

EMU-2TM

Energy Monitoring Unit



User Manual

Version 1.04
Dec 2012

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EMU-2™ – Energy Monitoring Unit

RFA-Z105-2
Version 1.04

User Manual

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Regulatory information

FCC Notices

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

FCC/IC RF Exposure Statement

This equipment complies with FCC and Industry Canada radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this equipment must be installed to provide a separation distance of at least 8 inches (20cm) from all persons.

ICES-003 Compliance

This Class B digital apparatus complies with Canadian ICES-003.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Compliance Regulations For Australia and New Zealand

This equipment complies with the C-Tick labeling requirements for Australia and in New Zealand. As a radio transmitter, this device complies with the requirements of AS/NZS 4268:2008 as designated in the Radiocommunications (Short Range Devices) Standard 2004 for Australia and as required by the Radiocommunications Regulations (General Users Radio License for Short Range Devices) Notice 2011 for New Zealand. This device is a Category A device as defined in the Radiocommunications (Compliance Labeling - Electromagnetic Radiation) Notice 2003.

Quick Setup

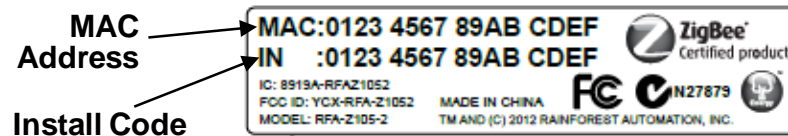
Step 1: Check Contents of the box

The box should contain the following items:

- a) 1 x **EMU-2™** Display unit
- b) 2 x AAA Batteries
- c) 1 x AC Power Adapter

Step 2: Register your EMU-2™

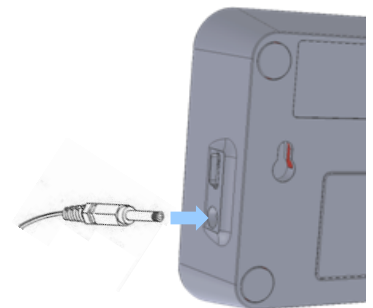
Your **EMU-2™** must be registered with your utility to connect to the smart meter. It may come to you preregistered. If so, you can skip to the next step. If not, you will need to contact your utility to register your device. You will need the following information, which is found on the Information Label on the back of your **EMU-2™**:



Note that it may take some time for your utility to enable the smart meter to connect with your device. You must wait until this process is complete before proceeding; your **EMU-2™** will not function correctly until the smart meter is enabled.

Step 3: Power up your EMU-2™

- a. Plug the AC Adapter into a convenient power outlet.
- b. Plug the AC Adapter cord into your **EMU-2™**.
- c. Optionally, you can install the batteries by:
 - 1) Pushing down on the catch and removing the battery door at the back of the unit
 - 2) Inserting 2 AAA batteries exactly as shown on inside of the battery compartment. Note that putting a battery in backwards can be hazardous, and may cause extensive damage to your **EMU-2™**. Always use alkaline batteries; never mix battery types. Replace all batteries at the same time.



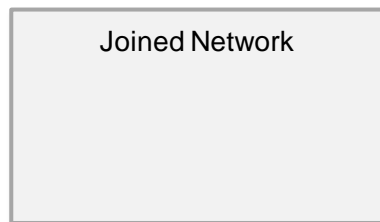
- 3) Replace the battery cover by inserting the bottom tabs first, then snapping the catch closed.

Step 4: Wait for your EMU-2™ to join the smart meter

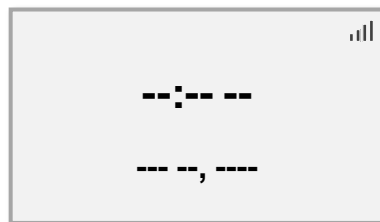
Your **EMU-2™** will attempt to connect to the smart meter. You will see these two screens:



You may see these two screens a few times. This could take 1-2 minutes. When your **EMU-2™** finds the smart meter and successfully communicates with it, you will see this screen:



A short time later, the *Current Time* screen will appear, with dashes instead of digits:



As soon as the dashes are replaced with the current time and date, it means that your **EMU-2™** has successfully read the meter, and is ready for use.

