase L1 to neutral voltage, as this is the first item within that page. Press the *left* button to add this to the Favourites Page. The display then stops flashing.



Press the *down* button to move to a different entry in Page 3, or press the *right* button to move to Page 4. When all the required displays have been copied into the Favourites Page, hold in the *up* and *down* buttons momentarily to exit 'Set up' mode.

**Note:** The operation of the buttons is subtly different when setting up the favourites page. The *up* and *down* buttons are used to navigate through the current page in search of the required displays. The *left* button is used only to paste the current display into the favourites page. The *right* button is used to move to the next page. Pressing in the *up* and *down* buttons together (momentarily) exits 'Set up' mode.

## SECTION F: MODEL VARIANTS

There are five Encore variants, with different features, as detailed right.

EN301 is a simple kWh meter with pulsed output. EN302 is an ammeter and voltmeter. EN303 combines energy metering with voltmeter and ammeter functionality. EN304 adds frequency and power factor metering to energy, ammeter and voltmeter functions. EN305 adds time of use tariffs and maximum demands.

EN303 and 304 models automatically compensate for reversed CTs for energy calculations, displaying the result as 'forwarded' energy. EN305 has separate displays for each quadrant. EN301 and 60 Hz models of EN303 and 304 display kWh without 'forwarding'.

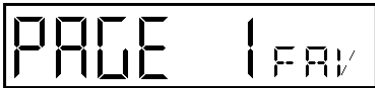
The table indicates which 'display page' each display appears in, as this varies between models.

Feature	EN301	EN302	EN303	EN304	EN305
Favourites Page	Page 1	Page 1	Page 1	Page 1	Page 1
Total kWh Cumulative Import Display	Page 2				Page 2
Total kWh Cumulative Forwarded Display		-	Page 2	Page 2	
Test Pattern	Page 2	Page 2	Page 2	Page 2	Page 2
Encore Date and Time	-	-	-	-	Page 2
Instantaneous kW Display	-	-	-	Page 2	Page 3
Voltage Displays	-	Page 3	Page 3	Page 3	Page 3
Current Displays	-	Page 4	Page 4	Page 4	Page 3
Power Factor Displays	-	-	-	Page 5	Page 3
Frequency Display	-	-	-	Page 5	Page 3
Instantaneous kvar and kVA Displays	-	-	-	-	Page 3
Total kWh export, kvarh and kVAh Displays	-	-	-	-	Page 4
TOD Energy Register Displays	-	-	-	-	Page 5
TOD Maximum Demand Displays	-	--	-	-	Page 6
Max. and Min. Voltage Displays	-	Page 5	Page 5	Page 6	Page 6
Max. Current Displays	-	Page 5	Page 5	Page 6	Page 6
Min. Frequency Display	-	-	-	Page 6	Page 6
Min. Power Factor Displays	-	-	-	Page 6	Page 6
Encore Configuration Displays	Page 3	Page 6	Page 6	Page 7	Page 7
Encore Diagnostic Displays	Page 3	Page 6	Page 6	Page 7	Page 7
Pulsed Output for Active Energy (kWh)	Yes	-	Yes	Yes	Yes
Pulsed Output for Apparent Energy (kVAh)	-	-	-	-	Yes

## SECTION G: DISPLAY FORMATS

Encore meters have a single custom-manufactured LCD information window, programmed to show a range of information relating to the Ipad that is being metered. To simplify access to particular information the displays are grouped in 'pages' accessed using the 'left' and 'right' buttons. The examples given below are for the EN305 model which features all possible displays. Other models have less displays and fewer display pages (see Section F).

### Favourites Page



Header display for the Favourites Page.

The contents of this page are determined by the user when the meter is set up (see Section E6).

### Test Pattern, Total Energies, Time & Date

**Displays are shown for model EN305**  
**Other models have fewer displays, arranged differently across the display pages. See Section F.**



'Lamp Test'  
(all segments illuminated)



Cumulative total register for kWh import (EN301 and 305). EN303 and 304 models compensate for reversed CTs and display the total as 'forwarded' active energy (kWh C F).



Cumulative total register for kWh export, in this case showing 24 kWh. (Only on model EN305).



Cumulative total register for kVAh, in this case showing 19238 kVAh. Measurements of apparent energy and demand are active in all four quadrants. (Only on model EN305).



Cumulative total register for kvarh lag, in this case showing 14196 kvarh. (Only on model EN305).



Cumulative total register for kvarh lead, in this case showing 459 kvarh. (Only on model EN305).



Billing register for kWh import, in this case showing 11726 kWh. The contents of the main energy registers are copied into the billing registers at each billing point. The billing registers remain 'frozen' at the most recently billed value until the next billing point. (Only on model EN305).



Billing register for kWh export, in this case showing 24 kWh. (Only on model EN305).



Billing register for kVAh, in this case showing 19146 kVAh. (Only on model EN305).



Billing register for import kvarh (lagging for active import energy), in this case showing 14117 kvarh. (Only on model EN305).