Step 5: Configure your EMU-2™

- a. Press both of the buttons on your **EMU-2™** simultaneously and release.



- b. Press the Bottom Button.



- c. Select the language you would like your **EMU-2™** to use.



- d. If your meter does not provide pricing (ask your utility), you will need to set your energy price.



The digit to be modified will be flashing, starting on the right, and working left. After you have entered all 5 digits of the energy price, you will see this screen:

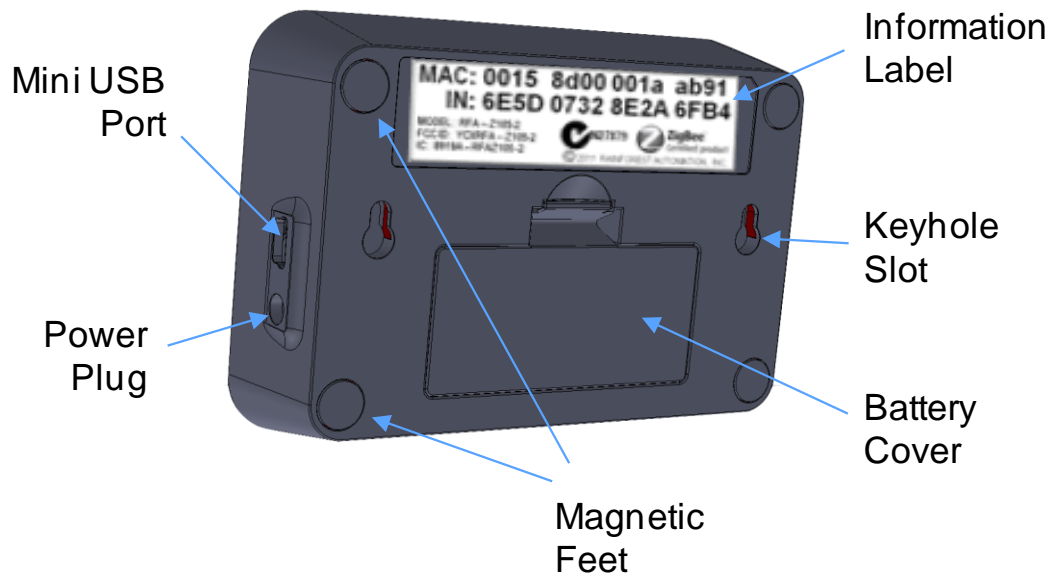


- e. Press the Bottom Button, and you will see the battery screen:



- f. Press any button to return to regular monitor mode. Your **EMU-2™** is ready to use.

Features of Your EMU-2™



Introduction to Your EMU-2™

Congratulations on getting an **EMU-2™**, the easiest way to get access to your smart meter energy information. This simple device tracks your energy usage for you, and makes you aware of your consumption – while it is happening. Just like your watch makes you aware of the time, and helps you stay on schedule, your **EMU-2™** will help you know when to take action to lower your utility bills and save energy.

Your **EMU-2™** is normally plugged into its AC Adapter, but it can also be powered by standard AAA batteries for short periods of time. This allows you to take your **EMU-2™** with you and see the results on-the-spot when major appliances are turned on or off.

Most of the time, your **EMU-2™** will be in Rest Mode. In this mode, the Display backlight will be off, but the Display can still be read. To put the unit into Active Mode, simply press one of the buttons, and the backlight will come back on. After 4 minutes of inactivity, your **EMU-2™** will automatically return to Rest Mode.

If you unplug your **EMU-2™**, so that it is powered only by the backup batteries, then the unit will run with the backlight off all the time, and will go into Sleep Mode after 2 minutes of inactivity. In Sleep Mode, the Display and the Indicator LED Lights will be off, but the **EMU-2™** will communicate occasionally with the smart meter. Pressing one of the buttons will wake the unit up, and the Display will come back on. Note that your **EMU-2™** is intended to be used with the AC Adapter plugged in; the batteries are not intended to last for long periods of time.

Your **EMU-2™** has two buttons that are used to make selections. By default, they are used to scroll through the different Display screens. The Top Button pages up, and the Bottom Button pages down. The screens are displayed in a circular sequence. Once you cycle through to the end of the sequence, the first screen is displayed again.



On some screens, the **EMU-2™** may need a response from you. For these screens the buttons will behave differently. The button functions will be indicated on the right side of the screen. When the **EMU-2™** presents you with options to choose from, pressing the

Top Button cycles through the different options to select, and pressing the Bottom Button saves the selected option and pages to the next screen.

Your **EMU-2™** communicates wirelessly with the smart meter to get usage information, and presents this information on the Display. The accumulated usage information is updated every 4 minutes while the unit is in Active Mode. If the electricity price per kWh is provided by the smart meter, the price is checked every 2 minutes.

Your **EMU-2™** checks every 2 minutes for a new text message from your utility. An envelope icon is shown in the upper left hand corner of the screen if there is an active message stored on your **EMU-2™**.

The quality of the wireless signal from the smart meter is indicated by the small bar graph in the upper right hand corner of the Active Mode screens. Four bars are shown for a good signal; fewer bars indicate a lower quality signal. If the connection to the smart meter is lost, a large “X” will replace the bar graph.

There are also a number of configuration screens. These are accessed by pressing and releasing both buttons simultaneously to put your **EMU-2™** into Configuration Mode. Note that your **EMU-2™** should have successfully connected to the smart meter before putting it into Configuration Mode.

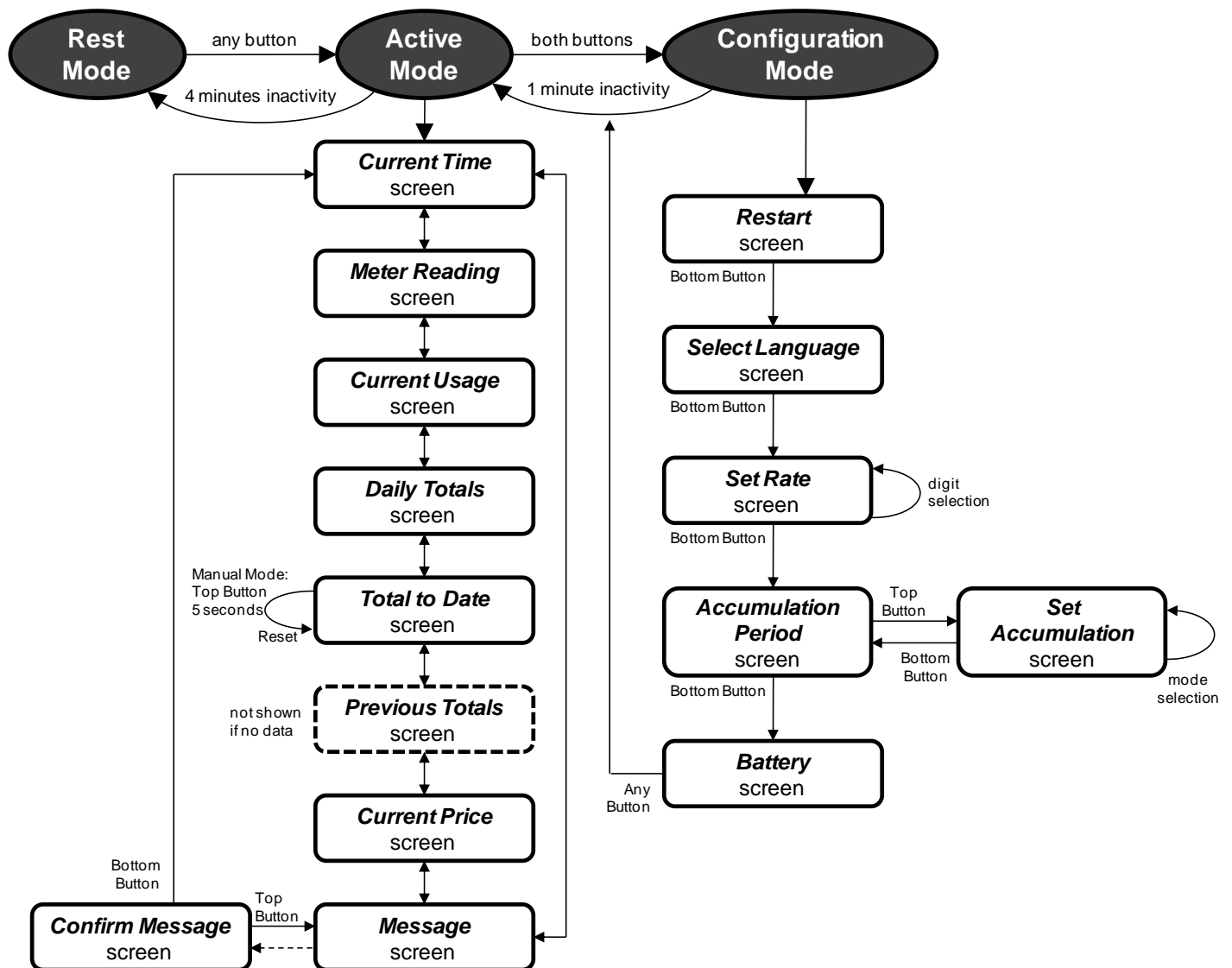
There are Indicator LED Lights to the left of the Display that various status conditions. Normally, the green LED should be on while the **EMU-2™** is in Active Mode and Rest Mode. When there is a new text message waiting to be read, the red and yellow LEDs will flash in an alternating pattern. If supported by the meter and your utility, the Indicator LED Lights will also indicate pricing levels.