000409  $\frac{\text{kV Arh}}{\text{h E}}$

Billing register for export kvarh (leading for active import energy), in this case showing 409 kvarh. (Only on model EN305).

16.07.53  $\frac{\text{TIM}}$

Meter time, in 24 hour format. (Only on EN305)

18.05.01  $\frac{\text{DAT}}$

Meter date, in DD.MM.YY format. (Only on EN305)

## Instantaneous Power, Power Factor, Frequency, Voltage and Current

003890  $\frac{\text{kW}}{\text{LOB}}$

Instantaneous active power, here showing 3890 kW import (consuming). A minus sign is used to indicate active export (generating) power.

005480  $\frac{\text{kVA}}{\text{LOB}}$

Instantaneous apparent power, in this case showing 54.80 kVA.

0038.50  $\frac{\text{kVAr}}{\text{LOB}}$

Instantaneous reactive power, here showing 38.50 kvar import (lagging for active consumption). A minus sign is used to indicate reactive export power (leading for active consumption).

0.718  $\frac{\text{PFA}}$

Average instantaneous three-phase power factor. A '-' sign indicates 'leading' power factor. In this example the power factor is 0.718 lagging.

49.967  $\frac{\text{HZ}}$

Instantaneous supply frequency, here showing 49.967 Hz.

235.6  $\frac{\text{V}}{\text{IN}}$

Instantaneous voltage, phase L1 to neutral, here showing 235.6 V.

235.6  $\frac{\text{V}}{\text{2N}}$

**N.B. Phase to neutral voltages are not displayed on 3-phase 3-wire models**

Instantaneous voltage, phase L2 to neutral.

235.6  $\frac{\text{V}}{\text{3N}}$

Instantaneous voltage, phase L3 to neutral.

407.8  $\frac{\text{V}}{\text{12}}$

Instantaneous voltage, phase L1 to phase L2, in this case showing 407.8 V.

407.8  $\frac{\text{V}}{\text{23}}$

Instantaneous voltage, phase L2 to phase L3.

407.8  $\frac{\text{V}}{\text{31}}$

Instantaneous voltage, phase L3 to phase L1.

00740  $\frac{\text{A}}{\text{L-1}}$

Instantaneous line current for phase L1, in this case showing 74.0 A. The line current corresponds to the value that would be indicated by an external ammeter scaled to the same primary value and without reference to the voltage vector.

00770  $\frac{\text{A}}{\text{L-2}}$

Instantaneous line current, phase L2. (For 3-phase 3-wire meters this value is synthesized).

00720  $\frac{\text{A}}{\text{L-3}}$

Instantaneous line current, phase L3.

00280  $\frac{\text{A}}{\text{L-N}}$

Instantaneous line current, neutral. This value is displayed only on 3-phase 4-wire models and is synthesised from the values observed on phases L1, L2 and L3.

## Time of Use (TOD) Registers - (Model EN305 Only)

012143  $\frac{\text{kWh}}{\text{CR1}}$

TOD register '1' for import kWh, in this case showing 12143 kWh. Up to eight TOD registers can be defined, identified as '1' through to '8'. The TOD energy registers are never reset. At the end of each billing period the values in these registers are copied into the corresponding billing registers.



000290 KW h  
CR 1

TOD register '1' for kWh export, in this case showing 290 kWh. Note that it is only possible to distinguish between the kWh import and kWh registers by the sequence of the displays within this page.

02 1049 KVA h  
CR 1

TOD register '1' for kVAh, in this case showing 21049 kVAh.

**Note: Registers for the current active TOD rate are displayed flashing.**

0 10964 KW h  
BR 1

Billing TOD register '1' for import kWh, in this case showing 10964 kWh. The billing registers reflect the contents of their respective TOD registers at the time of the last billing operation.

000028 KW h  
BR 1

Billing TOD register '1' for export kWh, in this case showing 28 kWh. Note that it is only possible to distinguish between the kWh import and kWh registers by the sequence of the displays within this page.

0 18277 KVA h  
BR 1

Billing TOD register '1' for kVAh, in this case showing 18277 kVAh.

### Maximum Demand, Billing Demand and Rising Demand - (Model EN305 Only)

0 170.62 KW  
CMU

Current universal maximum demand register for kW import. This register operates continuously, 24 hours a day, and is independent of any TOD rate registers that may be operating.

0339.50 KVA  
CMU

Universal maximum demand register for kVA. This register operates continuously, 24 hours a day, and is independent of any TOD rate registers that may be operating.

*Note: At each billing point the contents of all the 'Current MD' registers are copied into their corresponding 'Billing MD' registers. The 'Current MD' registers are then reset.*

0252.75 KW  
BMU

Billing universal maximum demand register for kW import. This contains the maximum value for kW import observed at any time (irrespective of TOD operation) during the previous billing period, if a billing operation has been performed.

039 1.37 KVA  
BMU

Billing universal maximum demand register for kVA. This contains the maximum value for kVA observed at any time (irrespective of TOD operation) during the previous billing period, if a billing operation has been performed.