The **EMU-2™** displays your immediate energy usage on the *Current Usage* screen. Use this screen like a speedometer for your home; it shows you how fast you are using energy right now. This screen reacts quickly to changes in electricity use, so you can observe changes in real time and see what a difference it makes when you turn electrical loads on and off.

Your **EMU-2™** also keeps track of your energy usage over time. The *Daily Totals* screen displays the total cost and usage, as well a graph of usage for each hour, for the previous day and the current day so far. This allows you to spot patterns in your daily electricity use, and to compare one day to the next.

The *Total to Date* and *Previous Totals* screens give you information about your energy consumption over longer periods of time. By default, they are set to record your accumulated usage each month, so the *Total to Date* screen shows your total usage so far this month, which you can compare to last month’s usage in the *Previous Totals* screen. You can use the *Set Accumulation* screen in Configuration Mode to switch the accumulation to manual, which allows you to start and stop your own custom accumulation periods – just like a stopwatch.

Screen Navigation Flowchart



EMU-2™ Display Screens

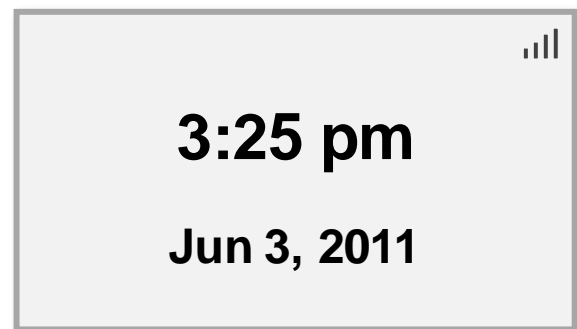
Startup

The *Startup* screen is shown when your **EMU-2™** is powering up for the first time.



Current Time

The *Current Time* screen shows the present time and date, as read from the smart meter. Your **EMU-2™** synchronizes its clock with the smart meter every 15 minutes.



Meter Reading

The *Meter Reading* screen shows the raw total accumulated electricity usage reading in kilowatt-hours from the smart meter.

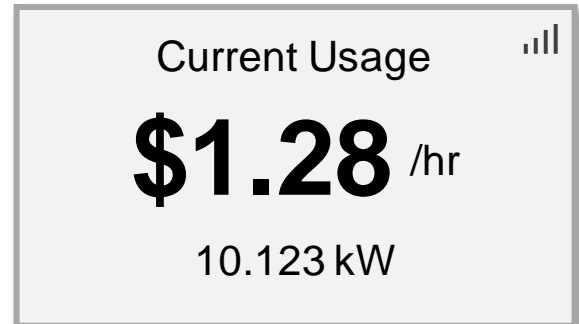
Your **EMU-2™** updates this data every 4 minutes while it is in Active Mode.

If you are generating your own electricity, and have a Net Metering agreement with your utility, then there may be times when you will be producing more energy than you are using, and electricity will flow out to the grid. In this case, the *Meter Reading* screen will show two totals: the amount of electricity delivered from the grid into your home (labeled "From Grid"), and the amount of surplus electricity you have delivered out to the grid (labeled "To Grid").



Current Usage

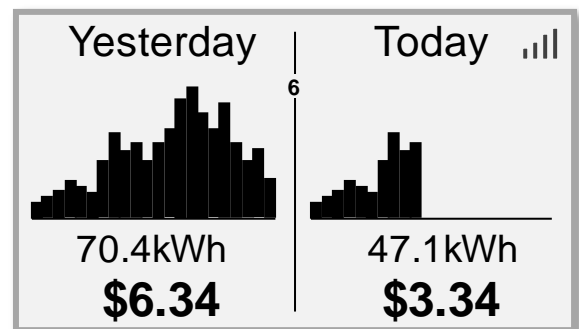
The *Current Usage* screen shows the rate of energy consumption and the estimated cost per hour in dollars (or cents, if it is less than one dollar). The estimated cost is calculated from the current price per unit multiplied by the current rate of energy consumption. The data is updated from the meter every 8 seconds while this screen is shown.



This is like the speedometer in your car; it shows you how fast you are consuming energy.

Daily Totals

The *Daily Totals* screen shows your accumulated totals in graphical and numerical format for energy consumption and estimated cost for the current day and the previous day. The current day ("Today") shows a running total from the start of the day (midnight) up to the present. At midnight, today's totals will be transferred to "Yesterday", and a new running total is started.



The graphs show hourly data, with a bar for each hour. The height of the bars is proportional to the number of kWh consumed for each hour. The graphs are auto-scaling, and meant to show relative, rather than absolute values. The small number near the top of the center line indicates the value (in kWh) of the highest bar in the graphs.

When you first start up your **EMU-2™**, there will be no Yesterday data, so you will dashes in the place of numbers until the end of the first day.

Total to Date

The *Total to Date* screen shows your accumulated totals for energy consumption and estimated cost for the current time period. The start date of the current time period is shown at the top of the screen. The number of elapsed days so far in this time period is shown in the upper right of the screen. The number of days is shown to the nearest one-tenth of a day. The cumulative energy consumption for the time period is shown as recorded by the smart meter. The estimated cost for the recorded energy consumption is shown in dollars (or cents, if it is less than one dollar), and is based on the current price value during the period. The average cost per day for the current time period is shown in the lower right of the screen.



This is like the odometer in your car; it shows you the total energy used so far.

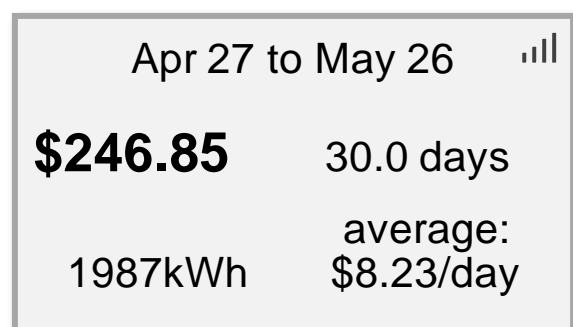
IMPORTANT: The **EMU-2™** displays the usage as recorded by the smart meter, and costs based on your input; these numbers may differ from what is shown on your actual utility bill.

The current time period is defined in the *Billing Dates* screen in Configuration Mode. At midnight on the Stop Date, the accumulated totals are saved and transferred to the *Previous Totals* screen, and the new current time period is started.