0028.20 KW  
ROB

Rising demand registers for kW and kVA. These values are reset at the start of each half-hour demand integration period (DIP). At the end of each DIP the rising demand values are used to determine if new maximum values have been reached. The main display shows the rising demand values, in this case 28.20 kW and 36.60 kVA. The smaller display shows the number of minutes elapsed during the current DIP, in this case 8. It is therefore possible for the user to perform a simple calculation to determine the demand at the end of the current DIP, so long as the load is constant.

0036.60 KVA  
ROB

0 170.62 KW  
CM 1

Current 'Rate 1' 1TOD maximum demand register for kW import. The MD registers operate in parallel with the TOD rate registers for energy, so Rate 1 MD is active when Rate 1 TOD energy register is active, and so on. Up to eight TOD registers can be defined, numbered from '1' to '8'.

0339.50 KVA  
CM 1

Current 'Rate 1' 1TOD maximum demand register for kVA. Each TOD energy rate register has a pair of maximum demand registers operating in parallel; one for kW import and one for kVA.

0252.75 KW  
BM 1

Billing 'Rate 1' 1TOD maximum demand register for kW import. This contains the maximum value for kW import observed when Rate 1 was active during the previous billing period. Up to 8 such TOD registers can be defined, numbered from '1' to '8'.

039 1.37 KVA  
BM 1

Billing 'Rate 1' 1TOD maximum demand register for kVA. This contains the maximum value for kVA observed when Rate 1 was active during the previous billing period. Up to 8 such TOD registers can be defined, numbered from '1' to '8'.

### Maximum and Minimum Values

250.8 V  
MX 1

Maximum voltage recorded on phase L1 since last reset, in this case 250.8.  
(For 3-phase 3-wire meters the voltage for phase L1 to L2 is displayed).

249.7 V  
MX 2

Maximum voltage recorded on phase L2 since last reset, in this case 249.7 V.  
(For 3-phase 3-wire meters the voltage for phase L2 to L3 is displayed).

248.3 V  
MX 3

Maximum voltage recorded on phase L3 since last reset, in this case 248.3 V.  
(For 3-phase 3-wire meters the voltage for phase L3 to L1 is displayed).

220.2 V  
MN1

Minimum voltage recorded on phase L1 since last reset, in this case 220.2 V.  
(For 3-phase 3-wire meters the voltage for phase L1 to L2 is displayed).

222.3 V  
MN2

Minimum voltage recorded on phase L2 since last reset, in this case 222.3 V.  
(For 3-phase 3-wire meters the voltage for phase L2 to L3 is displayed).

223.6 V  
MN3

Minimum voltage recorded on phase L3 since last reset, in this case 223.6 V.  
(For 3-phase 3-wire meters the voltage for phase L3 to L1 is displayed).

1071.5 A  
MX1

Maximum current recorded on phase L1 since last reset, in this case 1071.5 A.

1049.7 A  
MX2

Maximum current recorded on phase L2 since last reset, in this case 1049.7 A.  
(For 3-phase 3-wire meters this value is synthesized).

1065.3 A  
MX3

Maximum current recorded on phase L3 since last reset, in this case 1065.3 A.

0000.1 A  
MXZ

Maximum zero-sequence current recorded since the last reset, in this case 0.1 A.

-0.986 CAP

Lowest capacitive (leading) power factor recorded since the last reset, in this case 0.986.

0.519 IND

Lowest inductive (lagging) power factor recorded since the last reset, in this case 0.519.

49.757 MNF

Minimum supply frequency recorded since the last reset, in this case 49.757 Hz.

## Diagnostic Displays and Configuration Items

0497.10 kW  
MX

Maximum active import power recorded since the last reset, in this case 497.10 kW.

0733.70 kVA  
MX

Maximum apparent power recorded since the last reset, in this case 733.70 kVA.

0539.50 kVar  
MX

Maximum reactive (lagging) power recorded since the last reset, in this case 539.50 kvar.

----- OK

Diagnostic status.  
(See section C).

5 A  
CTS

CT secondary setting (fixed).  
(See section E2).

000800 MCN

Meter constant, showing the impulse value of the LED, in this case 800 flashes per kWh.

07.00.00 T--1

End times for rate registers.  
(EN305 only).

BASE OPT

Option display, showing that no hardware modules are fitted.

PULSE 1 W h  
IMP

Parameter setting for output 1. EN301 and EN305 use active consumed (Wh Imp) energy. EN303 and 304 use 'forwarded' (Wh FWD) energy. (EN305 also shows setting for Pulse output 2).

011000 V  
PTP

VT primary setting.  
(HV models only).

PULSE 1 W h  
FWD

110 V  
PTS

VT secondary setting (fixed).  
(HV models only).

0080 MSEC

Pulse output width.  
(See section E4).

000100 A  
CTP

CT primary setting.  
(See section E2).

0001 K  
VAL

Pulse output value.  
(See section E5).