If the Start and Stop Dates in the *Billing Dates* screen are set to “manual”, then the current time period will run until it is manually reset. This is done by pressing and holding the Top Button for 5 seconds, which will save all of the accumulated totals in the *Previous Totals* screen, and restart all of the current counters from zero.

Previous Totals

The *Previous Totals* screen shows your accumulated totals for energy consumption and estimated cost for the previous time period. The start and end dates of the previous time period are shown at the top of the screen. The number of days in the previous time period (to the nearest one-tenth of a day)



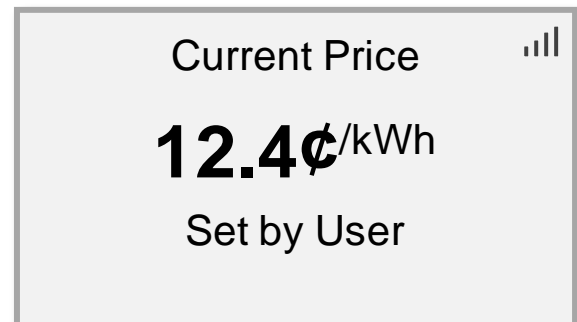
is shown in the upper right of the screen. The average cost per pay for the previous time period is shown in the lower right of the screen

This screen is overwritten with the values from the *Total to Date* screen each time the current time period is restarted. If the current time period has not been restarted at least once, then there will be no data values for this screen and it will not be displayed.

Current Price

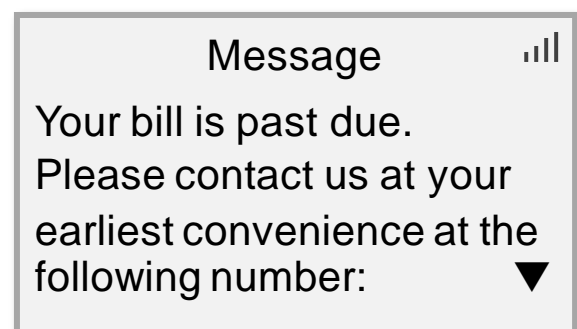
The *Current Price* screen shows the price of electricity that is currently in effect. The rate is shown in cents per kilowatt-hour. The current price is usually obtained from the value you manually set in the *Set Rate* screen. To manually set the current price value, simply press and release both buttons simultaneously. This will put you in Configuration Mode. Move through the *Restart* screen and *Select Language*

screen to get to the *Set Rate* screen, where you can change the current price value. This new value will become the current price, and the Rate Label will be displayed as “Set by User”. It is also possible to read the price directly from the smart meter. If you manually set the price to zero, and the meter supports this feature, then the **EMU-2™** will check the price with the meter every 2 minutes. If no price value has been set – either by the smart meter or manually – then dashes are shown for the price digits. For some utilities, the price can also be set by a special message sent to the meter by the utility. This message will be displayed as a text message on the *Message* screen, and the price will be automatically set. This will override any price value that has been set manually.



Message

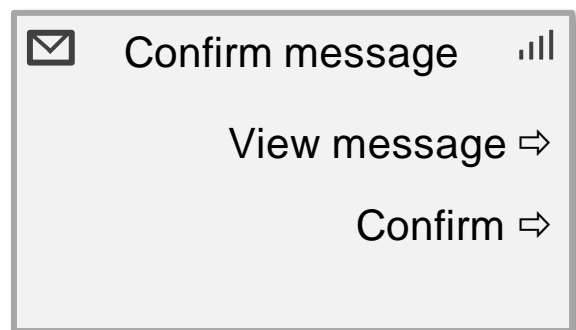
The *Message* screen will display a text message when there is a message from your utility. Your **EMU-2™** checks every 2 minutes for a new message. When a new message is received, the Indicator LED Lights will flash in a special red-yellow sequence to show that a new message is waiting for you to see. The envelope icon will also appear in the upper left hand corner of the screen to indicate that there is an active message. To see the message, use the buttons to go to the *Message*



screen, and the message will be displayed. A message can be up to 100 characters long. If the message is too long to fit on the screen, a continuation character (“▼”) will be shown at the end of the bottom line, and the message will automatically scroll up until the whole message has been displayed. Once the end of the message is reached, it will start again after a short pause. If the message requires an acknowledgment, you will automatically be sent to the *Confirm Message* screen. Viewing the message resets the Indicator LED Lights, but the envelope icon will remain on until the message has expired.

Confirm Message

The *Confirm Message* screen allows you to send a confirmation to your utility, telling them that you have read the latest text message that they have sent to you. If you wish to view the message again, press the Top Button, and you will be sent back to the *Message* screen. Once the message has been displayed, you will be returned to the *Confirm Message* screen. To send your confirmation, press the Bottom Button. You will then be sent to the *Current Time* screen.



EMU-2™ Configuration Screens

Restart

The *Restart* screen allows you to perform a device restart by pressing the Top Button. This will reboot your **EMU-2™** without losing the connection to the smart meter. To access this screen, press both buttons simultaneously, then release.

Pressing the Bottom Button sends you to the *Select Language* screen.



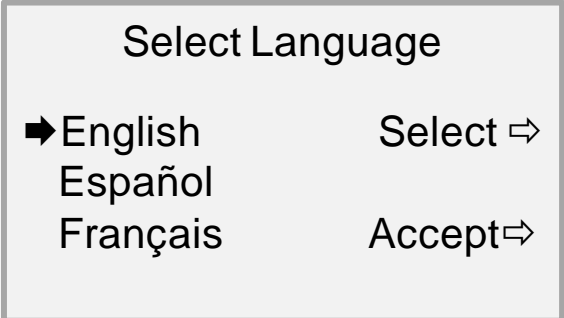
Restart?

Restart ⇨

Skip ⇨

Select Language

The *Select Language* screen is used to change the language displayed by your **EMU-2™**. This screen can only be accessed in Configuration Mode, after going through the *Restart* screen. To enter Configuration Mode, press and release both buttons simultaneously. Then press the Bottom Button to get to the *Select Language* screen. The currently selected language will have an arrow beside it. Press the Top Button to cycle between the different languages. Press the Bottom Button to save the selected language. You will then be sent to the *Set Rate* screen.

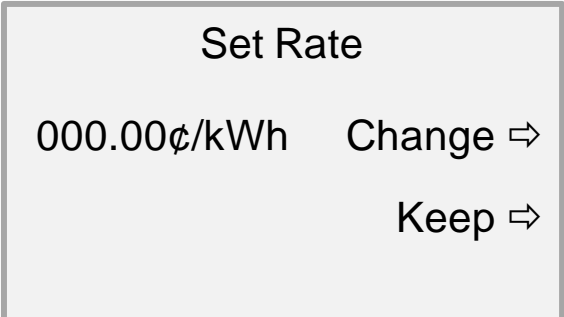


Select Language

➡ English	Select ⇨
Español	
Français	Accept ⇨

Set Rate

The *Set Rate* screen allows you to manually set the current price for electricity in cents per kWh. This screen can only be accessed in Configuration Mode, after going through the *Restart* and *Select Language* screens. The price shown will zero, unless it has been previously set in this screen. The rightmost digit of the price



Set Rate

000.00¢/kWh Change ⇨

Keep ⇨

will be flashing. To change this digit, press the Top Button and cycle through the numbers 0-9 until the desired value is displayed. Then press the Bottom Button to save this digit. The next digit to the left will then be flashing. Repeat the process until all five digits show the desired values. After the last digit is saved, your **EMU-2™** will go to the *Billing Dates* screen.

Accumulation Period

The *Accumulation Period* screen shows the start and stop dates for the current accumulation period that is displayed on the *Total to Date* screen. At the end of the stop date, the accumulated data is transferred to the *Previous Totals* screen, and the next accumulation period is automatically started.

This screen can only be accessed in Configuration Mode, after going through the *Restart*, *Select Language*, and *Set Rate* screens.

The default billing period is a simple monthly cycle, beginning at 00:00:01 on the first day of the month, and ending at midnight on the last day of the month. To change this setting, press the Top Button to get to the *Set Accumulation* screen. Otherwise, press the Bottom Button to go to the *Battery* screen.

Accumulation Period

Start	
Jan 01	Set ⇨
Stop	Skip ⇨
Jan 31	

Set Accumulation

The *Set Accumulation* screen allows you to set the mode for the current accumulation period displayed on the *Total to Date* screen. There are 2 modes: “Monthly” uses a simple calendar month for the accumulation period; “Manual” allows you to manually start and stop the accumulation period.

The current mode setting is shown in the lower left corner of the screen; it will be flashing. Press the Top Button to change the mode. Press the Bottom Button to save the setting and exit back to the *Accumulation Period* screen.

Set Accumulation

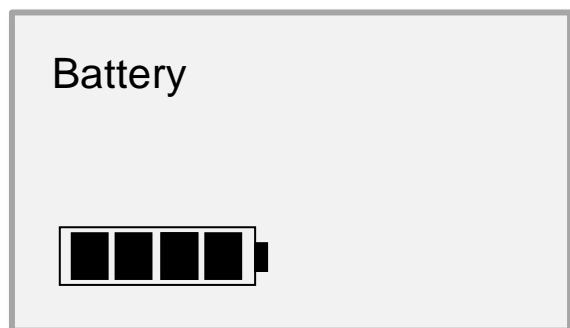
Enter Mode:	Change ⇨
Monthly	Keep ⇨

Battery

When your **EMU-2™** is running on battery power, the *Battery* screen indicates the charge level of the batteries. Four bars indicates the batteries have a good charge. Fewer bars indicate the battery charge is reduced. The batteries should be replaced if the *Battery* screen shows only one bar.

When your **EMU-2™** is powered by its AC adapter, the battery graph is replaced by the words “Plugged In”.

Pressing any button returns you to Active Mode.



Troubleshooting Guide

Generally, there are only 3 things that can go wrong with your **EMU-2™**:

1. The device stops working and needs to be restarted
2. There is no power to the unit
3. The device cannot connect to the smart meter

If the screen is dark and the unit does not respond to button presses, then either there is a problem with power (see Step 2 below), or the unit requires a restart (see Step 1).

If the wireless link bar graph in the upper right corner of the screen is down to 1 bar, or has been replaced by an “X”, then your **EMU-2™** is having trouble connecting to the smart meter (see Step 3).

Step 1. Restart the EMU-2™

If the **EMU-2™** screen is not displaying anything, and it does not respond to button presses, then try restarting the unit.

To restart your **EMU-2™**:

- a) Remove the batteries, if installed
- b) Unplug the power plug
- c) Wait 10 seconds
- d) Plug the power plug back in
- e) Check the display to verify **EMU-2™** is working

Step 2. Check the Power

If the **EMU-2™** is not responsive, and restarting it has no effect, check to see if the AC Adapter is working correctly. This can easily be done by unplugging the unit and installing new batteries. If the **EMU-2™** works with the batteries, then the AC Adapter is probably faulty.

Notes on Battery Replacement

Your **EMU-2™** uses 2 AAA batteries for short-term alternative power. To ensure a trouble-free battery operation:

- a) Replace the batteries when the battery indicator shows 1 bar.

- b) Replace all batteries at the same time with **new** batteries.
- c) Use new batteries with a current **best before date**.
- d) Do not use rechargeable batteries unless they are marked as 'rechargeable alkaline' and have a rating of 1.5V.

Step 3. Check the Smart Meter Connection

The wireless connection between your **EMU-2™** and the smart meter can be disrupted for a variety of reasons.

Try the following:

- a) Move the **EMU-2™** to a different location that is closer to the smart meter.
- b) Move the **EMU-2™** away from wireless routers, cordless phones, microwave ovens, or large metal objects.
- c) Try different areas of your house and different orientations in each room until you find one that works.

If there is a power outage in your neighborhood at the moment, please wait until power is restored and try again.

Technical Support

Contact us at: www.rainforestautomation.com/support